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ACAD. S.Yu. YUNUSOV INSTITUTE OF THE CHEMISTRY
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INTERNATIONAL SCIENTIFIC
CONFERENCE

Actual Problems of the Chemistry of Natural Compounds

ABSTRACTS

March 15–16, 2023
Tashkent

CONFERENCE TOPICS

1. Chemistry, biology, pharmacology, and technology of natural compounds and their derivatives.
2. Successes and problems of creation of new drugs.

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Acad. S.Yu.Yunusov Institute of the Chemistry of Plant Substances,
77, Mirzo-Ulugbek Str., Tashkent, 100170, Uzbekistan

PLENARY
PRESENTATION

TARGETED AGENTS FOR CANCER DIAGNOSTICS AND THERAPY

Sergey Deyev

Shemyakin & Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Moscow, Russia

Oncoteranostics (therapy + diagnostics) is a discipline that combines the diagnosis of a malignant neoplasm and personalized treatment of a patient, represents a promising medical strategy. It is based on accurate diagnostics of molecular targets of pathogenic cells and targeted exposure to them to ensure high selectivity of antitumor therapy. The teranostics approach is currently one of the most dynamically developing areas in the cancer treatment. The latest advances in the fields of genetic engineering and nanobiotechnology allow us to realize the concept of creating multifunctional structures that combine the functions of detection and therapy of pathology lesions, and it also becomes possible to monitor treatment.

Our recent results [1-14] on design of targeted agents with important types of anticancer compounds including radionuclide, photosensitizers, biological toxic principles as well as of nano-vehicle (liposomes, MOF, PLGA nanoparticles, luminescent UCNP upconversion nanoparticles) will be reviewed. The obtained results show promise for effective combined oncotherapy leading to prospective translation to clinical practices.

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THE USE OF NATURAL SUBSTANCES OF PLANT ORIGIN FOR THE PRODUCTION OF PROMISING ANTIBACTERIAL DRUGS

Pavel A. Nazarov, Marina V. Karakozova

Belozersky Institute of Physico-Chemical Biology, Lomonosov Moscow State University, Moscow, Russia

Antibiotic resistance is a global problem of modern medicine. Multidrug resistance (MDR) pumps, involved in the formation of resistance to xenobiotics, the export of toxins, the maintenance of cellular homeostasis, and the formation of biofilms and persistent cells, are the keystone of bacterial protection against antibiotics. MDR pumps are the basis for the nonspecific protection of bacteria. Thus, the nonspecific protection of bacteria formed by MDR pumps is a barrier that prevents the penetration of antibacterial substances into the cell, which is the main factor determining the resistance of bacteria. Plant extracts are promising sources of new antimicrobials. The key aspect is the penetration of antibacterial substances of plant origin into the bacterial cell through the protective barrier from the MDR pumps.

In this paper, we investigate the role of MDR pumps in protecting bacteria from antibiotics containing components of plant origin in order to elucidate the principles of selection of such compounds by MDR pumps. We tested various compounds such as berberine, plastoquinone, palmatine, carvone and limonene for gram-positive and gram-negative bacteria. We also used well-known antibiotics and antibacterial agents, such as chloramphenicol, triphenylphosphonium derivatives, rhodamine derivatives. We analyzed various deletion mutants for MDR pumps and established the role of pumps in biofilm formation and, at the expense of pumps, in protecting bacteria from antibiotics and herbal substances.

We compared the antimicrobial action of antibiotics and herbal substances Gram-negative bacteria E. coli by using standard 2-fold broth microdilution assays in identical conditions. We used various sub-lethal concentrations and incubation times with antibiotics and herbal substances to determine which pumps are influencing biofilm formation. To assess how compounds affect biofilm formation we evaluated the effects of a substances on biofilm formation as a change in the ratio of planktonic and sessile forms of bacteria by means crystal violet staining. To determine the number of surviving cells in the biofilm, we determined the CFU for each mutant by the MDR pump, which differed from the wild type in activity.

The originally floating form of the bacteria has evolved into a fully sessile biofilm form under pressure of some herbal substances. Moreover, in the form of a biofilm, a slow growth of bacteria was observed, which confirmed our assumption about the survival of bacteria due to the growth of the bacterial population in the composition of the biofilm. It is interesting that a number of substances were not recognized by MDR pumps, which suggests the presence of plant molecules "invisible" to bacteria that could be used in antibiotic therapy.

This research was funded by Russian Science Foundation (RSF) grant 22-15-00099.

SARS-COV-2: NEW DEVELOPMENTS FOR PREVENTION AND DIAGNOSIS

Sh. Azimova, S. Sasmakov, F. Eshboev, J. Abdurakhmanov, O. Ashirov, Sh. Khasanov, A. Makhnyov, Kh. Nasriddinov, A. Boymirzaev, M. Umarova, E. Yusupova, G. Piyakina, U. Khamidova, S. Gaynazarova, T. Sadullaev, A. Yarilkaganova, S. Ikramov, Kh. Dolimov, O. Alimukhamedova, N. Tosheva, D. Mansurov, E. Lysova, E Terenteva.

Acad. S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan

SARS-CoV-2 (severe acute respiratory syndrome-related coronavirus 2) is a single-stranded (+) RNA containing virus. Currently used vaccines mainly targets the receptor-binding domain (RBD) of the surface S (spike) protein of virus. However, the largest number of mutations is found in the spike protein of the coronavirus, for example, in the last widespread strain Omicron (SARS-CoV-2 B.1.1.529), there are more than 30 of mutations. It was established that N protein (Nucleocapsid) of SARS-CoV-2 is highly conserved and antigenic regions of the N protein are recognized by T cells on the surface of infected cells, which indicates the role of the N protein in generating not only the primary humoral (B), but also the cellular (T) immune response to infection of SARS-CoV-2. In this regard, the SARS-CoV-2 Nucleocapsid (N) or its combination with the S protein may be the most suitable candidate for the development of effective vaccines.

For developing vaccine to the SARS-CoV-2 we have used different regions of Spike. 14 new recombinant plasmids encoding S proteins (Spike1259, Spike906, Spike1020, Spike2136, Spike3820), Omicron-RBD, and nucleocapsid (N) were cloned for expression systems *Pichia pastoris* and *Bombyx mori* baculoviruses/insect cells.

The effective expression of recombinant Spike proteins (subunits), Omicron-RBD and nucleocapsid (N) in *Pichia pastoris* yeast cells were confirmed by PCR, ELISA, and Immunoblotting. The optimal conditions for cultivating of recombinant strains of *Pichia pastoris* were selected.

Recombinant baculoviruses expressing target SARS-CoV-2 genes (Spike 1259, 906, 2136 and Nucelocapsid N) were obtained on the basis of nuclear polyhedrosis virus of *Bombyx mori* (BmNPV). Synthesis of target recombinant proteins in larvae (silk worm) was determined by ELISA.

Methods for isolation and purifying of target recombinant proteins have been developed.

The results of the study on immunogenicity in laboratory animals (mice) for recombinant proteins Omicron-RBD, Nucleocapsid N SARS-CoV-2 and their combination showed high efficiency and safety.

For the prevention of SARS-CoV-2 infection were developed new drugs - combinations based on RNase and RNase/Niclosamide included in a liposome. The safety of developed drug confirmed by the studies on laboratory animals. According to the results of studies, the effectiveness of the drug in reducing the viral load by more than 1000 times it was established.

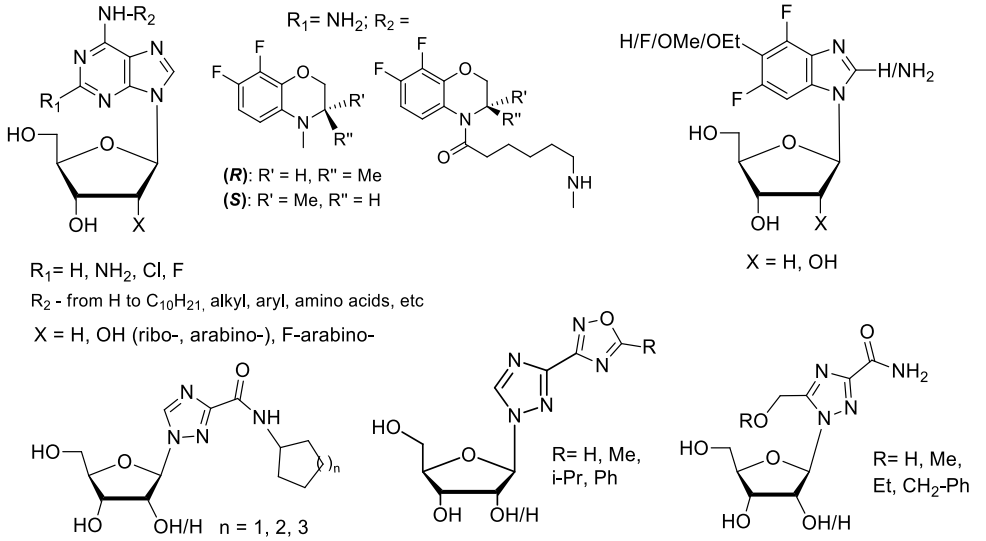
For determination of SARS-CoV-2 coronavirus RNA was developed a PCR diagnostic kit using hybridization-fluorescence detection. The sensitivity of PCR kit is at least 50 copies of coronavirus RNA in a PCR sample. The specificity of the PCR assay is 100%. Moreover, a set of reagents "ENCOR" for the extraction of nucleic acids (DNA/RNA) from biological samples such as blood plasma, swabs and scrapings of human mucous membranes in order to diagnose infectious diseases (SARS-CoV-2, HBV, HCV, HIV, TORCH, and etc.) was designed. The “SARS-CoV-2 PCR DETECT” diagnostic kit and set of reagents "ENCOR" were registered with the Ministry of Health of the Republic of Uzbekistan (Registration certificates TB/M 00585/08/22 and TB/M 00397/06/20).

E. coli PURINE NUCLEOSIDE PHOSPHORYLASE: IS THE SYNTHESIS OF MODIFIED NUCLEOSIDES ALWAYS REGIOSELECTIVE?

Irina D. Konstantinova, Ilya V. Fateev, Vera D. Knorre, Roman S. Esipov, Anatoly I. Miroshnikov

Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Miklukho-Maklaya St. 16/10, 117997, Moscow B-437, Russian Federation.

E. coli purine nucleoside phosphorylases (PNP) are often used in the enzymatic synthesis of modified nucleosides. It is known that the transglycosylation reaction is characterized by high stereo- and regio-selectivity and is environmentally friendly. PNP has a wide substrate specificity: it effectively glycosylates various purines, benzimidazoles, and 1,2,4-triazoles. Carbohydrate residues of the natural D-configuration are represented by ribose, 2-deoxyribose, arabinose, 2-deoxy-2-fluoro-arabinose, etc. The conversion of a base into a nucleoside depends on complexity of substituents and the type of carbohydrate fragment and can reach 95%.



Thermodynamically unfavorable N7 isomers of natural adenosine and guanosine appear in the transglycosylation reaction. The process of their transition to natural N9 isomers was described more than 20 years ago. We found that the synthesis of N9-modified nucleosides proceeds regioselectively with purines having amino groups in the C2 or C6 positions of purine or if there is a bulky substituent in the C6 position of purine. In the case of substituted benzimidazole, a mixture of N1- and N3-regioisomers is always formed in transglycosylation reaction. In synthesis of 1,2,4-triazole nucleosides the glycosylation regioisomerism by N1 atom is preserved in 99% of cases. We observed only one case of formation of both N2 and N4 regioisomers in the reaction. The largest number of errors was found in synthesis of nucleosides in the case of glycosylation of fleximer heterocyclic bases in which the purine and pyrrole/pyrazole rings are separated by a single C-C bond. Namely in enzymatic synthesis of fleximer nucleosides we detected nucleosides with two carbohydrate residues.

CHEMICAL STUDY OF TERPENOIDS AND PHENOLIC COMPOUNDS OF PLANTS USED IN FOLK MEDICINE OF UZBEKISTAN

E. Kh. Botirov

S.Yu. Yunusov Institute of the Chemistry of Plant Substance, Academy of Science of the Republic of Uzbekistan, 100170, Tashkent, 77 M. Ulugbek str.,
e-mail: botirov-nepi@mail.ru

In the laboratory of chemistry of terpenoids and phenolic compounds of the Institute of Chemistry of Plant Substances of the Academy of Sciences of the Republic of Uzbekistan, fundamental research work is being carried out to study terpenoid and phenolic compounds of plants used in folk medicine in Uzbekistan and have not passed the necessary verification by means of modern pharmacology, developing methods for their isolation, establishing the chemical structure, study of the relationship between structure and biological activity.

The purpose of the ongoing research is to create scientific foundations for the development of drugs with adaptogenic, hepatoprotective, hypolipidemic, anticoagulant, antioxidant, neurotropic, antihypoxic and anti-inflammatory properties. A chemical analysis of terpenoids and phenolic compounds of previously unexplored or poorly studied plants of the families *Asteraceae, Apiaceae, Fabaceae, Polygonaceae, Lamiaceae, Geraniaceae* was carried out, rich natural sources of terpenoids and phenolic compounds were identified.

More than thirty plant species have been studied, of which 80 substances have been isolated, including 7 new natural compounds. Establishment of the structure and identification of isolated substances was carried out using modern physical and chemical methods (UV-, IR-, ^{1}H and ^{13}C NMR spectroscopy and X-ray diffraction analysis).

The results of the ongoing research expand the field of fundamental knowledge about terpenoids and phenolic compounds of plants of the flora of Uzbekistan and will serve as a scientific basis for the creation of new effective natural preparations for medicine and the national economy.

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CHEMICAL PROFILE AND BIOLOGICAL ACTIVITIES OF KAZAKHSTANI ARTEMISIA SPECIES

Prof. Dr. Janar Jenis

[1]*The Research Center for Medicinal plants, Al-Farabi Kazakh National University, 050040, Almaty, Kazakhstan*
[2] *Research Institute for Natural Products & Technology, Almaty 050046, Kazakhstan;*
janarjenis@kaznu.kz

Artemisia species has a great economic and medicinal perspective due to the fact of the isolation of artemisinin, which is the main phytochemical of *Artemisia annua* L. represented as antimalarial drug. This research encouraged researchers all over the world to study traditional plants with the purpose of finding new bioactive medicines. The *Artemisia* L. species are potential sources of unique and new natural products, new chemical structures and displaying diverse bioactivities, leading to development of safe and effective phytomedicines against prevailing diseases in Kazakhstan and Central Asia region. The genus is represented in Asia in Kazakhstan, with 81 *Artemisia* species, 19 of them endemic. According to the literature, among 260 *Artemisia* species revealed, various classes of secondary metabolites were shown including lignans, sesquiterpenoids, flavonoids, coumarins, glycosides, caffeoylquinic acids, sterols, and polyacetylenes. Terpenes, particularly sesquiterpene lactones, which are typical for *Artemisia*, are extremely diverse and plentiful, which exhibit a wide range of therapeutic effects: anticancer, antimalarial, anti-inammatory, immunomodulatory, antiulcerogenic, antibacterial, antifungal, and antiviral. Many species of *Artemisia* genus as *A. rupestris*, *A. frigida* Willd., *A. annua* L., *A. lavandulaefolia* DC. have been described in The Kazakh Herbal Medicine (2012), and widely used in TKM (Traditional Kazakh Medicine) for the treatments of influenza, liver diseases, diarrhea, wounds, beriberi, tuberculosis, nervous disorders, to regulate pressure, weaken the processes of joint swelling, as well as for headaches and toothaches.

In our team recent study, the aim to search promising, potential active *Artemisia* species candidates, stimulating us to analyze PTP1B, α-glucosidase and BNA inhibition as well as antioxidant potentials of *Artemisia* plant extracts in which mostly endemic species have not been explored their secondary metabolites and biological activities so far. The main result of study was that for the first time among all species *A. scopaeformis*. *A. albicerata*., *A. transiliensis*, *A. schrenkiana*, *A. nitrosa* Weber and *A. albida* due to their special metabolites, showed has a high potential to α-glucosidase, PTP1B and BNA inhibition which associates with diabetes, obesity, and bacterial infections. Thus, our results would contribute to human health benefits of *Artemisia* species, based on inhibition of enzyme inhibitions. In general, phenolic contents were correlated with those of flavonoid and biological activities. The methanol extracts of these *Artemisia* species exhibited considerable high antioxidant activity. The presence of phenolic compounds in our extracts should be the main cause of its high antioxidant power. However, it is necessary that the examination of details between different *Artemisia* species in our research has shown that other species also good materials for the antioxidant functional natural source.

STUDY ON THE DITERPENOID ALKALOIDS OF *Delphinium* AND Aconitum GROWING IN CENTRAL ASIAN

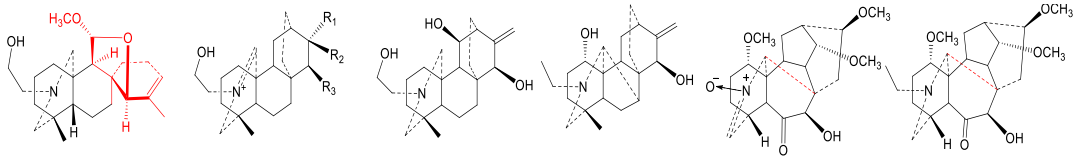
Bo-Zhao[a], Wen-juan Xue[a], Nurfida Ablajan[a], Ah. Samanbay[a], Jiang-yu Zhao[a], S. A. Zairovich[b], Sh. Sh. Sagdullaev[b], and H. A. Aisa[a]*

[a] State Key Laboratory Basis of Xinjiang Indigenous Medicinal Plants Resource Utilization, Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Urumqi 830011, China;
[b] S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan

Diterpenoid alkaloids, a group of structurally complex natural products displaying a wide range of interesting chemical properties and biological activities, were widely distributed in the genera of *Aconitum* and *Delphinium*, one of the characteristic resources in Central Asia. Four diterpenoid alkaloids, lappaconitine, 3-acetyaconitine, crassiculine A and guan-fu base A, have been used as medicaments in clinical for treatment pain and arrhythmia. The genera *Aconitum* and *Delphinium*, rich in diterpenoid alkaloids, are one of the characteristic resources in Central Asia.

Relying on the Joint Laboratory for Preparation Technology and Quality Standards of Medicines which was jointly established by the Central Asian Drug Discovery and Development Center of the Chinese Academy of Sciences and the Institute of Chemistry of Plant Substances of Uzbekistan Academy of Sciences, the extraction, isolation, structure identification and biological activity screening of diterpenoid alkaloids from *Aconitum* and *Delphinium* growing in Central Asia were carried out, such as *Aconitum barbatum var puberulum*, *Delphinium pseudoaemulans*, *Delphinium naviculare* var. *lasiocarpum*, *Delphinium aemulans, et al.*

As a result, 207 diterpenoid alkaloids were isolated, 48 of which were new compounds and 1 was new skeleton compound. Some compounds were found to have good antiarrhythmic, cytotoxicity and antibacterial activities. 16 articles have been published in SCI journals such as Phytochemistry, Phytochemistry Letters and Chemistry of Natural Compounds. 2 patents have been applied for, including an international PCT patent. 3 PhD students and 1 master student have been trained.



New diterpenoid alkaloids from *A. barbatum var. puberulum*

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CONVENTIONAL CROPS BYPRODUCTS AS SUSTAINABLE RAW MATERIALS FOR NOVEL PHARMACEUTICAL AND NUTRACEUTICAL PRODUCTS

Nazım Sekeroglu[1,3]* & Sevgi Gezici[2]

[1]Gaziantep University, Faculty of Science and Literature, Department Biology, 27310, Gaziantep- Türkiye
[2]Gaziantep University, Faculty of Medicine, Department of Medical Biology, 27310, Gaziantep- Türkiye
[3]Phytotherapy and Medicinal-Aromatic Plants Application and Research Center (GAUN-FITOTABAUM), Gaziantep University, 27310 Gaziantep-Türkiye
**Corresponding Author: nazimsekeroglu@gantep.edu.tr ; nsekeroglu@gmail.com*

Medicinal and Aromatic Plants (MAPs) are of important raw materials for the production of novel pharmaceutical and nutraceutical products. Besides these special plants, byproducts which are residues of conventional crops are important raw materials in natural products production. These sustainable byproducts; the seeds (grape, pomegranate, fig, pepper, tomato), kernels (olive, date, cherry, melon, sweet melon), fruit stalks (cherry), fruit peels (pomegranate, citrus, apple) and other parts of the conventional crops. These sustainable organic ingredients are byproducts of the conventional crops and have been used in traditional food recipes and folk medicine for centuries. Therefore, new natural products can be produced from these residues that offer environmental, social and economic advantages thanks to their reuse. Recently, scientific studies have rediscovered these materials with their rich phytochemical constituents. The seeds and kernels covering the seeds contain fatty oils rich in unsaturated fatty oils, which are rare ones. In this context, nervonic acid, a unique fatty acid, in the olive kernels was firstly reported by Sekeroglu and Gezici. Besides fatty oils, these plant residues may also contain other phytochemicals like essential oils, alkaloids, glycosides, tannins, flavonoids. While the grape seeds with distinguished phytochemical constituents have been widely used for pharmaceutical and nutraceuticals products, pomegranate seed fatty oil with punicic acid (also called trichosanic acid) content have also recently been started to use in cosmeceuticals, recently. Moreover, fig seed fatty oil, a new source of omega-3 and gamma tocopherol, have been rediscovered recently and started to be used in cosmetic and pharmaceutical industries. Besides its fatty oils, whole seeds and kernels have been included in traditional food mixtures and traditional herbal coffees throughout long human history. Melon and water melon seeds have been used for the breakfast za'atar in the southern part of Türkiye and in Arab countries, while date kernels have been used for a traditional date kernel herbal coffee (Café de noyaux de dattes) in the northern Africa. Moreover, a novel herbal coffee has been produced by Sekeroglu and Gezici from olive kernels, which are mainly used as a source of heating energy by burning. In the folk medicine, olive kernels are being swallowed for their gastrointestinal disorders and other health benefits in the southeastern part of Türkiye. Olive kernel coffee contains some medicinal plants and spices that have a good non-caffeine healthy functional beverage. In addition to their traditional uses, many plant residues as natural sustainable byproducts are waiting to be rediscovered for human welfare and zero waste in fighting the climate crisis on the worldwide.

ON THE PHARMACOLOGICAL ACTIVITY AND PROSPECTS FOR THE PRACTICAL USE OF 1-ARYL-1,2,3,4-TETRAHYDROISOQUINOLINES

F.M.Tursunkhodjaeva, A.A.Azamatov, Sh.N.Zhurakulov, V.I.Vinogradova

Institute of Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, ftm40438@gmail.com

The 1,2,3,4-tetrahydroisoquinoline (THIQ) derivatives have been reported to possess a wide range of pharmacological activities like anti-inflammatory, anti-bacterial, anti-viral, anti-fungal, anti-leishmanial, anti-cancer, anti-malarial, anti-Alzheimer, antiparkinsonian, antidepressant, anticonvulsant, antiarrhythmic, hypotensive and hypertensive, and inhibiting NO production. Some of the THIQ analogs are used clinically: Praziquantel (antihelmintic), Quinapril (antihypertensive), Apomorphine (Antiparkinsonian), Tubocurarine (skeletal muscle relaxant), Trabectedin (anticancer) and others.

We have investigated 1-aryl-1,2.3.4-THIQ derivatives synthesized at the Institute of the Chemistry of Plant Substances, Uzbekistan. Among 32 studied substances we have identified potent substances with local-anesthetic, analgesic, anti-inflammatory, antiarrhythmic, antihypoxic, psychotropic, antioxidant and anticonvulsant activity.

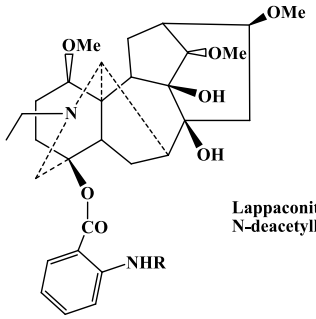
Structure-toxicity and structure-activity relations were analyzed.

ANTIARRHYTHMICS BASED ON DITERPENE ALKALOIDS. CREATING AN INJECTION FORM

M.S. Yunusov, E.M. Tsyrlina, S.P. Ivanov, T.M. Gabbasov, S.G. Yunusova

Ufa Institute of Chemistry, UFRC RAS, Russian Federation, 450054, Ufa, ave. October, 71, e-mail: msyunusov@anrb.ru

The hydrobromic salt of lappaconitine by name "Allapinin" was introduced into medical practice as an antiarrhythmic agent in 1987.



Lappaconitine R=COMe
N-deacetyllappaconitine R=H

The drug allapinin was approved for use, both in tablet and ampoule (injection) form. However, intravenous use of the drug was not widely used due to the late onset of the therapeutic effect and adverse cardiac effects. N-deacetyllappaconitine (DAL), the main metabolite of the drug allapinin, unlike the latter, realizes its antiarrhythmic effect in a significantly lower dose, is less toxic, surpasses allapinin in the speed of development of the antiarrhythmic effect. The most acceptable dosage form of DAL is the monohydrochloride of N-deacetylappaconitine (DAL•HCl).

DAL•HCl, as well as allapinin, inhibits Na+ currents. Unlike allapinin, DAL•HCl also exhibits the properties of a K-channel inhibitor and, according to its electrophysiological characteristics, can be attributed to antiarrhythmics combining the properties of 1C and III classes according to the Vaugham-Williams classification.

The concentrations of DAL•HCl, which effectively inhibit Na+ channels, are approximately 20 times less than those for allapinin. These data seem to be quite important, since DAL•HCl is not only active in significantly lower concentrations, but also less toxic than allapinin, which suggests that in the case of its potential use in the clinic, the spectrum of side effects of DAL•HCl will be significantly less than that of allapinin.

The study of the basicity of two DAL nitrogen atoms showed, that in the pH range 6-7, the nitrogen atom of the piperidine ring is protonated, and in the range pH 2-3 the nitrogen of the aromatic group is protonated. Given the data obtained, it is obvious that the stable form, especially in aqueous solutions, can only be a mono-salt of DAL. The conditions for the analysis of DAL by HPLC have been developed.

Thus, these data suggest that DAL can serve as a basis for obtaining a new effective antiarrhythmic agent in injectable form.

OVER TEN YEARS RESEARCH WITH SARACURA MIRÁ: *AMPELOZIZYPHUS AMAZONICUS* THE BRAZILIAN ADAPTOGEN FROM THE AMAZON

Suzana Guimarães Leitão[1]

[1]Faculdade de Farmácia, Departamento de Produtos Naturais e Alimentos, Universidade Federal do Rio de Janeiro, CCS, Bl. A, Ilha do Fundão, 21.941-902, Rio de Janeiro, Brazil.
sgleitao@pharma.ufrj.br

Ampelozizyphus amazonicus Ducke (Rhamnaceae) is an Amazonian medicinal plant popularly known as "saracuramirá" or "cervejade-índio" that is found in the Amazon forest territories, occurring in Brazil in the States of Amazonas, Pará, and Roraima [1]. An aqueous drink with reported tonic and antimalarial properties can be prepared from the bark and roots of the plant [1]. Ethnopharmacological studies indicate both stimulatory and energetic properties for *A. amazonicus*. Due to the growing interest in dietary supplements with adaptogen properties, our research group engaged in the study of its immunomodulatory properties, its chemistry and its biotechnological applications. The water extract from the barks was spray dried without drying adjuvants, resulting in a powder (SARF), which was characterized by its physicochemical properties and proximate, mineral and saponin contents [2,3]. The effect of SARF on the immune response was investigated which confirmed that SARF possesses immunomodulatory properties, inducing an in vivo modification of the B lymphocyte response and an increase in the basal levels of anti-ovalbumin, anti-LPS and anti-dextran IgM antibodies [2,3]. The SARF saponins were isolated into different groups by countercurrent chromatography (CCC) and characterized by off-line ultra-high-performance liquid chromatography/high resolution accurate mass spectrometry (HPLC-HRMS^n) analysis [4]. More recently, we initiated the study of a water extract from the woods, which are discarded in the traditional process of beverage preparation, but generate saponin-rich extracts as well. A methodology developed to dereplicate aqueous extracts from both bark and wood by high resolution (HRMS) precursor and tandem mass spectrometry (MS/MS) will be discussed. Taken together, these results suggest that SARF could be an interesting new functional ingredient for food applications or pharmaceutical products.

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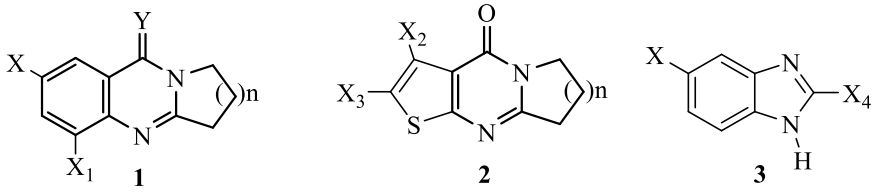
TARGETED SYNTHESIS AND MODIFICATIONS OF QUINAZOLINE ALKALOIDS AND THEIR ANALOGUES

A.U. Berdiev, U.M. Yakubov, B.Zh. Elmuradov*

Institute of the Chemistry of Plant Substances, Academy of Sciences, Republic of Uzbekistan, 100170, Tashkent, Mirzo-Ulugbek str., 77.
**E-mail: b_elmuradov@mail.ru*

Quinazolines are considered an attractive target for medicinal chemists, because they are the scaffold of several potent antitumor drugs. Leading examples are the well-known *erlotinib* and *gefitinib*. There are among of the new annelated imidazoles and pyrimidines some highly effective compounds, which were selected by the National Cancer Institute (NCI) for the treatment of different types of human cancer cell lines, also useful lead compounds in the search for powerful dual anticancer-antimicrobial agents. Some benzopyrimidines possessed remarkable broad-spectrum antitumor activity which was almost fifteen-fold more active than the known drug 5-fluorouracil [1-3]. In this present work, targeted synthesis and modifications of quinazoline alkaloids (**1**) and their perspective heterocyclic analogues (thienopyrimidines, **2** and benzimidazoles, **3**), also new organometallic alkaloid-ferrocene hybrid molecules (**4**) consisting different electron donating and electron withdrawing groups will be discussed [4-6]:



1: X, X_1=H, Br, NO_2, NH_2; Y=O, S; **2**: X_2, X_3 =alkyl, cycloalkyl;
3: X=Cl, X_4=alkyl; n=1-3.

Results of the influence of π-deficient and π-excessive rings, catalysts, synthesis of the novel potent active compounds, reactions with electrophilic and nucleophilic reagents, and formation of cross-coupling (Suzuki coupling) products, *mono*- and *double* - condensation products from ferrocene(di)carbaldehydes will be discussed.

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Anti-inflamatuvar and Apoptotic DNA Fragmentation Activities of White Pitaya Fruit Extracts Against Human Colon Cancer Cells

Sevgi Gezici[a*], Nazim Sekeroglu[b]

[a] *Department of Medical Biology and Genetics, Faculty of Medicine, Gaziantep University, 27310, Gaziantep-Türkiye,*
E-mail: drsevgigezici@gmail.com; sevgigezici@gantep.edu.tr
[b] *Department of Biology, Faculty of Science and Literature, 27310, Gaziantep University, Gaziantep-Türkiye,*
E-mail: nsekeroglu@gmail.com, nazimsekeroglu@gantep.edu.tr

The use of traditional and complementary medicine practices has become increasingly important in the world, especially for cancer, diabetes, and neurodegenerative diseases. Dragon fruit, also called pitaya, is a tropical plant and belongs to the cactus family (Cactaceae). Dragon fruit usually grows in tropical forests. Mexico, South America, Thailand and Vietnam are the homeland of this fruit. The fruits of the genus Hylocereus are called sweet pitaya. The skin color and the fruit's inside varies depending on the species. The skin can be red or yellow, and the fruit can be purple, red, or white. The genus Hylocereus generally includes three species: (1) *Hylocereus undatus* (white pitaya), (2) *Hylocereus costaricensis* (Costa Rican pitaya), (3) *Hylocereus megalanthus* (yellow pitaya). These fruits have a nutritional content particularly rich in active secondary metabolites, giving them pharmacological properties. In this study, *H. undatus* fruits were extracted with distilled water (dH_2O), ethanol (EtOH, 70%) and methanol (MeOH, 70%). The aim was to determine the cytotoxic and anti-inflammatory activities mediated by apoptosis and necrosis pathways of the extracts. In this context, 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) analysis was performed to investigate anti-cancer potential of the extracts against human colon adenocarcinoma (HT29), colon (HCT-116), and colorectal adenocarcinoma (SW480) cells. The anti-inflammatory capacities of various extracts of dragon fruit against cyclooxygenase enzymes (COX-1 and COX-2) were investigated using the COX inhibitor kit. Doxorubicin and ibuprofen were used as positive controls to determine the anti-cancer and anti-inflammatory activities, respectively. All conditions and chemicals were the same as described in our previous research. In addition, apoptotic activity in the cells treated and untreated with the fruit extracts was analyzed in terms of DNA fragmentation using the 'Apoptotic DNA-Ladder Kit'. All experiments were performed at least in triplicate, and linear regression analysis was performed to calculate IC_{50} values for each cell line. The results showed that white pitaya fruits are able to induce growth inhibition and apoptosis. MTT and COX assays revealed dose- and time-dependent anti-cancer and anti-inflammatory effects against human colon cancer cells. The EtOH extracts obtained from the fruit exerted the highest anticancer activity against HT29, closely followed by SW480 colorectal adenocarcinoma cells. In contrast to the anti-cancer and cytotoxicity results, the dH_2O extract also caused the highest apoptosis and DNA fragmentation in a dose- and time- dependently. Besides increasing extract concentration causing to decrease in the growth rate of the cancer cells, apoptosis was observed almost in all the human colon cancer cells, which rapidly exhibited signs of apoptotic cell death as detected by DNA fragmentation. Regarding in vitro evaluation of COX activity, which gives information about the inflammation, the results found a similar activity profile as observed in MTT assay. In conclusion, the results revealed that the extracts of the white dragon fruit could have remarkable anticancer and anti-inflamatuvar activities through enhanced apoptosis in colon cancer cells. The data obtained from this research should be validated using further *in vitro* and *in vivo* analyses.

Acknowledgment: This study was financially supported by the Scientific Research Project Unit of Gaziantep University, Gaziantep-Türkiye (Project code no: TF.HZP.22.62).

THE TECHNOLOGY OF PRODUCING THE SUBSTANCE OF DRUGS BASED ON DITERPENE ALKALOIDS

A.Z. Sadikov, Sh.Sh. Sagdullaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent, Uzbekistan

Alkaloids are products of the metabolism of amino acids of protein substances of plants and are one of the first compounds of plant origin that drew the attention of pharmacologists to create therapeutic agents based on them. Based on plant alkaloids over the past century, hundreds of preparations, bioreagents for medicine and the needs of the national economy have been created.

For many years, our Institute has been conducting research work on the isolation, chemical study of isolated substances, proof of the structure, work is underway to study biological activity and toxicity, industrial technologies for obtaining substances of biologically active drugs, bioreagents, etc., are being developed on the basis of alkaloids. To date, dozens of drugs based on alkaloids have been created and introduced into medical practice. As a result of many years of research by chemists and pharmacologists of our Institute, dozens of diterpene alkaloids from plant raw materials have been isolated from plants, and their biological activities have been studied. New, original drugs with antiarrhythmic action have been created, such as Allapinin, Aklezin, Aksaritmin, Antiarrhythmin, Dihydroathezine hydrochloride, Benzoraphin, Benzoylnapellin hydrochloride, high purity Akonitin bioreagent, etc. Currently, highly efficient industrial technologies for the production of the substance of the above drugs have been developed.

Due to the increasing requirements for the quality of active pharmaceutical ingredients, the variety of production equipment, and also given the sometimes-sharp price changes for various organic solvents used in the production of allapinin, various problems arise in the production of this drug. Therefore, several technological methods for the production of this drug have been developed, taking into account current economic and other conditions:

1. Method for the production of allapinin by extraction of plant materials with organic solvents under alkaline conditions;
2. The production of allapinin by extraction of plant materials with weak solutions of organic acids with further purification of the extract by ion exchange;
3. The production of allapinin by extraction of plant materials with weak solutions of organic acids with further purification of the extract by liquid-liquid extraction;
4. Method for the production of allapinin by extraction of plant materials with ethyl alcohol solutions with further purification;
5. Method for the production of allapinin by extraction of plant materials with weak acid solutions and purification of the extract by ultrafiltration.
6. The substance obtained by the above methods in terms of qualitative and quantitative indicators fully meets the requirements of the FS for the drug.

Currently, research work is underway to develop alternative new technological methods for obtaining the substance of drugs based on diterpene alkaloids, such as Aklesin, Aksaritmin, Antiarrhythmin, Benzoylnapelin hydrochloride, Dihydroatezine hydrochloride, etc.

QUINOLINE ALKALOIDS OF THE FAMILY RUTACEAE

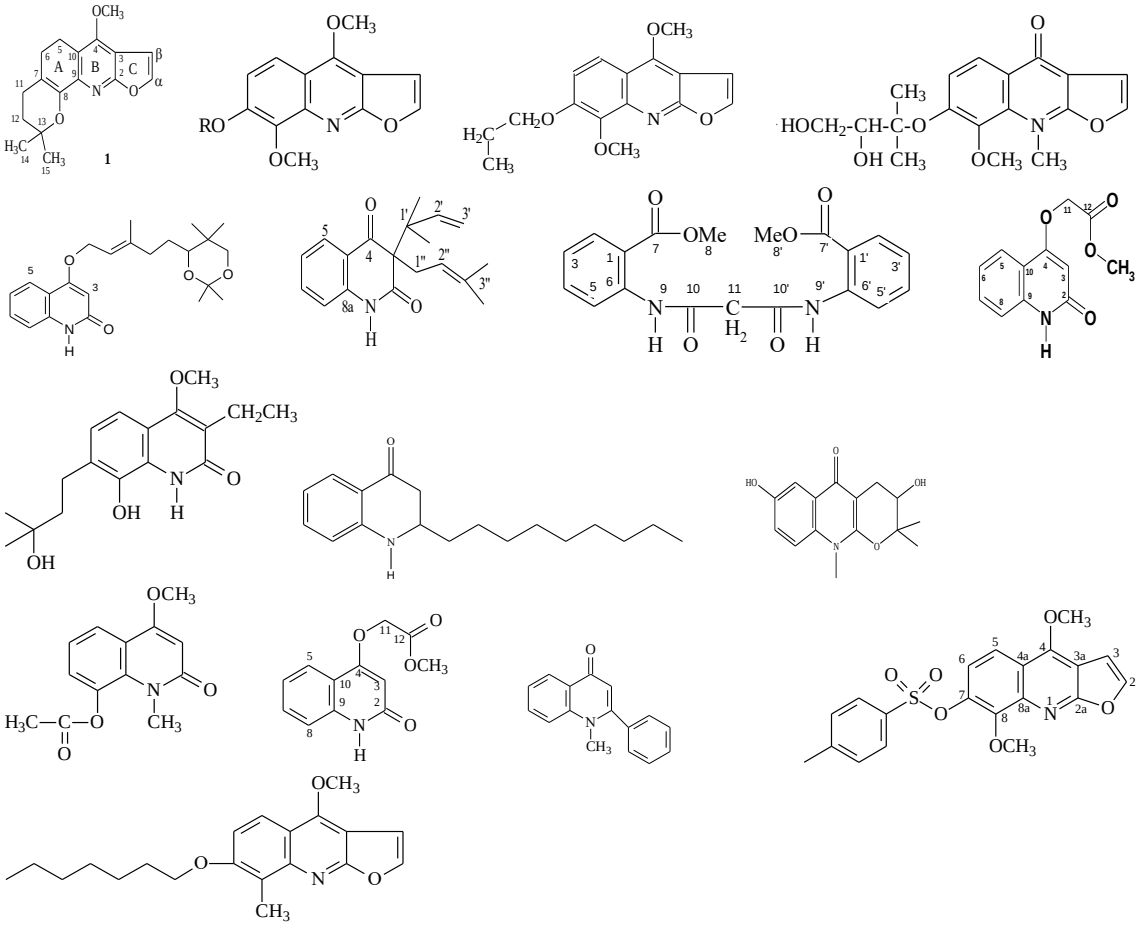
Kh.A. Rasulova, D.R. Kodirova, M.A. Eshonov, Z.Ch. Abraeva

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences, 100170, Tashkent, Uzbekistan, fax (99871) 120 64 75, e-mail: *khalida.rasulova@gmail.com*

The pharmacological studies of quinoline alkaloids and their derivatives isolated from plants of *Haplophyllum* genus *(*fam. Rutaceae), which are unique source of various alkaloids, showed that they are low toxic and have wide spectrum of pharmacological action. Most of them possess by inhibitory action on CNS, sedative, sleeping, anticonvulsant, estrogen and other effects.

In the last period, alkaloids of 6 plant species of the Rutaceae family have been studied. Alkaloids of the plants *Haplophyllum perfaratum, H.griffithianum, H.ramossimum, H.pedicellatum, H. acutifolium, Ruta graveolens, Dictamnus angustifolus* were studied. The study of 2 new plant species has begun.

The structures of the isolated new alkaloids were established on the basis of the study of spectral datas (UV-, IR-, ^{1}H and ^{13}C-NMR, DEPT-spectra) and X-ray diffraction data from the plants.



ORAL
PRESENTATIONS

CHEMICAL COMPONENTS OF *RUMEX* SPECIES GROWING IN THE UZBEKISTAN AND THEIR ANTIBACTERIAL, ANTIOXIDANT, ANTICOAGULANT ACTIVITIES

K.A. Eshbakova[1], Kh.I. Khasanova[1], N.M. Ashirmatova[1], B.D. Mamarasulov[2], B.J. Komilov[a]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: e_komila@yahoo.com
2) Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan

The genus *Rumex* belongs to the Polygonaceae family, and there are more than 200 species on Earth. 16 species grow in Uzbekistan. *Rumex* plants are widely used as medicinal, food, and fodder plants.

Since ancient times, the leaves of the *Rumex* species have been mainly eaten, while the roots and seeds have been used as medicines. The seeds help prevents diarrhea and the leaves are used to treat skin inflammation. Types of *Rumex* have diuretic, hematopoietic, blood-purifying, tonic, refreshing and antipyretic properties. Extracts have been used to treat diarrhea and constipation, menstrual cramps, edema, and ulcers. Pharmacological studies have shown that extracts and isolated individual substances of *Rumex* species exhibit various biological activities, especially as antioxidants, antitumor, anti-inflammatory, and antipathogenic agents.

The most medicinal types of *Rumex* growing in the Flora of Uzbekistan have been selected and 10 species of *Rumex*, *R. aquaticus*, *R. conglomeratus*, *R. confertus*, *R. crispus*, *R. holaezii*, *R. pomiricus*, *R. syriacus*, *R. tianschanicus* investigated.

All extracts and fractions were studied for their antibacterial, antifungal, antioxidant, anticoagulant, cytotoxic, surface activity, insecticidal, acaricidal, repellant effects.

The chemical components were studied by column chromatography and HPLC, and plants with good biological activity were selected. The studied types of rumex contain anthraquinones - chrysophanol, emodin, rein, 1-*O*-methylemodin. Emodin, chryzaphanol, 1-*O*-methylemodin - compounds that have broad pharmacological properties, anti-inflammatory, antitumor (including cancer of the esophagus, liver and lung), hepatoprotective, antioxidant (strong), antimicrobial action. A method for obtaining the sum of anthraquinones has been developed.

The founded that extracts and fractions of *Rumex* species has excellent antibacterial, antifungal, antioxidant and anticoagulant activities.

CHARACTERISTICS OF PEAT ORIGINATED FULVO ACIDS OF THE KHANTY-MANSIYSK AUTONOMOUS OKRUG - YUGRA

Nekhoroshev Sergey Viktorovich[1], Nekhorosheva Alexandra Viktorovna[1], Klimenko Lyubov Stepanovna[2], Sartakov Mikhail Petrovich[2], Orlov Sergey Anatolyevich[2], Nekhoroshev Viktor Petrovich[3]

[1] Khanty-Mansiysk State Medical Academy,
Russian Federation, Khanty-Mansiysk, Mira Street, 40.
[2] Yugra State University,
Russian Federation, Khanty-Mansiysk, Chekhov Street, 16.
[3] Surgut State University,
Russian Federation, Surgut, Lenin Avenue, 1.

Fulvic acids (FA) are a class of water-soluble compounds of humic matter, which is a mixture of polyphenolic acids formed in nature as a result of chemical and biological processes of decomposition of dead plants, animals and microorganisms. Recently, FAs have been found to have antioxidant activity, nutraceutical properties, and physiological effects on the human body: neuroprotective, antimicrobial, anti-inflammatory [1], and can also modulate the immune system and improve gastrointestinal function [2]. In this regard, further study of the properties of peat originated FA is an important research area for scientists from the Khanty-Mansiysk Autonomous Okrug - Yugra (KhMAO), on the territory of which about 25% of Russian and 10% of the world's peat reserves are concentrated.

In this work, we studied FA isolated from peat harvested on the territory of the Tavolozhny tract (KhMAO). As a result of IR spectroscopy of a freeze-dried sample, there was obtained an IR spectrum containing a set of groups absorption bands characteristic of fulvic acids: alcohol hydroxyls, aromatic and aliphatic carboxyls and carbonyls, aliphatic C–H, and amides. Taking into account the absence of water in the sample (less than 1%), a wide and intense absorption band with a maximum at 3407 cm^{-1} indicates the presence of strong hydrogen bonds between fulvic acid molecules, due to which these humic substances form a spatial network in aqueous solutions. The results of determining the atomic ratios in the sample also turned out to be characteristic of FC and were: H/C=1.21; O/C=0.76; N/C=0.02. A microbiological study of a sample of fulvic acids showed that they do not support the growth and development of Bacillus cereus (lat.), Gram-positive spore-forming soil bacteria.

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NEW ADENOSINE ANALOGS: CHEMICAL-ENZYMATIC SYNTHESIS

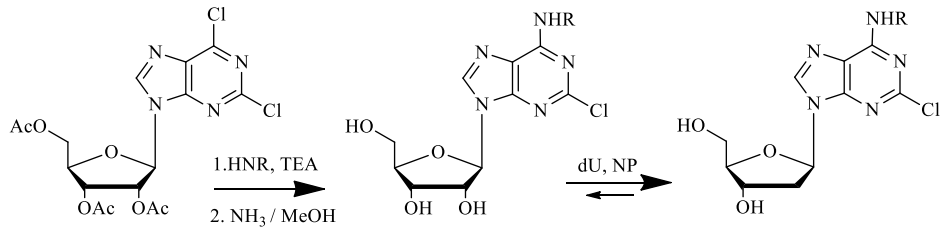
Maria Ya. Berzina, Alexey L. Kayushin, Elena V. Dorofeeva, Olga I. Lutonina, Irina D. Konstantinova

Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Miklukho-Maklaya st. 16/10, 117997, Moscow

Natural nucleosides are involved into key biochemical processes such as energy and signaling pathways. Adenosine is an intercellular signaling molecule that binds to several types of adenosine receptors. The variety of roles and involvement of adenosine into enzymatic processes of the cell, as well as its intercellular interaction, allows the use of its analogues in the treatment of various diseases.

The combined chemical-enzymatic approach to the synthesis of new nucleoside analogs has become widespread in modern research practice. Libraries of new compounds are being actively created. The use of a combination of chemical and enzymatic syntheses makes it possible to obtain a wide range of adenosine analogs. Methods of chemical synthesis allow to introduce modifications on the purine heterocycle. Enzymatic synthesis under mild conditions allows to replace carbohydrate residue stable under the conditions of chemical synthesis to a less stable one.

The reaction of nucleophilic aromatic substitution proceeds easily in the case of protected purine nucleosides modified at the C2 position by an electronegative chlorine atom. The subsequent removing of acetyl groups by ammonolysis allowed to obtain products in high yields. This method was used to obtain series of amino acid, amino alcohol, and other derivatives of 2-chloroadenosine.



R = residues of amino acids and amino alcohols, or alkyl

The ribosides obtained are substrates for *E. coli* nucleoside phosphorylases. Using the transglycosylation reaction, the corresponding 2'-deoxyribosides were synthesized.

The new nucleosides showed low toxicity on HepG2 cells and turned out to be partial agonists of A_1 type adenosine receptors.

This work was supported by a grant from the Russian Science Foundation (Project No. 21-13-00429).

ESSENTIAL OIL COMPOSITION AND BIOACTIVITY OF *TRIPOLIUM PANNONICUM* L.

Raigul Suleimen[1], Yerlan M. Suleimen[2,3,4*], Zharkyn A. Ibatayev[5], Meruyert Ashimbayeva[2,3], Petr Gorovoy [6], Tokay Tursonjan[2]

[1] L.N. Gumilyov Eurasian National University, Kazakhstan, Astana, K. Satpayev st, 2.
[2] Nazarbayev University, Kazakhstan, Astana, Kabanbay Batyr ave, 53.
[3]Kazakh University of technology and business, Kazakhstan, Astana, Mukhamedkhanov, 37A
[4] Sh. Ualikhanov Kokshetau University, Kazakhstan, Kokshetau, Abaya st, 76
[5]S. Seifullin Qazaq Agrotechnical University, Astana, Kazakhstan
[6]G.B. Elyakov Pacific Institute of Bioorganic Chemistry, Far East Branch, Russian Academy of Sciences, Vladivostok, Russia

Tripolium pannonicum subsp. *tripolium* (L.) Greuter (*Syn. Aster tripolium* L.), a perennial plant native to Europe, is a member of the Asteraceae Family, typically habitat of marine setting and owned purple daisy-like flowers, flowering from July to October.

The *T. pannonicum* plant was collected in Far East Shkotovo District, near the Shkotovo Township, 1 km southwest of the village between the estuaries of the rivers Shkotovka (Tsimuhe) and Artemovka by Prof. P.G. Gorovoy.

EOs of *T. pannonicum* was obtained from dried, crushed aerial parts by hydrodistillation in a Clevenger apparatus for 2 h according to the method described in Pharmacopoeia. The total yield percentage of EOs from dried aerial parts of *T. pannonicum* was 0,19%.

The EOs composition was determined by a Clarus-SQ 8 GC (PerkinElmer) with a mass-spectrometric detector. The EOs composition was identified based on the comparison of their retention indices in relation to (C_9-C_{24}) n-alkanes with those of published data or with authentic standards. Also, the compounds were identified by comparing their MS data with those from the NIST mass spectral library and available mass spectra and, wherever promising, using co-injection of authentic standards. The percentage contents of the extract constituents were calculated by internal normalization of the constituent peak areas. In the EO of *T. pannonicum* was found more than 50 compounds and the most abundant compounds (with % > 3.0) were α-pinene (20.7%), β-pinene (8.5%), myristicin (4.3%), limonene (4.1%), α-myrcene (3.4%) and caryophyllene oxide (3.4%).

In addition to the chemical composition, also larvicidal and free radical scavenging activities of the EO has been studied. Larvicidal activity was studied using *A. salina* larvae. EOs did not exhibit any toxicity on *Artemia salina* larva. The free radical scavenging activity was assessed by using DPPH radical scavenging assay. The EO showed weak DPPH radical scavenging activity.

The present study highlighted EO of *T. pannonicum* from Far East Asia. The chemical composition of the EO of *T. pannonicum* from Far East Asia was studied for the first time. It was found that the EO of *T. pannonicum* has low antiradical activity and no lauricidal activity.

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TOTAL ECDYSTEROID-CONTAINING AND FLAVONOID-CONTAINING SUBSTANCES FROM PLANTS OF UZBEKISTAN, THE POSSIBILITY OF THEIR PRACTICAL USE IN MEDICINE

F.R. Egamova, S.M. Yusupova, V.N. Syrov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ferustamovna_14@mail.ru

Total ecdysteroid-containing substances from *Ajuga turkestanica* (ecdysterone, turkesterone, cyasterone et al.), as well as total flavonoid-containing substances from *Thermopsis alterniphlora* (apigenin, luteolin, formononetin et al.) and *Pseudosophora alopecuroides* (glabrol, vexibidine, ammotamnidine et al.) were studied. That all these means in experimental conditions increase the adaptive potential of the body to the effects of adverse environmental factors. They have a pronounced positive effect on plastic and energy processes (mainly ecdysteroid-containing substances) and inhibit the development of lipid peroxidation processes (mainly flavonoid-containing substances). They exhibit an antistress effect, improve the tolerance of physical exertion, relieve fatigue, and exhibit pharmacotherapeutic effect when administered prophylactically to animals with experimental myocarditis, atherosclerosis, and CCl_4-hepatitis. In separate series of experiments, an increase in the life expectancy of animals under subtotal irradiation was revealed under their influence, as well as the restoration of erythro- and leukopoiesis suppressed in this case. There is a restoration of the immunological reactivity of the body in secondary immunodeficiency states.

The data obtained made it possible to test biologically active additives and drugs on the basis of these substances: exumide, ecditone, flaterone and flanorin in sports medicine and clinical practice as metabolically active agents that have a pharmacocorrective effect on many pre-pathological and pathological conditions of the organism. Ecdysteroid-containing drugs first of all proved promising in terms of improving the psycho-emotional status of athletes in various sports, improving their performance, eliminating asthenic and asthenodepressive symptoms during heavy physical exertion, whiter than easy adaptation to the conditions of stay. Under the influence of these funds, the process of rehabilitation of patients after severe somatic and surgical diseases is also accelerated.

Flavonoid-containing drugs, along with a restorative effect on the body, have found wider use as therapeutic agents for hypercholesterolemia and atherosclerosis (flaterone), for some forms of liver damage: alcoholic and viral hepatitis, hepatocholecystitis (flanorin).

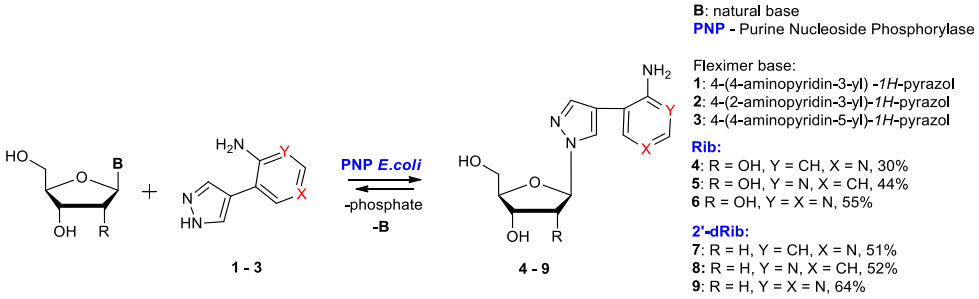
The conducted work shows the prospects of searching for new effective medicines among phytoecdysteroids and flavonoids.

BIOSYNTHESIS OF FLEXIMER ANALOGUES OF PURINE NUCLEOSIDES, BY-PRODUCTS OF TRANSGLYCOSYLATION

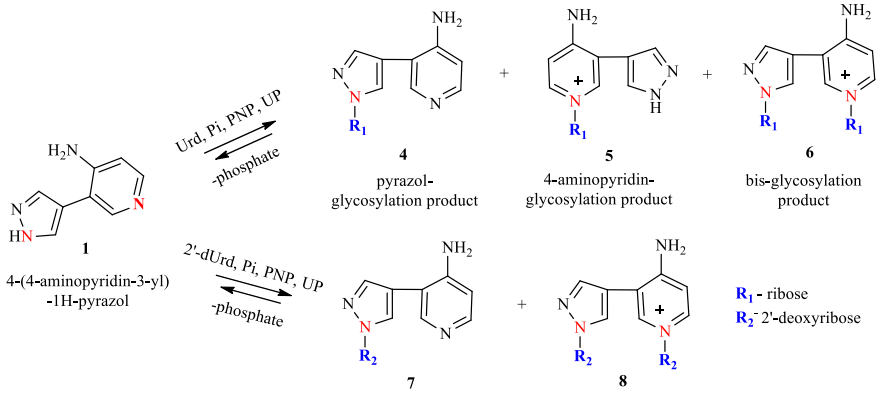
Barbara Z. Eletskaya[1], Anton F. Mironov[1,2], Elena S. Matyugina[3], Anastasya L. Khandazhinskaya[3], Sergey N. Kochetkov[3], and Irina D. Konstantinova[1]

[1]Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry, Moscow, Russian Federation
[2]Peoples' Friendship University of Russia (RUDN University), Moscow, Russian Federation
[3]Engelhardt Institute of Molecular Biology, Moscow, Russian Federation

Fleximer nucleosides are modified nucleosides in which the purine base is divided into two heterocyclic fragments with a C-C bond. The flexibility of the heterocyclic base allows the molecule to bind better in the active center of the target enzyme. A series of six new fleximer nucleosides with carbohydrate residues of two types (ribose and 2-deoxyribose, **4** – **9**) was obtained using the transglycosylation reaction. The reactions were catalyzed by *E. coli* purine nucleoside phosphorylase.



It was found that the principle of regioselectivity of transglycosylation in the case of fleximer base **1** is not implemented. For the fleximer base, the formation of 4-aminopyridin- and bis-glycosylation products of the reaction mixture was observed in the case of riboside synthesis. Only one minor bis-glycosylation product was formed in the synthesis of 2'-deoxyriboside.



Minor compounds were isolated and the structures were characterized by NMR spectroscopy data. Using *ab initio* and Molecular Modeling methods, it was found that due to the non-planarity of the cyclic systems of 4-aminopyridine and pyrazole glycosylation of the nitrogen of the pyrimidine ring becomes possible.

This research was supported by the Russian Science Foundation Project No. 21-13-0042.

ISOLATION AND IDENTIFICATION OF FUNGI FROM LICHEN PRODUCERS OF NEW ANTIBIOTICS

G.K. Mamytbekova[1], D.A. Birimzhanova[3], M.D. Ashimbayeva[1], O.A. Kataeva[4], Ye.M. Suleimen[1,2,5], T. Tursonjan[1]

[1]Nazarbayev University, Kazakhstan, Astana, Kabanbay Batyr ave, 53.
[2]Kazakh University of technology and business, Kazakhstan, Astana, K. Mukhamedkhanov st, 37 A.
[3]L.N. Gumilyov Eurasian National University, Kazakhstan, Astana, K. Satpayev st, 2.
[4]V.L. Komarov Botanical institute of the RAS, Russia, Saint Petersburg, Popova st, 2.
[5] Sh. Ualikhanov Kokshetau University, Kazakhstan, Kokshetau, Abaya st, 76

The search for new fungi from lichens, the study of the properties of new antibiotics and the determination of the biological activity of drugs and the development of the pharmaceutical industry is relevant [1].

31 samples collected from the Komarovsky Bereg Nature Reserve (60°10′ N, 29°47′ E), Leningrad Region, Russia were studied. The objects of research are obtained lichen isolates. Isolates were obtained according to method [2].

The antibacterial activity of the fungal isolates was determined in relation to *E. coli, St. aureus, S. marcescens* B-RKM 0059, antifungal activity – *C. albicans* ATCC 885-653 RKM-0475.

Micromycetes with antimicrobial activity were transplanted to a solid medium. All fungi were grown at room temperature in a dark place for 25 days. Extraction with ethyl acetate, biologically active oil mixtures of different colors were obtained: from light yellow to brick red.

The molecular-genetic properties of the 5 most active isolated isolates were evaluated by DNA isolation, obtaining a PCR product, followed by sequencing and analysis of nucleotide sequences in the GenBank - BLAST program to determine the generic and species identification of microorganisms.

31 species were isolated and 11 active species of fungi from lichens with antimicrobial and antifungal properties were selected: *Desmazirella acicola, Chaetomum globosum, Coniochaeta hofmannii, Trichoderma atroviride, Fungal sp, Coniochaeta ligniaria, Trichoderma harzianum, Fimeariella Rabenhorstii, Coniochaeta sp, Hypocrea lixii, Daldinia loculata.*

In the future, it is planned to isolate pure antibiotics from them and their structural identification.

This research has been funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP19679527)»

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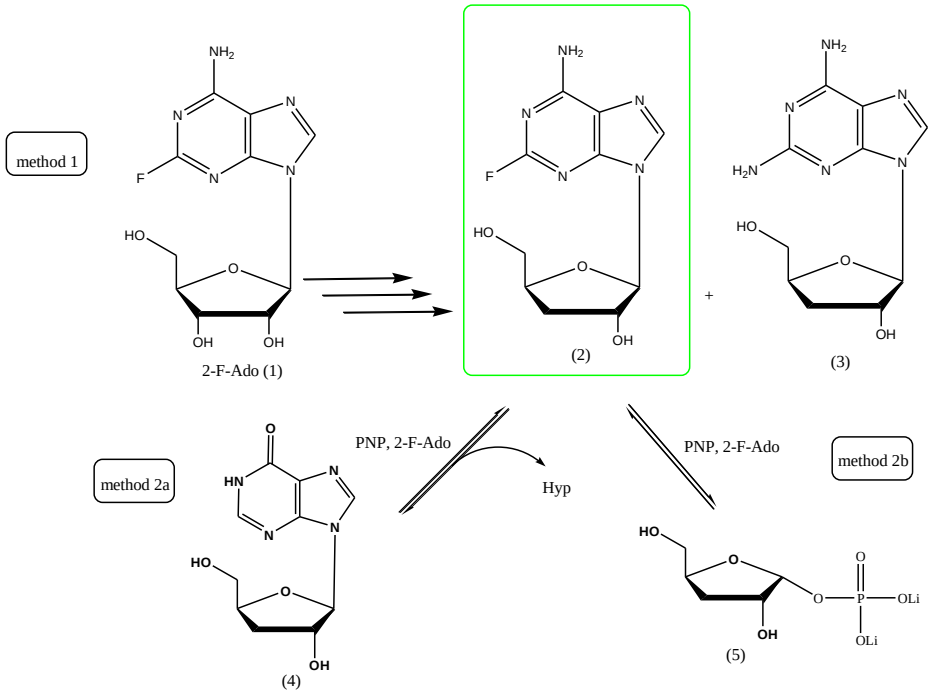
2. Lehmann J., Joseph S. Biochar for Environmental Maganement. London. – 2015. – 976 p.

SYNTHESIS OF 2-FLUOROCORDYCEPINE

Alexandra O. Arnautova, Alexey L. Kayushin, Konstantin V. Antonov, Irina D. Konstantinova

Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Miklukho-Maklaya 16/10, 117997 GSP-7, Moscow B-437, Russia

2-Fluorocordycepine (2-fluoro-3'-deoxyadenosine) is a potential effective antitumor and antiviral drug. We obtained 2-fluorocordycepin (2-F-Cord) (**2**) in two ways: by chemical synthesis and by enzymatic way using two different sources of 3-deoxyribose.



Method 1. The chemical synthesis was performed in 3 stages. In the first step, the initial 2-fluoroadenosine (2-F-Ado) (**1**) was treated with α-acetoxyisobutyryl bromide to form two protected bromine derivatives. Resulting mixture was dehalogenated using H_2/Pd, resulting in a mixture of protected 3'-deoxynucleosides. The protection groups were removed with aqueous methanol ammonia solution to form desired compound **2** and 2-aminocordycepine **3** in ratio 85:15 respectively. 2-F-Cord was isolated by reversed-phase chromatography with 28% yield.

Method 2a. The enzymatic synthesis was performed using 3'-deoxyinosine (**4**) and nucleoside **1** in presence of recombinant *E. coli* purine nucleoside phosphorylase (PNP). Conditions: ratio of substrates (**4**):(**1**) - 1.5:1.0, 2 mM potassium-phosphate buffer (pH 7.0), PNP - 2100 units, 50 ºC, the reaction time - 16 days. 2-F-Cord was isolated with 60% yield.

Method 2b. Lithium salt of 3-deoxyribose phosphate (**5**) and compound **1** were used in the transglycosylation reaction as substrates. Conditions: ratio of substrates (**5**):(**1**) – 3:1, 10 mM potassium-phosphate buffer (pH 8.0), PNP - 1050 units, 50 ºC, the reaction time - 7 days. Yield of target compound **2** - 38%.

This research was funded by the Russian Science Foundation (Project No. 21-13-00429).

STAUDYING THE POSSIBILITY OF OBTAINING PEKTIN FROM WASTE BY ENZYMATIC HIDROLYSIS

B.A. Abylaeva, T.T. Zhumabaeva

Osh State University, Kyrgyzstan, bakt70@mail.ru

In medicine and veterinary medicine, the use of drugs, in particular antibiotics, has led to a decrease in the body's resistance to harmful factors and a change in the environment in which microorganisms live.

In this regard, the use of pectin as a prophylactic is very important. Therefore, it became necessary to obtain pectin from the waste of juice producers, wild varieties of apple trees, as well as the peel of the local pomegranate variety Kara-Kaiyn, which grows in the Aravan district of the Osh region, has not been studied.

The purpose of the research is to study the possibility of obtaining pectin from plant waste by enzymatic hydrolysis.

The release of pectin in large quantities depends on the complete hydrolysis of plant cell components. The use of cellulase leads to the hydrolysis of cellulose, which contributes to the separation of the complex of polygalacturonic acid and hemicellulose from the cell membrane and the hydrolysis of the latter increases the content of polygalacturonic acid in the isolated pectin. Pomegranate and mandarin peels were used as vegetable waste. When using these plant wastes as a substrate, there is an increase in the yield of pectin under the influence of the fungi *Fomes fomentarius* and *Pleurotus ostreatus*, which are 72.78% and 46.7%. The study of the maximum yield of pectin showed that when the conditions of enzymatic hydrolysis were changed, the temperature was 50°C, and the pH was 4.5. The enzyme is added in an amount of 0.04% equivalent, in the ratio of the substrate used. Fruit pectins contain a sufficient amount of acetyl, carboxyl groups, which adversely affects the adhesion of pectin substances and creates a poor gel, while pomegranate, citrus, and apple pectins do not have such properties. Thus, research on the extraction of pectin once again showed that waste raw materials that are not used in practice and have a negative impact on the environment could be a promising raw material base for the production of surfactants using new technologies. Thus, research on the extraction of pectin once again showed that waste raw materials that are not used in practice and have a negative impact on the environment could be a promising raw material base for the production of surfactants using new technologies. It also allows the use of pectolytic enzymes to obtain an environmentally friendly product with a content of up to 40% compared to acid hydrolysis of fruit residues during pectin extraction. Therefore, the use of enzyme preparations of hemicellulase and cellulase allows increasing the yield of pectin and obtaining an environmentally friendly product, which in turn allows expanding the range of pectin applications.

ALKALOIDS FROM *Delphinium oreophilum*

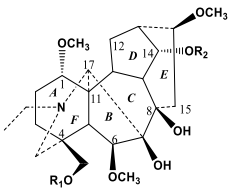
H.I. Ahunova[1], Kh.M. Bobakulov[2], B. Tashkhodzhaev[2], N.I. Mukarramov[2], Sh.V. Abdullaev[1]

1) Namangan State University, Namangan, Uzbekistan,
e-mail: ahunova.hilola@yandex.ru
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: khayrulla@rambler.ru

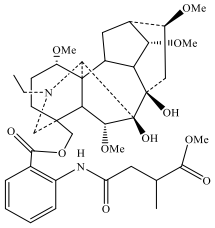
There are about 350 plant species of the genus *Delphinium* (family *Ranunculaceae*) in the world, of which 22 species are found in Uzbekistan and contain mainly diterpene alkaloids, some of which have valuable pharmacological properties.

Delphinium oreophilum Huth is a perennial plant 30-60 cm high, growing in the mountain ranges of the Zamin and Yangikorgan regions of Uzbekistan [1]. Earlier we studied the composition of *D.oreophilum* - essential oils, macro- and microelements. [2].

In our next work, we studied the alkaloid content of the aerial part of *D. oreophilum* collected during flowering in Zamin region. In the course of the study, well-known alkaloids were isolated: diterpenoid alkaloids delphatine **(1)**, 14-acetyldelectinine **(2)**, browniine **(3)**, 14-acetylbrowniine **(4)** [3] and delavaine B **(5)**. Along with them, the amide 4-{[2-(methoxycarbonyl)phenyl]amino}-2-methyl-4-oxobutanoic acid **(6)** and isoboldine **(7)** were also isolated. Among the above compounds **1**-**3** and **5**-**7** were found in this plant for the first time. A new C_{20}-diterpene alkaloid named 15-epinaviculine B with a thalasamine skeleton has also been isolated from the aerial part of *D. oreophilum* (**8**).



1. R_1=Me, R_2=Me
2. R_1=H, R_2=Ac
3. R_1=Me, R_2=H
4. R_1=Me, R_2=Ac



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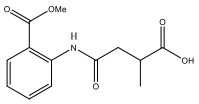

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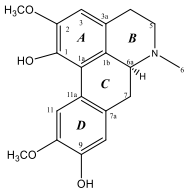

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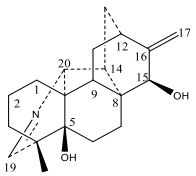

8

The structures of the isolated compounds were identified by 1D, 2D NMR spectroscopy, mass spectrometry, and the structure of alkaloids **4, 5,** and **8** was established by X-ray diffraction analysis.

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GENETIC ANALYSIS OF THE CRY GENES OF THE ENTOMOPATHOGENIC *BACILLUS THURINGIENSIS* AGAINST *Helicoverpa armigera*

I.M. Khalilov, F.B. Kobilov, N.S. Akhmedova

Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan, 7b Abdulla Qadiri Street, Tashkent 100128

Microorganisms are currently being used to produce ecologically green agricultural products. Among such microorganisms, *Bacillus thuringiensis* (Bt) bacterium is the best biological agent against pest insects. For this reason, it is possible to achieve many desired results by comprehensively studying this bacterium's morphological and genetic characteristics. That is why this bacterium has been the focus of the attention of many scientists.

Bacillus thuringiensis is a gram-positive, rod-shaped, spore-forming bacterium found worldwide in soil, water, dead insects, hay, tree leaves, various conifers, and diverse ecosystems, including insectivorous mammals, as well as humans with severe necrosis. It has been found that it occurs and develops in the tissues and as a probiotic in the composition of cow's milk, in environments contaminated with phenolic compounds and various pesticides. An entomopathogenic feature of Bts is that they produce crystalline proteins (Cry). These proteins cause the death of harmful insects. Cry genes code these Cry proteins.

Using the modified Marmur method, genomic DNA was isolated from *Bt* strains, specific primers for cry1Aa-I, cry1Ab, cry1Ac-I, cry9U-I, and cry2 genes were designed and PCR amplification was performed. When the partial sequence of the cry1Ab gene of strain *Bt94* was compared in the NCBI database, 93.53% similarity was observed with the genes numbered AY007686.1, M97880.1, and MT226609.1, and 93.41% with the gene numbered EU679502.1. The cry1Ab gene was compared using Slustal Omega online software to find SNP variation.

According to the results of the analysis, it was found that the *Bt94* cry1Ab gene was mutated at 32 points from the nucleotide sequence of other compared genes. In this case, at nucleotide 83 (T/C), at 87 (A/S), at 154 (T/S), at 195 (G/A), at 227 (T/G), at 282 (G/A), 315 (G/S), 318 (T/S), 357 (A/S), 361 (A/S), 372 (S/T), 381 (A/G), 388 (G/A), 435 (S/T), 440 (T/A), 461 (A/G), 493 (A /G), 501 (T/S), 517 (T/G), 552 (S/T), 555 (T/S), 564 (S/T), 567 (T/G), 571 (G/A), 576 (A/G), 591 (G/A), 597 (S/A), 621 (T/ A), it was observed that there was a mutation at 674 (G/T), 682 (S/G) and 685 (A/G) nucleotides, and only the *Bt94* cry1Ab gene changed from the others at these nucleotide positions with 20 transitions and 12 transversions. the mutation was analyzed.

It should be noted that the nucleotide sequence of the cry1Ab gene of the *Bt94* strain, assuming that the primers encoding the cry1Ab gene also encode the cry1s gene, it can be seen in the NCBI database that the gene product identified as the cry1Ab gene belongs to the variant of the cry1s gene.

Thus, when the partial genes *Bt1*-cry1Ac, *Bt18fo*-cry1Ab, *Bt26*-cry1Aa, *Bt31*-cry2, *Bt84*-cry1Ac, *Bt91*-cry9U, *Bt93*-cry9U, and *Bt94*-cry1Ab were constructed, a phylogenetic tree was created using the Mega-4 statistical program. All identified genes were observed to match their corresponding cry gene classification. In addition, it was found that all studied genes are in 1 cluster, respectively cry genes. The identified partial cry genes are a good scientific resource for future whole-genome sequencing and expression studies.

DITERPENOID ALKALOIDS OF THE ACONITUM PLANTS OF KYRGYZSTAN

U.T. Teshebaeva[1], Z.S. Boronova[1], M.N. Sultankhodzhaev[2], F.N.Dzhakhangirov[2] .

1. Osh State University, Osh, Republic Kyrgyzstan.
2. S.Y.Yunusov Institute of Chemistry of Plant Substances, AS Republic Uzbekistan. Uzbekistan, Tashkent 700 170, Mirzo Ylugbek Str. 77.

On the territory of Kyrgyzstan grow 9 kinds of Aconitum plants. We have studied alkaloidal constituents of Aconitum zoongaricum Stapf. and Aconitum karakolicum Rapaics, which were used in folk medicine for treatment rheumatism, migraines and toothache.

From the roots of *Aconitum soongaricum Stapf*. we have isolated several known and knew alkaloids such as aconitine, aconifine, flaconitine, napelline, napelline N-oxide, neoline, songorine, 12-acetylnapelline, 15-asetulsongorine, acozonine and acozonitine.

From the roots of *Aconitum karakolicum Rapaics*, we have isolated alkaloids karakoline,12-acetylnapelline,1-benzoilkarasamine,delsoline,dehydrosongorine, karakanine, karakolidine, montikamine.

Fharmakological study of above listed alkaloids show the cardiotoxic, analgetic, local anaesthetic, antiinflammatory and antitoxic to aconitine activity.

In silico STUDY OF BUFADIENOLIDES FROM *Bufo viridis* VENOM

M.B. Kayumov, Z.Zh. Mirakhmetova, N.R. Mukhamedov, Sh.Ya. Mirzaakhmedov

Institute of Bioorganic Chemistry, 100125, Tashkent, Mirzo Ulugbek street 83
e mail: mirzaakhmedov@mail.ru

In recent years, there has been increasing attention to study active substances isolated from the natural origin which are effectively inhibited Sars-Cov-2. The main protease (M-pro) of Sars-Cov-2 is one of the perfect targets to combat against the virus. Last three years there has been demonstrated several synthetic drugs which can inhibit M-pro. Bufadienolides from toad venoms has anti-cancer, anti-bacterial, anti-arrhythmic and anti-viral activities. Therefore, in-depth physicochemical and pharmaco-biological evaluation of bufadienolides is of great interest. Besides, bufadienolides including bufalin, arenobufagin, marinobufagin, telocinobufagin, bufarenogin, gamabufotalin extracted from Central Asian green toad, *Bufo viridis* venom still in demand of deeper investigation as an anti-Sars-Cov-2 compound. In this work, we presented *in silico* analysis of 6 bufadienolides from toad *Bufo viridis* venom applying molecular docking and molecular dynamics studies to study the possible receptor-ligand complex binding types and structural integrity of the complex. For free energy calculation, we used an umbrella sampling simulation.

For docking analysis used MOE 2014.0901 software and 3D structures of bufadienolides obtained from PubChem database in SDF and MOL format. The x-ray structure of 3CL protease (PDB ID: 7KPH) was downloaded from RCSB Protein Data Bank and protein was prepared using the software default Structure Preparation application. MD simulation carries out by GROMACS-2020 software package applying the CHARMM27 all-atom force field. To check the stability, of the protein-ligand complex, we calculated the root mean square deviation (RMSD), and root mean square fluctuations (RMSF). The final frame of the complex was extracted for umbrella sampling (US) simulation. The complex was enclosed in an appropriately sized box, and the centre of mass of the ligand was then pulled along the y-axis by applying an external force, while the protein was restrained and served as a reference for tension modelling. In the pulling simulation, a spring constant of 1000 kJ/(mol*nm^2) and pulling at a rate of 0.01 nm/ps for 500 ps were used. We identified 50 umbrella windows each 0.1nm then windows stabilized for 100 ps and then a 10 ns US simulation was performed. Among ligands the gamabufatalin in complex with 3CL-protease presented short equilibration time (5ns) at the 0.25-0.75 A^o with low range of RMSD value around 0.5 A^o. Reduced RMSF tones were obtained at residues 40-56, 130-150 and 180-190 of the active sites due to the interaction of the ligand with pocket amino acids. The free energy profile in the US simulation was calculated as -49.8 kJ/mol for the ligand-protein, indicating the formation of the most stable complex.MD and US simulation data analysis results exhibited that, the gamabufatalin might be an effective inhibitor against to SARS-Cov-2 main protease. Nowadays detailed *in-vitro* analysis of bufadienolides are going on.

DETERMINATION OF THE ACTIVITY OF BACTERIAL RIBONUCLEASES

M.K. Narmukhamedova, T.S. Khusanov, G.H. Kadirova

Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan, Tashkent, e-mail: narmuhamedovamohira@gmail.com

Viruses cause various diseases in plants and reduce yield and quality of flour. The main part of plant damaging viruses are RNA viruses. Based on this, it can be considered that ribonuclease enzymes synthesized by some bacteria may have a negative effect on the spread of viruses in plant tissue. Currently, more than 20 ribonucleases synthesized by bacteria: *B. subtilis, B. amyloliquefaciens, B. intermedius, B. pumilus, B. licheniformis, B. circulates, B. thuringiensis* are known [1].

The toxicity of bacterial enzymes is less compared to chemical compounds, they are easily utilized by plants and decompose without accumulating harmful substances in the environment [2].

In this work, the ribonuclease activity of microorganisms: *B. subtilis; B. cereus; B. licheniformis; B. pumilus; P. putida; P. aeruginosa; B. amyloliquefaciens; P. fluorescens; B. megaterium and P. syringae* has been determined. Microorganism strains were grown in LB medium with the addition of yeast RNA at 30^0 C. After 48 hours, 5 ml of 1 M HCl was poured over the colony and waited for 5 minutes. White color if there is no RNase enzyme in cultured medium, if the enzyme is present, a clear halo is formed around the bacterial colony. We found the ribonuclease activity of bacteria by calculating the distance from the border of the colony to the halo end line.

Table

Strains	Halo, mm
B. subtilis	4.5
B. cereus	3.0
B. licheniformis	2.3
B. pumilus	3.0
B. megaterium	2.5
B. amyloliquefaciens	2.0
P. fluorecens	3.2
P. aeruginosa	4.5
P. syringae	3.5
P. putida	4.0

According to the data presented in the table, strains of *B. subtilis* and *P. aeroginosa* produced halos of 4.5 mm and *P. putida* of 4.0 mm and showed high ribonuclease activity.

MOLECULAR GENETIC ANALYSIS OF THE EFFECT OF THE SUPRAMOLECULAR COMPLEX OF GLYCYRRHIZIC ACID WITH BENZOTRIOZOLE ON WHEAT FUNGAL DISEASES

S.Kh. Hojiboboeva, M. Khudaynazarov, U.M. Shapulatov, Kh.Kh. Kushiev

Gulistan State University, Uzbekistan

We studied the effect of a supramolecular complex of glycyrrhizic acid (GA) with benzathriosol, toxic to Fusarium fungi, and elicitor metabolites that activate proton and salicylate-dependent signaling systems in plants and induce systemic resistance to diseases. The results of experiments in which the fungicidal treatment was preceded by the treatment of wheat seedlings with the complex indicated that these metabolites can also serve as sensitizers that enhance the fungicidal effect against *Fusarium* diseases.

In this case, we performed a molecular-genetic analysis of the level of fungal infection of wheat under the influence of supramolecular complexes of GK with benzotrazole (GK:BT) and aminotriazole (GK:AT), whose effective effect against this fungus was studied. Genomic DNA from wheat plants infected with fungi was extracted using the STAV method, and the DNA concentration was homogenized in a NanoDrop 3300 (Thermo Fisher, USA) spectrophotometer. Genomic DNA samples extracted from wheat seedlings were analyzed by PCR. A DNA marker was used to compare the PCR product. The results showed that no fusarium DNA was detected in any of the control, non-fusarium wheat cultivars. Also, samples treated with control + GK:BT or GK:AT, but not infested with *Fusarium*, were negative for *Fusarium* DNA PCR reaction.

During our research, it was also clear that when wheat seeds were treated with GK:BT or GK:AT solutions and *Fusarium mycelium* (F. Poae), the level of *Fusarium* infection in the early stages of wheat seedlings was reduced. Patterns 1, 2, 3, and 4 in this study were observed in DNA samples extracted from October sprouts of winter wheat. In May, planted wheat samples enter the last stage of development, which has a great impact on productivity. It was at this stage that the PCR reaction to fusarium DNA showed a negative result in the plant samples isolated.

The replicate number of expression in plants was analyzed by qRT-PCR method of similar samples. The extracted DNA samples were initially brought to the same concentration and subjected to a real-time reaction using the method recommended by OOO "AgroDiagnostika" (Russia). This reaction was carried out on the DT-96 amplifier (OOO "NPO DNA-technology") equipment. The results showed that the PCR product of a specific locus in the *Fusarium* genome was observed to be lower in samples treated with GK:BT or GK:AT solutions. On the contrary, it was shown that the PCR product was higher only in wheat samples infected with fusarium.

NATURAL NEUROTROPIC AUTOANTIBODIES IN COVID-19 ASSOCIATED WITH ISCHEMIC STROKES

M.A. Rasulova, Kh.A. Rasulova

Tashkent Pediatric Medical Institute

Although considerable progress has been made in the understanding of immune mechanisms of development of acute ischemic stroke (IS), the clinical outcome of patients with COVID-19 associated IS is significantly influenced by the inflammatory response and neuroimmunological disorders.

Totally 80 patients with acute first-ever IS were included consecutively, who were divided into two groups: 50 patients with COVID-19 associated IS and pneumonia (1 group) and 30 patients with IS without COVID-19 positive test (2 group). The stroke severity and consciousness were measured by the NIHSS and Glasgow coma scale. In blood serum of all patients were studied the levels of natural IgG autoantibodies (Nabs) to NF-200, GFAP, S100β, MBP, receptors to dopamine, serotonin, choline, glutamate, GABA by Poletaev's enzyme immunoassay method. Serum samples of 16 healthy individuals matched by age and gender were used as control.

Mild stroke (NIHSS < 5) was found out in 29% patients, moderate stroke (NIHSS 16-20) in 25%, severe stroke (NIHSS 21-42) – in 46%. 8 patients died at acute stage. In 1 group, Nabs levels increased to NF-200 (132.9±2.8 CU) in 1.09 and 1.8 times, GFAP (118.9±3.9 CU) in 1.4 and 2 times, S100β (129.5±10.2 CU) in 1.05 and 1.6 times, MBP (97.3±4.5 CU) in 1.14 and 1.6 times, to receptors to dopamine (77.9±4.4 CU) in 1.2 times and 1.6 times, serotonin (81.96±3.25 CU) in 1.2 and 1.4 times, choline (61.42±3.6CU) 1.4 and 1.8 times, glutamate (85,28± 4,25CU) in 1.19 and 1.4 times, GABA (82,4±12,7 CU) in 1.5 and 1.8 times, respectively, in comparison with the same parameters in 2 group and control.

In 2 group, Nabs levels increased to NF-200 (121.56±2.8 CU) in 1.6 times, GFAP (82.7±3.42 CU) in 1.1 times, S100β (122.8±4.9 CU) in 1,5 times, MBP (85.56±3.4 CU) in 1.4 times, receptors to dopamine (63,16 ±3.8 CU) in 1.3 times, serotonin (63.8 ± 2.8 CU) in 1.1 times, choline (42.23±1.8 CU) in 1.2 times, glutamate (71.26±4.0 CU) in 1.2 times, GABA (53.3±3.3CU) in 1.1 times, in comparison with control group.

Autoimmune processes have the certain place in the pathogenesis of ischemic strokes, especially on the background of COVID-19 infection. The degree and duration of increase in the levels of Nabs have the prognostic significance for the evaluation severity degree of stroke course that could be an additional criterion in the integrated diagnosis and timely correction of treatment for this disease.

DEVELOPMENT OF HIGHLY EFFICIENT KAZAKHSTAN'S HERBAL MEDICINAL SUBSTANCES WITH ANTIVIRAL ACTIVITY AGAINST COVID-19 AND SIMILAR VIRAL INFECTION

A.F. Miftakhova[1,2], M.Zh. Zhurinov[1], A.Z.Abilmagzhanov[1], E.T.Talgatov[1]

[1] D.V. Sokolsky Institute of Fuel, Catalysis and Electrochemistry 142, Kunaev str., Almaty, 050000, Kazakhstan
[2] al-Farabi Kazakh National University 71 al-Farabi ave., Almaty, 050040, Republic of Kazakhstan

Subjects of research: medicinal plants (levant wormwood Artemisia cina Berg., annual wormwood Artemisia annua L., Jungar iris Iris songarica, lemon balm Melissa officinalis L., celandine large Chelidonium majus and licorice Glycyrrhiza glabra), santonin, strain hCoV-19/Kazakhstan/26562/2020 of coronavirus SARS-CoV-2, strain A/Puerto Rico/8/34(H1N1) of influenza virus, cell cultures Vero E6 and MDCK, laboratory animals.

The aim of the research is to develop highly effective drugs based on pharmacologically active substances from plant material with antiviral activity against COVID-19 and similar viral infections.

Research methods: WHO Guidelines for Good Agricultural and Collection Practice (GACP) for Medicinal Plants, ultrasound and CO_2 extraction, FTIR spectroscopy, chromatography (TLC, HPLC, GC-MS), cyclic voltammetry, virology and pharmacology methods (antiviral activity and toxicity studies, molecular genetic analysis).

Results and novelty: Optimum conditions of PAS (physiologically active substance) extraction from vegetative raw material have been determined. The analysis of extracts and their fractions by spectroscopic and chromatographic methods. New methods for the extraction of santhonine and ammonium glycyrrhizinate from plant material have been developed. The electrochemical activity of santonine has been studied. New derivatives of santonin by electrochemical modification, including with high antiviral activity have been synthesized.

For the first time in Kazakhstan, a successful screening of substances with activity against SARS-CoV-2 and influenza virus was carried out. Main constructive and technical-economical parameters: the studied extracts are promising as sources of drugs for the treatment of SARS-CoV-2 infection and influenza. The results obtained are patentable and can contribute to the creation in Kazakhstan of pharmacological production of drugs against the coronavirus disease COVID-19 and influenza. Of all the substances, the extracts of licorice, celandine, and the product of electrochemical modification (methoxylation) of santonin are of the greatest interest for further research. Implementation into practice is planned for the next stages. Development efficiency is determined by the novelty of technology in Kazakhstan.

BIOLOGICAL ACTIVITY SCREENING AND FRACTIONATION OF *Naja Naja oxiana* VENOM

N.R. Mukhamedov, M.B. Kayumov, Z.Zh. Mirakhmetova, Sh.Ya. Mirzaakhmedov

Institute of Bioorganic Chemistry, 100125, Tashkent, Mirzo Ulugbek street 83.
e mail: mirzaakhmedov@mail.ru

Naja naja oxiana also called the Central Asian cobra is an endemic species of venomous snake in the family *Elapidae*. Its venom contains mainly peptides and proteins (80-90%). Drugs produced from snake venom that are already licensed or in development show that unpleasant bioactivity may be converted into a therapeutic for the correct condition. Though some drugs were discovered in the cobra venom, there is a high possibility of finding new ones relying on the rich chemical constituent of the object.

Taking into account the aforesaid opinion, we aimed to separate and isolate novel biologically active low molecular weight peptides from *Naja oxiana* venom. To reach the aim, the following tasks were conducted: 1) biological activity screening of the venom; 2) ultrafiltration of the venom; 3) comparative analysis of the fractions obtained from the ultrafiltration by HPLC.

For the screening of the biological activity of the venom, it was dissolved in water and tested for antioxidant activity and inhibition of more than 10 types of kits corresponding to several diseases like cancer, SARS, HIV, etc. According to the test results, *Naja naja oxiana* snake venom showed the following 3 types of biological activities at a concentration of 0.1 mg/ml: (1) on HIV-RT (AIDS) – 100% inhibition; (2) p300 (cancer) enzyme – 83% inhibition; (3) the antiradical activity of snake venom was 80% at the initial time and decreased to 67% at 30 minutes.

Venom was dissolved in 0.1 M ammonium acetate pH 4 buffer to overcome proteolytic hydrolysis of the components. Ultrafiltration was carried out using ultrafiltration membranes 10 kDa and 3 kDa sizes. >10 kDa, <10->3 kDa, and <3 kDa fractions of the venom were obtained as a result. The fractions were lyophilized and stored at -20 ^{o}C for further experiments.

HPLC analysis of the venom and its fractions obtained after ultrafiltration was carried out using the C-18 column in the gradient mode of MeCN against 0.1 % TFA. HPLC profiles of all samples were analyzed using Origin software. The HPLC chromatogram of the venom consisted of two parts: 1) the hydrophilic part which was not adsorbed well in the column and was detected before 5 minutes; 2) the hydrophobic part which bound to the sorbent in the column and was detected between 10 and 20 minutes. In the case of fractions, the HPLC chromatogram revealed that the intensity of the hydrophilic part decreases and the intensity of the hydrophobic part increases with increasing molecular weights of the fractions and vice versa.

It can be concluded that potential anti-HIV, anticancer and antiradical peptides from the Cobra venom may be discovered. Low molecular peptides are less hydrophobic compared to high molecular peptides and proteins in the case of this object. Therefore, it could be speculated that new therapeutic agents with good water solubility may be developed on the base of low molecular peptides from *Naja naja oxiana*.

Isolation, identification, and deeper biological activity study of individual peptides, as well as investigation of their mechanism of action are planned for the near future.

BACTERICIDAL ACTION OF GENTIANA OLIVERI

F. Ashurova, N. Mirakhmedova, M. Zalyalieva

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
ms.ashurova@list.ru,

The study of the properties of the biomedical activity of different plant species due to their less aggressive action and the absence of side effects is relevant. Particular importance is attached to the antimicrobial effects of plants on different types of microorganisms. Gentiana (Gentiana) is a fairly common plant, more than 400 species has medicinal value, mainly the root part is used. In Uzbekistan, Gentiana Oliveri is found, which is used in folk medicine for gastrointestinal disorders of various etiologies in the form of an infusion of dried aerial parts of plants. Purposeful study of the antimicrobial activity of extracts from the aerial part of Gentiana oliveri is an urgent task.

The purpose of the study. To study the bactericidal activity in vitro of aqueous and alcoholic extracts of the aerial part of Gentiana oliveri.

Material and methods. Aqueous, 30% and 40% alcoholic extracts were prepared from crushed aerial parts by continuous extraction. The antimicrobial activity of the extracts was studied on clinical cultures of bacteria isolated from patients undergoing treatment in RCH 1.

Results and discussion. An aqueous extract of Gentiana oliveri inhibited the growth of Stafilococcus aureus by 67% higher than the control, gram-negative rods (*E. coli*, klebsiella) - by 16%. A 30% alcohol extract showed less bactericidal activity - 33% higher against St. aureus and 16% against E. coli and klebsiella. A 40% alcohol solution showed low bactericidal activity against Gram-positive St. aureus, and against gram-negative bacteria from 16% to 33% relative to the control. Our results showed a high bactericidal activity of the aqueous extract of Gentiana oliveri against gram-positive microbes St. aureus. These data are important, since staphylococci are one of the most common microorganisms that cause purulent-inflammatory diseases: various tissues of the human body.

Thus, our studies revealed a significant bactericidal activity of the aqueous extract of Gentiana oliveri. These data require further immuno-physiological study of the action of the aerial part of this plant, the mechanisms of its bactericidal activity.

CLONING ANALYSIS OF CRY1AA GENE OF *Bacillus thuringiensis 1FO* STRAIN

F.B. Kobilov, I.M. Khalilov, M.M. Nazirov, R.A. Alamuratov, N.Sh. Azimova

Institute of Microbiology of the Academy of Science of the Republic of Uzbekistan. 7b Abdulla Qadiri Street, Tashkent 100128

It is known that biological agents, in particular, microorganisms, are used in the care of agricultural crops, fruit and ornamental trees, especially in protecting them from various pests. *Bacillus thuringiensis* bacterium also contains genes encoding many anti-pest proteins, and screening and research on the genetic characteristics of *B. thuringiensis* have been carried out for more than 30 years.

B. thuringiensis (Bt) is an aerobic, spore-forming, gram-positive, and entomopathogenic bacterium that produces parasporal crystal proteins or δ-endotoxins (Cry).

Based on amino acid sequence similarity, 79 cry gene families (cry1-cry79) with more than 770 cry genes have been characterized to date. These toxins exhibit strong toxicity against Lepidoptera, Diptera, Coleoptera, Hymenoptera, Orthoptera, Hemiptera, and Nematodes, which are considered to be various insect pests. The Cry1Aa gene encodes the CRY1Aa protein, which is toxic to pests of the Lepidoptera group.

Firstly, genomic DNA was isolated from *B. thuringiensis 1fo* strain and specific primers were designed for screening Cry1Aa gene and PCR amplification was performed. Cry1Aa fragment was ligated into the vector (4634 bp) and chemically transformed into *E. coli DH5a* strain. Cry1Aa gene ligation was detected by oncolony PCR from colonies grown on LB agar medium with selective kanamycin (Fig. 1 A). The resulting colonies were planted in LB (kanamycin) liquid medium. Then, plasmid DNA was isolated and restricted using *KpNI* - *BamHI* enzymes (Fig. 1 B).

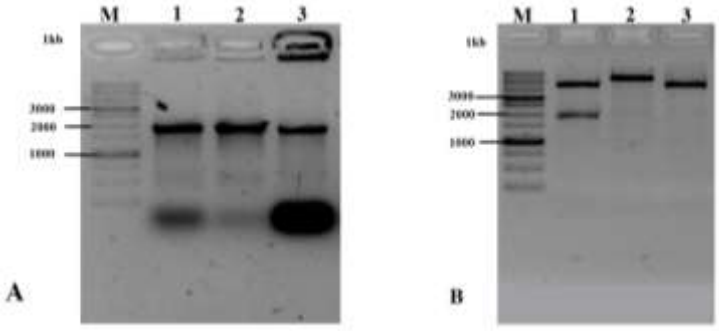

Figure 1. A-Cry1Aa gene oncolony PCR product, B- Cry1Aa gene restriction analysis: 1-*KpNI* and *BamHI*, 2-*BamHI*, 3-uncut plasmid

Figure 1 shows that the Cry1Aa gene was efficiently cloned, and the PCR and restriction enzyme products were of the same size as expected for the Cry1Aa gene.

According to the literature that CRY1Aa protein has an active effect on other pests besides *Helicoverpa armigera* and *Helicoverpa zea*. For example: *Plutella xylostella* insects fed on cabbage and brussels sprouts transformed with Cry1Aa genes were reported to die 100% within 72 hours.

In conclusion, the cloning of the Cry1Aa gene of *Bacillus thuringiensis* is an important scientific achievement in the field of insect pest control and can be a powerful tool for sustainable agriculture.

POSTER
PRESENTATIONS

PROTEIN SEQUENCES ANALYSIS OF THE MAIN MDR PUMP ACRAB-TOLC FROM *ESCHERICHIA COLI*: ANTIBACTERIAL ACTION OF SUBSTANCES OF PLANT ORIGIN

Marina V. Karakozova, Vasilisa N. Raldugina, Pavel A. Nazarov,

Belozersky Institute of Physico-Chemical Biology, Lomonosov Moscow State University, Moscow, Russia

Multidrug-resistance (MDR) pumps are the cornerstone of protecting bacteria from antibiotics. MDR pumps form the basis of non-specific protection of bacteria and belong to six families of MDR pumps. One of the best studied MDR pumps is the E. coli AcrAB-TolC pump. The study of pump sequences is an important task in understanding the processes of formation of new clinical isolates-superbugs, since resistance due to efflux occupies an important place in the total number of resistant bacteria arising as a result of antibiotic therapy. It is believed that the genes encoding MDR pumps are variable and belong to the so-called "luxury" genes, i.e., they are designed to adapt bacteria to changing environmental conditions. In this work, we analyzed all known sequences of TolC, AcrA, and AcrB proteins from *E. coli* strains, and based on the results obtained, we found important patterns for understanding the formation of resistance in the bacterial population. TolC, AcrA, and AcrB protein sequences for *E. coli* strains were downloaded from the NCBI database in genbank and fasta formats using the biopython package and the Etrez.Esearch and Entrez.Efetch functions. In this work, all currently existing sequences of the AcrAB-TolC proteins in the NCBI database were analyzed: TolC (8383 sequences), AcrA (5715 sequences), and AcrB (3561 sequences). The sequences were aligned with each other using BLASTp with the creation of an individual database. For further work with the data, the numpy and pandas packages were used. Analysis of laboratory strains showed that the sequences of a large number of laboratory strains used (K-12 and B) are conserved and do not detect any mutation in the amino acid sequences. This allows us to state that for each protein there are certain consensus sequences that do not change. Analysis of all sequences showed that there are several consensus sequences in the *E. coli* population and for each protein and there are many point mutations around these consensus sequences. However, consensus sequences predominate in the population, and this explains the fact that several decades of laboratory cultivation did not affect laboratory strains of E. coli. This normalizes the use of different laboratory strains in relation to at least the AcrAB-TolC pump in various studies. The conservatism of amino acid sequences of the pumps resembles the conservatism of the "housekeeping" genes, which indicates the great importance of these genes for bacteria, despite the fact that these genes are formally classified as nonessential genes. In this work, we used an approach to analyze the effect of plant substances based on quinones and terpenes on their ability to penetrate into bacterial cells.

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ANTI-INFLAMMATORY ACTIVITY OF PHENOLIC COMPOUNDS FROM TRANSFORMED ROOTS OF *ARTEMISIA ANNUA L.* AND *A. VULGARIS L.*

A. Bashylau[1], I. Zhavoronok[2], A. Basalai[2], P. Shabunya[3], S. Fatykhova[3]

[1]Central Botanical Garden of the NAS of Belarus, Minsk, Republic of Belarus
[2]Institute of Physiology of the NAS of Belarus, Minsk, Republic of Belarus
[3]Institute of Bioorganic Chemistry of the NAS of Belarus, Minsk, Republic of Belarus

Ultrasonic extraction at elevated temperature can be used to increase the efficiency of extracting biologically active compounds from plant materials. Artemisia annua L. and Artemisia vulgaris L. are known for their medicinal properties, which are associated with their composition. One of the promising ways to obtain pharmaceutical raw materials is the biotechnology of "hairy" roots, however, the substances obtained from transformed plants should be examined for the composition and activity of metabolites.

The objective of the work was to evaluate the composition of phenolic compounds in the extracts of the transformed roots of Artemisia annua and A. vulgaris, obtained using ultrasonic treatment, and to identify the anti-inflammatory effect of the extracts in the experiment.

Materials and methods. The total content of phenolic compounds was determined according to the Folin-Ciocalteu method, the content of extractive substances was determined according to the State Pharmacopoeia of the Republic of Belarus. For HPLC analysis, the Agilent 1200 chromatograph with a diode array detector and the Agilent 6410 mass selective detector was used. The study of anti-inflammatory activity was performed on male Wistar rats. Escherichia coli lipopolysaccharide was used to simulate a febrile response in the experiment.

Results. With the help of sonication, extracts of transformed roots of Artemisia annua and A. vulgaris were obtained. The composition and content of phenolic compounds were determined, the presence of caffeylquinic acids and caffeic acid derivatives in extracts of two species of wormwood was established. Tests were carried out on laboratory animals with an experimental systemic inflammatory process.

Conclusion. Ultrasonic extraction of transformed roots of Artemisia annua and A. vulgaris was effective in extracting phenolic compounds. In the obtained extracts, 8 compounds were identified, mainly caffeylquinic acids and caffeic acid derivatives were identified.

The study of the effect of extracts on deep body temperature in rats in normal conditions and with systemic inflammation led to the conclusion that the biologically active substances of wormwood have a modulating effect on thermoregulatory reactions. Intragastric administration of an extract of transformed roots of Artemisia annua 40 min before the systemic administration of E. coli LPS caused changes in the febrile response pattern, namely, it weakened the severity of phase II fever.

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NATURAL COMPOUNDS OF THE GENUS *LYCIUM* AND PROSPECTS OF A BIOTECHNOLOGICAL METHOD OF PRESERVATION AND PRACTICAL USE

Ekaterina Anatolyevna Lapchenko, Elena Vladimirovna Spiridovich, Vladislav Viktorovich Strelkovskiy, Vladimir Nikolaevich Reshetnikov

Central Botanical Garden of the National Academy of Sciences of Belarus

Plant cell and tissue cultures provide useful alternatives for the production of valuable biologically active compounds, providing standardized, contaminant-free, and biosustainable systems for producing targeted compounds on an industrial scale. For the production of valuable natural compounds, the choice of a producing plant is important. Representatives of the genus *Lycium* (russian dereza (*Lycium ruthenicum*), chinese dereza (*Lycium chinense*), common dereza (*Lycium barbarum*)) are medicinal plants containing, in general, natural phenolic compounds in all organs, among which there are also hydroxycinnamic acids (chlorogenic acid), flavonols (quercetin, kaempferol), flavonoids (rutin), catechins (epicatechin), betaine. The biological properties of goji berries (*Lycium barbarum*) are widely known. Data are given on antioxidant, anti-inflammatory, anti-aging properties, hypoglycemic and hypolipidemic activity, modulation of the intestinal microbiota, neuroprotective effect on retinal ganglion cells, immunomodulatory, hepatoprotective and antitumor effects.

Medicinal raw materials from plants of the genus *Lycium*, obtained by a biotechnological method, can be used as a promising source for the production of new highly effective drugs with an universal organ-protective effect on the human body. In cell culture in vitro, chains of biochemical reactions and transformations of substances are effectively analyzed. Identification of the most significant physiological reactions associated with salt tolerance will make it possible to use them as markers for testing and selecting salt-tolerant forms. Previously, researches on the studies of the biochemical composition of cell cultures and tissues of plants of the genus *Lycium* were not carried out in Belarus. We have studied the germination of seeds obtained from the bottom of the Aral Sea under a cooperation agreement with the Institute of Bioorganic Chemistry of the National Academy of Sciences of Uzbekistan, halophyte of russian dereza (*L. ruthenicum*), chinese dereza (*L. chinense*), common dereza (*L. barbarum*) under sterile conditions. For the germination of annual seeds of these species, a 16-hour photoperiod and a temperature of 25°C are optimal. When introduced into in vitro culture, it was found that multi-stage sterilization significantly reduces the viability of seeds and seedlings of *L. ruthenicum, L. chinense, L. barbarum* and, consequently, their germination. The optimal medium for the stable development of microsprouts (no anomalies, no callus formation) was Woody plant medium (WPM) supplemented with 15 g/l sucrose, 6.5 g/l agar-agar, pH 5.6–5.8 before autoclaving . To maintain samples of the in vitro collection, we used half WPM medium without hormones, without sucrose, a lower positive temperature of 4°C, illumination of ~500 lx, and a photoperiod of 8 h.

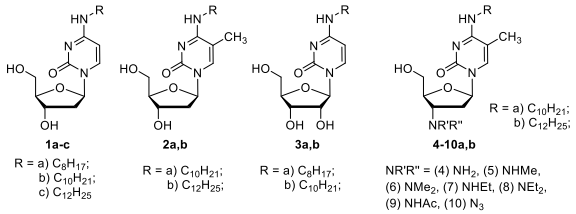
The obtained samples of *L. ruthenicum, L. barbarum, L. chinense* in vitro collections can be used to develop methods for healing microplants from viral infections; for genotyping samples; in the morpho-biological study of ex vitro plants resistant to salt stress, as a starting material for the initiation of cell and suspension cultures.

NOVEL N^4-ALKYLCYTIDINES AS PROMISING ANTIMICROBIAL AGENTS

L.A. Alexandrova[a], M.V. Jasko[a], D.A. Makarov[a], I.A. Oskolsky[a], I.L. Karpenko[a], O.V. Efremenkova [b], B.F. Vasilieva [b], D.A. Avdanina [c], G.K. Nuraeva [c], A.A. Ermolyuk [c], A.A. Zhgun [c], S.N. Kochetkov [a]

[a] Engelhardt Institute of Molecular Biology RAS, 32 Vavilova St., 119991 Moscow, Russia.
[b] Gause Institute of New Antibiotics, 11 Bol'shaya Pirogovskaya St., 119021 Moscow, Russia.
[c] Research Center of Biotechnology RAS, 33 Leninsky Ave, 119071 Moscow, Russia.

The emergence of drug-resistant strains of pathogenic microorganisms necessitates the creation of new drugs.



In order to find new inhibitors of pathogenic bacteria and fungi, we synthesized a set of N^4-derivatives of (2'-deoxy)cytidine, bearing extended N^4-alkyl and N^4-phenylalkyl groups **1-3**[1] as well as 3′-modified derivatives of N^4-alkyl -5-methyl-2′,3′-dideoxycytidines **4**[2]. The derivatives **1-3** demonstrated activity against *Mycobacterium smegmatis* and some Gram-positive bacteria, including *Staphylococcus aureus* (MIC= 50 – 200 mM), comparable with the activities of a number of antibiotics in medical use. The most promising are low toxic nucleosides **1b** and **1c**, demonstrating high inhibitory activity not only against Gram-positive bacteria but filamentous fungi that can, among other things, damage works of art, such as tempera painting. In this case the fungal growth inhibitory concentration appears to be in the range of 0.5 - 3 mM. The replacement of the 3′-hydroxyl group with amino, aminoethyl and dialkylamino groups significantly enhances the antifungal activity, most prominently towards *Aspergillus* genus. Several new compounds were able to completely inhibit growth of all the tested moulds (at 0.7 mM), previously isolated in the Moscow State Tretyakov Gallery. In particular, such compounds are promising for use as antiseptics for protecting works of art from mould fungi.

3′-Modified N^4-alkyl-5-methyl-2′,3′-dideoxycytidines **4** also demonstrate activity against gram-positive bacteria as well as mycobacteria. Unfortunately, their high cytotoxicity does not allow to consider them as potential antibacterial drugs. However, cytotoxicity is not the issue for their application on lifeless but (hopefully) eternal works of art. It appeared that our compounds display a wide range of activity against a large number of microorganisms. In this regard, the obtained substances may be an important tool for preventive treatment and scientific restoration of tempera paintings and oil paintings on canvas as biocidal coatings.

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QUANTITATIVE ANALYSIS OF FLAVONOIDS OF THE LEAVES OF LINGONBERRY (FOLIUM *VITIS IDAEAE),* CURRANT *(RIBESNIGRUM L),* PEPPERMINT (FOLIA MENTHAE L*).*

Victoria Bonacheva

Surgut State University, Russia

The research work is aimed at determining the percentage of bioflavonoids in the leaves of lingonberries, currants, peppermint which are growing in the Surgut region of the Khanty-Mansi area and comparison with the data presented in the scientific literature. The paper presents the calculations, made a comparative analysis and presents the conclusions. Using modern analysis methods and calculation formulas, the quantitative content of flavonoids in lingonberry leaves (in terms of rutin) was found to be 2.811%, in peppermint leaves - 1.881%, in currant leaves - 1.400%. Studies were conducted to determine the optimal extractant, which was selected as 70% C_2H_5OH. The results obtained indicate the effectiveness and prospect of isolating flavonoids in an individual form from this plant material for their further use, as well as the creation of medicines based on these valuable substances. Flavonoids are waste products of plants. General distribution in flora is inherent. Interest to flavonoids is very great in view of a wide range of biological activity inherent flavonoids. Quantitative determination of flavonoids in the alcohol extract was carried out by differential spectrophotometry based on the complexation reaction with $AlCl_3$. To extract flavonoids from dry crushed plant material, extraction was performed with 70% ethanol. 5 ml of the extract was placed in a 50 ml volumetric flask, 20 ml of 95% C_2H_5OH and 4 ml of a 2% solution of $AlCl_3$ in C_2H_5OH were added. After 10 min, a 0.2 ml CH_3COOH solution was added and 95% C_2H_5OH was added. So we got solution A. 5 ml of the obtained extract was placed in a 50 ml volumetric flask, 20 ml of 95% C_2H_5OH were added. After 10 minutes, 0.2 ml of a solution of CH_3COOH and 95% C_2H_5OH (solution B) were added. After 30 minutes, the optical density of solution A relative to solution B was measured on an SF-2000 spectrophotometer in cuvettes with a layer thickness of 10 mm at an analytical wavelength of 410 nm. At the same time, the optical density of the solution of a standard sample of rutin prepared as follows was measured: 0.05 g of rutin was placed in a 100 ml volumetric flask and C_2H_5OH was added to the mark. 1 ml of the resulting solution was placed in a volumetric flask with a capacity of 25 ml and then acted as described above (preparation of solutions A and B). The calculation of the number of flavonoids in terms of rutin in absolutely dry raw materials was carried out according to the formula:

$$X \qquad \frac{A_x\, a_{ст}\; W_{x1}\, W_{x2}\, V_{acт}\, 100 * 100}{A_{ст}\, a_x\, V_{ax}\, W_{ст1}\, W_{ст2}\; 100} \quad , \quad \%$$

A_x - optical density of the test solution; A_{cm} - optical density of the rutin solution ; a_x - leaf weight, g; a_{cm} - rutin weight, g; V_{ax} - aliquot volume of the test solution, ml; V_{acm} - aliquot volume of the rutin solution, ml; W_{x1}, W_{x2} - volumes of volumetric flaks in which solutions were prepared, ml; W_{cm1}, W_{cm2} - volumes of volumetric flaks for the preparation of a rutin solution, ml.

Using the calculation formula, it was determined that the content of antioxidants - flavonoids in the leaves of lingonberry is 2.811%, in the leaves of peppermint is 1.881%, in the leaves of currant is 1,400 %.

Conclusions. Studies were conducted on the selection of the optimal extractant for extracts of lingonberry leaves, peppermint, currant - 70% C_2H_5OH. Using differential spectrophotometry in the studied plants, the quantitative content of the sum of flavonoids was established. Since the content of flavonoids in the studied plants falls within the range of 0.5-5%, the results obtained by us indicate the effectiveness and prospect of isolating flavonoids in an individual form from the leaves of lingonberry, peppermint, currant for their further use, as well as creating on the basis of these valuable substances of medicines.

STUDY OF THE ESSENTIAL OIL FRACTION FROM *FERULA PERSICA*

E.G. Karimli[1,2]

[1]Azerbaijan Medical University, Baku, Azerbaijan
[2]Institute of Botany, Ministry of Science and Education of the Republic of Azerbaijan

Introduction.

The genus Ferula belongs to the celery family, unites 130 species distributed in Central Asia, Siberia, China (Xinjiang), Afghanistan, Iran and North Africa, 10 species in the Caucasus and 8 species in Azerbaijan.

The chemical constituents from *F. persica* include volatile compounds, sesquiterpene coumarins, sulfur-containing compounds, and sesquiterpene coumarin glycosides. Osthole, sitosterol, L-chimgin, L-chimganin were obtained from *F. persica* growing in Azerbaijan. The roots of *Ferula* species contain large amounts of sesquiterpene coumarin ethers *F. persica* contains biologically active sesquiterpene coumarins including umbelliprenin, farnesiferols A and B. Umbelliprenin has shown anti-inflammatory, apoptotic and anti-pigmentation properties. Farnesiferols A and B indicated reversal of multi-drug resistance and cytotoxic properties. Isolated sesquiterpene coumarins and polysulfides from *F. persica* have cytotoxic, antibacterial, antifungal.

Experimental part.

The chemical composition of the essential oil was studied by chromato-mass spectrometry on a gas chromatograph GC-MS-QP2010 (Shimadzu, Tokyo, Japan). Qualitative analysis was based on comparison of retention times, indices, and mass spectra with corresponding data from the literature and NIST/FFSNC mass spectrum computer libraries.

Vegetable raw materials. The raw material of *F. persica* was harvested during the fruiting period on July 20, 2021 in the Republic of Azerbaijan (Jangi village, Gobustan district; 40º30'03.04" C 49º15'33.11" B 356 m a.s.l.).

Obtaining the sum of biologically active substances: 2 kg of finely ground air-dried roots of the part were extracted three times with ethyl alcohol (≥ 99% Merck KGaA, EMD Millipore Corporation) for three days.

The extract was filtered off, the alcohol was distilled off in a water bath using a rotary evaporator. Residue 146 g dark brown resin. Yield, 7.3% (weight method).

60 g of the total extractives were subjected to chromatographic separation on a column with neutral alumina II degree. From fractions 22-30, eluting with a mixture of hexane, an essential oil with a pungent odor was obtained.

The discussion of the results.

Identified components in the essential oil of the underground part of *F. persica. Main components: Thiophene (C_4H_4S); 1,2-Dithiolane ($C_3H_6S_2$); Disulfide, bis(1-methylpropyl) ($C_8H_{18}S_2$); 3,5-Diethyl-1,2,4-trithiolane ($C_6H_{12}S_3$); 1,3-Oxathiolan-5-one ($C_3H_4O_2S$); Pentadecane ($C_{15}H_{32}$); 1-Ethyloctylmethyl sulfide ($C_{11}H_{24}S$); Triacontane ($C_{30}H_{62}$); Ethyl Linoleate ($C_{20}H_{36}O_2$); Sulfurous acid, hexyl pentadecyl ester ($C_{21}H_{44}O_3S$); Nonadecane $C_{19}H_{40}$); Hexadecane ($C_{16}H_{34}$); Heneicosane ($C_{21}H_{44}$); Octacosane ($C_{28}H_{58}$); Tetratriacontane ($C_{34}H_{70}$).*

RESEARCH OF HEPATOTROPIC BİOLOGİCALLY ACTİVE SUBSTANCES

Eldar Garayev, Sara Pashayeva

Azerbaijan Medical University, Pharmaceutical Toxicology and Chemistry Department,
Anvar Gasimzade str. 14, AZ1022 Baku, Azerbaijan

The liver is considered one of the organs that carry out very important functions in the human body. Also, the liver is called the "chemical laboratory" of the body, as it plays a leading role in the body in eliminating of toxic substances. The main organ where xenobiotics are biotransformed is the liver. As a result of liver functional disorder, lipid peroxide oxidation, inhibition of protein synthesis, changes in bile formation and secretion, adverse effect on the course of immunological reactions, disturbance of calcium homeostasis, etc. such cases may occur. Such functional disorders include fatty liver, fibrosis or necrosis, carcinogenesis, cirrhosis, etc. leads to these pathologies. The main purpose of our research is synthesizing and studying representatives of more effective hepatotropic substances for the treatment of liver diseases caused by various reasons. Purine alkaloids (caffeine, theobromine, theophylline) obtained from tea and coffee waste have been intended as sources of natural compounds. The sum of alkaloids was obtained from these plant wastes by the general isolation method of alkaloids with 90% ethyl alcohol, and individualized with the help of flash chromatography. Hydrolysis of individualized caffeine, theobromine and theophylline alkaloids was separately carried out with 40% KOH solution (for obtaining hepatotropic derivatives). The obtained synthetic derivatives were re-individualized by the preparative method and identified by UV and IR spectroscopy methods. The biological activity of purine alkaloid derivatives was studied by *in silico* computer programs (PASS Online, Swiss TargetPrediction) and the presence of various interesting biological effects was discovered. Among these derivatives, theophyllidine differs from the other two derivatives by having hepatotropic effect. Researches are continued in this direction. The results are presented in a comparative table.

Table. *In silico* biological activities of synthetic derivatives of purine alkaloids

Synthetic derivatives of purine alkaloids					
Theophyllidine		Caffeidine		Theobromidine	
Biological activity	%	Biological activity	%	Biological activity	%
Hepatic disorders treatment	87	Vascular endothelial growth factor antagonist	95	Vascular endothelial growth factor antagonist	93
Phobic disorders treatment	72	Vascular endothelial growth factor 2 antagonist	94	Vascular endothelial growth factor 2 antagonist	93
Nucleotide metabolism regulator	65	Kidney function stimulant	64	Kidney function stimulant	61
Mannotetraose 2-alpha-N-acetylglucosaminyl-transferase inhibitor	66	Phobic disorders treatment	67	Phobic disorders treatment	75

IN SILICO PREDICTION OF TRINITRO AND TRIAMINE TROPIC ACID DERIVATIVES, THEIR *IN VITRO* AND *IN VIVO* STUDIES

Garayev Eldar Abdulla, Huseynguliyeva Konul Fada

Azerbaijan Medical University, Department of Pharmaceutical Toxicology and Chemistry, Baku

Recently, topics includes issues such as synthesis of chemical compounds with biological activity based on natural compounds, the *in silico* prediction of compounds obtained using computer programs, the *in vitro* and *in vivo* study of the corresponding biological effects of the obtained predictions.

For this, biologically active semisynthetic derivatives of the natural compound alkaloid atropine were synthesized and *in silico* toxicity prediction was carried out using modern programs.

To achieve this goal, the expectations derived from *in silico* studies are confirmed by *in vivo* and *in vitro* experiments.

At the initial stage of research, the alkaloid atropine, the main biologically active substance of the plant, was obtained from the dried raw materials of *Datura stramonium* L., growing on the territory of Azerbaijan, by the appropriate method of isolation. First, as a result of acid hydrolysis of the alkaloid atropine, tropic acid was synthesized, and then trinitro and triamine derivatives of tropic acid were synthesized. The biological activity and toxicity of the obtained semisynthetic trinitro and triamine derivatives of atropine were studied *in silico* using the PassOnline program.

It was found that the fibrinolytic (71%), antihypoxic (64%), antitoxic (56%) effects of the trinitro derivative, and antitoxic (68%), fibrinolytic (63%), antihypoxic (58%), etc. effects of the triamine derivative is greater than that of atropine. Using this in medical practice will show more effective results.

Trinitro and triamine derivatives of tropic acid, a semi-synthetic derivative of atropine alkaloid, have been synthesized and identified by analytical methods, *in silico* studies have been carried out using computer programs.

Studies in the direction of studying the results of investigations *in silico* with experiments *in vivo* and *in vitro* are continuing.

TECHNOLOGY FOR OBTAINING CELLULOSE FROM SEED HUSKS AND MILKY JUICE OF *FERULA FERULA ASSA-FOETIDA L.*

Z.Kh. Sandybaeva, M.M. Murodov, N.F. Yusupova

Osh State University, Osh city, Republic of Kyrgyzstan e-mail: zsandybaeva@oshsu.kg , tel. (996) 555-02-20-99.

Introduction. It is known that about 50% of the medicines produced at pharmaceutical enterprises around the world are prepared from the raw materials of medicinal plants. Microcrystalline cellulose is used in the pharmaceutical industry as a binder and carrier in the production of tableted medicines.

Purpose: Technology for obtaining cellulose from seed husks and milky juice of Ferula Ferula assa-foetida L for the pharmaceutical industry.

Description: MCC is usually obtained by hydrolysis of cotton or wood pulp with nitric acid, with or without pressure. During hydrolysis, cellulose decomposes into small fractions and the bond between crystals decreases, while the degree of crystallinity itself increases sharply. When processing ferula seed husks, due to their fibrous and porous structure, heat and mass transfer processes in the volume of raw materials are difficult. To obtain MCC, seed husk, after preliminary extraction of tannins from it, is treated with an aqueous solution of nitric acid when heated. As a result of this treatment, part of the insoluble substances of the husk becomes water-soluble, and the rest is easily removed during subsequent alkaline cooking in an open vessel. In this case, a gray mass is obtained, consisting of cotton fiber (delint), as well as from the cellulose residue of the husk itself. If it is necessary to obtain separately the cellulose of the husk itself, the mass before or after bleaching can be subjected to light grinding (grinding), after which the short fibers of the husk of the ferula seeds can be separated by washing on a sieve. 10 g of seed husks are poured with a 3% HNO3 solution and heated for some time until the dark beige natural color of the husk changes into a uniformly light beige. The temperature and time are selected depending on the type of the husk itself and on the requirements for the final product - cellulose. For the available sample, good results were achieved by treatment with 3% HNO3 At - 10 minutes 90°, 80-20 minutes, 60-65° - 1 hour.

One of the main uses of MCC is the pharmaceutical industry. The main requirements for this type of MCC include the need to comply with standards for whiteness, humidity, ash content and the content of water-soluble components. To ensure conditions for direct pressing, the product must also have good flowability, which is largely determined by the shape and granulometric composition of the particles; therefore, MCC is produced not only in the form of a fine powder, but also in the form of fine granules with a particle size of 80–250 μm.

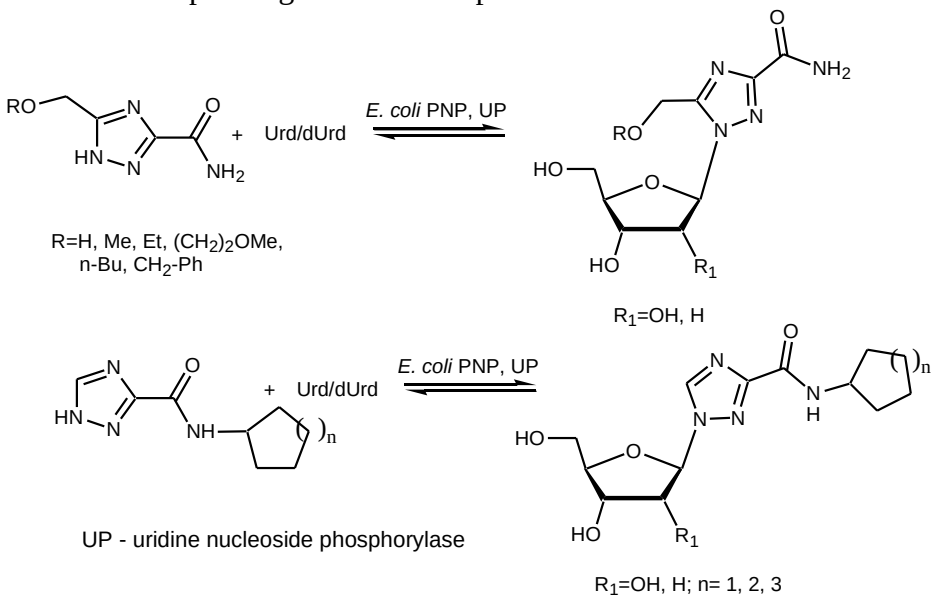
Conclusion. From the above material it can be seen that the production of microcrystalline cellulose from ferula seed husks is of great economic interest as a non-waste raw material and a quality product for the pharmaceutical industry.

CHEMO-ENZYMATIC SYNTHESIS OF NEW RIBAVIRIN ANALOGS

Olga S. Smirnova, Irina D. Konstantinova

Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Miklukho-Maklaya St. 16/10, 117997, Moscow B-437, Russian Federation.

Ribavirin, 1-β-D-ribofuranosyl-1,2,4-triazole-3-carboxamide, is a modified nucleoside with broad spectrum antiviral activity. The disadvantage of ribavirin is its cytotoxicity and teratogenicity. For this reason, the search for new safe drugs does not lose its relevance. The biotechnological method for the synthesis of new ribavirin analogs by the transglycosylation reaction has a number of advantages over multi-stage chemical synthesis: high efficiency, regio- and stereoselectivity. Testing of new bases of 1,2,4-triazole as substrates of *E. coli* purine nucleoside phosphorylase (PNP) helps to reveal the structural features of substrates that determine the possibility of carrying out the reaction of synthesis of modified nucleosides in the active center of the enzyme. *E. coli* PNP is able to synthesize ribonucleosides and 2'-deoxyribonucleosides having structurally different alkyl(aryl)oxymethyl substituents at the C5 position of 1,2,4-triazole-3-carboxamide. A number of 5-alkyl/aryloxymethyl-1,2,4-triazole-3-carboxamide nucleosides have been synthesized. It has been established that N-cyclic (C-5, C-6, C-7) aliphatic 1,2,4-triazolecarboxamides are substrates with a degree of conversion to the corresponding nucleosides up to 99%.



After optimizing the conditions for carrying out enzymatic reactions a number of ribo- and 2-deoxyribonucleosides of N-substituted 1,2,4-triazolecarboxamides were synthesized (yields up to 90%). Currently, the Gamaleya National Research Center for Epidemiology and Microbiology studies the antiviral activity of the synthesized compounds on models of herpes simplex viruses and influenza type A virus.

This research was funded by the Russian Science Foundation (Project No. 21-13-00429)

ISOLATION AND CRYSTAL STRUCTURE OF 8α,14-DIHYDROXY-11,13-DIHYDROMELAMPOLIDE

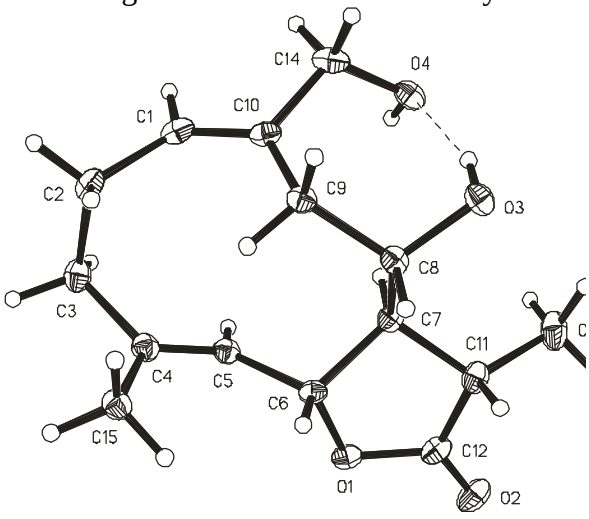
K.M. Turdybekov[1], A.S. Serik[1], R.I. Jalmakhanbetova[2], Y.M. Suleimen[3], Kristofer Van Hecke[4]

[1] E.A. Buketov Karaganda University, st. University, 28, Karaganda, Republic of Kazakhstan
[2] L.N. Gumilyov Eurasian National University, st. Satbaeva, 2, Nur-Sultan, Republic of Kazakhstan
[3] Sh. Ualikhanov Kokshetau University, st. Temirbekova, 30, Kokshetau, Republic of Kazakhstan
[4] XStruct, Department of Chemistry, Ghent University, Ghent B-9000, Belgium

8α,14-Dihydroxygermacra-1(10)E,4E-dien-6β,7α,11βH-12,6-olide (8α,14-Dihydroxy-11,13-dihydromelampolide)] (**1**), $C_{15}H_{23}O_4$, was isolated from the *Artemisia sublessingiana* [1,2]. Compounds **1** was isolated from *Artemisia* species for the first time.

To establish the spatial structure, an X-ray diffraction study 1 was carried out, the general view of which is shown in the figure. The configuration of the C6, C7, C8, and C11 chiral centers is correlated with that known in germacranolides [3]. The Fleck parameter was -0.04(7).

According to the conformational analysis carried out in 1(10)Z,4E-germacranolides



(melampolides), the ten-membered ring A can take four main conformations: chair-chair type $_{15}D^5,^1D^{14}$ (**a**), bath-bath type $_{15}D^5,_1D_{14}$ (**b**), chair-bath type $^{15}D_5,_1D_{14}$ (**c**) and bath-chair type $^{15}D_5,^1D^{14}$ (**d**) [4]. In trans-jointed nonlinear melampolides in a ten-membered ring, only type (**c**) and type (**d**) were found experimentally. In structure **1**, cycle A adopts the chair-bath conformation of the $^{15}D_5,_1D_{14}$ type (**c**).

The lactone ring takes the conformation of a somewhat distorted 7α-envelope (ΔC_S^7=3.9°).

The cycles in 1 are articulated in the trans-type (torsion angle H6C6C7H7 = 159°).

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NOVEL FLAVONOID FROM *SERRATULA CUPULIFORMIS*

L.N.Zibareva, O.A.Kotelnikov, V.S.Sidelnikov, D.I. Kazantseva, S.I. Konnova

National Research Tomsk State University, Russia, 634050, Tomsk region, Tomsk, Lenin Ave., 36.

Previously, the species *Serratula cupuliformis* Nakai & Kitag. was recommended as a new plant source of ecdysteroids - 20-hydroxyecdysone, ecdysone, 2-deoxy-20-hydroxyecdysone and polypodin B (Zibareva et al., 2017).

The plant material was grown from seeds obtained from the Botanical garden of Jena (Germany) and successfully introduced in the Siberian Botanical Garden of Tomsk State University. Now this species is presented as a rich source of flavonoids.

In the process of isolation by selective extraction of secondary metabolites from the ethanol extract of the aboveground part of *S.cupuliformis*, chloroform, ethyl acetate, butanol fractions were obtained, the yield of which was, respectively, 0.16; 1.61; 1.97% of the mass of raw materials. The composition of flavonoids of the ethyl acetate fraction was studied, some of which were identified based on HPLC data and comparison with the characteristics of standards. The presence of at least 20 flavonoids with different absorption maxima – 270/335, 267/344, 251/351, 252/366 nm - was found in the aboveground part. The structure of the individual flavonoid isolated by column chromatography was established by HPLC-MS and ^{1}H and ^{13}C NMR methods. The value of m/z 315.0 corresponds to the molecular ion [M-H]-, m/z 300.0 corresponds to a fragmentary ion formed by the cleavage of a methyl group from a molecular ion. The mass spectrum of the sample according to the molecular ion and the nature of fragmentation corresponds to a substance with the gross formula $C_{16}H_{12}O_7$.

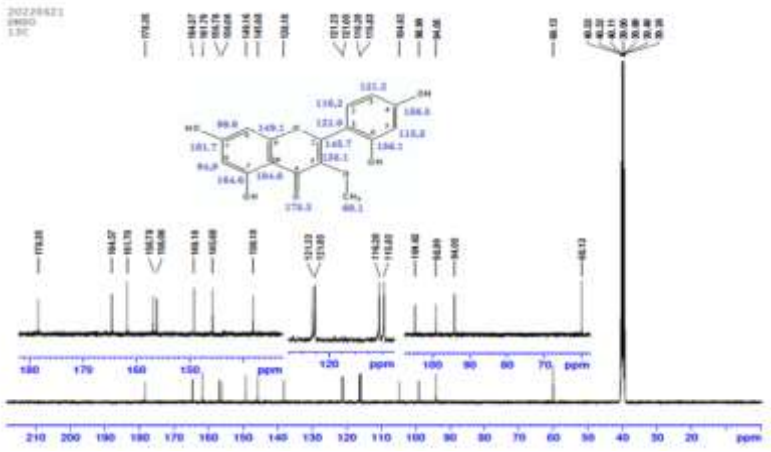


Fig. ^{13}C-NMR spectrum of the studied flavonoid

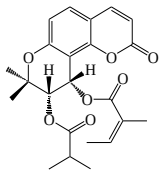
According to the results of the studies conducted by liquid chromatography-mass spectrometry and NMR spectroscopy, by the mass of the molecular ion, the nature of fragmentation, the number of signals and areas of chemical shifts it was found that the compound under study corresponds to the substance 2-(2,4-dihydroxyphenyl)-5,7-dihydroxy-3-methoxy-4H-chromene-4-one. This flavonoid was isolated for the first time.

NEW COUMARINS OF WILD AND CULTIVATED *APIACEAE* PLANTS OF SIBERIA

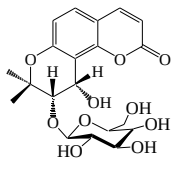
Daniil N. Olennikov[1], Nina I. Kashchenko[1], Nadezhda K. Chirikova[2]

[1] *Institute of General and Experimental Biology, Siberian Division, Russian Academy of Science, 6 Sakhyanovoy Street, 670047 Ulan-Ude, Russia;* [2] *Institute of Natural Sciences, North-Eastern Federal University, 58 Belinsky Street, 677027, Yakutsk, Russia*

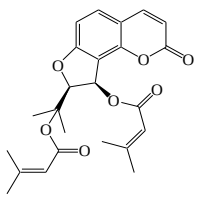
Plants of *Apiaceae* family are widely distributed in a Siberian flora and are the subject of a constant interest within the scientific community as a source of new and effective bioactive metabolites. As a part of ongoing studies of phenolics produced by Apiaceous plants [1–3], we discovered some new coumarins and investigated their biopotential. In particular, four new angular pyranocoumarins phlojosibirinins I–IV were isolated from the roots of *Phlojodicarpus sibiricus* (Fisch.) Koso-Pol. of Baikal origin and identified as (+)-*cis*-khellactone di-*O*-esters with fragments of isobutyric, isovaleric, angelic, and senecic acids. The leaves of the plant were the source of new non-acylated and acylated (+)-*cis*-khellactone *O*-glycosides (phlojosibirisides IV–VII) with moieties of galactose and glucose. Two new umbelliferone and scopoletin monoacetylated 6′-*O*-apioglucosides (villosides I and II) characterized in herb of *Phlojodicarpus villosus* (Turcz. ex Fisch. & C.A.Mey.) Turcz. ex Ledeb collected in Sakha (Yakutia) Republic. Vaginidiol di-esters (ferulopsins A–C) and new vaginidiol-1′-*O*-galactoside were found in roots of *Ferulopsis hystrix* (Bunge) Pimenov collected in Chita region. The plants of *Levisticum officinale* W.D.J.Koch cultivated in Siberian farming demonstrated a high level of apterin [3] and new derivatives including apterin-*O*-glycosides in roots and hydroxycinnmate-acylated apterins in herb (levistisides A–D). Bioactivity studies demonstrated antioxidant, cytotoxic, anticholinesterase-inhibiting and antibacterial potential of new compounds making wild and cultivated plants of Siberia promising sources of new pharmacological agents.



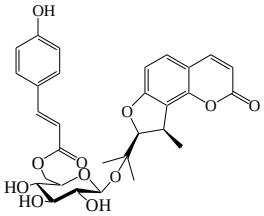
phlojosibirinin II



phlojosibiriside IV



ferulopsin A



levistiside B

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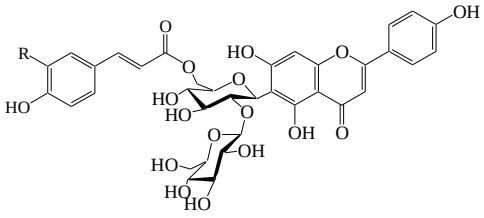
The study was funded by a grant of the Ministry of Education and Science of Russia № 121030100227-7, FSRG-2023-0027.

NEW ACYLATED *C,O*-GLYCOSYLFLAVONES AND ETHYL PHENOL GLUCOSIDES FROM *CUCUMIS SATIVUS*

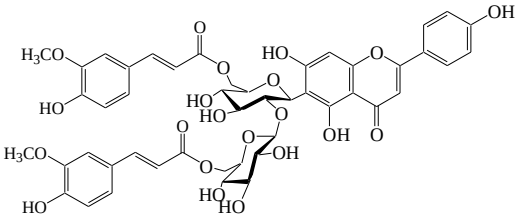
Nina I. Kashchenko, Daniil N. Olennikov, Kristina V. Markova

Institute of General and Experimental Biology, Siberian Division, Russian Academy of Science, 6 Sakhyanovoy Street, 670047 Ulan-Ude, Russia

Cucumber (*Cucumis sativus* L.) is a mass culture of greenhouse crop rotation; the amount of waste received from it is up to one million tons per year. Metabolites of vegetative green of *C. sativus* are poorly studied and may be of practical importance as a source of biologically active agents for the treatment and prevention of socially significant diseases. Previous studies demonstrated the accumulation of the specific complex *C*-glycosyl flavonoid phytoalexins cucumerins in leaves of cucumber infected by powdery mildew *Podosphaera xanthii* [1], lately found in tissues of healthy plants [2]. Continuing our findings of cucumber bioactive metabolites, we used flash, column and preparative chromatography on NP- and RP-SiO_2, polyamide, Sephadex LH-20 for the bioactivity-guided separation of phenolic components with pancreatic lipase inhibitory activity. Methanolic extract of *C. sativus* non-infected leaves firstly yielded known acylated isovitexin derivatives isovitexin 2″-*O*-(6‴-*p*-coumaroyl/feruloyl)-glucosides and isovitexin 4′-*O*-glucoside-2″-*O*-(6‴-*p*-coumaroyl/feruloyl)-glucosides [3] as well as new compounds **1**–**6**. Based on UV-, NMR-spectroscopy and mass-spectrometric data, the structures of new compounds were found as feruloylated / *p*-coumaroylated isovitexins (**1**–**3**) and ethyl phenol glucosides (**4**–**6**). Acylated flavonoids showed strong inhibitory potential against pancreatic lipase and concluded as perspective anti-lipase agents.



1: R = OCH_3; **2**: R = H



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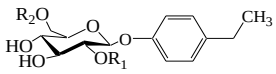

4: R_1 = R_2 = H
5: R_1 = H; R_2 = CH_3CO
6: R_1 = β-D-Glc*p*; R_2 = H

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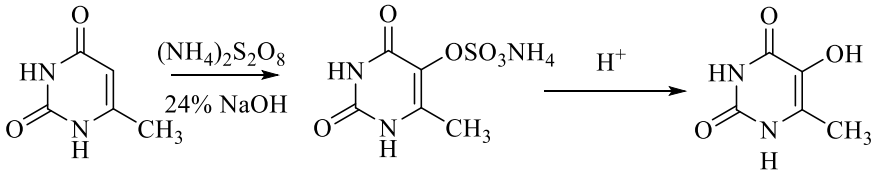
The study was funded by a grant of the Russian Science Foundation № 23-26-00063 (https://rscf.ru/project/23-26-00063).

CATALYTIC OXIDATION OF 6-METHYLURACIL

Y.Z. Khazimullina, A.R. Gimadieva, A.G. Mustafin

Ufa Institute of Chemistry UFIC RAS, 71, Prospekt Oktyabrya, Ufa, 450054 Russia

It is well known that pyrimidine bases are an integral part of DNA and RNA in organisms; therefore, derivatives of this class of compounds are used as the active ingredient of many drugs. For example, there are a number of drugs based on uracil due to its wide spectrum of pharmacological activity: fluorouracil (antitumor activity), zidovudine (antiviral activity), 6-methyluracil (immunomodulatory action), etc. [1]. One of the compounds with proven anti-inflammatory, immunotropic activity is 5-hydroxy-6-methyluracil registered as a drug Immureg [2]. One of the methods of obtaining oxymethyluracil is the Elbs oxidation of 6-methyluracil:



However, according to the classical reaction of persulfate oxidation, the yield of the target product does not exceed 15%, therefore, a modification of the Elbs reaction was carried out - catalysts (phthalocyanines of various metals) were used, which significantly changed the picture, increasing the yield of the intermediate product (further PP) 5-ammoniumsulfate-6-methyluracil to 85-88% [3], the second stage of acid hydrolysis proceeds quantitatively, forming 5-hydroxy-6-methyluracil (further OMU).

Dependence of PP yield on the type and amount of catalyst (0.01% weight) (molar ratio 6-methyluracil:NaOH:ammonium persulfate = 1:4.1:1.5)

№	Catalyst	PP yield, %	OMU yield, %
1	Fc Co	87	83
2	Fc Fe(II)	89	85
3	Fc Fe(III)	82	79
4	Fc Ni	71	67
5	Fc Mn	72	67
6	Fc Zn	69	61

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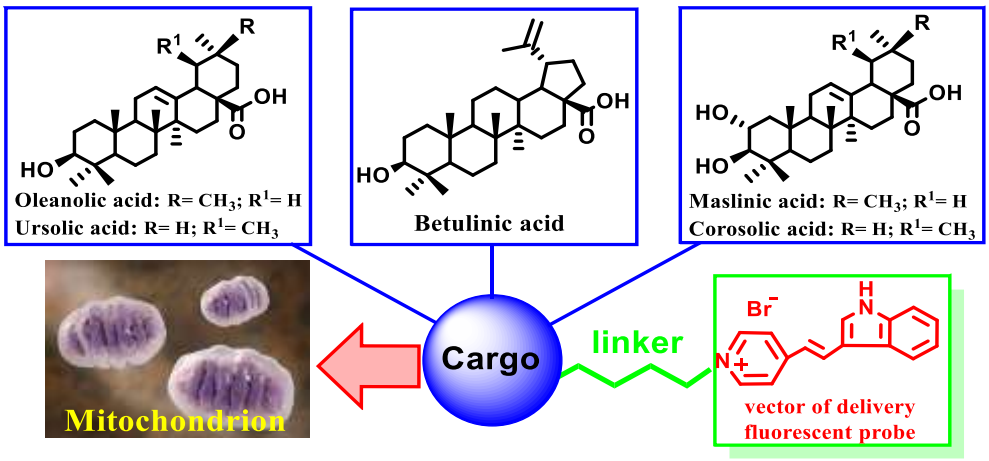
ADDUCTS OF NATURAL TRITERPENOID ACIDS WITH MITOCHONDRIA-TARGETED CATIONIC COMPOUND F16, PROMISING AS NEW ANTICANCER DRUGS

Eldar Valerievich Davletshin, Darya Alexandrovna Nedopekina, Anna Yulievna Spivak

Institute of Petrochemistry and Catalysis, Ufa Federal Research Center, Russian Academy of Sciences, Prospekt Oktyabrya 141, Ufa, Republic of Bashkortostan, 450075, Russia

In order to design an effective anti-cancer drugs, have been synthesized a series of conjugates of natural pentacyclic triterpene acids (betulinic, ursolic, oleanolic, maslinic, and corosolic acids) with a mitochondria-targeted delocalized lipophilic cationic compound F16 [E-4-(1H-indol-3-ylvinyl)-*N*-methylpyridinium iodide]. A fragment of the lipophilic membrane-penetrating compound F16 was used as a vector for the transfer of pentacyclic triterenoids through cell membranes, selective delivery into the mitochondria of cancer cells, and simultaneously as a fluorescent probe. The most hybrid molecules demonstrated multiple synergistic effect of antitumor activity (≈50-100 times) *in vitro* tests on human leukemia tumor cell lines (U937, K562 and Jurkat), breast adenocarcinoma (MCF-7) and human lung adenocarcinoma cells (A549 and H1299). The study of the mechanism of antitumor activity in relation to the MCF-7 cell line showed that the antitumor activity of the conjugates is due to their prooxidant effect associated with the massive generation of reactive oxygen species in cancer cells, as well as the antiproliferative effect causing cell cycle arrest at the G0/G1 phase. Visualization of the distribution of conjugates in intracellular organelles, performed using the method of confocal microscopy, indicated a high degree of their localization in the mitochondria of cancer cells. (The work was carried out in collaboration with the Mari State University, Yoshkar-Ola and the Institute of Theoretical and Experimental Biophysics of the Russian Academy of Sciences, Laboratory of Mitochondrial Transport, Pushchino). *This work was performed under financial support from the Russian Science Foundation (Grant 23-23-00098).*



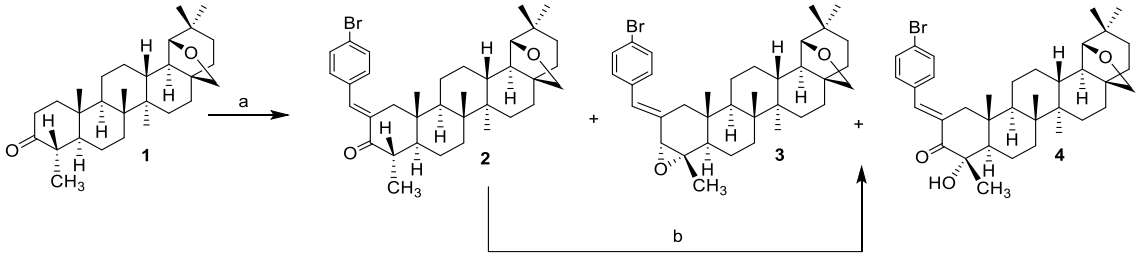
AN APPROACH TO THE OXO-, EPOXY- AND HYDROXY-DERIVATIVES OF 2*E*-BENZYLIDENE-24-NOR-ALLOBETULIN

Liana Marselevna Zakirova[1], Irina Petrovna Baikova[1]

[1]Ufa Institute of Chemistry of the Ufa Federal Research Centre of the Russian Academy of Sciences, Ufa, 450054, Prospekt Oktyabrya, 71, Russian Federation; e-mail: liana.zakirova@gmail.com

Allobetulin is a natural origin oleanane-type pentacyclic triterpenoid being a part of the extractive substances of birch bark. Allobetulin and its derivatives are potent bioactive triterpenes with a wide spectrum of biological activities, such as cytotoxic, antiviral, antifeedant, immunotropic, antimicrobial and anti-inflammatory combined with low toxicity [1].

We have modified 3-oxo-24-nor-allobetulin with obtaining 3β-hydroxy-, oxime-, methoxyoxime- and lactame- derivatives. The screening of α-glucosidase inhibitory activity has shown that 24-nor-allobetulins are more active than allobetulins [2].



Reactions and conditions: (a) 4-bromobenzaldehyde, 40% KOH/EtOH, EtOH, r.t., 24 h.; (b) 40% KOH/EtOH, EtOH, r.t., 24 h.

Making the Claisen-Schmidt reaction of 3-oxo-24-nor-allobetulin **1** with 4-bromobenzaldehyde for several times we have noticed that depending on the reaction time two byproducts **3** (32 %) and **4** (19 %) were formed among the expected 2*E*-*p*-bromobenzylidene derivative **2** with the yield of 49%**.** When compound **2** was kept in a 40% solution of KOH/EtOH without the addition of aldehyde, we observed the formation of a mixture of compounds **3** and **4** with the yield 56 % and 44 %, respectively. We should note that the treatment of compound **3** with the 40% solution of KOH/EtOH at room temperature or under reflux do not lead to the formation of compound **4**.

It was also found that the reaction proceeded according to the mechanism of second-order nucleophilic substitution with inversion of the configuration in compounds **3** and **4**. The structure of all synthesized compounds is confirmed by NMR spectroscopy data.

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ANTIOXIDANT ACTIVITY OF *PINUS SYLVESTRIS* AND *PINUS SIBIRICA* NEEDLES EXTRACTS

V.V. Kraynik

Surgut State University, krajnik_vv@surgu.ru

Introduction. Pinus is a popular medicinal plant that is used in several traditional medicines to cure various diseases. Shoots, buds, bark, roots and wood contain various active components with anti-inflammatory, expectorant, multivitamin and analgesic properties.

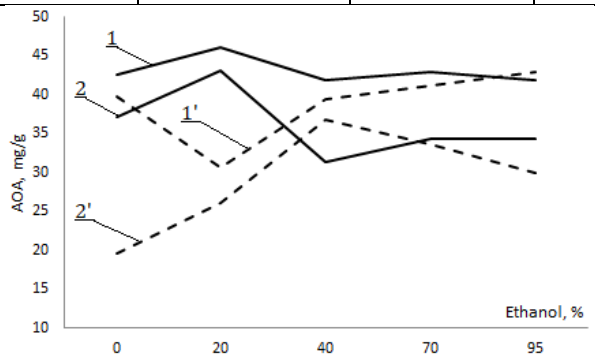
Research methods. The study material consisted of *Pinus sylvestris* and *Pinus sibirica* needles collected in 2022 from the city park (Russia, Khanty-Mansi Autonomous Okrug – Ugra, Surgut). The needles were collected in May (spring) and in October (autumn) and fixed using natural-air drying at 25 °C for 72h. The dried needles were crushed to a particle size of 0.5 - 0.9 mm.

The total content of favonoids (TCF) was estimated using a method based on the formation of favonoids with aluminium (III) ions. The result was expressed as the rutin equivalent.

The volume of extract in ml used for titration with 1 ml of 0.05N potassium permanganate solution served as an indicator of relative antioxidant activity (AOA). The result was expressed as the quercetin equivalent.

The results obtained. All results are presented in Table and Fig.

Sample	*Pinus sylvestris*		*Pinus sibirica*		solvent
	spring	autumn	spring	autumn	
AOA, mg/g	39,8±0,1	42,6±0,7	19,6±0,1	37,1±0,1	water
TFC, %	1,8±0,2	2,1±0,1	1,1±0,2	1,6±0,3	ethanol 70%



Pinus sylvestris 1-1', *Pinus sibirica* 2-2', autumn- spring respectively

Pinus sylvestris and *Pinus sibirica* needles are a raw material characterized by content of biologically active compounds with antioxidant properties. Aqueous and ethanol extracts of pine needles can be used in functional foods as a source of antioxidants.

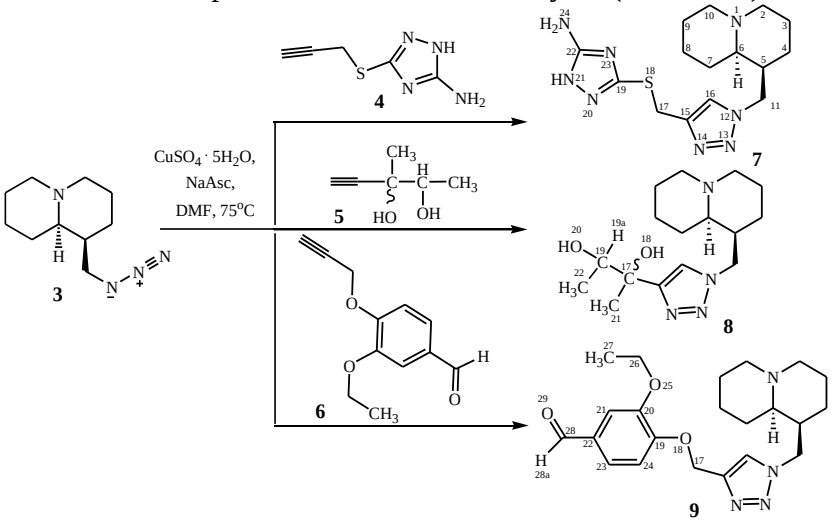
SYNTHESIS OF (1*S*,9a*R*)-1-[(1,2,3-TRIAZOL-1-YL)METHYL]OCTAHYDRO-1*H*- QUINOLIZINES FROM ALKALOID LUPININE

Z.M. Muldakhmetov, Zh.S. Nurmaganbetov, O.A. Nurkenov, S.D. Fazylov

Institute of organic synthesis and coal chemistry of the Republic of Kazakhstan, Kazakhstan, 100008, Karaganda, str. Alikhanov, 1; e-mail: nzhangeldy@yandex.ru

Azide of lupinine alkaloid has been obtained from lupinine in two stages. The reaction of lupinine **1** with methanesulfonyl chloride in the presence of Et_3N in CH_2Cl_2 has resulted in octahydro-2*H*-quinolizine-1-yl)methyl methanesulfonate **2**. The reaction of octahydro-2*H*-quinolizine-1-yl)methyl methanesulfonate with NaN_3 in DMF has led to a relevant natural quinolizine azide **3**. The synthesis of this compound **3** has been described before in the paper of [1].

The (1*S*,9a*R*)-1-[(1,2,3-triazol-1-yl)methyl]octahydro-1*H*-quinolizines of **7-9** have been synthesized by the reaction of lupinine azide **3** with the terminal alkynes of 3-(prop-2-yn-1-yl-thio)-1*H*-1,2,4-triazol-5-amine **4**, (2*R*,2*S*)-3-methylpent-4-yne-2,3-diol **5** and with aryloxymethyl-substituted 3-ethoxy-4-(prop-2-ynyloxy)benzaldehyde **6** under the reaction conditions of 1,3- dipolar cycloaddition. In addition, the (1*S*,9a*R*)-1-[(1,2,3-triazol-1-yl)methyl]octahydro-1*H*-quinolizines of **7-9** have contained various substituents at C-4 position of 1,2,3-triazole cycle (**Scheme 1**).



Scheme 1. Synthesis of quinolizine-triazoles of **7-9**

The structure of the synthesized compounds of **7-9** has been confirmed by IR-, ^{1}H-, ^{13}C- NMR spectroscopies and mass spectrometry. Compound **8** has been formed as a mixture of (17′*R*,17′*S*)-diastereomers (4:1, as in an original alkyne **5**). The structure **8** has been determined by correlation of proton signals at C-19 atom, doublets of the C-22 methyl group and singlets of the C-21 methyl group.

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(TETRAHYDROXYETHYL-1,4-NAPHTHOQUINONYL)OXY-UREA – METABOLITES OF THE DRUG HISTOCHROME

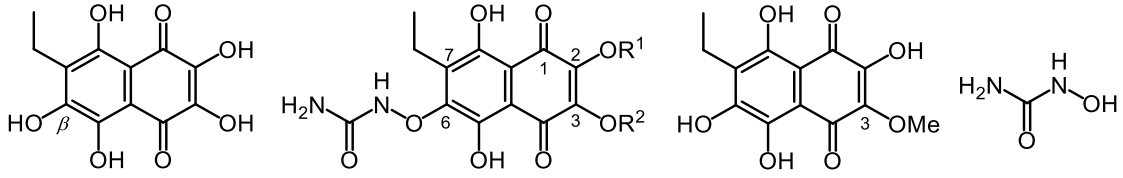
A. E. Zakirova, R. S. Popov, V. V. Makhankov, V. Ph. Anufriev

G.B. Elyakov Pacific Institute of Bioorganic Chemistry, Russian Academy of Sciences, 690022 Vladivostok, Russia

By high-resolution HPLC coupled with mass spectrometry using a deuterium label, it was found that the mice renal excretions after histocrome injection contain 1-((6-ethyl-2,3,5,8-tetrahydroxy-1,4-naphthoquinone-7-yl)oxy)urea and its 3-methoxy derivative.

Histochrome® series drugs are effective for the treatment of cardiac and ophthalmic diseases. Despite extensive experience in the use of histochrome, to date, the structures of its metabolites have not been systematically studied.

Earlier, by high-resolution HPLC-MS/MS, using a deuterium label, it was found that in the renal excretions of mice after injection of histochrome, in addition to the drug substance echinochrome (**1**), its methoxy derivatives and their monoglucuronides occur. We continued the research related to the search for metabolites possibly responsible for the biological activity of histochrome. Two products with t_R 9.4 and 10.3 min were detected by high-resolution HPLC-MS/MS. Their negative ion mode mass spectra contain peaks of molecular ions $[M-H]^-$ *m/z* 326.0712 and *m/z* 340.0844, respectively. The difference between the position of the peak of the molecular ion $[M-H]^-$, *m/z* 326.0712, the first of them and its main fragment peak *m/z* 267.0474 is 59.0235 units of mass. This atomic mass, with a high degree of probability, corresponds to the structural fragment of urea NH_2CONH^- (*m/z*: 59.0240). The absence of a signal with *m/z* 249.001 in the spectrum indicates the blocking of the hydroxyl group adjacent to the ethyl radical of echinochrome, that is, the presence of the fragment NH_2CONH^- at position 6. Thus, the detected product has the structure 1-((2,3,5,8-tetrahydroxy-7-ethyl-1,4-naphthoquinone-6-yl)oxy)urea(**2a**).



1 **2** R^1,R^2: H,H (**a**); H,Me (**b**); Me,H (**c**) **3** **4**

The second product molecular ion peak $[M-H]^-$ with *m/z* 340.0844 (calculated data 340.0866, Δ 0.0022) corresponds to two structures **2b** and 2c. Taking into account the dominance of the 3-methoxy derivative of echinochrome (**3**) in renal excretions, it can be assumed that this product has a structure of 1-((2,5,8-trihydroxy-3-methoxy-7-ethyl-1,4-naphthoquinone-6-yl)oxy)urea (**2b**).

The final conclusion about the structure of the detected products can be made on the basis of the results of counter synthesis. In addition, synthesis will make these compounds available, which will allow them to be biotested. Of particular interest is the synthesis of metabolite **2a**. This product is notable because it is a hybrid of hydroxycarbamide (**4**), a cytostatic, and echinochrome (**1**), a cardioprotector, known vital medicines.

DEVELOPMENT OF A DOSAGE FORM - GEL BASED ON EXTRACT OF *XANTHIUM STRUMARIUM* L.

Nazigul Serikovna Remetova, Khorlan Iskozhiyevna Itzhanova

NJSC "Karaganda Medical University", Karaganda, Republic of Kazakhstan

Key words: *Xanthium strumarium* L., extracts, gels, medicinal plant, technology.

Of great interest for practical medicine are medicinal preparations for external use in the form of gels, since they have great advantages over ointments. When they are applied to the skin, the thinnest smooth films are formed, they are well absorbed through the skin, and so on. Gels are widely used in the treatment of rheumatoid arthritis, atopic dermatitis, in dentistry, proctology, urology and in the treatment of other diseases [1-3].

We have developed a gel for external use, the active ingredients and auxiliary ingredients (polyethylene glycols, microcrystalline cellulose, polyvinylpyrrolidone, carbopol, gelatin) have been introduced into the composition. The compositions of 5 gel models were selected. Biopharmaceutical parameters for the release of active substances by diffusion into a 2% agar solution were carried out and the optimal composition was determined.

The optimal composition of the medicinal agent in the form of a gel consists of an extract of *Xanthium strumarium* L. 5.0; essential oil of *Pinus sylvestris* L. 1.0; chondroitin sulfate 0.1; polyethylene glycol brand 400: polyethylene glycol brand 1500 in the ratio (95:5); purified water up to 100.0.

The indicators of the appearance and consistency of the dosage form were established in terms of mass uniformity, where the criterion for uniformity was the absence of individual visible particles of active substances, foreign impurities, as well as signs of coagulation, particle aggregation, phase separation.

The developed gel is a viscous, homogeneous brown mass. Potentiometric method determined the pH of the water extract, which was -5.4. The rheological quality indicators for the dosage form - gel were established.

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SYNTHESIS OF NEW BENZIMIDAZOLE NUCLEOSIDES

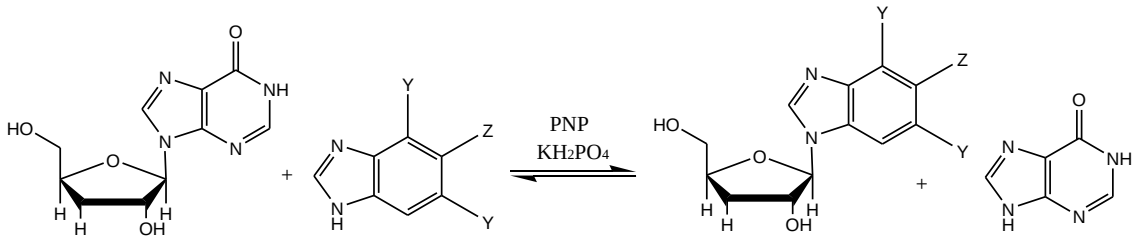
I.A. Aleksakhina[1], A.L. Kayushin [2], A.O. Arnautova [2]

[1]MIREA – Russian Technological University, 86 Vernadsky Avenue, Moscow, 119571, Russia
[2]Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry RAS, Miklukho-Maklaya 16/10, 117997 GSP, B-437 Moscow, Russia

The development of benzimidazole nucleosides as antiviral drugs is a rapidly evolving field. Researchers are ongoing to improve their potency, specificity, and safety profile. Various modifications have been made to the structure of benzimidazole nucleosides, for instance, modifications of benzimidazole cycle or ribose residue.

In this study we synthesized a number of benzimidazole ribosides.

An effective biotechnological method for synthesis of modified benzimidazole nucleosides has been developed.



3'-deoxyinosine

Y, Z=H - Benzimidazole (Benz)

Y=F, Z=OMe - 4,6-difluoro-5-o-methyl-benzimidazole (Sk-473)

Y, Z=H - Benzimidazole 3'-deoxyriboside

Y=F, Z=OMe - 4,6-difluoro-5-o-methyl-benzimidazole 3'-deoxyriboside .

Hypoxanthine

Syntheses of benzimidazole and 4,6-difluoro-5-O-methylbenzimidazole 3'-deoxyribosides were optimized as follows:

• The amount of purine nucleoside phosphorylase (PNP) (2800 units for synthesis with Benz, 2100 units for synthesis with Sk-473)

• Substrate ratio (Benz:3'dIno and Sk-473:3'dIno 2:6 and 1:7, respectively);

After optimizing the conditions, preparative syntheses of benzimidazole nucleosides were performed. Structures of target compounds were confirmed by NMR and mass spectrometry.

Yields of benzimidazole and Sk-473 3'-deoxyribosides were 26% and 70% correspondingly.

Studies of antiviral activity and cytotoxic properties of nucleosides obtained have shown that benzimidazole and Sk-473 3'-deoxyribosides developed significant antiherpetic activity. Right now further investigations are performed.

The study was supported by RSF grant (Project No. 21-13-00429).

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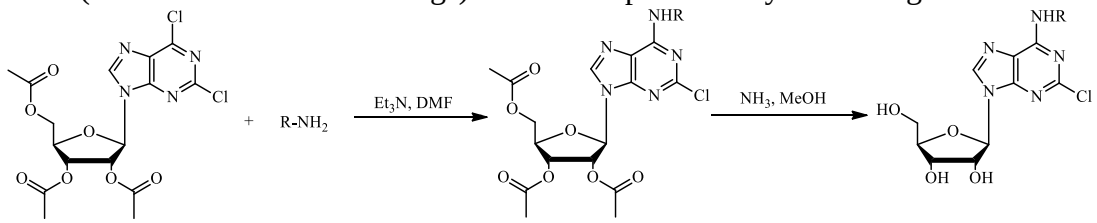
SYNTHESIS OF NEW PURINE NUCLEOSIDES – ANALOGUES OF ADENOSINE RECEPTOR AGONISTS

Olga N. Zhavoronkova[1,2], Maria Ya. Berzina[1], Irina D. Konstantinova[1]

[1]Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Miklukho-Maklaya st. 16/10, 117997, Moscow
[2]RTU MIREA, Institute of Fine Chemical Technologies named after M.V. Lomonosov, 86 Vernadsky Ave., 119571 Moscow

Adenosine receptors (ARs) are activated during pathological conditions and stress. Adenosine can correct energy imbalances by increasing or decreasing basal activation of four AR subtypes (A_1AR, $A_{2A}AR$, $A_{2B}AR$, A_3AR). Slower heart rate and a decrease of intraocular pressure occur due to the activation of A_1AR [1]; A_1ARs are highly expressed in adipose tissue and their activation results in inhibition of lipolysis and modulation of insulin sensitivity [2]. Activation of $A_{2A}AR$ improves myocardial blood supply [3]. Endogenous adenosine is an agonist of all AR. Today, the problem of finding selective ARs agonists that activate on a certain type of receptor in various tissues of the body is very relevant.

In previously published studies in isolated mouse atria, conjugates of 2-chloro-9-(*β-D*-ribofuranosyl)purine and amino acid amide residues at the C6 position were found to be A_1AR agonists. These compounds have also been shown to reduce intraocular pressure [1]. We decided to expand the library of compounds by including amino alcohols (reduced amino acids analogs). These compounds may be ARs agonists.



$R\text{-}NH_2$ = various amino alcohos

Currently, target compounds are being synthesized using chemical and chemical-enzymatic methods. It is planned to study the agonistic activity of the obtained compounds in relation to A_1AR and $A_{2A}AR$.

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THE CYTOTOXICAL PROPERTIES OF OLEANANE ALDEHYDE-B-ENONE AGAINST DOXORUBICIN-RESISTANT CANCER CELLS

Daria V. Eroshenko, Irina A. Tolmacheva, Mikhail A. Nazarov, and Victoria V. Grishko

Institute of Technical Chemistry of the Ural Branch of the Russian Academy of Sciences, Perm Federal Scientific Centre, Russia, 614013, Perm, Academician Koroleva st, 3

This study was aimed at assessing the proapoptotic potential of previously synthesized oleanane aldehyde-β-enone (**OA**) [1] against cancer cell lines, including doxorubin-resistant subclones with the P-gp overexpression. **OA** showed equal toxicity to parental HBL-100 and K562 cancer cells (IC_{50} 0.47–0.53 μM) and their Dox-resistant subclones HBL-100/Dox, K562/i-S9 and K562/i-S9_Dox (IC_{50} 0.45−1.24 μM), as was determined by the MTT test [2]. **OA** overcomes the resistance of overexpressing P-gp cancer cells, with **OA** being neither a direct inhibitor, nor a competitive substrate of P-gp [2].

The **OA** proapoptotic effect against HBL-100 and HBL-100/Dox cells was assessed by means of double staining with the Annexin V/PI kit and analyzed by flow cytometry after **OA** treatment at IC_{50} for 16 h. The **OA**-treatment led to an increase in the early and late apoptotic cell population for HBL-100 cells (23.6% vs 2.51% for untreated cells) and HBL-100/Dox cells (8.06% vs 2.53% for untreated cells). In addition, the cell cycle analysis of the HBL-100 and HBL-100/Dox cultures after 16 h **OA**-treatment evinced **OA** to cause a significant increase (up to 9%) in the sub-G0/G1 subpopulation with DNA-reduced cells. Fluorescence microscopy revealed the incubation of HBL-100 and HBL-100/Dox cells with of **OA** to be accompanied by a significant decrease in mitochondrial fluorescence (ΔΨm loss) and ROS generation. The release of cytochrome *c* from mitochondria to cytosol in the HBL-100 and HBL-100/Dox cells, which was more remarkable in HBL-100/Dox cells, was observed after 16 h **OA**-treatment. We had ascertained **OA**-induced apoptosis as being attributed to activation of caspase cascade: it was simultaneously associated with extrinsic and intrinsic pathways mediated by activation of caspases-8,-9,-3,-6,-7 and cleaved-poly-ADP ribose polymerase (PARP) in HBL-100 cells. As opposed to that, an increase of only activated caspase-9 associated with intrinsic pathway of cell death and the emergence of caspase-6 and cleaved-PARP without caspase-3,-7 activation was found in HBL-100/Dox cells. Thus, cytotoxic activity of **OA** was attributed to induction of cell apoptosis in HBL-100 and HBL-100/Dox cancer cells.

This work was financially supported by the Russian Science Foundation (grant No. 21-13-00161).

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STUDY OF THE ALKALOID COMPOSITION OF THE ROOTS OF THE PLANT *THALICTRUM MINUS* L. FROM THE FLORA OF AZERBAIJAN

Ilkin. U. Nasirli*; Eldar. A. Garaev;

*****Department of Pharmaceutical toxicology and chemistry, Faculty of Pharmacy, Azerbaijan Medical University, Nasimi district, Enver Qasimzade 14. AZ1022, Baku, Azerbaijan, E-mail: ilkinnesirli92@gmail.com*

Key Words: *Thalictrum minus* L., medicinal plants, alkaloids, preparative thin layer chromatography and NMR spectroscopy.

OBJECTIVES: *Thalictrum minus* L, a plant of the genus *Thalictrum*, is one of the medicinal plants that are widespread in the flora of Azerbaijan and contain alkaloids, flavonoids, triterpene glycosides, saponins, and other biologically active substances. The *Th. minus* plant, which mainly contains isoquinoline and aporphine group alkaloids, has been used in folk medicine for anti-inflammatory, anti-infection, anti-tumor, anti-malarial, and nervous system diseases. The sedative effect was found in experiments. It is known from world literature that alkaloids have a wide range of effects and cause poisoning when taken in large amounts. For this reason, our goal is to conduct a preliminary analysis of the alkaloids found in the root of the *Th. minus* plant, which is common in Azerbaijan.

METHODS: The raw material for the study was the root of the *Th. minus* plant collected in the Altiagach settlement in July 2020, crushed and dried in the shade. Crushed raw material (200 g) is concentrated by extracting 3 times with 75% methanol. The solid residue is basified with a 10% ammonia solution and extracted with chloroform and dichloromethane to give the alkaloid complex. The obtained aggregate is analyzed firstly by thin layer chromatography (TLC) method then by preparative TLC (PTLC) method (Chromatography plates: Merck (Germany); solvent system: methanol - dichloromethane - 25% ammonia solution (8:2:0.1), clarifier: Dragendorf reagent). NMR spectra of individually obtained alkaloids are recorded with a Bruker 600MHz Avance III spectrometer.

RESULTS. Alkaloids of the root of *Th. minus* plants growing in Azerbaijan were studied. By PTLC method individual alkaloids were separated from this part. To determine the chemical structure of the separated alkaloid which has an R_f -0.51, identified by NMR spectrsocopic method.

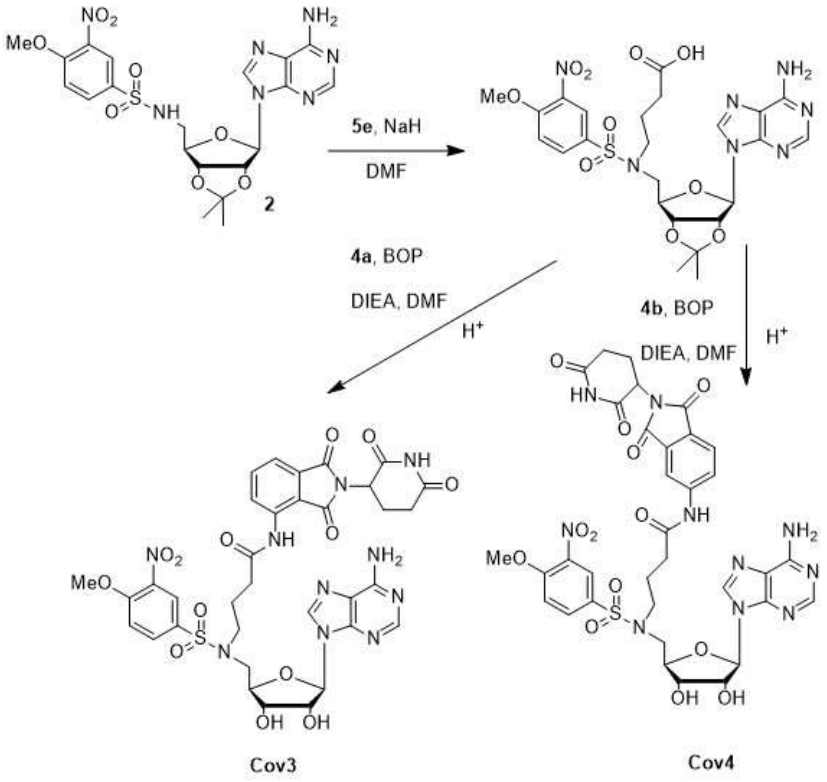
CONCLUSION. The alkaloid of the root of *Th. minus* from Azerbaijan flora, were investigated and it was determined as berberine.

LIGAND SYNTHESIS FOR TARGETED DEGRADATION OF SARS CoV-2 NSP14

Maria A. Zakharova, Mikhail V. Chudinov

MIREA - Russian Technological University, 86 Vernadsky avenue, Moscow, Russia

The technology of targeted protein degradation (Protac©) is based on the production of chimeric molecules consisting of 2 ligands to various biological targets: to the element of the proteasome complex ligase E3 and to the target protein. The ligands are interconnected by a spacer. As a result of the action of such a chimeric molecule, the target protein is labeled by the E3 ligase as a target of the proteasome complex of the cell and is further destroyed by the proteasome. This new technology has already proven itself in the creation of antitumor drugs, but its use in the fight against viruses is just beginning [1]. Based on the recently developed inhibitors of the nonspecific protein nsp-14 of the SARS-Cov2 virus [2], we synthesized chimeric compounds **Cov3** and **Cov4**, potentially suitable for use in Protac technology to combat SARS-Cov2 **(Schema1)**.



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GROWTH AND BIOCHEMICAL CHARACTERISTICS OF WINTER WHEAT SEEDLINGS AFTER SEED TREATMENT WITH CONJUGATE CHITOSAN-CAFFEIC ACID

J.N. Kalatskaja[1], N.A. Laman[1], K.M. Herasimovich[1], K.I. Rybinskaya[1], S.M. Turaeva[2], R.P. Zakirova[2], V.V. Nikalaichuk[3], K.S. Hileuskaya[3]

[1]V.F. Kuprevich Institute of Experimental Botany, National Academy of Sciences of Belarus, 27 Academicheskaya str., Minsk, 220072, Belarus
[2] S.Yu. Yunusov Institute of the Chemistry of Plant Substances AS RUz
[3] Institute of Chemistry of New Materials, National Academy of Sciences of Belarus, 36 F. Skoriny Minsk, 220141 Belarus

Phenolic compounds play an important role in the regulation of seed germination, plant growth and development, and sustainability plants. Hydroxylated and methylated derivatives of cinnamic acid can have a significant effect on plant metabolism. Caffeic acid is an early intermediate in phenylpropanoid metabolism and a precursor of polyphenols and many secondary compounds regulated the protective responses plants. The potential applied of hydroxycinnamic acids (HCA) is significantly limited by their low solubility in aqueous solutions. Overcoming poor bioavailability of HCA can be the creation of their conjugates with biopolymers, such as chitosan. Chitosan is a non-toxic, biodegradable material and is extracted from natural raw materials. Chitosan has biological activity (elicitory, antibacterial, fungicidal, etc.), therefore, the use of caffeic acid in the form of a conjugate with it can provide multiple effects – protective properties when coating seeds with a film (film-forming properties of the polymer), stimulation of growth plants, fungistatic effect, induction of sustainability plants.

It has been established the chitosan-caffeic acid conjugate is unstable when stored in liquid form. Its lyophilized form was obtained. Additives were used as a stabilizer and filler of lyophilizate. Kaolin and sepiolite have been shown to stabilize chitosan-caffeic acid conjugate more effectively than the organic cryoprotectant mannitol. Lyophilized conjugates are easy to transport, store and restore to the active form before seed treatment, which avoids the loss of chemical and biological activity during storage. The lyophilized form of the chitosan-caffeic acid conjugate accelerated seed vigor under normal growing conditions. There were no significant changes in the growth and development parameters of seedlings in normal and unfavorable growing conditions (prolonged salt stress - 200 mM NaCl). At the same time, seedlings under normal growing conditions showed a decrease of oxidative processes in the roots treated with chitosan-caffeic acid conjugate and antioxidant activity in seedlings (total antioxidant activity, total phenolic compounds content and proline content) relative to control seedlings of winter wheat.

Proline content was increase and intensity of oxidative processes declined in seedlings from treated chitosan-caffeic acid conjugate seeds under the salt stress. This may indicate the viability preservation of seedlings under longer-term stress conditions or its greater intensity.

The research work was carried out within the framework of the BRFFR-SCST grant B21UZBG-019.

CHEMICAL SYNTHESIS OF 2-AMINOBENZIMIDAZOLE 3'-DEOXYRIBOSIDE

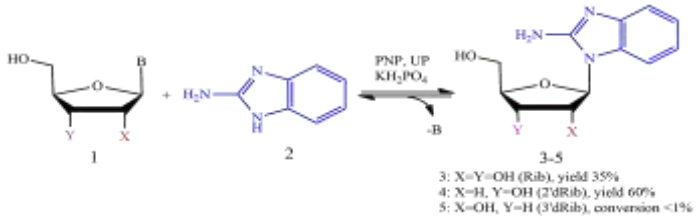
Zorina E.A.[1,2], Kayushin A.L.[2], Arnautova A.O.[2], Konstantinova I.D.[2]

[1]MIREA – Russian Technological University, 86 Vernadsky Avenue, Moscow, 119571, Russia
[2]Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry RAS, Miklukho-Maklaya 16/10, 117997 GSP, B-437 Moscow, Russia

Nucleoside analogues are used in medical practice due to their wide range of activity. They are used in treatment of viral diseases, malignant neoplasms, parasitic diseases, as well as bacterial and fungal infections. Different derivatives of benzimidazole nucleosides are known to be active against some viruses. Thus synthesis of such derivatives is rather actual.

Two approaches to obtaining analogues of natural nucleosides exist: chemical and enzymatic synthesis.

We investigated the possibility of synthesis of 2-aminobenzimidazole riboside (**3**), 2'-deoxyriboside (**4**), and 3'-deoxyriboside (**5**) by enzymatic glycosylation using nucleoside phosphorylases (*E.coli* PNP and UP) (Scheme 1). Yields of compounds **3** and **4** were acceptable but synthesis of **5** failed (it was shown for the first time). According to HPLC data, the conversion of base **2** to target nucleoside **5** was less than 1%



Scheme 1.

Thus we decided to synthesize nucleoside **5** from previously obtained riboside **3** (Scheme 2):

Scheme 2.

The chemical synthesis of 3'-deoxyriboside **5** includes 4 stages. Total yield of the target nucleoside - 23%. Purity according to HPLC data - 97%. The structure was confirmed by mass- and NMR-spectroscopy.

The study was supported by RSF grant (Project No. 21-13-00429).

STUDYING THE QUALITATIVE COMPOSITION OF SUBSTANCES OBTAINED FROM POPLAR BUDS BY EXTRACTION AND BAROTHERMIC METHODS

Mechshanova Anna, Polyakov Vladilen

Non-profit limited company "Manash Kozybayev North Kazakhstan university", Department of "Chemistry and Chemical Technologies", Petropavlovsk, Republic of Kazakhstan

Currently, among the most acute problems of the Republic of Kazakhstan, it should be noted the creation and development of its own pharmaceutical base, which would meet all international standards. Therefore, the actual problem today is the creation of new highly effective domestic drugs based on the plant resources of the country. It is also important to master the production of original domestic drugs, the creation of safe and environmentally friendly technologies for their production. In this direction, plants of the genus Populus (poplar) of the Salicaceae (willow) family have an advantage due to large reserves of renewable raw materials (poplar plantations in the North Kazakhstan region have industrial reserves of medicinal raw materials) and the content of various classes of compounds with a wide range of biological activity.

The aim of this work was to study the qualitative composition of substances from the buds of balsam poplar Populus balsamifera obtained by extraction and barothermal methods.

Objectives: to obtain the substance from the balsam poplar buds Populus balsamifera by extraction and barothermal methods; establish the qualitative composition of the obtained substances; compare the composition of substances obtained by extraction and barothermal methods.

Materials and methods. A method for obtaining a substance from balsam poplar buds, includes the use of freshly harvested balsam poplar buds, extraction with solvents with an increasing polarity gradient. There were used as solvents: hexane; dichloromethane; ethyl acetate. The resulting extract was evaporated.

The results and conclusions: the results of the study showed almost complete identity of the qualitative composition of the hexane extract of substances obtained by extraction and barothermal methods. In the case of ethyl acetate fractions, the difference is the presence of chalcones in the substance obtained by the barothermal method. Extraction with methylene chloride allows the separation of flavonoids, subsequent extraction with ethyl acetate allows the separation of gibberellins.

Key words: Populus balsamifera, buds, pinostrobin, extraction, barothermic method, flavonoids, chalcones, chromatography, composition of substances.

INTERACTION OF TETRA-μ-FORMIATO-DIMOLYBDENUM MONOHYDRATE WITH A POLYDENTATE DONOR BASE

Akhmedov Eldar Latif, Huseynguliyeva Kenul Fada, Akberova Saida Shamil

Azerbaijan Medical University, Department of Pharmaceutical Toxicology and Chemistry, Baku

Previously, we found that the tetra-μ-carboxylate complex of dimolybdenum, in particular, $Mo_2(O_2CH)_4H_2O$, is capable of forming complexes of the $Mo_2(O_2CH)_4L_2$ type (L are organic bases). Introduction of donor bases into axial positions leads, in comparison with the initial complex, to more noticeable changes in the values of ν(MoMo), ν_s(MoO), ν_{as}(COO), and ν_s(COO) in the spectra of $Mo_2(O_2CH)_4L_2$-type complexes. In continuation of the research, it is advisable to obtain complexes of the $Mo_2(O_2CH)_4L_2$ type, where L is 4-aminopyridine (4-NH_2Py). When carrying out the reaction of $Mo_2(O_2CH)_4H_2O$ with the indicated donor base, the task was also to study the preferred methods for coordinating axial ligands.

In the case of 4-NH_2Py, two modes of coordination are possible: through the nitrogen atom of the amino group Mo-N (amine), or through the nitrogen atom of the heterocycle Mo-N (pyridine).

In the IR spectra of $Mo_2(O_2CH)_4$(4-NH_2Py)$_2$ there are intense absorption bands with maxima near 3475 and 3375, 3230 cm^{-1}. We assigned them to asymmetric and symmetric stretching vibrations of the amino group of 4-aminopyridine. The corresponding frequencies are increased compared to ν(NH_2) of uncoordinated 4-aminopyridine by 31-60 cm^{-1}, i.e. in the 4-NH_2Py molecule, the donor nitrogen atom of the NH_2 groups does not participate in the bond with the molybdenum atom, since otherwise, the frequencies of stretching vibrations ν(NH_2) of the amino group would have to decrease significantly. The absorption band of the bending scissor vibrations of the amino group in the region of 1655 cm^{-1} practically does not shift.

Thus, 4-aminopyridine forms a bond with molybdenum in $Mo_2(O_2CH)_4$(4-NH_2Py)$_2$ through the nitrogen atom of the pyridine ring, which is consistent with an increase in the frequencies of the stretching vibrations of the ring in the region of 1500-1600 and 1000-1100 cm^{-1} by 10-30 cm^{-1}. These data are consistent with the stoichiometric rules, according to which the closure of the metallocycle through the functional groups of cyclic ligands located in the β-position relative to each other is very difficult, and in the γ-position it is almost impossible.

Thus, the study of the spectral characteristics of the $Mo_2(O_2CH)_4$ (4-NH_2Py)$_2$ complexes showed that the nitrogen atom of the heterocycle has more efficient donor properties than the nitrogen atom of the amino group located in the para position to the nitrogen atom of the heterocycle.

In the region 400-500 cm^{-1} in the IR spectrum of $Mo_2(O_2CH)_4$ (4-NH_2Py)$_2$ three intense absorption bands were found with maxima at about 435, 440 and 464 cm^{-1}; the first two absorption bands, which are inactive in the Raman spectra, are also present in the spectrum of the initial complex, $Mo_2(O_2CH)_4H_2O$, which gives reason to attribute them to asymmetric stretching vibrations of the Mo–O bonds.

COMPARATIVE ACIDIC COMBINATION ANALYSIS OF SOME SPECIES OF *ASTERACEAE* FAMILY

N.R. Sagdollina[1], M.M. Ibrayeva[2]

[1]S. Amanzholov East Kazakhstan University, Ust-Kamenogorsk, Kazakhstan
[2]The Caspian University of Technology and Engineering named after Sh.Yessenov, Aktau, Kazakhstan

Currently, there is a tendency to expand the range of domestic phytopreparations. It is known that medicinal plant raw materials with sufficient pharmacological activity have less toxicity and allergenicity.

Asteraceae is one of the largest families of dicotyledonous plants. A variety of biologically active substances are represented in various species of *Asteraceae*. The study of the possibility of complex use of medicinal plant raw materials and species that are systematically close to the official ones, having a sufficient raw material base, will contribute to increasing the range of medicines. However, a number of plants in Kazakhstan are yet to be researched. Amino acids are the structure forming units of a protein molecule. Approximately 300 of amino acids are found in nature with only 20 of them belong to protein amino acids or proteinogenic amines.

The article presents the results of the amino and fatty acid analysis of the aerial parts of *Zinnia elegans* and *Symphyotrichum novi-belgii*, of *Asteraceae* family, collected during the fruiting period in September 2021 in the East Kazakhstan region. The relevance of the work lies in the extraction of biologically active substances and the production of medicines from plants growing in East Kazakhstan. The study determined the volumetric composition of various amino and fatty acids in the aerial part of *Zinnia elegans* and *Symphyotrichum novi-belgii*. According to the results of the study, in the aerial part, in terms of the amount of nutrients from amino acids, the following dominate: glutamic (*Zinnia elegans* (2800 mg/100 g) and *Symphyotrichum novi-belgii* (2712 mg/100 g)) and asparagic acids *Zinnia elegans* (1210 mg/100 g) and *Symphyotrichum novi-belgii* (1120 mg/100 g); from fatty acid – oleic acid *Zinnia elegans* (47,1 %) and *Symphyotrichum novi-belgii* (46,8 %).

The aerial part has been determined to be the source of many essential compounds. By using paper chromatography from plants were detected amino acids, phenolic acids, flavonoids and carbohydrates. The results of the study showed that the plants of two species *Zinnia elegans* and *Symphyotrichum novi-belgii* have a sufficient content of biologically active substances, which can in the future expand the range of effective domestic herbal medicines available in medicine and agriculture of the Republic of Kazakhstan.

CHEMICAL RESEARCH OF THE GENUS *MYRICARIA* (I)

[1]Ma Huan,[1]A.K. Umbetova, [1]Janar Jenis, [2]Sh. Sh. Sagdullaev, [3]N.G. Gemedzhieva

[1]Al-Farabi Kazakh National University Almaty, Kazakhstan.
[2] S. Yu Yunusov Institute of the chemistry of plant substances of the Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan.
[3]Institute of Botany and Phytointroduction of the Ministry of Education and Science Almaty, Kazakhstan.
ma.huan@inbox.ru

The flora of Kazakhstan is rich in promising little-studied plants that are used in traditional medicine, but additional research is required for their introduction into medicine. The objects of the study are the aerial part of the plant of the genus *Myricaria (Myricaria bracteata Royle)*, collected in the Almaty region Enbekshikazakh district, the Zaili Altau ridge, the gorge of the Turgen River, in the vicinity of the village of Batan.

In this work, methods of investigating the quality of raw materials of the *M.bracteata* plant have been worked out: humidity - 4.75%, total ash - 5.78%, sulfate ash - 10.85%, extractive substances - 25.54% (70% water-ethyl alcohol). The content of macro- and microelements was determined by atomic absorption spectroscopy. The highest content of iron is - 3.38% and potassium is - 0.35%.

The qualitative and quantitative composition of the plant was studied, carbohydrates, organic acids, coumarins, tannins, flavonoids and terpenoids were found. The highest content of tannins is 7.84%, carbohydrates - 6.77% and flavonoids - 4.12%. Technological parameters for obtaining the substance from the *M.bracteata* plant have been worked out: the extractant - 70% water-ethyl alcohol, the ratio of the extractant and raw materials - 1:9, the extraction time - 24 hours, the temperature - 24-25℃. Fatty acid components were determined qualitatively and quantitatively by gas-liquid chromatography (GLC). During which 8 fatty acids were identified, among which unsaturated fatty acids predominate - linoleic - 47.8% and oleic acids - 33.4%, and among saturated ones - palmitic acid - 10.6%. Vitamins A, E were determined by the fluorimetric method of analysis, which showed that in the studied plant species the highest content of vitamin E (tocopherol) is 3.5 mg/100 g. In the aqueous extract, 20 amino acids were identified by GLC methods, and vitamin C was determined by the titrimetric method in an amount of 10.1 mg/100 g. CO_2 extract was obtained by supercritical fluid extraction. The GC/MS method was used to study the component composition of the CO_2 extract, which identified 51 components in the carbon dioxide extract. The analysis of antioxidant components showed that the content of fat-soluble antioxidant was 1.67±0.03 mg/100g, and the content of water-soluble antioxidant was 2.93±0.04 mg/100g.

INVESTIGATION OF THE CYTOTOXIC ACTIVITY OF COMPOUNDS OF ISOQUINOLINE ALKALOIDS AND THEIR SYNTHETIC DERIVATIVES

E.O. Terenteva, U.B. Khamidova, M.R. Umarova, E.M. Lysova, V.I. Vinogradova, Sh.N. Zhurakulov, A.A. Makhnyov, O.B. Alimukhamedova, L.K. Mustafina, Sh.S. Azimova

S. Yu. Yunusov Institute of the Chemistry of Plant Substences, M. Ulugbek Str. 77, 100170, Tashkent, Uzbekistan; e-mail: genlab_icps@yahoo.com

The cytotoxic activity of 48 isoquinoline alkaloids and their synthetic derivatives has been examined. The relationship between structure and function is established. It has been shown that cytotoxic activity depends on the presence of halogen derivatives in the molecule and on the length of the methylene chain. The effect of the most active compounds on the expression of the apoptosis genes Bcl2, Bax, and Casp3 was studied by PCR analysis. It was found that the most active compounds do not affect the expression of Bcl2, Bax, and Casp3 apoptosis genes, but reduce the expression of the JAK2 gene with the V617F mutation (a marker of chronic Ph-negative myeloproliferative diseases).

BIODEGRADATION OF POLYETHYLENE IN THE EFFECT OF TEMPERATURE BY MICROORGANISMS

I.M. Khalilov, M.M. Nazirov, F.B. Kobilov, N.A. Sherbekova

Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan, 7b Abdulla Qadiri Street, Tashkent 100128

Plastic polymers are widely used in agriculture, industry and our daily life due to their convenience and low cost. At the same time, pollution with plastic polymers, especially polyethylene (PE), has a negative impact on the environment, as well as on the health of animals and people, since they are almost non-degradable in natural conditions. Biodegradation of PE in nature mainly occurs due to the biological activity of microorganisms after thermal oxidation. PE breaks down into low molecular weight substances such as alkanes, alkenes, ketones, aldehydes, various alcohols and fatty acids.

Bacterial species such as fluorescens and *P.aeruginosa* isolated from aqueous media have been shown to be capable of degrading polyethylene at a pH of 7 and a temperature of 30-37 ºC.

The purpose of the study is to study the effect of different temperatures on PE decomposition of bacterial strains belonging to the genus *Pseudomonas*.

Four strains of bacteria belonging to the genus *Pseudomonas* were grown at temperatures of 35ºC, 40ºC and 45ºC, and their effect on the degradation of PE was studied for 1 month. It was observed that the bacterial strains cultured in LPEM liquid medium had a reduced growth compared to the control medium. 40ºC was found to be optimal for *Pseudomonas* strains. Among the used strains, it was found that *P.putida* and *P.fluorescens* strains produced 24.21 and 16.36 times more organic compounds in the nutrient medium than the control one, respectively. In particular, the presence of these substances is shown in the absorption line between 190-200 nm (carbonyl groups) and 240-300 nm (aldehyde groups) of the UV spectrum. This indicates the formation of carbonyl groups and aldehydes in the food environment. It can be observed that the bacterial strains grown under the influence of the temperature of 45ºC produced less organic compounds than at 40ºC. In this case, we can see that *P.stutzeri*, *P.fluorescens, P.putida* and *P.aeruginosa* produced 17.51, 16.6, 22.25 and 13.47 times more organic compounds in the form of carboxyl and aldehydes compared to the control, respectively. It is important to note that *Pseudomonas* strains grown at 35ºC produced less organic compounds than those at 40ºC and 45ºC. *P.stutzeri, P.fluorescens, P.putida* and *P.aeruginosa* bacterial strains at 35ºC temperature are 10.89 compared to the corresponding control; 13.46; It was studied that 19.72 and 12.04 times more organic compounds were formed in the food environment.

Thus, strains of bacteria belonging to the genus *Pseudomonas* were observed to decompose PE at different temperatures. It was observed that the growth and development range of *Pseudomonas* strains was from 30 °C to 44 °C, and these bacterial strains degraded PE and produced organic matter even at these temperatures. Among the different temperatures used in the experiment, it was found that *Pseudomonas* strains grown at 40ºC had the highest PE degradation. It should be said that among the *Pseudomonas* strains, *P.putida* strain produced the largest amount of organic compounds (carboxyl and aldehydes) in the nutrient medium compared to *P.stutzeri, P.fluorescens*, and *P.aeruginosa* strains at all studied temperatures, and was considered an active PE-degrading strain. found.

INFLUENCE OF GROWING *ASTRAGALUS XANTHOMELOIDES* ON THE ELEMENTAL COMPOSITION IN THE CONDITIONS OF TASHKENT CITY

E.R. Kurbanova, A.A. Janibekov, R.P. Zakirova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ilichkakurbanova@mail.ru

Plants of the genus *Astragalus* are sources of flavonoids, alkaloids, saponins, coumarins, and triterpenoids with antioxidant activity, which significantly increases the value of medicinal raw materials [1].

It is known that macro-microelements are concentrated in astragalus, each of which, in turn, affects the synthesis of biologically active compounds with various physiological activities [2].

One of the main directions of expanding the resource base of useful plants and identifying new opportunities for their use is the cultivation of plants.

The research aimed to study the composition of the elemental composition in the aerial and root parts of the plant *Astragalus xanthomeloides*.

A. xanthomeloides seeds were sown on February 25, 2022. Plant seeds were satisfied with concentrated sulfuric acid for 10 minutes, after which they were planted in open ground at the vegetation site of the Institute of Chemistry of Plant Substances of the Academy of Sciences of the Republic of Uzbekistan.

For the first time in *A. xanthomeloides* plants grown in the conditions of the city of Tashkent, 44 elements were identified, of which the predominant macro-K, Ca, Mg, Na, P, and microelements - Al, Si, and Fe. Toxic elements, Cd, Hg, Bi, and Sb, were not found in the aerial part and the roots of *A. xanthomeloides*.

According to the results of the analysis, it was revealed that in the vegetative shoots of *A. xanthomeloides*, the content of macro elements was: K - 26390.77; Ca, - 10936.63; Mg - 1627.886; P - 23.978 and was more than in the roots, in which this indicator was: K - 563.776; Ca - 1590.387; Mg - 563.776; P - 19.227.62 mg/kg. The quantitative content of Na was found to be higher in the roots of the plant - 1580.917 mg/kg than in the aerial part. -342.392 mg/kg.

The content of Se in the above-ground part of the plant was 0.272 mg/kg, and in the roots - 0.022 mg/kg.

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GROWING AN ENDEMIC PLANT *Astragalus babatagi* IN THE CONDITIONS OF TASHKENT CITY

E.R. Kurbanova, A.E. Egamberdiev, A.M. Nigmatullaev, R.P. Zakirova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ilichkakurbanova@mail.ru

Preservation and restoration of the biological diversity of the world's flora is an important task in the field of nature protection. This is due to the growing impact of anthropogenic factors and changing climatic conditions. Medicinal plants are a category that is especially vulnerable due to intensive, irrational procurement of raw materials. Particularly vulnerable species are endemic and rare plant species. One of the real and effective and long-term ways to conserve biodiversity can be the breeding of endemic and rare species under controlled conditions. An effective approach to solving this issue should be based on a deep knowledge of the biological characteristics and ecological properties of endemic species.

Astragalus babatagi - is an endemic of Central Asia, Southern Pamir - Alai. It is distributed mainly in the Surkhandarya region, on the slopes of northern exposures on gypsum-bearing variegated flowers.

The work aims to establish the distribution areas of *Astragalus babatagi* M.Pop. in the south of Uzbekistan and study plant growth features in Tashkent.

Studies of the distribution area of the plant showed that the species is mainly distributed in the middle part of Mount Babatag, in the vicinity of the village. Zarkamar, Chagam, in the tract Kyndik-kutan. The plant is rare or so scattered, single specimens, do not form plant groups. This suggests that its harvesting is completely unprofitable.

Seeds of plants of the species *A. babatagi* for research were collected in the Surkhandarya region, in the middle part of the Babatag mountain (near the village of Zarkamar) at an altitude of 1700 m above sea level. The sowing was carried out on February 25, 2022. sulfuric acid showed that in seeds with 5 and 10 minutes of treatment, germination was 32.8% and 34.5%, respectively, in those treated for 20 minutes - 62.3%, and in the control variant only 12.4%. Carrying out scarification had a positive effect on the further development of plants, the appearance of the first leaves was observed on April 8, the beginning of the branching of rosettes on April 22, the beginning of flowering on June 3, the fruiting stage on June 27 and the mass ripening of fruits was completed by mid-July. In the control variant, the plants lagged in development stages by a month did not reach the flowering stage, and by the end of July began to die off.

The experimental accumulated material will serve as the basis for solving the issue of preserving these species and their successful cultivation in the future.

CHEMICAL COMPOSITION OF THE UNSAPONIFIABLE FRACTION PLANT *Adonis turkestanica*

N.M. Mamatkulova, Kh.M. Bobakulov, T.T. Khamraev, I.M. Zhumaboeva, N.K. Khidyrova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: nhidirova@yandex.ru

Adonis turkestanica is a medicinal plant of the Ranunculaceae family, approved for use as medicines, like other types of Adonis. The plant contains 0.07-0.15% cymarin, adonitoxin, adonivernit, saponins and phytosterols. For medicinal purposes, the aerial part of the plant is used. In folk medicine, infusions and decoctions of the aerial part of the plant are used for fevers, dropsy, jaundice, infectious diseases, typhoid, influenza, scarlet fever, and as a sedative for the central nervous system.

Based on the foregoing, it was of interest to study the chemical composition of the aerial parts of plants. What was obtained alcohol extract using ultrasonic mixing. Further, hexane, chloroform, ethyl acetate and water-soluble fractions were obtained by re-extraction. As well as the unsaponifiable fraction according to the method with the corresponding yields of 10%, 8%, 7.5% and 74.5%. The chemical composition of the unsaponifiable and hexane fractions was studied using the GC/MS method; as a result, 19 and 18 compounds were identified, respectively.

The main components of the unsaponifiable fraction are diterpene alcohol phytol (53.78%), saturated, unsaturated and aromatic hydrocarbons (31.44%), alcohols (4.93%) and their esters (0.49%), hexahydrofarnesyl acetone (1.5%), (9*E*,12*E*,15*E*)-9,12,15-Octadecatrien-1-ol (2.8%), provedol (0.7%) and 2,7-dimethyl-1-octanol (0.7%)(*Z*)-14-tricosenyl format (1.9%).

The hexane fraction mainly contains fatty acid esters (53.73%), and eicosanotriene - midic acid (ω-9-acid) is rarely found in plant objects, it is synthesized mainly in animals and humans. In addition, it contains hydrocarbons - 27.51, diterpene alcohol - phytol 8.60%, cytronelyl isobutyrate 0.96%.

Thus, the chemical composition of the unsaponifiable and hexane fraction of the aerial part of the plant *Adonis turkestanica* was studied by GC/MS. As a result, 19 and 18 compounds, respectively, were identified that are of interest in medicine and cosmetology.

COMPOSITION BASED ON THE GROWTH REGULATOR FLOROXAN WITH GLYCYRRHIZIC ACID FOR COTTON GROWTH

R.P. Zakirova[1], Khalikov S.S.[2], Turaeva S.M.[1], Kurbanova E.R.[1], Chkanikov N.D.[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ranozakirova@mail.ru
2) Acad. A.N. Nesmeyanov Institute of the Organoelement Compounds, Russian Academy of Sciences, 119334 Moscow, st. Vavilov, 28/1;
e-mail: salavathalikov@mail.ru

Floroxan is an original development of Institute of Organoelement Compounds named after A.N. Nesmeyanov RAS and its biological properties have been studied by scientists in Russia and Uzbekistan for several years as a promising plant growth regulator. For the first time, the unique properties of floroxan were noted by All-Russian Research Institute of Phytopathology. specialists when studying it in the form of an aqueous solution on such crops as rapeseed, corn, and sunflower. The drug showed biological activity at doses up to 100 mg/ha, which did not allow it to be used as a separate drug on an industrial scale in agricultural practice.

The work aims to develop drugs based on floroxan to stimulate the growth of crops.

A fundamentally new approach to improving the properties of floroxan by its mechanochemical modification with glycyrrhizic acid (GA) is proposed. The choice of this polysaccharide is explained by the fact that GA has a complex of useful properties, namely, it has a high solubilizing ability and increased permeability through plant membranes.

The study of the growth-stimulating activity of the drug based on a solid dispersion of floroxan and glycyrrhizic acid was carried out on hopscotch. Pre-sowing soaking of cotton seeds showed high efficiency of the drug in terms of germination, growth, and development of cotton, as well as the formation of its fruit elements compared to floroxan. The drug, when dissolved in water, forms a supramolecular complex that provides increased solubility, bioavailability, and absorption (penetration through plant membranes) of floroxan, and, consequently, a general increase in its biological activity.

The drug, obtained by low-energy and waste-free one-stage technology, has a plant growth-stimulating activity that exceeds the activity of floroxan, is based on available domestic raw materials, is environmentally safe, stable during long-term storage, is highly soluble in water, and is convenient to use.

CHEMICAL COMPOSITION AND ANTIMICROBIAL ACTIVITY OF *Perovskia botschantzevii* ESSENTIAL OIL

O.K. Askarova[1], Kh.M. Bobakulov[2], A.M. Yarylkaganova[2], S.A. Sasmakov[2], E.Kh. Botirov[2], Sh.S. Azimova[3]

1) Namangan Institute of Engineering and Technology, Namangan, Uzbekistan
2) S.Yu.Yunusov Institute of the Chemistry of Plant Substance, Academy of Science of the Republic of Uzbekistan, e-mail: botirov-nepi@mail.ru

Perovskia botschantzevii Kovalevsk. & Koczk *(Lamiacaeae):* semi-shrub found in Kyrgyzstan, Uzbekistan, Tajikistan, and Afghanistan on rocky slopes, pebbles, and river valleys. The chemical composition of *P. botschantzevii* is practically unstudied [1].

In order to search for biologically active compounds, we studied the composition of the essential oil of the aerial part of *P. botschantzevii,* collected during the flowering period. The extraction of essential oil from crushed fresh and air-dry aerial parts was carried out by hydrodistillation at atmospheric pressure for 2.5 hours.

According to GC-MS data, the main components of the essential oil of both the air-dry and fresh aerial parts are 1,8-cineol; its content is 34.8 and 40.7%, respectively. Bornyl acetate (12.3%), alloaromadendren (5.5%), borneol (5.4%), Δ-3-karene (5.3%), β-caryophyllene (5.2%), o-cymene (4.9%), camphor (4.1%) and other compounds. In addition to 1,8-cineol, the dominant components of fresh plant essential oil are Δ-3-karene (8.6%), borneol (7.7%), bornyl acetate (7.0%), alloaromadendren (3.6%), and β --caryophyllene (3.2%).

1,8-Cineol (eucalyptol) belongs to the bicyclic monoterpenes and is used for respiratory diseases such as bronchitis, the common cold of the respiratory tract, chronic and inflammatory respiratory diseases, asthma, and hay fever. The aerial part of *P. botschanzevii* can serve as a rich source of 1,8-cineole.

A modified agar diffusion method was used to study the antibacterial, and antifungal properties of *P. botschanzevii* essential oil. Microorganism strains *Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli,* and one *Candida albicans* fungal strain were used as test cultures. The results of *in vitro* antimicrobial tests showed that all the studied microorganisms were sensitive to the action of the essential oil from *P. botschanzevii.* At the same time, the greatest antibacterial effect was observed in relation to the gram-positive strain of bacteria *Bacillus subtilis.* This activity of the essential oil may be due to the presence of 1,8-cineol in its composition, while the antimicrobial activity of the studied sample may vary significantly depending on the chemotaxonomic characteristics of the plant as well as the biological properties of the test microorganisms used.

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COMPOSITION OF ESSENTIAL OIL AND PHENOLIC COMPOUNDS OF *Lophanthus schtschurowskianus*

O.K. Askarova[1], E.Kh. Botirov[2], Kh.M. Bobakulov[2], A.A. Ganiev[2], N.K. Usmanova[3]

1) Namangan Institute of Engineering and Technology, Namangan, Uzbekistan
2) S.Yu.Yunusov Institute of the Chemistry of Plant Substance, Academy of Science of the Republic of Uzbekistan, e-mail: botirov-nepi@mail.ru
3) Namangan State University, Namangan, Uzbekistan

Lophanthus is a genus of perennial herbaceous plants of the *Lamiaceae* family, represented by more than twenty species growing in alpine or highland areas. Four species of plants of this genus grow in the territory of Uzbekistan. We studied the component composition of essential oil obtained by hydrodistillation from an air-dry above-ground part of the *Lophanthus schtschurowskianus* (Regel) Lipsky plant growing in Surkhandarya region of Uzbekistan. By the GC-MS method, 57 components were identified in the composition of the essential oil, which is 93.8 % of the total amount of the oil, including 52 volatile compounds. The main components of the essential oil are 1,8-cineol (13.4%), viridiflorol (8.5%), α-terpineol (4.3%), terpinen-4-ol (4.2%), τ-cadinol (4.1%), β-spatulenol (3.9%), α-p-dimethylstyren (2.1%). The essential oil is dominated by oxidized monoterpenes (33.6%) and oxidized sesquiterpenes (24.7%), also detected compounds belonging to sesquiterpene hydrocarbons (8.6%). Essential oil contains an insignificant amount of monoterpene hydrocarbons (3.9%). In qualitative and quantitative composition of components, the essential oil of *L. schtschurowskianus* significantly differs from the essential oils of other studied plant species of the genus *Lophanthus.*

1,8-Cineol has moderately pronounced anti-exudative and cytotoxic activity, and is also characterized by analgesic and antitumor properties. It is used for chronic and inflammatory respiratory conditions such as bronchitis or respiratory tract colds, as well as asthma and hay fever [1].

Four phenolic compounds were isolated from various fractions of a 75% alcohol extract of the above-ground part of *L. schtschurowskianus,* and identified with phenyl-propanoids caffeic acid, rosmarinic acid, nepotidin B and flavone luteolin based on the study of ^{1}H, ^{13}C NMR, HSQC and HMBC spectra.

Rosmarinic acid is characterized by immunomodulatory, anti-inflammatory, antimicrobial, antioxidant, neuroprotective, and antidiabetic activities. Luteolin has anti-inflammatory, antioxidant, anticarcinogenic, and cytotoxic effects against tumor cells and enhances the effect of anticancer drugs. Nepetoidin B was shown to have greater antioxidant activity than gallic, rosmarinic, and caffeic acids and showed activity as an insect phagostimulant.

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FATTY ACIDS AND ESSENTIAL OILS FROM AERIAL PART OF *Ferula kyzylkumica* - AN ENDEMIC PLANT OF UZBEKISTAN

D. T. Asilbekova, Kh.M. Bobakulov, A.M. Nigmatullaev

S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, 77 M. Ulugbek St., Tashkent, 100170, Uzbekistan,
e-mail: dasil@rambler.ru

There are about 40 species of wild *Ferula* (Apiaceae family) in our region. Seven of its species, including the *Ferula kyzylkumica* Korovin is listed in the Red Book of Uzbekistan. This species is a polycarpic plant and a rare endemic of the remnant mountains of Kyzylkum. The objectives of this report were focused on the determination of the of fatty acid compositions of lipids and essential oil components isolated from the aerial part of *F. kyzylkumica* Korovin.

Air-dried aerial part (100 g) was ground in a coffee grinder. Essential oil (0.0103 g) from half of plant material (50 g) was isolated by hydro distillation. For isolation of lipids second part of material (50.0 g) extracted with chloroform – methanol (5 x 100 mL) by Folch method. All extracts were combined, was worked up beforehand with aqueous $CaCl_2$ solution (0.04%) to remove non-lipid components constituents. Extract evaporated and lipids underwent alkaline hydrolysis to isolate fatty acids. Fatty acids (0.565 g) convert to methyl esters by treatment with freshly prepared diazomethane solution in Et_2O. The conditions for all chemical and GC-MS, GC-FID analyses over columns with HP-5 and HP-INNOWax (respectively fatty acid methyl esters and essential oil) were analogous as before [1].

The yield of essential oil from aerial part of *F. kyzylkumica* was 0.23% of the dry plant material. The results by GC-MS analysis indicated that the main constituents of the essential oil compounds were the sesquiterpene hydrocarbons δ-cadinene, germacrene B and D, α-muurolene as well as oxygenated sesquiterpenes such as α-cadinol, T-cadinol and germacrene-D-4-ol. The content of monoterpenes in the essential oil is low.

Identified acyl fragments of the lipids were dominated by unsaturated constituents with linolenic and linoleic acids as the main ones, but oleic acid was significantly less. The major saturated acid of the 12:0−22:0 series was hexadecanoic acid. This acid was also identified among the volatile compounds of this plant.

Thus, essential oil and fatty acid profiles of *F. kyzylkumica* were studied for the first time.

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CHEMICAL COMPONENTS OF *Melilotus officinalis* AND *Melilotus albus*

N.K. Usmanova[1], A. R. Khurramov[2], Kh. M. Bobakulov[2], E. Kh. Botirov[2]

1) Namangan State University, Namangan, Uzbekistan, e-mail: nargiza_unq@mail.ru
2) *S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent*

Melilotus officinalis (L.) Pall. - a biennial herbaceous plant of the *Fabaceae* family. In the folk medicine of Central Asia, preparations of melilot are used as an expectorant, emollient, analgesic, distraction, and sleeping aid, as well as for the treatment of septic wounds. *M. officinalis* has been found to have antioxidant, antibacterial, antitumor, and anti-inflammatory activity; the extract is active against the flu virus [1].

Melilotus albus is a one- and two-year herbaceous plant with anticoagulative and fibrinolytic activity. *M. albus* is used in folk medicine for thrombosis, infusion or decoction of the above-ground part of the plant as a lactogenic, anti-fever, for ascites, and for headaches.

Kempferol 3-*O*-β-*D*-galactopyranoside, quercetin 7-*O*-α-*L*-rhamnopyranoside, dihydrocoumarin, and melilotoside were isolated from various fractions of a 75% ethanol extract of M. officinalis above ground parts by column chromatography on silica gel and Sephadex LH-20, except for previously found compounds [2,3]. The isolated substances were identified based on UV, ^{1}H, ^{13}C NMR spectra, hydrolysis results, and comparison of physicochemical properties with the literature data.

To search for biologically active substances, we studied the component composition of the essential oil of the air-dried above-ground part of *M. albus* growing in Uzbekistan and collected it during flowering. The extraction of essential oil from crushed air-dry above-ground parts was carried out by hydrodistillation under atmospheric pressure. The Qualitative and quantitative composition of essential oil was determined on an Agilent 5975C Inert MSD/7890A GC chromatography-mass spectrometer (Agilent Technologies, USA). By the GC-MS method, 5 compounds were identified in the composition of essential oil from the air-dry plant, which is 98.93% of the total amount of essential oil. The main component of the essential oil is coumarin, which content is 97.92%. Benzyl alcohol (0.30%), 2-hexenal (0.27%), dihydrocoumarin (0.26%), and phenyloxyran (0.08%) were found in the essential oil, except coumarin.

As a result of pharmacological studies, it was found that extracts and individual compounds isolated from *M. officinalis* possess antioxidant, anticoagulant, and anti-diabetic properties. Quercetin 7-*O*-α-*L*-rhamnopyranoside has antiviral activity.

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CHEMICAL COMPOSITION OF ESSENTIAL OIL FROM *Halimodendron halodendron*

K.R. Allambergenova[1], A.A. Janibekov[2], M.A. Agzamova[2], M.Kh. Malikova[2]

1) Karakalpak State University named after Berdakh, 230112, Nukus, Republic of Karakalpakstan
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: j.aziz@mail.ru

The plant *Halimodendron halodendron* (Pall.) Voss, silver chingil is the only representative of the genus *Halimodendron* of family Fabacea (Leguminosae).

H. halodendron grows in saline soil, is photophilous, drought-resistant has a powerful and branched root system, and gives abundant root shoots.

H. halodendron is used as an ornamental plant for landscaping, thorn hedges, and protective afforestation. A yellow dye is obtained from the roots for wool. these are used only in late autumn as feed for livestock.

The purpose of this work is to study the chemical constituents of the essential oil and carbohydrates from the aerial part of *H. halodendron*. The raw material was harvested in 2022 in the flowering phase in the Taslak village of the Republic of Karakalpakstan.

By hydro distillation of a fresh sample of the aerial parts of the plant (leaves and flowers), the essential oil was obtained and compounds have been identified that make up 89.69% of the volatile components.

The essential oil contains the following major compounds: *cis*-3-hexene-1-ol (2.44%), 1-octen-3-ol (3.20%), benzenemethanol, α,α-dimethyl-(1.22%), *l*-cysteine, *S*-propyl- (2.42%), methyl-d3 2-methyl-2-propenyl ether (24.14%), ethanethioic acid (20.47%), maltol (4.35%), 2-methoxy-4-vinylphenol (5.28%), benzofuran, 2,3-dihydro- (3.93%), indole (1.23%), palmitic acid (1.39%).

Thus, the qualitative and quantitative constituents of compounds of essential oil from the aerial part of the *H. halodendron* plant growing in the Republic of Karakalpakstan was revealed. The carbohydrate composition of the plant was studied, and polysaccharides (7.7%), pectin substances (2.1%), and hemicellulose (10.2%) were isolated and characterized, the monosaccharide of which is represented by acidic and neutral monomers.

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ANALYSIS OF THE AERIAL PART OF *SCUTELLARIA COMOSA* PREPARED RAW MATERIAL

Sh.A.Ergasheva, M.A.Mamatkhanova, R.M.Khalilov, E.Kh.Botirov, A.U.Mamatkhanov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

e-mail: munir_05@mail.ru

There are more than 700 species of medical plants in Uzbekistan. Of which about 120 species that grow in natural conditions are used in scientific and folk medicine. Today about 40-47% of medicines used in medicine are obtained from raw plant materials. Such plants include *Scutellaria L.* belonging to the *Lamiaceae* family. In particular, the *Scutellaria comosa* can be used as a raw material in the field of pharmaceuticals for the creation of new drugs. *S. comosa* is used in folk medicine for cardiovascular diseases, epilepsy, inflammation, anti-allergic, and blood pressure lowering.

S. comosa 5,7-dihydroxyflavone (chrysin), chrysin-7-*O-GlcAp*, chrysin-7-*O-(6''-OMe)GlcAp*, baicalein-7-*O-GlcAp* (baicalein), 5,6,7-trihydroxyflavone (baicalein), 5,7,8-trihydroxyflavone (norvogonin), 5,7-dihydroxy-8-methoxyflavone (vogonin), vogonin-7-*O-GlcAp* (vogonoside), 5,7-dihydroxy-6-methoxyflavone (oroxylin A), oroxylin A-7-*O-GlcAp* (oroxyloside), 5,7,2'-trihydroxyflavone-7-*O-GlcAp*, 5,7,4'-trihydroxyflavone (apigenin), apigenin-7-*O-Glcp* (kocmosiin), 5,6,7,4'-tetrahydroxyflavone (scutellarein), scutellarein-7-*O-GlcAp* (scutellararein), 5,7,4'-trihydroxy-6-methoxyflavone (hispidulin), 5,7,3',4'-tetrahydroxyflavone (luteolin), (±)-5,2'–dihydroxy-6,7,6'-trihymethoxyflavone, (-)-5,2'-dihydroxy-6,7,8,6'-tetramethoxyflavanone and 5,7,3',4'-tetrahydroxyflavonol (quercetin) contains flavonoids such as.

Taking into account the above, a drug with an adaptogenic effect was developed based on the flavonoids of the aerial part of *S. comosa*. While continuing the research, studies were conducted on the standardization of raw materials prepared from the aerial part of *S. comosa*. The research was conducted according to the methods specified in the State Pharmacopoeia of the Republic of Uzbekistan (1st edition, 1st volume). Based on the scientific research, the results of the analysis of the raw material prepared from the aerial part of *S. comosa* are presented in the following table:

Indicators	It was determined
Appearance	Consists of a mixture of stems, leaves, and flowers
Color	Light green to dark green
The taste	Partially bitter
The smell	Idiosyncratic
Mass fraction of moisture	4,92 ± 0,15%
Mass fraction of ash	5,2 ± 0,17%
Mass fraction of organic additives	0,94 ± 0,02%
Mass fraction of mineral additives	1,37 ± 0,04 %
Amount of flavonoids	7,1 ± 0,22%

Studies on determining and normalizing are going on the mass fraction of flavonoids in the aerial part of the *S. comosa*. Preliminary results showed that the total amount of flavonoids in the raw material reach up to 7.1% compared to the isoscutellarein flavonoid.

GC-MS ANALYSIS AND COMPARISION ON *Haplophyllum pedicellatum*

Kh. A. Rasulova[1], M. A. Eshonov[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent. mubashshir@inbox.ru
2) National University of Uzbekistan named after Mirzo Uluqbek, 100174, Tashkent, University street 4, phone (99894)5077451. e-mail: mubashshir@inbox.ru

The genus *Haplophyllum* belongs to *Rutaceae* family, comprising of approximately 50 species, which is widely distributed in the Central Asia, Southern Europe, the Mediterranean coast and northwest and northeast of China. The genus plants have been used in folk medicine for the treatment of burns, toothache, stomach, respiratory organs and skin diseases, and several types of cancer.

A decoction of leaves of *Haplophyllum pedicellatum* Bge. Is widely used in folk medicine at toothache, stomach diseases, meteorism, external in itch.

For the first time we studied alkaloids of the overground part of *Haplophyllum pedicellatum* from a new growing place. The aerial part in flowering period containe 0.29% of alkaloids. By separation of the total alkaloids the following alkaloid were isolated: γ-fagarine, skimmianine, haplamine, glicoperine, haplotusine, robustine, perfamine, folifine, folipidine and new quinolin-2-one alkaloids - pedicine, pedilinine.

By GC-MS analysis, the major components in petroleum ether fraction of the plant *H. pedicellatum*, collected from Babatag, Surhandarya were identified and main components from the aerial part were Alloaromadendrene - 25.11 min (2.04%), 1,3-dihidroxy-*dl*-glyceradehyde dimer - 27.43 min (0.9%), *L*-β-Seseline (8,8-dimethyl-2H, 8H-pyrano[2, 3-f]chromen-2-one) - 2.74 min (28.31 %), Junipene – 2.74 min (28.31%), Patchoulene – 3.30 min (31.94%), Eudesma-3,11-diene – 3.30 min (31.94%), Hexadecane – 37.57 min (49.64 %), Linolenic acid (11.99 %). In petroleum ether fraction of flowers, major components were 5 (4H)-Isoxazolone, 3-phenyl-4-(phenylmethy- (38.95%), Seselin (2H, 8H-Benzo [1, 2-b: 3, 4-b'] dipyran-2-one, 8,8-dimethyl) (28.96 %). Main components of the extracts of the plant from Kashkadarya (petroleum ether fraction) were Dodecanoic acid (20.47%), Tetradecanoic acid (19.60%), *n*-Hexadecanoic acid (10.08%), Phytol (8.24%), 15-Octadecatrienoic acid, methyl ester (15.28%), 9,12-Octadecadienoic acid, methyl ester, (*E*,*E*)- (11.88%), 9-Octadecenoic acid (*Z*)-, and methyl ester (11.02%).

ON THE COMPOSITION OF TRAIL PHEROMONE OF *Anacanthotermes turkestanicus*

Z. Tilyabaev, Togaev U.R., Sh.Turageldiev, Kh. Khaitbaev

Institute of Bioorganic Chemistry, 100125 Tashkent, Uzbekistan, Mirzo Ulugbek str., 83

The termites trail pheromones serve as chemical signals that regulate their communication. This opens the opportunities to use the trail pheromones as attractants for the pest insects towards the nutrients that contain the toxic compounds, which cause the massive death of the termites' colony.

This paper reports on identification of chemicals comprising the trail pheromone of *Anacanthotermes turkestanicus.*

It has been established experimentally that the methanol extract of the working termites exhibits the trail activity.

The fractional separation of the extract of working termites using the GC-MS methods is presented on the figure below.

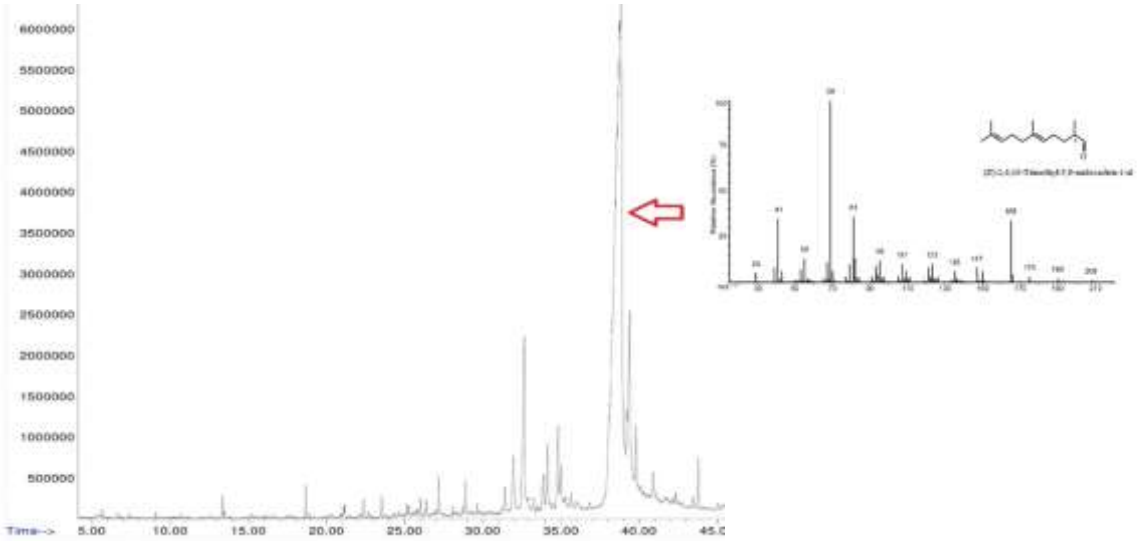


Figure. GC-MS-assisted fractional separation of the extract of working termites

The GC-MS chromatogram contains two peaks, one of which corresponds to oleic acid, and another one represents (E)-2,6,10-trimethylundeca-5,9-diene-1-al. Oleic acid has been tested for the trail activity using the Y-method.

Based on the results obtained, it has been concluded that oleic acid identified by GCMS method does not exhibit the trail pheromone properties. It is possible that the trail pheromone of *Anacanthotermes turkestanicus* consists of two components. To examine this hypothesis there are carried out the synthesis of (E)-2,6,10-trimethylundeca-5,9-diene-1-al, which is not a commercial preparation.

This research has been conducted within UZB-Ind-2021-90 Uzbek-Indian scientific project.

STUDY OF THE ELEMENTAL COMPOSITION OF MELON *Melo mill GROWING IN KARAKALPAKSTAN*

S.D. Baltabayeva., Sh.Y. Mirzaakhmedov, G.Y. Berdimbetova

Karakalpak Scientific Research Institute of Natural Sciences of the Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan, Nukus.
e-mail: baltabaeva.sarbinaz@mail.ru

Currently, the most valuable source of biologically active substances can be food plants, widely used in folk medicine and characterized by a wide range of growth. In this regard, melon Melo mill plants are of great interest.

Melon (*Melo mill*) is a very common fruit consumed all over the world. They have anti-inflammatory and antioxidant effects on the body, have immunostimulating properties.

Fruit waste and vegetative organs (stems, leaves, roots) of melon are of particular interest for the chemical study of macro- and micronutrients. All parts of melon are sources of protein, carbohydrates, lipids and fiber, as well as bioelements.

The elemental composition of vegetative organs of melon (leaves, stems) collected in the autumn of 2022 on the territory of Karakalpakstan has been studied.

The obtained results of the analysis are presented below in Table 2.

Table 2- Elemental composition of vegetative organs of melon Melo mill

Эл.	Stem (mcg/kg)	Leaves (mcg/kg)	Эл.	Stem (mcg/kg)	Leaves (mcg/kg)	Эл.	Stem (mcg/kg)	Leaves (mcg/kg)
Li	5.308	4,772	Co	0,234	0,201	Sn	0,442	0.359
Be	0.041	0,042	Ni	1,095	2,088	Sb	0,006	0.005
B	18.978	84,106	Cu	1.662	1.964	Cs	0,00	0.005
Na	15992,61	3592,782	Zn	7.273	3,539	Ba	2.138	2.747
Mg	8368,085	16091,406	Ga	0,332	0,484	Ta	0,000	0,000
Al	516,848	531,428	Ge	0,003	0,003	W	0,009	0.017
Si	1025,927	1401,395	As	0,164	0,191	Re	0,000	0.001
P	5024,180	4358,205	Se	0,080	0,065	Hg	0,016	0.030
S	777,349	869,516	Rb	0,535	0,294	Tl	0,00	0.001
K	42787.328	17879,722	Sr	262,983	524,943	Pb	0,137	0.131
Ca	31068.115	52557,538	Zr	0,119	0.031	Bi	0,001	0.000
Ti	-50.385	822.724	Nb	0,006	0.010	U	0,030	0.045
V	0,602	0.508	Mo	0,166	0.255			
Cr	1.462	1,513	Ag	0,004	0,004			
Mn	10.104	11,282	Cd	0,010	0.009			
Fe	878,470	1210,121	In	0,000	0.000			

Among the macronutrients, potassium, calcium, sodium and phosphorus accumulated in the largest amount, among the trace elements – iron, manganese and zinc. The level of toxic metals (Cd and Pb) does not exceed the permissible concentrations.

The data obtained allow us to note that melon waste (stems, leaves) contain significant amounts and combinations of many important mineral elements (primarily essential). In combination with other BAS (polysaccharides, phenolic compounds, organic acids) this emphasizes the therapeutic significance and makes it possible to create new valuable drugs of a combined nature, and also allows the use of raw materials more fully and comprehensively.

Thus, according to the results obtained, the stems and leaves of melon growing in Karakalpakstan can be a source of vital macro- and microelements.

ANALYSIS OF OIL AND VITAMIN COMPOSITION OF MELON SEEDS

J.G. Bakhtiyarov[1], K.R. Tukhtaev[1], G.Sh. Karimova[2]

1) Tashkent Pharmaceutical Institute, Tashkent. Uzbekistan,
2) National Research Institute of Renewable Energy Sources under the Ministry of Energy of the Republic of Uzbekistan.

In the countries of Central Asia, melon (*Cucumis melo*) is considered a gourd and is grown in large quantities. Its composition is rich in minerals, and the fruits are very nutritious. Melon fruits contain vitamins A, B_1, B_2, B_5, B_6, C, E, PP, and also include beta-carotenes, natural pectin and folic acid. Melon pulp has also been found to contain dietary fiber, magnesium, phosphorus, potassium, manganese, calcium, iron, zinc, and many other minerals. Along with melon fruits, their seeds are also a valuable product. Analysis of the content of protein nitrogen reaches 6%, in the composition of oil seeds it reaches up to 55%. When used, melon seeds increase the protective functions of the body, which is of great importance for a weakened body.

Seeds prevent inflammatory processes in the body, improve metabolism, increase urination, lower blood cholesterol levels and have a positive effect on men's health. Crushed melon seeds are recommended in folk medicine for colds of the respiratory tract and coughs. Due to the content of zinc, it has a beneficial effect on the skin, hair and nails. The aim of the study is to study the content of oil, seed coat and vitamins in crushed melon seeds.

The melon variety "Torpedo" (*Cucumis melo subsp.velo var. Mirza*) grown in the Bostanlyk district of the Tashkent region was used In the experiments. Seeds were separated from melon fruits, the fetal membrane was isolated, and the seeds were dried at room temperature. Melon seeds were crushed in a blender and passed through a sieve with a size of 2 mm. Thereafter, the oil was extracted with hexane at a ratio of 5:1 to separate the oil. The oil has the following indicators: d_{20} 0.9321±0.0020, n_d^{20} 1.4601±0.0200, iodine number 128±2.0.

By removing the seeds, the seed coat of the melon was separated. When the seed coat was dried, a brown powder was formed. The powder is soluble in water and forms a gel. In relation to the mass of the melon, the seeds together with the placenta have a weight of about 5%. If the seeds are separated and dried to a constant weight, then their share reaches 0.41%. An aqueous solution of gels isolated from the placenta was subjected to hydrolysis with a 2 n sulfuric acid solution. Chromatographic analysis on paper on alumina showed (system water, ethanol:hexane at a ratio of 1:3:5) the presence of glucanose and arabinose. The findings suggest melon placenta is composed of complex polysaccharides and gum of gluconase and arabinose.

Grinding the seeds was subjected to extraction with hexane. By removing the solvent, melon oil was obtained with a yield of 46.5%. The analysis showed that the oil contains 81.5% of unsaturated fatty acids, and the amount of saturated fatty acids reaches up to 18.5%. The content of linoleic acid is 60.5%, and palmitic acid in the oil reaches 9.8%. Chromatography revealed that 100 g of crushed samples contained the following vitamins: 31.3 ± 2 mg B1, 20.5 ± 1.5 mg B2, 22.2 ± 3 mg B6, and 57.0 ± 2.5 mg C. According to the results of the analysis, 100 g of ground melon seeds contain 0.002525 mg of thiamine, 0.004619 mg of ascorbic acid, 0.00786 mg of riboflavin. The results obtained showed that melon seeds are an important raw material for obtaining biologically active substances. The composition of melon seeds was analyzed and the amount of vitamins in it was determined.

DETERMINATION OF MACRO- AND MICRO-ELEMENTS IN PERSIMMONS BY THE METHOD OF MASS-SPECTROMETRY WITH INDUCTIVELY-COUPLED PLASMA

A.A. Ibragimov, A.Sh. Toyiraxon, Sh.Sh. Isakova

Ferghana State University

Persimmon is a subtropical tree or shrub belonging to the genus Diospyros of the Ebenacea family. About 500 species are found in tropical and subtropical regions. The palm tree is grown in China, Japan, the Mediterranean countries, Australia, the USA, the Caucasus, Central Asia and Uzbekistan. Tree 8-12 m high, trunk rounded or pyramidal. Lives 100-400 years, sometimes more, but good fruits bear fruit up to 50-60 years. Tolerates cold up to 15-20°C, photophilous plant. The leaf is large, ovoid, dark green above, pubescent on the reverse side, arranged in a row, turns red before falling off.

Persimmon leaves for the study were collected in the Baghdad district of the Fergana region. 30 ml of concentrated nitric acid was added to the crushed leaves in a flask and kept for 30 min until a clear solution was obtained. Then the resulting solutions were filtered into flasks with a capacity of 100 ml and topped up with distilled water to the mark. The mineral composition was determined by inductively coupled plasma mass spectrometry on an ICP-MS AT 7500 instrument.

In the course of studying the mineral composition of persimmon leaves by inductively coupled plasma mass spectrometry, the content of 44 elements was analyzed. Of these, the content of 40 elements was determined. The content of the elements decreases in the following order Ca > K > Mg > Fe > Si > Mn > S > Al > Sr > B > Na > Ti > Ba > Zn > Rb > Sn > Ni > Li > Cu > As > Cr > Mo > Pb > Hg > Se > V > Ga > Zr > Co > U > Sb > Cd > Cs > Nb > Re > W > Ag = Ge > Ta > BeIn the leaves, the total content of elements is 35750.313 mg/l. The leaves contain 5 macronutrients. It has been established that the amount of macronutrients in persimmon leaves is for Ca 23545.653 mg/l, K 6284.906 mg/l, Mg 3843.511 mg/l, S 142.312 mg/l and Na 30.310 mg/l. The following trace elements were found in the leaves Si, Al, Fe, B, Mn, Co, Ni, Cu, Zn, Sr, Ba, Rb, Ga, Cr, Ge, Se, Li, Be, Ti, Sb, Sn, Sb, Cs, Ba, Li, Mo, Ag, Ta V, Re, V and U. The largest amount of microelements in the leaves are: Fe 990.545 mg/l, Si 347.766 mg/l, Mn 214.732 mg/l, Al 122.139 mg/l, Sr 109.934 mg/l and B 75.146 mg/l. The remaining elements have a concentration of 0.001-16.622 mg/l. Of the toxic elements, arsenic, cadmium, mercury and lead were found. The content of toxic elements is 0.012-1.241 mg/l. Analysis of the macro- and microelement composition of persimmon leaves shows a tendency for the amount of the element to decrease with an increase in atomic mass. According to the results of the study, persimmon leaves are a rich source of calcium and can be used as ingredients in various nutritional supplements.

OLEANOLIC ACID FROM DIPSACUS AZUREUS

L.N. Ashurova, A.R. Khurramov, Kh.M. Bobakulov, N.Sh. Ramazonov, N.D. Abdullaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
E-mail: ashurova_lola1985@mail.ru

The plant *Dipsacus azureus* Schrenk (azure hairweed) (fam. Dipsacaceae) is widely distributed in Europe and some tropical regions of Asia and Africa. In Uzbekistan, it grows in the mountainous and foothill regions of the Tashkent, Samarkand, Fergana, Andijan and Surkhandarya regions. Dipsacus species have long been used as traditional medicine. to their kidney-toning and circulation-simulating activities.

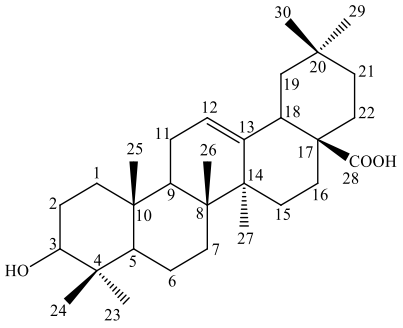
The aerial parts and roots of this *D. azureus* Schrenk plant contain large amounts of saponins. Previous phytochemical examination of *D. azureus* roots revealed the presence of triterpenoids, an alkaloid, coumarins, flavonoids, and triterpene glycosides - dipsacoside A_4 and dipsacoside B.

The air-dried crushed plant (3kg) was extracted five times at room temperature with 80% ethanol. The extract was concentrated under vacuum, then the saponins were precipitated with acetone. The precipitate (total saponins) was dried in an oven under vacuum, the yield was 300 g. Then the alcohol-water extract was evaporated in vacuum, the residue was diluted with water in a ratio of 1:1 and subjected to liquid-phase extraction with chloroform and n-butanol. Having distilled off the solvents, 50 g of chloroform, 120 g of n-butanol and 300 g of sum saponins were obtained.

The sum of saponins was chromatographed on column eluting with silica gel by chloroform, chloroform-methanol system with increasing polarity. Eluting in the $CHCl_3$–CH_3OH (100:1–0:1) solvent system, seven F1–F7 fractions were obtained.

Compound **1** was isolated from the F-6 fraction on with column silica gel in the solvent system ($CHCl_3$–CH_3OH) with a gradient increase in the methanol content from 100:0 to 10:1.

The chemical structures of the isolated compound were determined using the spectral data of NMR spectroscopy (^1H, ^{13}C, HSQC, HMBC, COSY) followed by comparison with those of the literature data identified as oleanolic acid.



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Thus, the obtained results showed that compounds 1 were isolated for the first time from the aerial part of *D. azureus* growing in Uzbekistan.

TRACHELANTIC ACID FROM *Rindera oblongifolia*

R.M. Ruzibaeva, N.I. Mukarramov, A.R. Khurramov, Kh.M. Bobakulov

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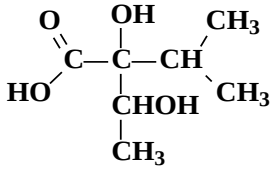
S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

e-mail: ruzibayevarayhon@mail.ru

There are 8 species belonging to the *Rindera* genus in Central Asia. *Rindera oblongifolia* M. Popov is an endemic species widely distributed in the mountain and sub-mountain regions of Central Asia. This plant grows, in the Pskem mountain and sub-mountain regions of the Tashkent region of Uzbekistan [1]. In our previous work, four alkaloids: exinatine, N-oxide trachelantamine as well as new alkaloids rinderidine and oblongifolidin were isolated from *R. oblongifolia* M. Popov [2].

Secondary metabolites of *R. oblongifolia* M. Popov collected from the Tashkent region were extracted in 80% ethyl alcohol using an ultrasonic extractor. The obtained alcohol extract was divided into four parts: chloroform, ethylacetate, n-butanol and water part., A white powdery substance was isolated by column chromatography using silica gel (100-160 μm) and eluting with chloroform: methanol (100:2) from fractions 60-71 of the ethyl acetate part. The temperature of melting point was 70-71OC. The chemical structure of isolated compound was established as trachelantic acid by 1D and 2D NMR spectroscopy and mass-spectrometry.



Structure of trachelantic acid

Trachelantic acid was first time isolated from the *Rindera oblongifolia* M. Popov.

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BIOLOGICAL ACTIVITIES OF ALKALOIDS FROM *Rindera oblongifolia*

R.M. Ruzibaeva, P.A. Nurmakhmadova, R.P. Zakirova, N.I. Mukarramov, A.M. Nigmatullaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ruzibayevarayhon@mail.ru

Currently, extracts from plant materials are widely used in the pharmaceutical, food industry and agriculture. However, use of chemicals give good results, in agriculture it harms the environment and significantly worsens the quality of vegetable crops. Natural ingredients. a will modern and safe alternative be biological growth stimulants. They don't just improve vegetation, but also make plants more adaptable to environmental conditions. For this reason, the purpose of this work is to study the biological activity of hydroalcoholic extracts obtained from plants - *Rindera oblongifolia* M.Popov.

Rindera oblongifolia M. Popov collected from the Pskom mountains of Tashkent region, wich was extracted with 80% ethanol using an ultrasonic extractor [1]. The alcohol was evaporated by rotary evaporator, the aqueous part was mixed to an acidic medium (pH=2-3) with a solution of sulfuric acid, non-polar substances were extracted with chloroform. The remaining aqueous part was blended wich alkaline medium (pH=8-9) in 10% ammonia solution and also extracted with chloroform. The chloroform was removed and the aqueous fraction was extracted with ethyl acetate to get an ethyl acetate fraction. Echinatin and trachelanthamine N-oxide were isolated from the chloroform part, and new alkaloids rinderidine and oblongifolidin were obtained from the ethyl acetate part [2].

Next, tests were carried out the growth-promoting activity of the alkaloids concentrations were tested in the range of 0.1% - 0.00001%.

The results of the primary screening, echinatin and oblongifolidin showed growth-stimulating activity to the wheat seeds at 0.00001% concentrations. The growth of the root of plant of wheat was 8.8 sm and 8.1 sm, which exceeded the control (water) variant by 37.5% and 26.5%, respectively. The growth of wheat shoots was 5.6 sm and 5.1 sm, where percentage terms it was 40.0% and 27.5% more than the control (water).

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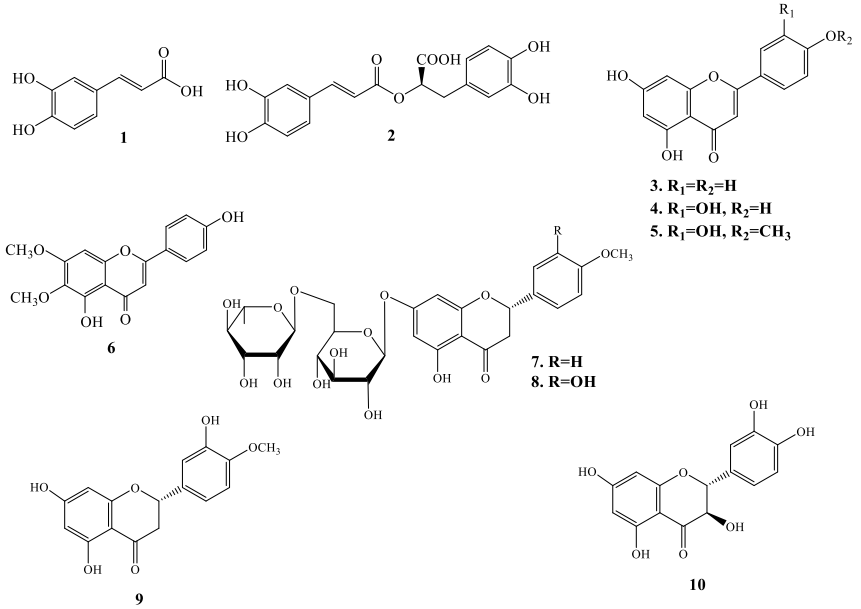
FLAVONOIDS OF THE AERIAL PART OF *Perovskia angustifolia*

O. K. Askarova[1], A. A. Ganiev[2], Kh. M. Bobakulov[2], D. R. Siddikov[2], E. Kh. Botirov[2]

1) Namangan Institute of Engineering and Technology, Namangan, Uzbekistan
2) S.Yu.Yunusov Institute of the Chemistry of Plant Substance, Academy of Science of the Republic of Uzbekistan, e-mail: botirov-nepi@mail.ru

The genus *Perovskia* Kar. belongs to the clover berry family (Lamiacaeae). It includes 9 species of semi-shrubs, most of which (7 species) grow wild in mountainous areas of Central Asia, including four species in Uzbekistan [1]. *Perovskia angustifolia* Kudr is a honeybee and perganosum that grows in Tashkent, Samarkand, Surkhandarya, and the Fergana Valley. The decoction of the leaves is used as an antihelminthic agent, and infusion and tincture have an antibacterial and wound healing effect, a short-term decrease in blood pressure, and an increase in heart rate. Leaf extract has anthelmintic activity and is used for skin diseases, stomach disorders, and as a diuretic. Caffeic (**1**) and rosmarinic (**2**) acids were isolated from an alcoholic extract of the air-dried above-ground part of the plant collected on the territory of the Namangan region (Kamchik pass) of the Republic of Uzbekistan during flowering (June 2021), as well as flavones apigenin (**3**), luteolin (**4**), diosmetin (**5**), cirsimaritin (**6**), flavanones neoponcirin (**7**), hesperidin (**8**), hesperetin (**9**) and flavanonol derivative taxifolin (**10**).



Identification of isolated compounds was performed by studying their spectral data of UV, 1H and 13C NMR, as well as by HSQC and HMBC experiments followed by comparison with literature data.

The above compounds were isolated from P. angustifolia for the first time.

Reference

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COMPONENTS OF THE AERIAL PART OF *Scutellaria oxystegia*

M. T. Muradov[1], A.R. Khurramov[2], Kh. M. Bobakulov[2], A. M. Karimov[1], E. Kh. Botirov[2]

1) Namangan State University, Namangan, Uzbekistan
2) S.Yu.Yunusov Institute of the Chemistry of Plant Substance, Academy of Science of the Republic of Uzbekistan, e-mail: botirov-nepi@mail.ru

Plants of the genus *Scutellaria* (family *Lamiaceae*) are presented by approximately 360-469 species on the globe are widely distributed in temperate, subtropical, and tropical regions, including Europe, North America, and East Asia [1]. There are 38 species of *Scutellaria* on the territory of Uzbekistan, some of which are used in folk medicine to treat epilepsy, allergies, neurosis, hypertension, and other diseases.

Continuing the systematic study of the chemical components of plants of this genus, we studied the chemical composition of phenolic compounds of the above-ground part of *S. oxystegia* collected on the territory of Tashkent region (Kamchik pass) of the Republic of Uzbekistan during flowering (May, 2021). Three flavonoids were isolated earlier from this species and the component composition of the essential oil of the aboveground part was studied.

By chromatography on columns with silica gel and Sephadex LH-20, the flavonoids chrysin, luteolin, cynaroside, phytosterols β -sitosterol, daucosterol, and iridoid latifonin were isolated from a 70% ethanol extract of air-dried, crushed above-ground parts of the plant.

Identification of the isolated compounds was performed by studying their spectral data from UV, ^{1}H and ^{13}C NMR, as well as HSQC and HMBC experiments, followed by comparison with literature data for the corresponding compounds.

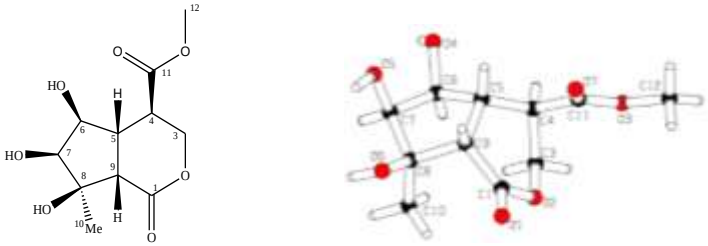

Fig.1. Chemical and spatial structure of the latifonin molecule

The configuration (4*R*,5*S*,6*S*,7*S*,8*R*,9*S*) and structure - methyl(4*R*,5*S*,6*S*,7*S*,8*R*,9*S*)-6,7,8-trihydroxy-8-methyl-1-oxooctahydrocyclopenta[*c*]-pyran-4-carboxylate were established based on X-ray diffraction analysis results for latiphonine.

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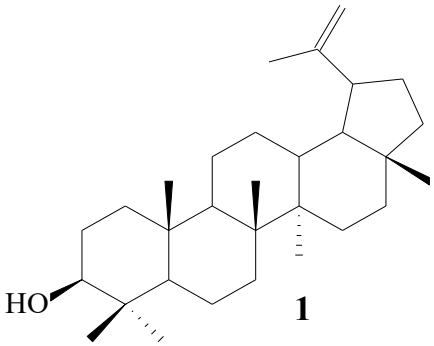
TRITERPENOIDS FROM THE PLANT *Astragalus transoxanus*

T.N. Kaipnazarov[1], N.G. Valeeva[2], N.Sh. Ramazonov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: kturdibay1@mail.ru
2) Tashkent State Technical University named after Islam Karimov.

Currently, herbal medicines are widely used in medicine for the treatment and the prevention of various diseases. For this reason, we studied the chemical composition of the plant *Astragalus transoxanus* Fisch., which belongs to *Fabaceae* family.

The previously known individual triterpenoids lupeol (**1**), cyclodisectoside (**2**), and cyclosiversioside E (**3**) were isolated from the chloroform and *n*-butanol fractions of the aerial part of this plant.



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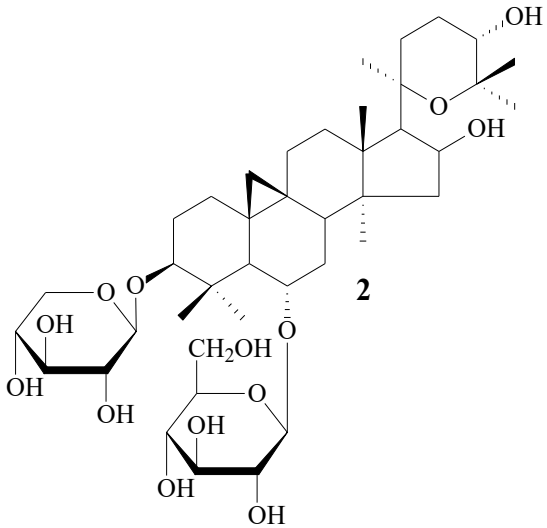

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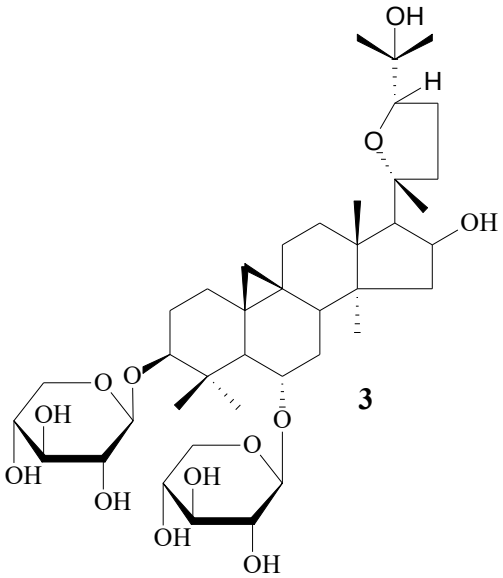

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The structure of the compounds was established on the basis of ^{1}H and ^{13}C NMR spectra. Also TLC was used for identification of mentioned above compounds.

Thus, the plant *Astragalus transoxanus* was found to contain previously known triterpenoids, which were found in this plant for the first time.

RAW MATERIALS OF *Ammothamnus lehmannii* IN KIZILKUM

Sh.Sh. Solijonov[1], A.M. Nigmatullaev[1], I.U. Mukumov[2], T.Sh. Khushatov[1], A.E. Egamberdiev[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent,
e-mail: solijonovsharifjon0617@gmail.com, *phone: +998936160033*
2) Samarkand State University, 140104, Samarkand, Republic of Uzbekistan

Ammothamnus lehmannii Bunge – belongs to the leguminous family (Fabaceae) is a semi-shrub plant 30-50 cm high. The stem is strongly branched from the base, the branches are straight, 5-10 cm long. Petals are in white color. The seeds are yellowish brown, gilded, oval-spherical. It blooms in April-June, gives fruit in June - July. It reproduces with the help of seeds. Life expectancy is 10-20 years. It grows in the plains, mainly on sandy and loamy soils, desalinated barrens, stony sandy soils. It has sand-strengthening and decorative properties, and can be used for beautification of settlements.

Alkaloids and flavonoids are stored in the above-ground part of the plant up to 0.6-4%. The seeds and roots contain sophocarpine, an alkaloid with antirheumatic and ganglioblocking properties. According to its chemical composition, it contains plant dyes flavonoids, carotenoids, anthraquinones, naphthaquinones and beta-cyanins. Among them, flavonoids such as luteolin, quercetin, synaroside, and rutin are used in medicine due to their astringent, antioxidant, and complex-forming properties.

A decoction of the root is used in folk medicine to treat rheumatism.

In 2021-2022, we studied the distribution of *Ammothanus lehmanni* in the Navoiy region (Kizilkum) of Uzbekistan and learned its root stock.

We have determined the distribution and biological reserves of *Ammothanus lehmanni* on the Zarafshan-Davgistag road in the vicinity of the Amantag mine, Davgistag mine, Balakaral village, Karakata village and Kuljuktog region in Navoiy region. Forms an association with *Ferula foietida*. The association includes *Convolvulus subsericeus, Iris songorica, Carex pachystilis, Artemisia terrae-albae,* and other plants, in addition to the bitter bush and the stinking carpet.

The distribution area of *Ammothamnus lehmanni* on the Zarafshan-Davgistag road: around the Amantag mine - 255 hectares, around the Davgistag mine - 275 hectares, around the village of Balakaral - 330 hectares, around the village of Karakata - 156 hectares, around Kuljuktog - 1071 hectares; its biological reserve: around the Amantag mine - 48.45±1.27 t, around the Davgistag mine - 44.0±1.37 t, around the village of Balakaral - 59.40±1.65 t, around the village of Karakata - 32.76±0.78 t, around the village of Karakata - 32.76±0.78 t, around Kuljuktog - 246.33±5.35 tons and its exploitation reserve: around the Amantag mine - 42.33±0, 51 t, around the Davgistag mine - 35.2±0.55 t, around the village of Balakaral - 47.52±0.66 t, around the village of Karakata - 24.65±0.31 t, around the village of Karakata - It was 24,650.31 tons, around Kuljuktog - 172.43±2.14 tons.

In general, the distribution area of *Ammothanus lehmanni* in Navoiy region (Kizilkum) was 2087 hectares, its biological reserve was 430.94±10.42 tons, and its extractive reserve was 322.13±4.17 tons.

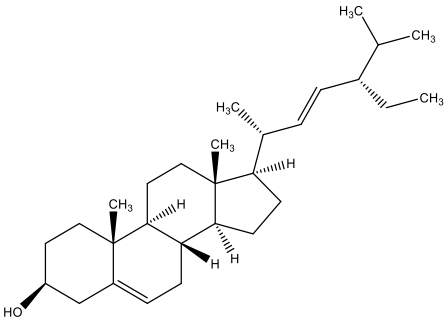
CHEMICAL COMPONENTS OF *Ferula lapidosa*

Kh. I. Khasanova[1], A.U. Babekov[2], K. A. Eshbakova[1], K.K. Turgunov[1], B. Tashkhodzhaev[1]

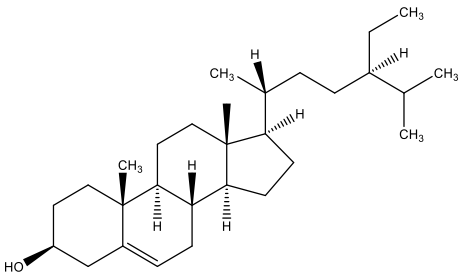
1) *S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent*
e-mail: e_komila@yahoo.com;
2) Osh State Pedagogical University. A.Zh.Myrsabekov, 723500, Osh st. Isanov 73, fax: (+996) 4 35 67, Kyrgyzstan. e-mail: eababekov2511@mail.ru

The plant *Ferula lapidosa* of the Umbrella family (*Apiaceae*) is endemic to Central Asia. The roots of *F. lapidosa* were collected during the flowering period in the Republic of Kyrgyzstan. Dried and crushed roots of *F. lapidosa* were extracted with 96% alcohol. The condensed alcohol extract was separated by column chromatography with systems of a gradual eluting benzene and ethyl acetate (9:1-1:1). Three compounds were isolated by column chromatography. Isolated compounds identified based on their spectroscopic data (IR, MS, ^{1}H, ^{13}C NMR) XRA and by comparison with compounds described in the literature, with β-stigmasterol, β-sitosterol and sesquiterpene lactone 3,6,9-trimethylazulenol[4,5-b] furan-2,7-dione.

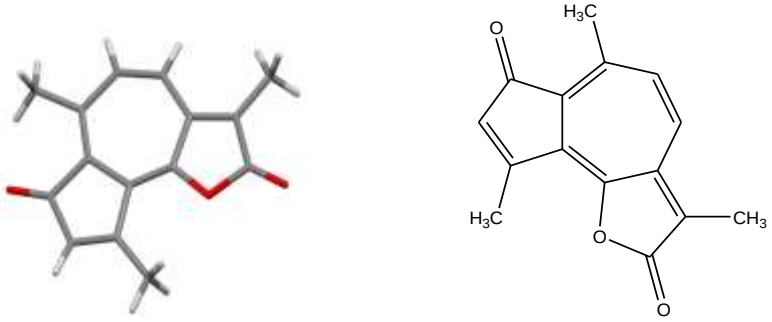
These compounds from *F. lapidosa* are isolated for the first time.



β-stigmasterol



β-sitosterol



3,6,9-trimethylazulenol[4,5-b]furan-2,7-dione

DEFINITION OF STEVIOSIDE IN *Stevia rebaudiana* SAMPLES BY HIGH PERFORMANCE CHROMATOGRAPHY

D.K. Mutalova, R.A. Botirov, G.E. Saidova, A.Z. Sadikov, Sh.Sh. Sagdullayev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent,
e-mail: noza-gold@mail.ru

Diabetes mellitus is the most acute medical and social problem in almost all countries of the world. The search for evidence-based approaches to the prevention of diabetes continues. *Stevia rebaudiana* leaves, leaf extracts are used both for the prevention of diabetes mellitus and in the complex therapy of the disease. The main group of biologically active compounds in stevia raw materials are diterpene glycosides. Sweet diterpene glycosides were found in all aerial parts of Stevia: stevioside, rebaudiosides A, B, C, D and E, which have the ability to enhance insulin secretion, enhance the effect of insulin on cell membranes, stabilize glucagon secretion and blood sugar levels.

The object of the study is the aerial part of *Stevia rebaudiana* growing in Uzbekistan. Several samples of plant materials were studied by numerical indicators.

Name of indicator	Characteristic				
Appearance	The finished raw material consists of yellow-green, green and dark green parts of the plant				
Moisture content,%	6,11	5,98	6,25	6,15	5,95
Total ash,%	7,0	6,5	7,3	6,8	6,8
Organic impurities, %	1,88	0,98	1,5	0,85	1,2
Mineral impurities,%	0,76	0.55	0,67	0,70	0,70

And also developed a method for identifying the complex of glycosides in stevia leaves by spectrophotometry and high-performance liquid chromatography.

The developed method for the quantitative determination of stevioside using high performance liquid chromatography (HPLC) was validated. This technique is simple and well reproduced. The developed method was validated according to the following indicators: specificity, linearity, accuracy, limit of detection and limit of quantitation.

The analysis was carried out on an Agilent 1200 3D LC System chromatograph with a diode array detector in isocratic mode, using a LUNA NH2 250×4.6 mm 5 μm column, at a wavelength of 210 nm. As a comparison, standard samples of Stevia and Rebudioside A were used.

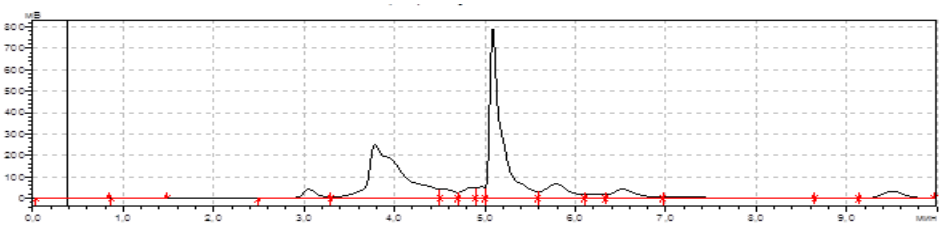


Fig. 1. Chromatogram of *Stevia rebaudiana* raw material extract

The metrological characteristics of the method are calculated. The developed technique is successfully used to study the stage-by-stage control of stevioside production.

EXTRACTION PROCESS OF SKIMMIANINE ALKALOID FROM *Haplophyllum perforatum* PLANT

R.A. Botirov, Sh.R. Nigmanova, A.Z. Sadikov, Sh.Sh. Sagdullayev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent,
e-mail: botiroovr@mail.ru

Haplophyllum perforatum, which has large reserves in the regions of the Babatag mountain ranges of the Republic of Uzbekistan, is rich in alkaloids and has antidepressant properties. It was determined to be more than 0,5 % of the plants raw material mass during the flowering and fruiting vegetation period of the plant [1,2].

In order to create a technology for the production of skimmianine alkaloid from plant raw materials on an industrial scale, we conducted scientific research work on the extraction process of plant raw materials. The influence of the main factors affecting the extraction process - the type of extractant, the extraction time, the extraction temperature, and the degree of fineness of raw materials - was studied. The influence of the main factors on the process, the interrelationship of the factors was determined using the Box-Wilson method of mathematical planning. The amount of skimmianine alkaloid in the extracts obtained during the experiments was determined using the chromatospectrophotometric method.

As a result of our research, it was determined that in order to extract skimmianine alkaloid from the surface of the plant, it is necessary to grind the raw material into 5-7 mm size, to use 80% ethyl alcohol solvent as an extractant, and to carry out the extraction process at a temperature of 20-30°C. Using the obtained results, the kinetics of the extraction process was studied, as a result, it was determined that it is necessary to extract the raw materials 6 times - 1 - extraction for 8 hours, 2 - 6 hours, 3.4 - 4 hours, and 5,6 it was determined that it is appropriate to extract the castings for 2 hours. As a result of the conducted experiments, it was possible to extract skimmianin alkaloid in the amount of 96% compared to its storage in the raw material of the plant during the extraction process. At present, scientific research is being carried out on the extraction of skimmianine alkaloid from the extract.

Thus it is first time developed effective extraction method for plants *Haplophyllum perforatum*

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COMPONENT COMPOSITION OF ESSENTIAL OIL *Senecio subdentatus* FLORA OF UZBEKISTAN

B.S. Okhundedaev, Kh.M. Bobakulov, Sh.R. Makhmudova, S.Z. Nishanbaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: sabir78@rambler.ru

The genus *Senecio* belonging to the tribe *Senecioneae* of the family *Asteraceae* (Compositae) is the largest genus and includes more than 1500 species of aromatic herbs and shrubs widely distributed throughout the world [1-2]. Several herbaceous species of the genus are grown as ornamental plants. In the flora of Central Asia, plants of the genus *Senecio* are represented by twenty-three species, ten of which grow in Uzbekistan, with the most common being *S. subdentatus* (Bunge) Ledeb. In chemical terms, this plant is practically little studied, it is only noted that flavonoids quercetin, isorhamnetin and their glycosides were found from the aerial part of the plant [3]. The chemical composition of the essential oil of *S. subdentatus* has not been previously studied.

The aim of this work was to study the chemical composition of the aerial part of *S. subdentatus* of the flora of Uzbekistan.

The aerial part of *S. subdentatus* was collected during the flowering period in the Kyzylkum deserts, along the Khiva-Bukhara road in the Bukhara region of the Republic of Uzbekistan in early May 2022.

The essential oil from the finely chopped aerial part of *S. subdentatus* was obtained by hydrodistillation for 3-4 hours. The resulting essential oil of *S. subdentatus* was a pale yellow mobile liquid with a specific odor (yield was 0.19%). The qualitative and quantitative composition of the essential oil was determined by GC-MS. Components were identified based on a comparison of the characteristics of the mass spectra with the data of electronic libraries and retention indexes (RI) of the compounds, determined in relation to the retention time (RT) of a mixture of *n*-alkanes (C_9-C_{34}).

72 compounds have been identified in the essential oil of *S. subdentatus*. The identified components make up 90.4% of the whole oil. Dominant in the composition of the essential oil were 8 components out of 72 identified substances.

The main components of the essential oil were: acyclic natural monoterpene hydrocarbons β-myrcene (26.8%), *cis*-β-ocymene (12.6%), *trans*-β-ocymene (5.1%); monoterpene alcohol terpinen-4-ol (7.5%), monocyclic monoterpene α-terpinolene (3.3%), α-terpineol (3.1%), monocyclic sesquiterpenes zingiberene (2.9%) and *m*-cymene (2.1%).

Thus, 72 volatile components of dominant acyclic monoterpene hydrocarbons, monocyclic monoterpene, bicyclic alcohol, and monocyclic sesquiterpenes were identified for the first time in the composition of the essential oil obtained by hydrodistillation from the aerial part of *S. subdentatus*.

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STUDY OF TERMITOCIDAL PROPERTIES OF *Inula britannica, Inula helenium, Inula grandis* PLANT EXTRACTS

V.N. Akhmedov[1], D.E. Dusmatova[2], R.F. Mukhamatkhanova[2], B.R. Kholmatov[1], I.D. Sham'yanov[2]

1*) Institute of Zoology AS RUz, 100053, Bogishamol st., 232b,*
e-mail: akhmedov.vokhidzhon@mail.ru
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent,
e-mail: rfm8@yandex.ru

In many regions of Uzbekistan, termites do seriously damage apartment houses, buildings, historical and cultural monuments, and other wooden parts of constructions, and it should be noted that these insects are an unprecedentedly damaging pest. In situations where insecticides are used repeatedly against termites, their survival is high due to their resistance (adaptability) properties. Therefore, one of the main tasks today is to identify and implement natural biologically active agents that have termiticidal activity against termites and are environmentally safe.

The genus *Inula* L. includes about 100 species. They are widespread in Eurasia, and 32 species are also found in the CIS countries. In particular, 9 species grow in Uzbekistan, included *Inula helenium, I. grandis, I. britannica* [1].

Laboratory experiments were conducted to investigate the termiticidal properties of extracts prepared from *Inula britannica, Inula helenium,* and *Inula grandis* plants against termites belonging to the *Anacanthotermes* genus distributed in the territory of Uzbekistan.The experiments were carried out in laboratory conditions at a temperature of +22 - +26°C. 10 worker termites were placed in clay plastered and sterilized Petri dishes. The extracts being tested are sieved 2×2 cm size filter paper and was fed to the termites. For control, filter papers with distilled water were given to the termites. Petri dishes with termites were kept in a cool and dark place. A daily account of the conducted experiments was kept. The number of surviving, paralyzed and dead termites was counted. Each experiment was performed in 5 replicates. Biological efficiency against termites was calculated based on Abbot's formula.

Preliminary results obtained from the laboratory experiments showed extracts prepared from *Inula britannica, Inula helenium, Inula grandis* have high (65-75%) termiticidal activity against termites belonging to the genus *Anacanthotermes*. Based on the results of the above experiments, it is intended to study the chemical composition of *Inula britannica, Inula helenium,* and *Inula grandis* plants in depth, and to continue the experiments in an expanded situation in the future.

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CYTOTOXIC ACTIVITY OF SESQUITERPENE LACTONE BRITANIN FROM *Inula britannica*

D.E. Dusmatova, R.F. Mukhamatkhanova, I.D. Sham'yanov, E.O. Terenteva, Sh.S. Azimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: rfm8@yandex.ru

The britanin is a chemotaxonomic marker for the plant *Inula britannica*. Britanin has anti-inflammatory, anti-allergic activity [1], is a promising candidate for chemotherapy of stomach cancer (BGC-823) [2], blocks the growth of cell lines of breast cancer (MCF-7, MDA-MB-468) [3], human tumor cell lines RD (rhabdomyosarcoma), MCF7 (adenocarcinoma breast) and MS (melanoma) [4], inhibits topoisomerase II and cancer cell lines A549, HepG-2 and HT-29 [5] and has the potential effect of pancreatic cancer treatment [6].

Britanin was isolated from the aerial part of *Inula britannica*, growing in the Tashkent region of the Republic of Uzbekistan.

Cytotoxic activity of britanin *in vitro* in relation to cervical cancer (HeLa) and laryngeal adenocarcinoma (HEp-2) cells has been studied. In concentrations of 1 μg/ml, britanin showed cell suppression at 19.4 0.5% (HeLa) and 2.8 0.8% (HEp-2) and in concentrations of 10 μg/ml at 77.5 3.3% and 79.8 4.0%, respectively. Cisplatin was used as a reference drug, with 81.6 3.9% (HeLa) and 52.8 3.6% (HEp-2) and 95.0 5.0% and 89.2.2% at 10 μg/ml, respectively.

Thus, britanin has high cytotoxic activity with regard to cervical cancer cells (HeLa) and laryngeal adenocarcinoma (HEp-2).

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METABOLITES' COMPOSITION OF *Stachys hissarica*

E.A. Mukhammadiev, N.Z. Mamadalieva

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: elbekmuhammadiyev93@gmail.com

Stachys is a plant genus, one of the largest in the Lamiaceae (mint) family. Several *Stachys* species have been used in various ethnomedicines for thousands of years. *Stachys* have been used in traditional medicine as astringent, wound healing, antidiarrheal, antinephritic, and anti-inflammatory agents.

Stachys hissarica Regel (local name is Hisor quddusi) is a perennial species that occurs in the regions of Tashkent, Samarkand, and Surkhandarya. This plant is an endemic of the Pamir-Alay, grows in mountainous areas, in rocky places. Information on the chemical composition of the *Stachys hissarica* plant is not available in the literature.

The aerial parts of *S. hissarica* (1.9 kg) were collected from the Tashkent region. The dried plant was extracted with methanol. As a result, 270 g of crude methanolic extract was obtained. To precipitate the chlorophyll in the extract, the dark extract was mixed with 60% ethyl alcohol and placed in a cold place. At the next step (after the chlorophyll was completely precipitated and separated), the extract was divided into chloroform (32 g), ethylacetate (5 g) and butanol (84 g) fractions.

Butanol fraction of *S. hissarica* was subjected to the column chromatography with silicagel and eluted with solvents such as chloroform, chloroform: methanol (increasing methanol to 20%). For TLC, as a mobile phase, the system: tetrahydrofuran-toluene-1mM solution of trifluoroacetic acid in methanol-water (16:8:2:1) was used. Results showed that butanol extract is rich in iridoids, flavonoids, phenylethanoids, and glycosides. Research studies are continuing on the isolation of pure compounds.

METABOLOMIC PROFILING OF *Silene* SPECIES USING UHPLC-MS ANALYSIS

N. Z. Mamadalieva

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Silene is a genus of flowering plants in the family Caryophyllaceae. Containing approximately 700 species, it is the largest genus in the family. It is distributed mainly in the Northern Hemisphere, but some species also occur in Africa and South America.

Phytochemical investigations of the genus *Silene* have led to the isolation of several phytoecdysteroids, triterpenes, terpenoids, benzenoids, flavonoids, anthocyanidins, nitrogen-containing compounds, sterols, and vitamins which have been reported for their significant biological properties.

Silene kuschakewiczii Regel & Schmalh. is natively present in Uzbekistan, while *Silene viridiflora* L. is introducing in our country since 2004. Previous phytochemical studies of *S. viridiflora* have isolated and identified several ecdysteroids, lipids, neutral substances, carbohydrates, and microelements. *S. kuschakewiczii* has previously never been studied for its chemical content.

Continuing the search for structurally unique and biologically active compounds in *Silene* genus, the aerial parts of *S. kuschakewiczii* and *S. viridiflora* were investigated. The Ultra High Performance Liquid Chromatography coupled to Electrospray Ionization Quadruple Time-of-Flight Mass Spectrometry (UHPLC-ESI-Q-TOF-MS) technique is a new approach in the chromatographic separations and has been successfully employed for fast, high-resolution separations with required sensitivity. The TOF-MS is helpful in the structure elucidation and identification of fragmentation patterns of the compounds. The present study aimed to explore the secondary metabolites present in crude methanol extracts of *S. kuschakewiczii* and *S. viridiflora* by UHPLC-ESI-Q-TOF-MS. Due to its high content of secondary metabolites, we have developed a simple, rapid, and precise method to characterize all the secondary metabolites using UHPLC-MS for the methanolic extracts. The unexplored metabolites of *S. kuschakewiczii* belongs mostly to the class of flavonoids. A total 23 secondary metabolites (18 flavonoids, 1 triterpene, 1 steroid, 2 phenolic compounds) from *S. kuschakewiczii* were identified. Results showed that the composition of *S. viridiflora* was found to be rich in triterpenes and ecdysteroids. A total of 34 metabolites (9 ecdysteroids, 6 flavonoids and 19 triterpenes) were annotated in the methanolic extract of this species.

Our results clearly indicate that species have totally different metabolite profile, despite they belong the same genus. The developed method can be successfully applied to annotate and identify metabolites in crude methanolic plant extracts.

METABOLOMIC PROFILING AND BIOLOGICAL ACTIVITIES OF *Ferula foetida* USING UHPLC-MS AND GC-MS ANALYSIS

N. Z. Mamadalieva[1], O. K. Khojimatov[2], L. A. Wessjohann[3]

1) Institute of Botany of the Academy Sciences of Uzbekistan, DurmonYuli Str 32, Tashkent 100125, Uzbekistan;
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
3) Leibniz Institute of Plant Biochemistry, Weinberg 3, 06120 Halle (Saale), Germany.
e-mail: nmamadalieva@yahoo.com

The genus *Ferula* has a wide distribution all over Central and South-West Asia (especially Uzbekistan, Iran, and Afghanistan), the far-East, North India, and the Mediterranean, and some are distributed in desert areas. There are 114 species of *Ferula* in Central Asia and about 60 of them in Uzbekistan. In Uzbekistan *Ferula* species grow in sandy deserts, hills, mountains, and foothills of the country, in Tashkent, Surkhandarya, Kashkadarya, Jizzakh, Navoi, Bukhara regions and the Republic of Karakalpakstan. The majority of the *Ferula* plants have a pungent odor and can be used for different purposes.

The oleo-gum-resin of *Ferula foetida* (Bunge) Regel is a popular food and herbal supplement. The full complement of bioactive compounds has yet to be elucidated, a step necessary in order to explain its nutraceutical and medicinal use. Here, untargeted metabolic profiling techniques were utilized to help gain a broader insight into oleo-gum-resin of *F. foetida* chemical composition. The technical aims of the project focused on the development of analytical methods for metabolic profiling of oleo-gum-resin obtained from *F. foetida* species. The metabolite profiling of the species carried out using rapid and sensitive chromatographic (UHPLC, GC) and mass spectrometric (MS) methods.

UHPLC-MS metabolite profiling of the resin obtained from *F. foetida* identified high levels of coumarins and their derivatives, flavonoids, fatty acids. Metabolites identified for *F. foetida* included several metabolites, such as foetisulfide A, rivulobirin G, quercetin, microlobin, 1-acetate-5-isovalerate of lapiferol, 1-acetate-6-isovaleriat ferulinkiol, ethyl myristate, *cis*-octadecenoic acid, etc. In the oleo-gum-resin of *F. foetida*, the major volatile compounds were bis (1-methylpropyl) disulfide, 2-(isopropyldisulfanyl) butane, β-ocimene and α-pinene.

In addition, biological effects of the oleo-gum-resin of *F. foetida* was evaluated. The results of anthelmintic, antifungal, and cytotoxic assays demonstrated that the oleo-gum-resin was not toxic in *in vitro* assays.

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PLANT PROTEIN COMPOSITION OF *Delphinium paradoxun* AND *Delphinium ajacis*

U.Kh. Kurbanov[1], Sh.Kh. Rakhimova[1], L.G. Mejlumyan[1], U.J. Ishimov[2], N.I. Mukarramov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: utkir.88.88@inbox.ru, tel. (90)9208608
2) A.S. Sadykov Institute of Bioorganic Chemistry AS RUz, 83, Mirzo Ulugbek Str.

The plants *Delphinium paradoxun* and *D. ajacis* contain different types of natural compounds and we recently studied the alkaloids of this plants. In the present work, we studied the protein content of *D. paradoxun* and *D. ajacis* plants.

After extracting the total alkaloids from *D. paradoxun* and *D. ajacis* plant extracts, the aqueous part was dried using a vacuum evaporator, and the total free amino acids from the protein content were separated and analyzed (Tables 1,2).

Table 1

Free amino acids in plant protein of *D. paradoxun*

Non-essential amino acids	Concentration, mg/g	Essential amino acids	Concentration, mg/g
Asp	11.32	Tre	6.27
Glu	21.33	Val	13.51
Ser	6.41	Met	3.18
Gly	9.28	Iley	11.86
Sis.-n	11.52	Ley	14.19
Arg	5.59	Gis	4.31
Ala	10.46	Fen	6.39
Pro	6.19	Liz HCl	6.14
Tir	7.66		
Amount	89.76	Amount	65.85

Table 2

Free amino acids in plant protein of *D. ajacis*

Non-essential amino acids	Concentration, mg/g	Essential amino acids	Concentration, mg/g
Asp	10.70	Tre	6.70
Glu	21.23	Val	7.92
Ser	5.45	Met	2.23
Gly	9.58	Iley	9.73
Sis.-n	12.00	Ley	13.55
Arg	5.49	Gis	4.31
Ala	9.89	Fen	6.39
Pro	5.81	Liz HCl	5.14
Tir	4.94		
Amount	85.09	Amount	55.97

According to the results of the above research, for the first time it was found that *D. paradoxun* and *D. ajacis* plants contain all important aliphatic, aromatic and heterocyclic free amino acids.

NEW C_{20}-DITERPEN ALKALOID FROM *Delphinium paradoxun*

U.Kh. Kurbanov, M.G. Levkovich, N.I. Mukarramov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: utkir.88.88@inbox.ru , tel. (90)9208608

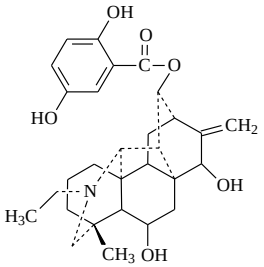
Plants of the genus *Delphinium*, distributed in the flora of Uzbekistan, are adapted to grow in the soil of the foothills, steppes and deserts. The plant *Delphinium paradoxun* is widely distributed in the desert zones of Navoi and Bukhara regions, on sandy soils, and among saxaul groves.

Information about the chemical composition of *D. paradoxun* is not found in the literature. In our previous works, diterpene alkaloids - ayaconine, 14-dihydrodelcosine, neolin, nominine, and 14-O-benzoyldictyocarpine alkaloids - were isolated from this plant, and their structure was determined by physical research methods [1-3].

We extracted 0.935 kg of *D. paradoxun* plant from Navoi region of the Republic of Uzbekistan in April-May with 80% ethyl alcohol extraction. A total of 2.876 g (0.31%) of chloroform alkaloids was obtained in relation to the dry mass of the plant.

The sum of the obtained alkaloids was separated into fractions by a multiphase rechromatographic method on a silica gel column in a mixture of solvents chloroform-methanol from 200:1 to 1:1. The isolated fractions were separated into fractions in hexane, hexane-acetone, chloroform, a mixture of solvents chloroform-methanol by rechromatography on columns with aluminum oxide and silica gel (ratios 1:30 to 1:60). As a result, the above alkaloids were isolated.

Similar fractions were combined and rechromatographed on a silica gel column (1:50 ratio) using the cyclohexane-acetone system. In a 1:1 solvent mixture of cyclohexane-acetone, fractions 23-27 obtained the base substance.



The structure of the obtained alkaloid was proved by IR, NMR and mass spectra. The isolated alkaloid is new and belongs to the hetidine type.

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CREATING OF THE COMPOSITION AND TECHNOLOGY OF SUPPOSITORIES BASED ON THE ESTROGEN ACTIVE TEFESTROL

Sh.N. Madrakhimov[1], S.K. Burkhonova[2], S. F Aripova[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent;
e-mail: latin06@mail.ru
2) Tashkent Pharmaceutical Institute

Tefestrol (FS 42 Uz--0150-2005) is a natural mixture of esters of sesquiterpene alcohols and its esters the main components are ferutinin and tenuferidin, obtained from the roots of Ferula finely dissected White, with a cream color powder, soluble in chloroform, moderately soluble in 96% alcohol, and in oils (opalescence of the resulting solution is allowed), practically insoluble in water.

One of the important and major factors affecting the effectiveness of the drug substance is the suppository base. Suppository base should provide optimal structural and mechanical properties and one of the important indicators is the stability of viscoplastic systems. The base, which forms a large part of the suppository, has certain physical and chemical properties and a significant impact on the bioavailability of the active substances, the therapeutic effect, the uniformity of drug distribution, dosing accuracy. When conducting research as an active pharmaceutical substance was taken tefestrol, as a choice of carrier studied four types of base, often used in modern pharmaceutical production and recommended by GF v. XIII.

For the experiment, suppositories were prepared and suppository models were obtained with a mass of 2.5 g containing 3 mg of the active substance. Suppositories were prepared by pouring method due to the fact that this method is used in industrial conditions. Considering that. the amount of active substance in the suppositories was less than 5%, the substitution factor was not taken into account. The required amount of the base was melted in a water bath. Separately, tefestrol was pre-mixed in a porcelain cup with a small amount of molten base, then added to the suppository base and thoroughly mixed. The consistency of the molten mass at the time of pouring should be close to the solidification temperature. Then stirring quickly poured into pre-lubricated with soapy alcohol suppository forms and placed in the refrigerator for solidification. After 35-40 minutes the prepared suppositories were removed from the mold and checked for compliance with the requirements of GF XII. Ready suppository models were analyzed in accordance with the ND by the following criteria: description, mass uniformity, melting temperature, solidification temperature, average mass and deviations from the average mass.

PHYTOCHEMICAL INVESTIGATION OF *Artemisia persica* FROM THE FLORA OF UZBEKISTAN

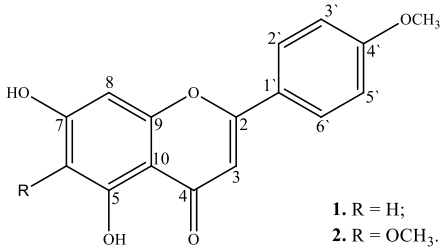
J.F. Umaraliev[1,3], A.A. Ganiev[2], N.B. Begmatov[1,2], Kh.M. Bobakulov[2], Zhao Bo[1], N.D. Abdullaev[2], H.A. Aisa[1]

1) Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Urumqi 830011, China, E-mail: haji@ms.xjb.ac.cn
2) Acad. S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, 77, M. Ulugbek str., 100170, Tashkent, Uzbekistan, khayrulla@rambler.ru
3) University of Chinese Academy of Science, 100039, Beijing, P. R. China

The genus *Artemisia L*. is one of the largest in the *Asteraceae* family and is interesting with respect to chemistry, because it is the source of many secondary metabolites including terpenoids, flavonoids, and coumarins [1]. The *Artemisia* species commonly known as mugwort, wormwood and sagebrush are reported to possess various pharmacological activities such as antimicrobial, antioxidant, anticonvulsant agent, anticoagulant, antidiabetic, antispasmodic, anthelmintic, anticancer, colds, anticolic, anticoughs, cardiac stimulant, dyspepsia, febrifuge, insecticidal, headaches, anti-inflammatory, antimalarial, stomachic and antiulcer etc. [2].

We have investigated aerial part of *A. persica* collected in Namangan Region of the Uzbekistan. Air-dried raw material was extracted exhaustively with EtOH (96-70%) at room temperature. The chloroform fraction was chromatographed over a column with silica gel by elution with *n*-hexane:$CHCl_3$:MeOH. Three compounds (**1**-**3**) were isolated from the chloroform fraction of plant.

Investigation by 1D and 2D NMR spectral data of compounds and their comparison with the literature as well as direct comparison with authentic samples the isolated compounds were identified as acacetin (**1**), pectolinarigenin (**2**) and scopoletin (**3**). All compounds were identified first time from *A. persica*.



1. R = H;
2. R = OCH_3.

3

Acknowledgement

This work was financially supported by the Join Laboratory for Preparation Technology and Quality Standards of Natural Medicines Established by the Central Asian of Drug Discovery and Development of Chinese Academy of Sciences and Institute of the Chemistry of Plant Substances, Academy of Sciences, as well as the Alliance of International Science Organizations for Young Talents (ANSO) scholarship.

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STEROID GLYCOSIDE FROM *Silene tomentella*

S.S. Narzullaev, U.Yu. Yusupova, D.A. Usmanov, N.Sh. Ramazonov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Silene is a large genus with more than 700 species growing in various temperate regions of the world [1]. Several phytochemical studies have been carried out on *Silene* species, highlighting the occurrence of ecdysteroids, triterpene saponins, terpenoids [2,3].

However, the same metabolites responsible for increasing plant production performance can also make them undesirable for human consumption. Steroid glycosides are a class of wide-spread natural products having either terrestrial or marine origins [4].

Thus, on the basis of the biological activities reported for *Silene* species, the phytochemical investigation of *S. tomentella* was carried out. Herein, we report the isolation and structural characterization by NMR experiments of steroid glycoside, which investigated for the first time from this plant.

The collected plant material was kept in the dark and air-dried for 10 days. The air-dried plant material (1 kg) was chopped into thin pieces and extracted with 90% aqueous MeOH (4 × 5L, each soaking was continued for 1 week). A methanol extract of the roots of *S. tomentella* was suspended in H_2O and partitioned with hexane and n-BuOH. The BuOH-soluble extract (15.7 g) was subjected to CC (SiO_2 (780g); AcOEt/MeOH gradient 100:0; 0:100) to yield 18 fractions (Frs. A – R). Fr. H (4.5 g; AcOEt/MeOH 4:1) was subjected CC (SiO_2 (200 g); with MeOH/H_2O 0:100, 10:90, 30:70, 50:50, 70:30, 100:0) to yield six fractions (Frs. H1 – H6). Fr. H6 (12.2 mg; asetonitril/H_2O 0:100-100:0), which was purified by Sephadex G-15 and yielded one individual compound lineolon.

The structure of this compound was determined using chemical and spectroscopic methods, such as 1D and 2D nuclear magnetic resonance (NMR) [heteronuclear single quantum coherence (HSQC) and heteronuclear multiple bond correlation (HMBC)], as well as high-resolution electrospray ionisation mass spectrometry (HR-ESI-MS) experiments.

Lineolon is a white powder, its formula is $C_{21}H_{32}O_5$. ESI-MS, *m/z* 365. 2572 $[M]^+$ (calculated for 364.2584); M.p. 140°C. $\alpha_{[D]}^{20}$ - 13±2.5 (Methanol).

Lineolon belonging to steroid glycosides is known, but it was isolated from aerial part of *Silene tomentella* for the first time.

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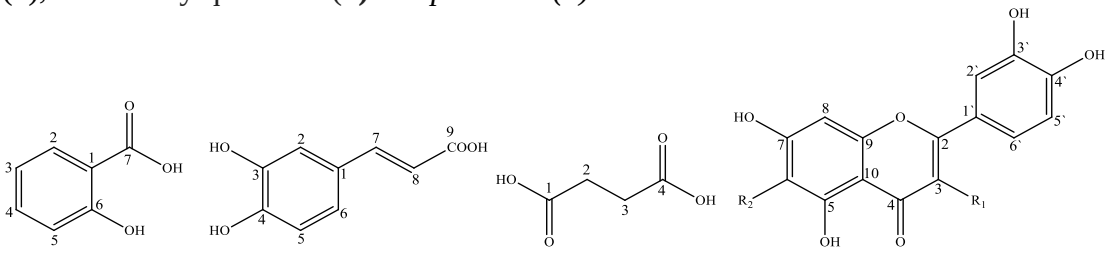
PHENOLIC COMPOUNDS AND FLAVONOIDS FROM THE *Artemisia porrecta*

O.A. Abdullajanov[1], A.A. Ganiev[2], N.B. Begmatov[1], Kh.M. Bobakulov[2], Zhao Bo[1], N.D. Abdullaev[2], H.A. Aisa[1]

1) Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Urumqi 830011, China, E-mail: haji@ms.xjb.ac.cn
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent, khayrulla@rambler.ru
3) University of Chinese Academy of Science, 100039, Beijing, P. R. China

Artemisia, one of the largest genera in the *Asteraceae* family, including more than 350 species, is wide distributed in the temperate regions of the northern hemisphere such as Asia, Europe and North America [1]. 81 species of Artemisia, grow in the territory of Uzbekistan [2].

Air-dried plant (10 kg) of *Artemisia porrecta* was extracted with 90% ethanol at room temperature, with 5 time for 24 h. After remove the solvent under vacuum pressure at 45°C, a crude extract fractionated by *n*-hexane, chloroform, ethylacetate and *n*-butanol. The ethylacetate fraction was chromatographed on a column with silica gel by elution with $CHCl_3$:MeOH (from 100:0 to 0:100). Three organic acids (**1-3)** and two flavonoids **4**, **5** were isolated from the ethylacetate fraction of plant. Investigation of their spectral data (UV, IR and NMR spectroscopy) and comparison them with the literature as well as direct comparison with authentic samples the structures of the isolated compounds were established as: *salicylic acid (**1**),* caffeic acid (**2**), succinic acid (**2**), 3-O-methylquercetin (**4)** and *patuletin (**5**).*



All isolated secondary metabolites were isolated first time from the *A. porrecta.*

Acknowledgement

This work was financially supported by the Join Laboratory for Preparation Technology and Quality Standards of Natural Medicines Established by the Central Asian of Drug Discovery and Development of Chinese Academy of Sciences and Institute of the Chemistry of Plant Substances, Academy of Sciences, as well as the Alliance of International Science Organizations for Young Talents (ANSO) scholarship.

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CHEMICAL COMPONENTS OF *Delphinium semibarbatum* FLOWERS

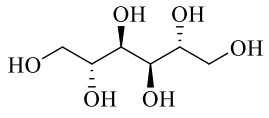
D.R. Siddikov, A.A. Ganiev, Kh.M. Bobakulov, U.Kh. Kurbonov, N.I. Mukarramov, N.D. Abdullaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: drsiddiqov@mail.ru

Delphinium semibarbatum Bien. ex Boiss. - perennial herbaceous plant of the Ranunculaceae family, growing on the loess slopes of the foothills in the middle belt of mountains in the Tashkent, Namangan, Andijan, Fergana, Samarkand, Kashkadarya, Bukhara and Surkhandarya regions.

The purpose of our research was to study the chemical composition of flowers of *D. semibarbatum*, collected during the flowering period in the mountainous areas of the Akhangaran district of the Tashkent region.

We have studied the component compositions of the ethyl acetate and n-butanol fractions of the alcoholic extract of *D. semibarbatum* flowers. The ethyl acetate fraction was separated on a column with KSK silica gel, eluting with chloroform and a gradient mixture of chloroform-methanol with increasing methanol content. Eight individual compounds were isolated by subsequent rechromatography of the obtained subfractions on Sephadex LH-20 and elution with an ethanol-water mixture (8:2): *D*-mannitol (1), undulatoside A (**2**), kaempferol (**3**), quercetin (**4**), isorhamnetin (**5**), isorhamnetin 3-*O*-β-glucopyranoside (**6**), isoquercetin (**7**) and rutin (**8**).



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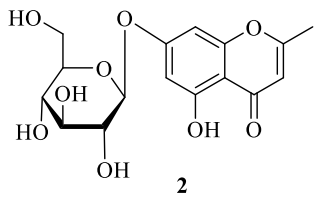

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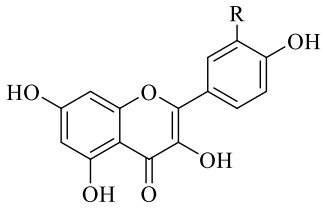
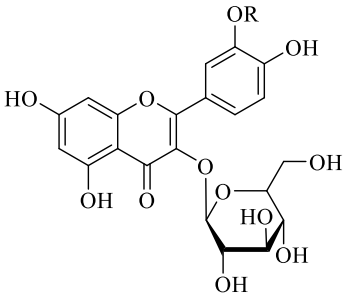
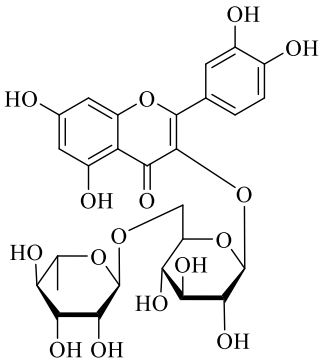


3. R=H; **4.** R=OH; **5.** R=OCH_3



6. R=CH_3; **7**. R=H



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The chemical structure of the isolated compounds was established based on the study of UV, IR, ^{1}H, ^{13}C NMR spectra data and using DEPT, HSQC, HMBC, COSY experiments as well as direct comparison with authentic samples of substances.

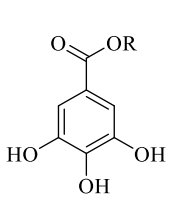
PHENOLIC COMPOUNDS OF THE AERIAL PART OF *Pelargonium hortorum*

D.R. Siddikov, A.A. Ganiev, Kh.M. Bobakulov, Sh.K. Khidoyatova, S.Z. Nishanbaev

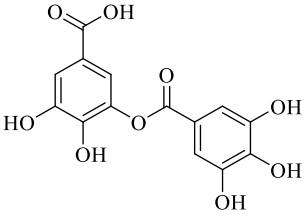
S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: drsiddiqov@mail.ru

Pelargonium hortorum L.H. Bailey (garden pelargonium) is a perennial herbaceous plant of the *Geraniaceae* family. Homeland of plant is the southeastern and southern regions of South Africa, this plant does not grow in Uzbekistan, but is currently widely cultivated. The purpose of our research was to study the chemical composition of *P. hortorum* cultivated in Tashkent (Uzbekistan).

Air-dried aerial part of a *P. hortorum* plant, collected in the flowering phase in November 2020, five times extracted at room temperature with 70% ethanol. The combined hydro-alcoholic extract was concentrated in vacuo, diluted with water and extracted successively with gasoline, chloroform, ethyl acetate and *n*-butanol.



1. R=H, **2.** R=C_2H_5



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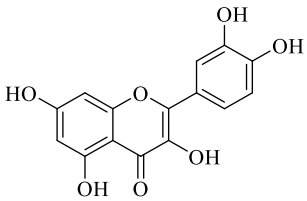

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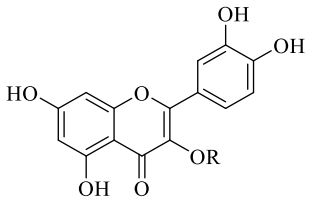
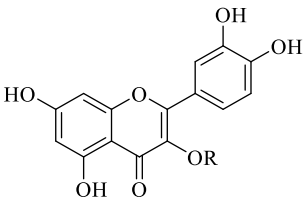


5. R=alpha-L-Ara*p*
6. R=alpha-L-Ara*f*
7. R=beta-D-Glc*p*



8. R=alpha-Rhap-1➔6-beta-D-Glc*p*
9. R=alpha-Rhap-1➔6-beta-D-Galc*p*

The *n*-butanol fraction (30.0 g) was chromatographed on a column (4 × 135 cm) with silica gel in a chloroform-methanol (40:1-1:10) gradient system of solvents, the volume of fractions was 50 ml. Rechromatography of individual eluates on Sephadex LH-20 in an ethanol-water gradient system were isolated nine individual phenolic compounds: ethyl gallate (**1**), gallic acid (**2**), digallic acid (**3**), quercetin (**4**), guajaverin (**5**), avicularin (**6**), hyperin (**7**), rutin (**8**), quercetin 3-O-robinobioside (**9**).

The chemical structures of the isolated compounds were established based on the analysis of their spectral (UV, IR, ^{1}H, ^{13}C, and 2D NMR) data and comparison with literature data.

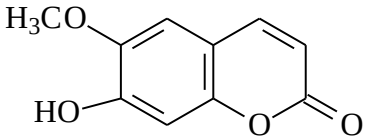
CHEMICAL COMPONENTS OF *Ferula tadshikorum*

Q.S. Juraev, Kh.I. Khasanova, B.J. Komilov, K.A. Eshbakova

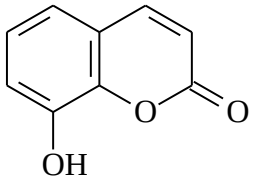
S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: e_komila@yahoo.com

Ferula tadshikorum belongs to the family *Apiaceae* and is a widespread medicinal plant growing in Uzbekistan. *F. tadshikorum* has been used as a medicinal plant in medicine since ancient times. The use of *F.tadshikorum* in folkmedicine has also a centuries-old history. Since ancient times, the species has been used as an analgesic agent for arthritis and joint pain. Pharmacological studies have shown that the plant exhibits expectorant and anticonvulsant properties in exudativediathesis, pulmonary tuberculosis, otitis, lymphadenitis. Some studies have shown an effective effect of the plant in malignant tumors and syphilis, for which the leaves of the plant are mixed with acidic milk. In veterinary practice, a porridge obtained from the roots of *F.tadshikorum*, prepared with boiling water, is used as a wound healing agent in skin diseases of domestic animals. The population also eats young stems in spring in the form of salads and as a filling of green dolma. Leaves in dry form are used to feed cattle [1].

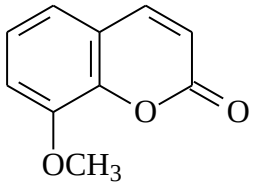
We studed the roots (6,5 kg) of the *F. tadshikorum* plant collected in the Surxandaryo region of Uzbekistan. Extracted with 70% alcohol at room temperature. The obtained alcohol extract was chromatographed on a silica gel column using a chloroform and methanol (9:1, 4:1, 2:1) gradient system were isolated scopoletin, 8-hydroxycoumarin, 8-methoxycoumarin. The chemical structures of the isolated compounds were established on the basis of the spectral data of ^{1}H, ^{13}C NMR, 2D.



Scopoletin



8-Hydroxycoumarin



8-Methoxycoumarin

These compounds from *F. tadshikorum* are isolated for the first time.

Reference

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CHEMICAL COMPOSITION *Ferula tadshikorum* OF THE FLORA OF UZBEKISTAN

E.Kh. Khalilova, Kh.M. Bobakulov, S.F. Aripova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: elik_ch@rambler.ru

A number of resolutions of the President of the Republic of Uzbekistan noted "To ensure the development of technologies for the production of medicines necessary for medicine and agriculture by processing raw ferula". In light of this Decree, the goal is: based on chemical components, namely terpenoids of the *Ferula tadshikorum* plant of the flora of the Republic of Uzbekistan and the identified biological activity, the development of technology and preparation for the introduction of a number of effective medicines for medicine. *F. tadshikorum* is a perennial, monocarpic, strongly and unpleasantly smelling herbaceous plant of the family – *Apiaceae* (*Umbelliferae*).

Ferula tadshikorum grows in Kashkadarya, Surkhandarya and other regions of the Republic of Uzbekistan. It is known from the literature that in the East, resin obtained from fresh ferula roots by cutting is used as a spice. Currently, industrial preparations of this resin, which is exported by tons as a spice to India, Iran, Pakistan, Afghanistan, lead to depletion of stocks of this plant. In folk medicine of the East, *F. tadshikorum* is known to be used as an antiparasitic, antispasmodic, expectorant, for tuberculosis, syphilis, malignant tumors, to improve digestion and other properties.

The chemical composition of the aerial part of *F. tadshikorum* collected in Surkhandarya region with 85% ethanol was studied. The condensed ethanol extract was fractionated according to solubility in various organic solvents (extraction benzene, chloroform, ethyl acetate). In the benzene extract of the aerial part of *F. tadshikorum* were identified 8 compounds (54.4%) by GC-MS analysis. The main components of the benzene extract were thiophene derivatives: 2,5-dimethylthiophene (1.7%), 2,4-dimethylthiophene (7.9%), 3,4-dimethylthiophene (21.1%).

In order to identify the main components of *F. tadshikorum* resin benzene extracts of 7 samples from different collection regions were obtained. The presence of common chemical components (palmitic, oleic, palmitooleic, lauric, myristic acids, their esters, β-bisabolene, α-selinene and sulfur-containing components) was noted in all resin samples.

The macro- and microelement composition of the resin of the roots of the *F. tadshikorum* plant was studied by mass spectrometry with inductively coupled argon plasma. The data obtained indicate the content of a large number of macro- and microelements (K, Ca, Mg, Zn, Fe, Ag) useful for a living organism in the resin.

Thus, by studying the chemical composition of the aboveground part of *F. tadshikorum* growing in the flora of Uzbekistan, it is shown that the main components in the plant are thiophene derivatives: 2,5-dimethylthiophene, 2,4-dimethylthiophene, 3,4-dimethylthiophene, which can be used in the standardization of the substance obtained on the basis of this plant. The elemental composition of this plant was studied for the first time.

OPTIMAL TIME FOR HARVESTING LICORICE ROOTS FOR THE PRODUCTION OF GLABRIDINE AND THE PLACE OF COLLECTION FROM THE TERRITORY OF UZBEKISTAN

A.I. Sanoev[1,2], B.S. Okhundedaev[1], Sh.Sh. Sagdullaev[1], I.D. Shamyanov[1], R.M. Khalilov.[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Tashkent Pharmaceutical Institute, e-mail: sanoev.a85@mail.ru

In Uzbekistan, the roots of *Glycyrrhiza glabra* are mainly used on an industrial scale as a source of glycyrrhizic acid and its salts. However, the roots of *Glycyrrhiza glabra* also contain other biologically active substances, including flavonoids such as glabridin, liquiritin, isoliquiritin, liquiritoside, etc. In the plant, the content of flavonoids reaches 4-6% of the mass of air-dry raw materials. This shows that the roots of Glycyrrhiza glabra can be a source of biologically active substances based on flavonoids.

We have studied the dependence of the amount of isoflovane glabridin in the roots of licorice growing in Uzbekistan on the growing season and place of growth.

The content of glabridin was determined by high performance liquid chromatography HPLC (Shimadzu) brand "LC-20", Under the following conditions:

- column "Supelco" (150x4.6 mm) with a stationary phase C18 with a particle size of 5 μm;
- column temperature - 40°C;
- UV detection - 282 nm;
- the volume of the injected sample was - 20 μl;
-mobile phase methanol: acetonitrile 1:1;
- the flow rate of the mobile phase was 1.0 ml/min.

The mass concentration of glabridin was determined by the sum of the peak areas using the external standard method, which was the standard sample of glabridin (Sigma-Aldrich). The results of the analysis are presented in the table.

Table

Changes in the amount of isoflovane glabridin in licorice roots depending on the growing season and place of growth

№	Place of collection of licorice roots	Content of isoflovane glabridin %			
		March	August	October	December
1	Republic of Karakalpakstan	0,102	0,105	0,105	0,108
2	Khorezm region	0,105	0,107	0,108	0,115
3	Syrdarya region	0,130	0,142	0,148	0,152

The results presented in the table showed that the amount of glabridin in licorice root, collected in October and December from the territory of the Syrdarya region, is relatively high. In our further work, the samples of roots collected from this place of this period were chosen as an object.

METHOD FOR OBTAINING THE SUBSTANCE "DRY EXTRACT TRIBULUS" WITH A RESIDUAL AMOUNT OF BUTANOL LESS THAN 1 PPM

T.A. Khajibaev, R.M. Khalilov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: hajibaev84@mail.ru

Tribulus terrestris L from the family *Zygophyllaceae* is an annual creeping herbaceous plant. In the world, *Tribulus terrestris* L is distributed in warm areas of Europe, America, Africa, Australia, and Uzbekistan. Furostanol-type steroid glycosides from the aerial part of *T. terrestris* have the property of increasing strength and muscle mass of the body. At the Institute of Chemistry of Plant Substances, technology has been developed for obtaining and serial production of the substance "Dry extract Tribulus" has been launched with a content of furostanol saponins of at least 45% in terms of protodioscin from the aerial part of *T. terrestris* growing in Uzbekistan. “Dry extract Tribulus” is produced in the Scientific and Technological Center for GMP Requirements of the Institute of Chemistry Plant Substances according to the requirements of PA 42 Uz-3283-2021 for the production of medicines and Tc 03535440-050:2022 for biological active supplements. According to the requirements of PA 42 Uz-3283-2021, the residual amount of butanol in the dry extract should be no more than 5000 ppm, and according to the requirements of solvents Tc 03535440-050:2022, it should be 1 ppm.

As we reported earlier, when preparing an aqueous solution of furostanol saponins, when concentrating the butanol extract, the ratio of dry mass and supplied water should be at least 1 kg: 30 l. In this case, the concentration of an aqueous solution of furostanol saponins must be continued until a dry weight residue of 10%. As noted, this technique made it possible to obtain a "Dry extract Tribulus" according to the requirements of PA 42 Uz-3283-2021. However, with this technique, it was not possible to reduce the residual amount of butanol in the dry extract below 1 ppm. In this regard, several experiments were carried out further and based on the results, it was found that ethyl alcohol effectively removes the butanol residue from an aqueous solution more than water. Thus, to obtain a "Dry extract Tribulus" that meets the requirements of Tc 03535440-050:2022, we propose the following technology: aerial part of *T. terrestris* is extracted six times with 70% ethyl alcohol, concentrated, and diluted with water. The aqueous solution of saponins is sequentially treated with chloroform and then with ethyl acetate, the saponins are extracted from the purified solution with butanol and concentrated the butanol extract, which at the end of the process is first submitted with water in the ratio of the dry mass of the extract and the supplied water 1 kg: 20 l and is continued the concentration process. Ethyl alcohol is sequentially fed into the aqueous solution of saponins in the ratio of the dry mass of the solution and the supplied ethyl alcohol 1 kg: 10 l and is continued the concentration process. Then, to remove the rest of the ethyl alcohol, water is again added to the aqueous solution of saponins in the ratio of the dry mass of the extract and the supplied water 1 kg: 10 l, and the solution is concentrated to the remainder of the dry mass of the aqueous solution of 10-15%. An aqueous solution of furostanol saponins is dried in a spray dryer "ZPG 150" at an inlet temperature of 170 °C, an outlet of 90 °C, supplying a solution at a rate of 80 l/h, a spray head rotation speed of 8000 rpm, and a heat carrier velocity of 2000 kg/h. Get "Dry extract Tribulus" with a yield of 3.2% to the weight of the raw material.

STEP-BY-STEP PRODUCTION CONTROL "DRY EXTRACT TRIBULUS" FROM THE AERIAL PARTS OF *Tribulus terrestris*

D.K. Mutalova, T.A. Khajibaev, R.M. Khalilov, Sh.Sh. Sagdullaev, R.G'. Axmadjonova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: noza-gold@mail.ru

We have developed a technology for obtainment and launched the serial production of the substance "Dry extract Tribulus" with a content of furostanol saponins of at least 45% in terms of protodioscin from the aerial part of *T. terrestris*. The technology is as follows: the aerial part of *T. terrestris* is extracted six times with 70% ethanol at room temperature, insisting for 8 hours. The combined and filtered extract is concentrated to a dry weight content in the aqueous extract of 25%. The aqueous extract is treated three times with chloroform and then twice with ethyl acetate. Furostanol saponins are extracted four times from the purified aqueous extract with butanol. The butanol extract is thickened by dissolving with water in a ratio of dry mass and water of 1.0 kg: 10.0 l. Then the aqueous solution of saponins is concentrated to a dry residue content of 10%. An aqueous solution of saponins is dried in a spray dryer at an inlet temperature of 170°C, an outlet of 90°C, a solution feed rate of 70.0 l/h, and a spray head rotation speed of 7500 rpm.

To control the quality of the substance, appropriate methods were designed: the authenticity of the substance was assessed using a qualitative reaction for saponins, the identification of impurities was carried out by TLC, the quantitative determination was carried out by spectrophotometry, and was developed for step-by-step control TLC and spectrophotometry methods.

The results of the step-by-step control of furostanol saponins according to the above technology are given in the table.

Table

Technology stages	Yield of total furostanol saponins, %	
	% by weight of raw materials	% of the content in raw materials
The aerial part of *Tribulus terrestris*	2,5	100,0
United extracts	2,3	91,9
Schroth	0,2	8,1
Chloroform extract	0,08	3,2
Ethyl acetate extract	0,15	5,9
Butanol extract	1,68	67,2
Residual solution	0,39	15,6
Spray dryer losses	0,14	5,6
Dry extract Tribulus	1,54	61,6

It was revealed that with the proposed technology, a large amount of furostanol saponins remains in the residual solution after extraction with butanol. During spray drying, the loss of the finished product is 10-12% of the loaded mass, which determines the loss of furostanol saponins at this stage.

EXTRANEOUS IMPURITIES OF TENESTROL SUBSTANCE

M.A. Mamatkhanova, R.M. Khalilov, A.U. Mamatkhanov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: munir_05@mail.ru

For a chromatographic study, a solvent system of hexane-ethyl acetate-ethanol was used, and chromatography was carried out on Silufol UV-254 plates, then viewed in ultraviolet light at a wavelength of 254 nm and sprayed with a solution of vanillin in sulfuric acid.

In all samples of the Tenestrol substance, when applied to a chromatographic plate of 100 μg (I), 5 spots were detected, two of which - the first and third - when sprayed with a solution of vanillin in sulfuric acid give a characteristic color: green, turning into blue (ferutinin), and pinkish-violet (tenuferidine).

When applying 1.25 μg (II), no more than two main spots were found, when sprayed with a solution of vanillin in sulfuric acid, ferutinin dyed green, turning into blue; tenuferidine does not form a characteristic stain.

When applying 15 μg (III)of the substances were observed 4 spots: two main spots (first and third) - ferutinin and tenuferidin, which, when sprayed with a solution of vanillin in sulfuric acid, give a characteristic stain, the second spot - 4β-hydroxy-6α -β-hydroxybenzoyloxy-10α-angeloyloxy-dauk-8-ene and the fourth spot is a substance of undetermined structure (Fig.).

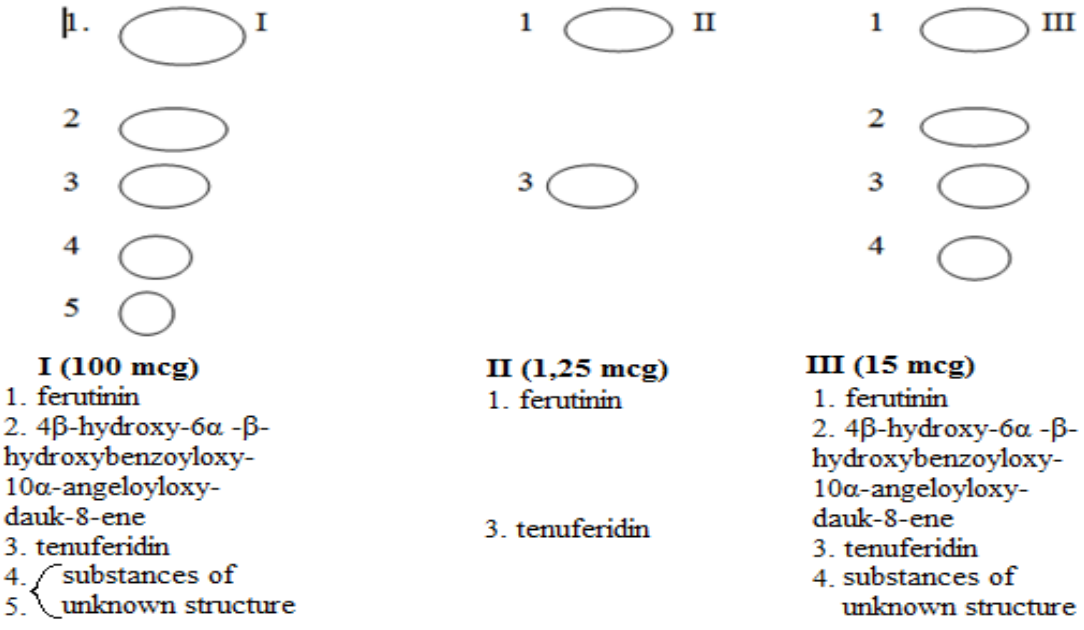

Fig. Thin layer chromatography of Tenestrol substance

ABOUT THE PRODUCTION TECHNOLOGY OF THE DRUG SUBSTANCE GALANTHAMINE HYDROBROMIDE

Sh.R. Nigmanova, R.A. Botirov, A.Z. Sadikov, Sh.Sh. Sagdullaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: shohistanigmanova1989@gmail.ru

In our institute, industrial production technology of galantamine hydrobromide medicinal substance with anticholinesterase properties from the leaves of Victor's sedge plant was created and put into practice for serial production [1,2]. The medical requirements of our country are fully satisfied with the drug, and the substance is partially exported abroad. (Registration certificate RUz - DV/M 03313/06/20, Registration certificate RF - No. FS-000247). As we all know, special attention is currently being paid to the production of medicines based on international GMP requirements, and to the creation of analytical methods based on the requirements of the USP international standard in terms of quality and quantity.

Taking into account the above, we have conducted scientific research to increase the export potential of galantamine hydrobromide medicinal substance and to create a production technology of galantamine hydrobromide substance produced from the raw materials of *Ungernia Victoris* that meets the requirements of international standards in terms of quality and quantity. As a result of our research, in the production of a high-purity substance, alkaloids are extracted from plant raw materials using weak solutions of mineral acids, alkaloids are purified from the extract using the ion exchange method, the main substance is eluted from cations using an ethyl alcohol solution containing alkali, and galantamine alkaloid is extracted from the eluate, and its hydrobromide salt is extracted, the amount of additives in the substance has achieved the reduction 2 times with the help of recrystallization. At present, research is being conducted to study the chemical composition and harmlessness of small amounts of additional substances in the substance. As a result of the ongoing research, the possibility of producing a substance that meets the requirements of international standards will be created and the export potential of the product will be increased.

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STRUCTURE AND BIOLOGICAL ACTIVITY OF ARABINOGALACTAN OF *Ferula tenuisecta*

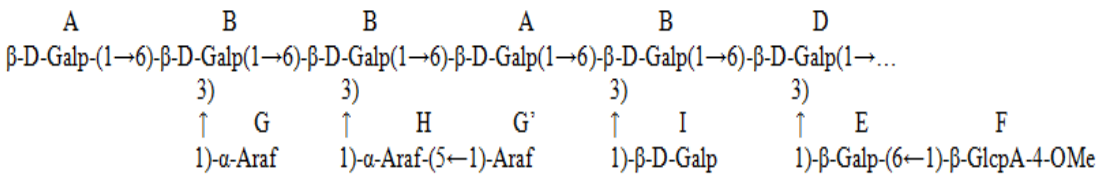
D.Z. Azizov[1], A.S. Dmitrenok[2], R.K. Rakhmanberdiyeva[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

2) Institute of Organic Chemistry. N.D. Zelinsky RAS, Moscow, Russia

From the aerial part of *Ferula tenuisecta*, arabinogalactan AG-Ften with a molecular weight of 38 kDa was isolated, consisting of galactose, glucose, arabinose in a ratio of 25:3.3:10.6. Using methylation, GC, GC-MS and ^{13}C NMR spectroscopy, it was found that AG-Ften consists of D-Galp residues linked by β-1,6-glycosidic bonds as the main chain, and the side chain is represented by α-L-Araf, β-D-Galp and 4-O-MeGlcAp. To determine the type of glycosidic bonds between monosaccharide residues, AG-Ften was methylated according to method of J. Ciucanu, and F. Kerek, The completeness of methylation was controlled by IR spectroscopy by the absence of an absorption band at 3400–3200 cm^{-1} (OH groups). Permethylate was subjected to methanolysis, the product of methanolysis was acetylated to give trimethylsilyl derivatives, which were analyzed by GC-MS. Analysis of GC/MS data showed that AG-Ften contains T-Araf (14.94%), 1,5-Araf (4.46%), galactose residues consist of terminal T-Galp (5.64%), 1,6-linked Galp (38.58%), 1,3-linked Galp (6.44%), and 3,6-linked Galp (14.2%). The detection of 2,3,6-tri-O-Me-Glcp (2.71%) is probably associated with the presence of β-GlcpA-4-OMe-(1→6)-β-Galp-(1→disaccharide fragment in AG-Ften.

^{13}C NMR of arabinogalactan was taken in the region from 60 to 180 ppm. The COZY, TOCSY, and ROESY spectra showed the presence of β-galactopyranose (β-Galp), α-arbinofuranose (α-Araf), and uronic acid β-glucopyranoside (β-GlcpA) residues as the sugar component of the polysaccharide. Analysis of the HSQC spectrum revealed a substitution in β-Galp residues at position C-6 (residues A and E) and positions 3,6 (residues B and C), as well as a part of unsubstituted β-Galp residues (terminal, I). Two types of α-Araf residues were observed in the polymer: terminal (G and G') and 5-substituted (H). The β-GlcpA (F) residues turned out to be substituted at position 4. All conclusions about the substitution in the residues were made on the basis of a comparison of the ^{13}C NMR subspectra of the residues with the spectra of the starting sugars, taking into account the positive α-effect of substitution. The following is the structure of the main *F. tenuisecta* arabinogalactan fragment:



Pharmacological studies have shown that arabinogalactan has bifidogenic activity and can be used as part of functional foods.

QUANTITATIVE ANALYSIS OF PROTEIN IN LIQUID EXTRACT *"EXTRADENT"*

Sh.S. Yuldasheva[1], N.A. Yunuskhodzhaeva[1], N.E. Yunuskhodzhieva[1], Sh.Kh. Rakhimova [2]

1) Tashkent Pharmaceutical Institute., Tashkent. Uzbekistan
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan 100170, Tashkent, M. Ulugbek st., 77
e-mail: shahnoza2380@mail.ru

The use of standardized extracts improves the quality and greatly accelerates the technology of water-alcohol extracts. At the Department of Pharmaceutical Chemistry, we have developed a liquid extract from herbs of peppercorn *(Polygonum hidropiper L.)*, shepherd's purse *(Bursa pastoris*), calendula flowers (Calendula officinalis L.) and nettle leaves (*Urtica dioica L.).* The raw materials of these plants have been used for many hundreds of years in scientific and folk medicine. They are pharmacopoeial objects that are used as an anti-inflammatory, hemostatic and vitamin remedy.

The purpose of our study was to study the protein content in the new phytopreparation *"Extradent"*.

To determine the protein content in the isolated fractions, the aliquot part of them was taken into a heat-resistant flask (from 5-10 ml), concentrated sulfuric acid H_2SO_4 (1.84 g/cm3) was added to the aliquot part of the fraction taken. The flasks were placed on a sand bath, setting the temperature equal to 400 ^{0}C. Distilled water was carefully poured into the cooled flasks along the walls and quantitatively transferred to a measuring flask with a capacity of 50 ml. An aliquot was taken from a measuring flask, after mineralization, to determine the protein content by nitrogen, depending on the estimated protein content. With a high nitrogen content in the samples, dilution was carried out. Then the solution was neutralized. And added 1 ml of Nessler reagent. Solutions in flasks were brought to the mark with water and thoroughly mixed. 15 minutes after painting, the solutions were colorimetrated on an electro-photocolorimeter KFK-3 [1-2].

Total protein content in liquid alcohol extract "Extradent"

Sample number	Proteins, %	Average protein content, %	Proteinic nitrogen content, %
Test 1	5,61	**5,56**	**0,88**
Test 2	5,52		

The protein content in the liquid extract "Extradent" was studied for the first time, the amount of protein was 5.56%, and the nitrogen content was 0.89%

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QUANTITATIVE ANALYSIS OF PROTEINS IN *Dictamnus angustifolius, Haplophyllum perforatum* AND *Ruta graveolens* PLANTS GROWING IN THE REPUBLIC OF UZBEKISTAN

Sh.Kh. Rakhimova, Z.Ch. Abraeva, L.G. Mezhlumyan

S.Yu.Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
e-mail: *shahnoza2380@mail.ru*

Among the compounds of primary metabolism that are formed in all living organisms on our planet, proteins are essential for growth and development.

It was interesting to study the proteins of alkaloid-bearing plants, such as *Dictamnus angustifolius, Haplophyllum perforatum, Ruta graveolins,* collected during the flowering period in the Republic of Uzbekistan.

The total protein content in plant samples was determined by the total nitrogen content. The colorimetric method using Nessler reagent on a V-5000 Metach spectrophotometer [1-2] determined the quantitative protein content in these plant organs. The analysis was carried out under laboratory conditions using the accelerated method with Nessler reagent.

The results of the analysis are presented in the table.

Table

Total protein content in medicinal plants

Sample number	Proteins, %	Average protein content, %	Proteinic nitrogen content, %
Dicthamnus angustifolius (aboveground part)			
Test 1	10,30	**10,37**	**1,65**
Test 2	10,44		
Dicthamnus angustifolius (meal after extraction with 96% ethanol)			
Test 1	13,63	**13,55**	**2,16**
Test 2	13,48		
Haplophyllum perforatum (aboveground part)			
Test 1	8,52	**8,48**	**1,35**
Test 2	8,44		
Ruta graveolens (aboveground part)			
Test 1	7,81	**7,85**	**1,25**
Test 2	7,90		

Thus, it was determined that some alkaloid-containing plants of the *Rutaceae* family have a moderate protein content. Probably, during the growing season, plants produce a minimum amount of protein due to their protective functions from being eaten during the flowering period.

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PROTEIN SUBSTANCES OF RHIZOMES WITH ROOTS OF *Aconitum septentrionale* AND *Aconitum leucostomum* PLANTS

Sh.Kh. Rakhimova[1], Kh.O. Tursunov[2], L.G. Mezhlumyan[1], A.Z. Sadikov[1], Sh.Sh. Sagdullaev[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
e-mail: shahnoza2380@mail.ru
2) State Center for Expertise and Standardization of Medicines, Medical Devices and Medical Technics[2]

In the metabolism of plants and humans, alkaloids occupy an important place, being products of amino acid metabolism. Alkaloids are one of the first compounds of plant origin that drew the attention of pharmacologists to create medicinal preparations based on them. A significant amount of alkaloids - up to 4-5% by weight of air-dry raw materials contains rhizomes with roots that differ little from plants *Aconitum septentrionaleae* and *Aconitum loucostomum*. These plants are widely distributed all over the world; there are significant areas of growth in North America, Europe and Asia. There are large reserves of wild-growing raw materials on the territory of the Russian Federation and China.

Based on the alkaloids of these plants, new highly effective medicines with antiarrhythmic effects of Allapinin and Axaritmin have been created and introduced into medical practice. Based on the alkaloids of these plants, the experimental production of the ICPS AS RUz annually produces about one tonne of the substance Allapinin and Axaritmin, having processed 300-400 tonnes of plant raw materials.

The purpose of this work is to study the protein substances of these plants, as well as in industrial waste such as liquid water waste and solid waste (meal) for possible disposal.

Determination of protein substances in these samples was carried out by colorimetric method using Nessler reagent. Because of the conducted studies of the content of protein substances in the roots and rhizomes of *Aconitum septentrionaleae* and *Aconitum loucostomum* plants, the value of 10-11% protein from the air-dry mass of raw materials was obtained. After processing of vegetable raw materials, the protein content is kept in the processing waste (liquid and solid).

IR spectra of the protein were taken on a Perkin-Elmer 2000 IR Fourier spectrophotometer in tablets with KBr. IR (KBr, ν_{max}, cm^{-1}): 3218 (-C(O)NH-), 2926 (CH_2 asymmetric), 1645, 1538 (NH_2), 1416 (=C-H deformation. oscillation), 1075, 1027 intensive peak, (-CO-C), 670 (C_6H_6) -CH deformation. oscillation, 612 (O=C-N).

In order to determine the quality of the isolated protein in the roots of *Aconitum septentrionaleae*, their amino acid composition was analyzed.

It has been established that proteins contain the entire set of essential amino acids. It should also be noted that proteins are dominated by amino acids such as lysine, phenylalanine, valine, alanine, histidine and glutamine.

CHARACTERISTICS OF PROTEIN FRACTIONS OF *Cucurbita* PUMPKIN SEEDS

Sh.Kh. Rakhimova[1], N.K. Khidirova[1], Sh.M. Kasimova[2], B.R. Baratova[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
e-mail: shahnoza2380@mail.ru
2) Andijan Institute of Agriculture and Agrotechnology

Pumpkin seeds are an excellent source of protein, and have antidiabetic, antifungal, antibacterial, anti-inflammatory and antioxidant pharmacological effects. One gram of pumpkin seed protein contains as much tryptophan as a full glass of milk. The main reserve proteins in pumpkin seeds are salt-soluble globulins and glutelins with a small amount of albumins and protamines. The proteins of melon crops have been studied to a much lesser extent than the proteins of other types of edible plant raw materials.

In recent years, little research has been conducted in Uzbekistan on the fractionation and characterization of proteins of the botanical family, pumpkin *(Cucurbitaceae).* As far as we know, the fractionation and characterization of pumpkin seeds remain practically unexplored. Pumpkin seeds are a rich source of well-balanced proteins. A by–product of pumpkin processing are seeds that have a unique chemical composition and pharmacological properties. A promising and valuable source of a whole complex of biologically active substances are pumpkin recycling products - seeds. The protein composition of pumpkin seeds was analyzed, which are a source of easily digestible vegetable protein.

At the same time, it was found that pumpkin seed proteins are not inferior to traditional protein supplements of vegetable origin. The average protein content is 30%, with a predominance of water-soluble and salt-soluble fractions, the total content of which is about 65%. The expediency and effectiveness of using pumpkin seed powder as a raw material for obtaining physiologically functional additives has been theoretically and experimentally proven. The relatively high protein content and its unique fractional composition emphasize the possibility of their use for food purposes. The results on the content of the fractional composition in the seeds of the studied culture are presented in the diagram.

Diagram of the fractional composition in pumpkin protein seeds

Note: Blue- mature seeds, Orange- not mature seeds

The IR spectrum of the globulin fraction of the protein was taken on a Perkin-Elmer 2000 IR Fourier spectrophotometer in tablets with KBr. IR (KBr, vmax, cm-1): 3279 (-OH, (H bond)), 2925 (CH_2), 1635 (C=O), 1538 ($-NH_3+$), 1447, 1398 ($-CH_3$), 1238, 1107 (-C-O-C-), secondary alcohols (C-OH), 603 (O=C-N).

PROTEINS OF *Convolvulus subhirsutus* AND *Arundo donax* PLANTS GROWING IN THE REPUBLIC OF UZBEKISTAN

Sh.Kh. Rakhimova, L.G. Mezhlumyan, S.F. Aripova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
e-mail: shahnoza2380@mail.ru

Convolvulus subhirsutus is a species of perennial herbaceous plant of the Convolvulaceae family with a climbing stem and a creeping branching rhizome. Preparations based on field convolvulus are widely used in folk healing, as a laxative and hypotensive agent, as well as as a choleretic and diuretic [1].

Giant reed (*Arundo donax L.*) is a tall perennial herb native to Asia and widespread throughout the Mediterranean region. It has been cultivated for use as a building material, erosion control and wind protection throughout the Middle East and the Mediterranean for thousands of years, and is now widely distributed in Southern Europe, North Africa, the Middle East, Australia, South America and North America [2]. Continuing the research of medicinal plants growing in the Republic of Uzbekistan, proteins [3] from the aboveground part of *Convolvulus subhirsutus* and of *Arundo donax L*. and meal after extraction with ethanol were studied. The results are given below in the table.

Table. Total protein content in alkaloid-bearing medicinal plants

Sample number	Proteins, %	Average protein content, %	Proteinic nitrogen content, %
***Convolvulus subhirsutus* (aboveground part)**			
Test 1	9,79	**9,83**	**1,57**
Test 2	9,88		
***Convolvulus subhirsutus* roots (meal after extraction with 96 ethanol)**			
Test 1	7,39	**7,35**	**1,17**
Test 2	7,32		
***Arundo donax L*. (aboveground part)**			
Test 1	20,35	**20,40**	**3,26**
Test 2	20,46		
***Arundo donax L*. (meal after extraction with 96 ethanol)**			
Test 1	11,65	**11,7**	**1,87**
Test 2	11,75		

As can be seen from the table, the comparative quantitative protein content in the meal of *Convolvulus subhirsutus* and *Arundo donax L.* contains 7.35% and 11.7%, respectively. That allows us to assume the possibility of creating a waste-free production in order to create affordable protein feeds for livestock and fisheries.

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QUANTITATIVE DETERMINATION OF PROTEINS IN *Mentha longifolia* PLANT GROWING IN UZBEKISTAN

Sh.Kh. Rakhimova, D.E. Dusmatova, R.F. Mukhamatkhanova, L.G. Mezhlumyan

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
e-mail: shahnoza2380@mail.ru

Mentha longifolia (L.) Huds. - Long leaf mint, a plant cultivated in Africa, Asia, Europe, the North Caucasus, Western Siberia and used as a condiment agent, in making a green cheese and a source of essential oil, which used in pharmaceutical, perfume, confectioners, alcoholic and soap fields of industry.

Protein research is important for the development of an integrated use of plant raw materials. The leaves of this species, collected in the Tashkent region during the period of rapid growth, the waste of leaves after the removal of lipophilic and semi-polar fractions, as well as the waste of leaves and flowers collected during the flowering period and after the removal of lipophilic and semi-polar fractions, have investigated.

The quantitative protein content of the above specimens has determined by an accelerated colorimetric method under laboratory conditions using the Nessler reagent on the spectrophotometer V-5000 Metach [1]. The results of the analysis are presented in the table.

Total protein content in *Mentha longifolia*

Sample number	Proteins, %	Average protein content, %	Proteinic nitrogen content, %
Mentha longifolia (leaves)			
Test 1	19,07	**19,16**	3,06
Test 2	19,25		
Mentha longifolia (the waste of leaves)			
Test 1	20,50	**20,54**	3,28
Test 2	20,58		
Mentha longifolia (the waste of leaves and flowers)			
Test 1	13,25	**13,1**	2,09
Test 2	12,95		

Thus, it has been determined that *Mentha longifolia* leaves collected during the growth period (May) are a rich source of protein and the waste after the removal of lipophilic and semi-polar fractions, with riching of proteins; can be recommended as a valuable fodder source.

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Polymolecular Complexes of Protein and Chitosan *Bombyx mori*

R.Yu. Milusheva, O.B. Avazova, A.T. Abdurasulov, S.Sh. Rashidova

Institute of Polymer Chemistry and Physics of ASRU, Tashkent, Kadyri St., 7, b

The production of polymolecular complexes (PMC) of protein and chitosan from silkworm pupae *Bombyx mori*, which are waste products of silk production, which have antibacterial activity due to the introduction of chitosan, has been developed. A feature of chitosan is not only an increase in the resistance of living organisms, but also in the ability to regulate and stimulate digestion, the absorption of feed increases, and the growth of organisms is stimulated. This allow the use of PMC as an active additive in feed for fish, poultry and livestock, as well as in the pharmaceutical, cosmetic and food industries.

Silkworm pupae are used as a source of raw materials, from which a protein hydrolyzate is obtained by deproteinization with sodium hydroxide solution. For protein coagulation, an organic acid is added at which the maximum protein precipitation occurs. By the method of potentiometric titration of protein solutions with a solution of chitosan at the isoelectric point (IEP), polymolecular complexes are obtained.

The IR spectra of chitosan-protein complexes with different percentages of protein (from 0.5 to 5%) showed that the intensity of the characteristic absorption bands of the complexes strongly depends on the quantitative content of the complex component.

The nutritional value of proteins depends on their amino acid composition, in particular on the presence of essential amino acids. As part of the isolated protein, 16 amino acids were identified, nine of which are essential - valine, isoleucine, leucine, lysine, arginine, histidine, methionine, threonine, phenylalanine.

The antibacterial activity of chitosan in various concentrations on the suppression of various strains of microorganisms *in vitro* conditions was studied. It is shown that, depending on the concentration, chitosan has an antibacterial effect on microorganisms of the staphylococcal group - Staph, Klebsiella, Prot. vulgaris and fungicidal microorganisms *Actinomyces*. It should be noted that with an increase in the concentration of chitosan to 1%, an antibacterial effect is also observed on anaerobic bacteria *Ps. aerogenosa*.

The obtained polymolecular complexes were tested at the Scientific Research Institute for the Development of Fisheries (Yangiyul) as part of compound feed (with a crude protein content of 33.3%) for various indicators: fish output, survival, feed efficiency. In the experiment, an industrial species of fish - *Cyprinus carpio*, was used. During the experiment, the survival rate of fish was 94%, which is 7% higher than the control, and PMC also had a positive effect on fish growth and feed ratio.

Thus, the resulting polymolecular complexes based on protein and chitosan, isolated from silkworm pupae, which are waste products of silk production, have antibacterial activity for use in feed for fish farming, poultry farming and animal husbandry.

The study was carried out within the framework of the applied project No. F3-2019062110 "Development of technology for obtaining preparations based on protein and *Bombyx mori* chitosan for fish farming".

CONTENT OF LIGNIN IN THE LICORICE ROOT RESIDUES

B. B. Abduazimov, R.M. Khalilov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

By estimates of the Regional Program for Sustainable Agricultural Development in Central Asia and Caucasus, over 70 per cent of licorice harvested and prepared in Uzbekistan exported abroad, including China, Germany, France and South Korea. Uzbekistan exported 2281.05 tons of licorice roots to China in 2010. According to the chamber of Commerce and industry of Uzbekistan, more than thirty enterprises and companies with different forms of ownership are engaged in harvesting and processing of licorice root in various regions of Uzbekistan. Natural reserves of licorice root are most actively due to climatic features growing in the south in the territory of Surkhandarya, Kashkadarya regions, north-west in the Republic of Karakalpakstan and the Khorezm region [1]. The significant part of the biomass is remains as a residue after the extraction of glycyrrhizin. According to the latest data, about more than thousand tons of licorice roots are processed inside Uzbekistan.

The key component of interest for the employing of licorice is glycyrrhizin or glycyrrhizin acid. The extraction of glycyrrhizin is often performed using an aqua-ethanol solution at high temperatures. Applications in traditional and herbal medicine are particularly related to the inhibitory effect to the action of *Helicobacter pylori*, therefore working as a liver protector, due to flavonoids found in licorice root.

The current work we examined lignin quantity of residues of licorice roots taken from the factories, processed by water and aqua-ethanol extraction at high temperature. Common quantification of lignin mainly relies of sulfuric acid hydrolysis known as Klason-lignin analysis [2]. This method is achieved in the industry and commonly in biomass refinery processes.

Our study demonstrates that residues content 29.84±0.89 % lignin. and 5.09±0.21 % ash. This quantitative content of lignin in the residues is observed mainly in softwood.

Reminding, lignin is the second most abundant natural polymer and the leading natural source of phenolic compounds. The value of lignin as naturally renewable source has significant potential in the field of biorefining to produce value-added such as aromatic organic products, carbon nanofibers, ameliorant, grow stimulator, fertilizers, fuel briquettes etc. In the following investigations we will study possible way of valorizations of lignin in its unmodified form or after modifications. In future, producing medicine from extracts and conversion of residues for agricultural protectors will increase the profitability of agricultural and phytochemical enterprises in the regions of Uzbekistan.

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ACHIEVING SOLUBLE LIGNIN FROM LICORICE RESIDUES AND THEIR PHYSIOLOGICAL ACTIVITY

B. B. Abduazimov, R.M. Khalilov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

The accumulated remains of licorice roots in the territories of phytochemical enterprises must be refined according to terms of environmental and economic requirements. These wastes in their composition consist of biopolymers: hemicellulose, cellulose, and lignin. Lignin is the second most abundant natural polymer after polysaccharides, both of which form the matrix of plant biomass. Lignin is the most common aromatic polyfunctional biopolymer with an irregular heterogeneous structure synthesized in plant cells from the three alcohol monomers: p-coumaryl alcohol, coniferyl alcohol, and sinapyl alcohol.

Lignin and hemicelluloses fasten bundles of celluloses, strengthening the walls of cell tissues and blood vessels, giving the plant mechanical strength. The biosynthesis of lignin in plants is essential for survival, despite abiotic and biotic environmental influences. The biodegradation of lignin is carried out by basidiomycetes from the white-rot fungi. Lignin is the basic source of formation humic and fulvic acids in nature. Recent times, research-sciences centers are strengthening of research and development of growth stimulators, plant protectors of plants from lignocellulose sources.

We have searched the oxidative and hydrolytic degradation of lignocellulose residues of licorice roots. Water-soluble lignin was produced by the action of nitric acid and the alkaline destruction of the bonds between lignin and polysaccharides.

The main factors in the extraction of water-soluble lignin with nitric acid depend substantially on the reaction temperature and acid concentration. The soaking process of residues in weak concentrations of nitric acid, achieved nitration of lignin and hydrolysis of phenolic ester bonds. Continuing the processes at more strong concentrations of nitric acid and temperature contributed to the nitration and oxidation of lignin carboxylated products. These products of nitrification and oxidation were transferred into solution due to alkali solutions. These products of nitrification and oxidation were transferred into liquid due to aqua-alkali solutions.

Residues of licorice roots contained lignin 29.84% (according to Klasson), analyzes of lignin in residues after alkaline solution was 2.34%. Thus, 92.14% of lignin was extracted into solution from the residues of licorice roots. The alkaline solution after partial neutralization with acid solutions had a stable liquid form. Preliminary analyzes for physiological activity showed a stimulating activity on the germination of cotton seeds. Also, acidic solutions were used for the preparation of organic fertilizer. Because, it contained a large part of decomposition products of carbohydrates, lignin, and unreacted nitric acid. Therefore, the aqueous solution of ammonia was added to the waste liquid to neutralize it and increase the nitrogen content. The solution was dried. The dry organic fertilizer was a dark brown solid.

The content of total nitrogen and organic matter in the fertilizer was 9.78% and 71.4%, respectively. Compared to some commercial fertilizers, content of total nitrogen and organic compounds are satisfactory and comparable. That show that the spent nitric acid liquid is suitable for the preparation of organic fertilizers.

ACHIEVING SOLUBLE LIGNIN FROM LICORICE RESIDUES AND THEIR PHYSIOLOGICAL ACTIVITY

B. B. Abduazimov, R.M. Khalilov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

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WASTE COTTON PLANT CAN BE ALTERNATIVE FEEDSTOCK FOR VALUATED PRODUCTS

B. B. Abduazimov, R.M. Khalilov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

The sustainability of agricultural and rural waste management is very important for most developing countries. The unsustainable nature of rural waste leads to environmental pollution and can eventually lead to the complete depletion of natural resources. Agricultural waste is recognized as having a "hidden" economic value.

Uzbekistan is the seventh largest global cotton producer and third largest cotton supplier for world markets. To make cotton cultivation more economical, it is necessary to achieve the maximum use of cotton by-products. Cotton seed husks, cotton stalks, cotton linters, cotton gin trash (CGT), are the main important by-products of cotton cultivation.

Cotton stalks. On average, from one hectare of land, from 2 to 3 tons of stems are formed. Most of the stem is treated as waste, although a small portion (15%) is used as fuel [1]. Most of the stems without removal are plowed and digs. This reduces the productivity and quality of plowing. In addition, plowing will enable cotton worms, fungi, wilt to complete their life cycle and remain in the soil, provoking plant diseases and harvest in next year.

Cotton gin trash. Waste from ginning plants averages 10 to 25% of the harvested crop. Cotton gin trash, consist of small sticks, leaves, cottonseed, husks and burrs. Cotton gin waste generated during cotton processing is a cheap source of valuable lignocellulosic material. Cotton bolls are mostly accumulated during the last harvest. To find the best ways to process cotton waste, it was necessary to study the chemical composition and ratio in the waste collected from the fields and ginneries of the Tashkent region.

Table 1. Ratio of lignocellulose constituents of cotton waste.

Cotton plant wastes	Ash, %	Lignin, %	Hemicelluloses, %	Cellulose, %
CGT	9.8	22.4	28.8	37.7
Cotton boll peels	4.9	21.9	17.6	38.2
Cotton stalks	5.4	25.9	21.2	38.7

The analysis of the obtained results indicates significant differences in the chemical composition of various cotton wastes. The increase quant of ash content in waste materials is caused by contamination. All cotton waste is rich in hemicelluloses, celluloses, lignins. The ginneries expenses can be offset by increasing new products from plant wastes. Cotton waste will be rational use to the production of cellulose, furfural, protein feed, ethanol, fertilizers and plant growth stimulants. This will bring economic and environmental prospects.

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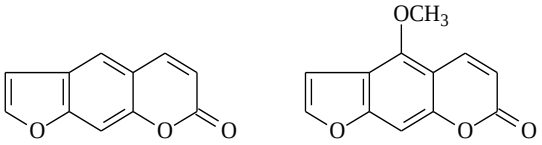
OPTIMIZED METHOD FOR OBTAINING FUROCOUMARINS FROM *Ficus carica* LEAVES

R.F. Mukhamatkhanova, D.E. Dusmatova, B.S. Okhundedaev, I.D. Sham'yanov, Sh.Sh. Sagdullaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
e-mail: rfm8@yandex.ru

With the development of new applications of photodynamic therapy in oncology and surgery (infected-inflammatory processes), the need for natural photosensitizers, including furocoumarines, has increased.

Ficus carica leaves are a good source of furocoumarines. A review of existing methods of producing furocoumarines psoralen and bergapten from *Ficus carica* leaves showed that the main drawback of known methods of obtaining furocoumarines from *Ficus carica* leaves is low their yield from plant raw material, as well as the use of toxic solvents. The low furocoumarines yield is due to the fact that the previously developed methods do not take into account the physico-chemical properties of the produced furocoumarines.



Psoralen **Bergapten**

The inventive new method for producing psoralen and bergapten from the leaves of *Ficus carica* eliminates the above-mentioned disadvantages, thereby increasing the yield of the target product. The optimized method includes extracting a chopped vegetable raw material with heated ethyl alcohol, which exhaustively extracts both aglycone and glycoside forms of furocoumarines; the target products are extracted from the solution after hydrolysis with ethylacetate; the chromatographic cleaning on the column is carried out first with petrol, then the target products are isolated by elution with a mixture of petrol-ethylacetate (1:1); the resulting technical sum is recrystallized from a mixture of petrol-ethylacetate (7:3).

According to ^{1}H NMR spectrum data, the sum of furocoumarines consists of a mixture of psoralen and bergapten in a ratio of 3:1.

Spectral characteristics of the isolated product:

IR (KBr, ν, cm^{-1}): 3448, 3148, 2913, 2846, 1727 (C=O δ-lactone), 1631 (C=C), 1577, 1542, 1468, 1449 (C=C), 1386, 1359, 1285, 1259, 1215, 1159, 1131 (C-O-), 1021, 920, 894, 824, 749, 719, 604, 544, 448.

PMR of psoralen (400 MHz, $CDCl_3$): 6.32 (1H, d, J = 9.55, H-3), 6.77 (1H, dd, J = 1.01; 2.31, H-6), 7.40 (1H, d, J= 0.9, H-9), 7.62 (1H, s, H-5), 7.64 (1H, d, J = 2.27, H-7), 7.75 (1H, d, J = 9.58, H-4).

PMR of bergapten (400 MHz, $CDCl_3$): 4.21 (3H, s, OCH_3), 6.20 (1H, d, J = 9.78, H-3), 6.96 (1H, dd, J = 1.03; 2.43, H-6), 7.50 (1H, t, J= 0.84, H-9), 7.53 (1H, d, J = 2.42, H-7), 8.08 (1H, dd, J = 9.77; 0.59, H-4).

The developed method is covered by the RUz patent IAP 06993 from 21.06.2022.

GUAIANOLIDE AUSTRICIN IS A RICE YIELD STIMULANT

I.D. Sham'yanov[1], R.F. Mukhamatkhanova[1], B.S. Okhundedaev[1], N.D. Abdullaev[1], S.Kh. Zakirov[2], Z.Sh. Mukhidova[2], N.G. Otamirzaev[3], M.A. Sattarov[3]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: rfm8@yandex.ru
2) Tashkent State Agrarian University, Republic of Uzbekistan, 100140, Tashkent region, Kibray district, st. University, 2
3) Research Institute of Rice Growing, Republic of Uzbekistan, 111506, Tashkent region, Urtachirchik district, mahalla "Sholikor", st. Madaniyat

The creation and use of non-toxic natural preparations that act as phytohormones in ultra-low concentrations is relevant. This is also true for the cultivation of rice, since rice is one of the staple foods of the inhabitants of Southeast Asian countries, including Uzbekistan.

The most optimal method is the use of plant growth biostimulants during presowing seed treatment, which allows you to increase the energy of seed germination, get quick and friendly shoots, increase the development of the root system and plant biomass, leaf surface area and chlorophyll content, and increase yield capacity.

As a result of the research, the growth-regulating properties of the sesquiterpene lactone austricin were brought out, which make it possible to increase the yield of rice with a single pre-sowing treatment.

The results of the stimulating activity of austricin obtained under the conditions of a small-plot field experiment in comparison with the widely used drug Edagum SM are presented in Table 1.

Table 1. Rice yield indicators

№	Type of experience	Number of plants per 1 m^2, pieces	degree of bushiness	Plant growth, cm	Panicle length, cm	Grain weight of one panicle, (average), g		Weight 1000 pcs. grains, g	Biological yield, g	Real yield capacity, centner/ha
						Main panicle	Lateral panicle			
1	Control	240	1,12	127	25,3	1,8	0,8	28,9	698	55,9
2	Edagum SM	255	1,13	132	27,8	1,8	0,9	32,1	864	65,4
3	Austricin 50 g/ton seeds	262	1,12	135	27,9	2,2	1,0	33,3	880	70,4

The data presented in the table indicate that austricin has a high stimulating activity at low concentrations, which leads to an increase in rice yield, exceeding the widely used drug Edagum SM.

Austricin, as a means for pre-sowing treatment of rice seeds, is covered by the patent of the Republic of Uzbekistan No. IAP 070990 dated 31.10 2022.

A NEW ANTI-HELMINTH COMPOSITION

I.D. Sham′yanov, Zh.I. Islamova, M.A. Mamatkhanova, R.F. Mukhamatkhanova, D.E. Dusmatova, V.N. Syrov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: rfm8@yandex.ru

The problem of treatment and prevention of helminthiasis is one of the topical in the world medical practice. Because of their hepatotoxic and immunotoxic effects, the widely used synthetic agents are of limited use, especially in children's practice and for patients with hepatobilar disorders.

In this connection, a new anti-helminth composition based on purified sums of sesquiterpene lactones of plants *Artemisia annua* L., *Inula grandis* L. and *Tanacetum pseudoachillea* C. Winkl., which has not been shown to have the above mentioned side effects, was created. The new composition with conditional name «Helminthabs» includes in addition to lactones, auxiliary components - microcrystalline cellulose and crystal medical glucose. The results of screening studies for the presence of pronounced anti-helminth activity of "Helminthabs" in comparison with the widely used antihelminth drug "Antihelminth" are given in tables 1 and 2.

Table 1

Expressiveness of dwarf tapeworm infection activity of preparations «Helminthabs» and «Antihelminth» (M±m, n=10)

Experimental conditions	Dose, mg/kg	Number of parasites detected after autopsy, individual	p	Intens-efficiency, %
Control	-	16,8±2,1	-	-
Helminthabs	50 100	0,9±0,31 0,5±0,22	<0,001 <0,001	94,6 97,0
Antihelminth	500	6,9±1,6	<0,001	60,7

Table 2

Expressiveness of antiaspikulurosic activity of preparations «Helminthabs» and «Antihelminth» (M±m, n=10)

Experimental conditions	Dose, mg/kg	Number of parasites detected after autopsy, individual	p	Intens-efficiency, %
Control	-	51,6±6,6	-	-
Helminthabs	50 100	0,2±0,13 0	<0,001 <0,001	98,8 100,0
Antihelminth	500	25,5±3,42	<0,002	51,7

The presented data show that the created new anthelminthic composition has a high anticestodal and antinematodal activity, exceeding the known drug «Antihelminth».

ANATOMICAL STRUCTURE OF THE ASSIMILATED ORGANS OF *Physalis angulata* IN THE NATURAL CONDITIONS

S.F. Aripova[1], G.M. Duschanova[2], I. Xikmatullaev[3], M.A. Isabekova[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Tashkent Pedagogical University named after Nizami, [3]Kokan Pedagogical Institute
e-mail: guljon.duschanova@mail.ru, *+998909434916*

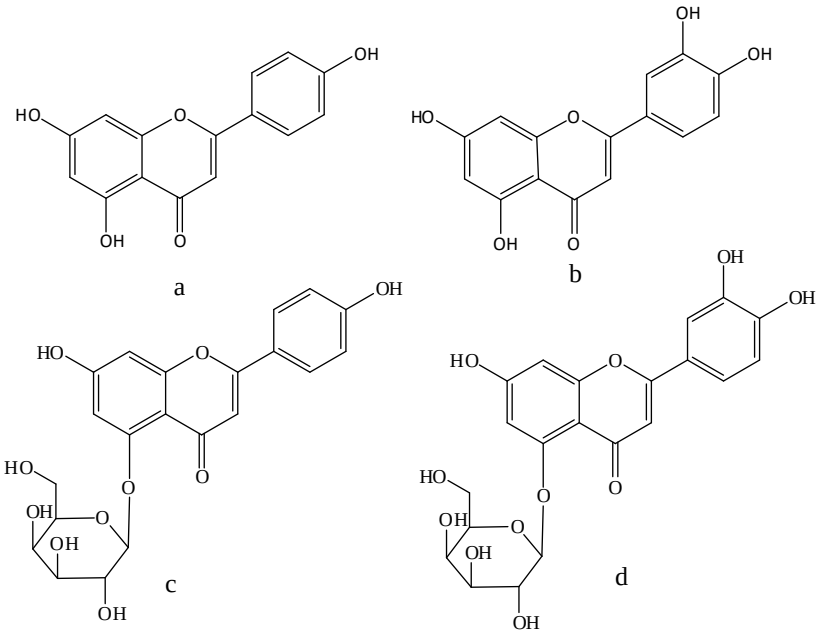
The anatomical structure of the assimilating organs of the raw material of the medicinal plant *Physalis angulata* in the generative phase was studied on the basis of the developed microscopic methods. The epidermis was studied on paradermal and transverse sections. Transverse sections of the leaf are made through the middle, petiole - the base. When studying the anatomical structure of the leaves and petiole of *Physalis angulata*, diagnostic signs and localization of biologically active substances in organs and tissues were determined. On the paradermal section, the outlines of the epidermal cells of the leaves on the adaxial side of the leaf are slightly sinuous, not numerous, while the abaxial side is more sinuous, the projection is polygonal and numerous. The leaves are amphistomatic, the shape of the stomata is oval, non-immersed, anomocytic and hemiparacytic type and most numerous on the abaxial side, few on the adaxial. Leaf mesophyll in transverse section of dorsiventral type. The epidermis consists of a single row of cells, covered on the outside with a thick-walled cuticle layer and pubescent with single- and two-celled simple ones with papillary hairs along the veins and multicellular glandular trichomes on the leaf surface. The presence or absence of trichomes in an epidermal cell can serve as a taxonomic feature. The palisade parenchyma is chlorophyll-bearing and consists of one row of large and elongated cells. Spongy chlorophyll-bearing parenchyma is round-oval and large-small-celled with small intercellular spaces, consists of 5-6 rows of cells and is located under the palisade parenchyma. Between the palisade and spongy parenchymal cells, numerous druses of calcium oxalate were found, which have spherical formations consisting of many small intergrown crystals. The main leaf vein protrudes on the abaxial side. Under the adaxial and abaxial epidermis in the costal parts of the leaf there is an angular 2-4 row collenchyma. The rest of the vein is occupied by the main parenchyma, in which one large vascular bundle is immersed, parenchyma cells are thin and thick-walled, multifaceted, among which hydrocytic cells are found. Conductive bundles, closed collateral type, are not sclerified, due to the absence of mechanical tissues (sclerenchyma) in them. The localization of biologically active substances in the assimilation organs of palisade and spongy cells was determined. The petiole is kidney-shaped in cross section, the structure is of the parenchymal-beam type and protrudes on the abaxial side of the leaf. Epidermal cells are single-row round-oval. The peripheral parts of the petiole are most sclerified due to the presence of a group of multi-row cells of the angular type collenchyma under the epidermal cell, which alternate with 4-5 row chlorophyll-bearing parenchyma. The main part of the petiole is made up of parenchymal cells that contain biologically active substances and hydrocytic cells are found between them. Between the parenchymal cells there are 1 large and 2 small vascular bundles. Conductive bundles of closed collateral type, consist of phloem and xylem. These revealed structural diagnostic features of the leaf are species-specific and can be used in taxonomy and in the identification of plant materials for this species.

STUDY OF CHEMICAL COMPOSITION OF *Dracocephalum paulsenii* PLANT

S.F. Aripova[1], D.U. Khasanov[2], S.A. Maulyanov[2], I.J. Jalolov[3]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: Salima_aripova@mail.ru
2) National University of Uzbekistan
3) Fergana State University

The aerial part of *Dracocephalum paulsenii* plant was extracted with 70% EtOH. The extract was absorbed on silica gel (1:1) and placed in a column for CC. The column was eluted with solvents in the following order: benzene, $CHCl_3$, EtOAc, EtOAc:EtOH (8:2). Ethylacetate eluate was fractionated in the $CHCl_3$: MeOH gradient system. During the fractionation process, 2 individual flavonoids were isolated for the first time from this plant growing in Uzbekistan [1]. Spectrum of these flavonoids were taken in the NMR spectrometer and their structure was identified. The resulting flavonoids were found to be apigenin (a) and luteolin (b) [2]. The resulting EtOAc:EtOH (8:2) mixture was chromatographed on a Sephadex LH-20 column eluting with 80% EtOH to get 62 fractions (frs. F1 to F62). Frs. F14 to F25 combined and chromatographed on a Sephadex LH-20 column, eluting with EtOH 80 % to obtain 30 fractions (frs. F14/25-1 to F14/25–30). During elution, 2 individual flavonoids 4.3 mg of apigenin-5-galactoside (c) and 6.2 mg of luteolin-5-galactoside (d) were isolated:



Flavonoids (a,b,c,d) have been isolated from the plant *Dracocephalum paulsenii* first time.

References:

1. Vvedenskiy A.I. Flora of Uzbekistan, V. 5. Tashkent. 1961, P. 309-310.

2. D. N. Olennikov, N. K. Chirikova, Z. M. Okhlopkova and I. S. Zulfugarov. Molecules 2013, 18, 14105-14121; doi:10.3390/molecules181114105.

STUDY OF PROCESS EXTRACTION OF THE CYCLOARTHANE TRITERPENOIDS FROM AERIAL PART OF PLANTS OF THE GENUS *Astragalus*

A.A. Janibekov[1], Sh.B. Jandullaeva[2], U.M. Abillaeva,[2]
O.K. Urazimbetova[2], G.B. Sotimov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Karakalpak State University named after Berdakh, Republic of Karakalpakstan
e-mail: j.aziz@mail.ru

To develop a technology for obtaining cycloartane triterpenoids from the aerial parts of *Astragalus mucidus, Astragalus turkestanus,* and *Astragalus macronyx,* the technological cycle was studied in stages. This work is devoted to the study of the extraction process of the aerial part of plants *Astragalus* growing in the Tashkent region. Was carried out the extraction of raw materials with ethanol with a concentration of 50% to 90%. It was found that 80% ethyl alcohol extracts the largest amount of the sum of cycloartane triterpenoids, therefore, we chose 80% ethyl alcohol as extraction for raw materials.

To determine the optimal fineness of the particle size, the raw material was crushed and sieved through a sieve with different hole diameters. From each batch, 0.5 kg of raw material was taken and loaded into the extractors as follows: into the first extractor - crushed raw material with a particle size of less than 2 mm, in the second - 2-6 mm, in the third - 6-10 mm, in the fourth - 10 -14 mm and not ground raw materials were loaded into the fifth extractor. Extraction was carried out similarly to the method described above.

To establish the temperature regime, 0.5 kg of the crushed aerial part of *A. mucidus, A. turkestanus,* and *A. macronyx* with a particle size of 2-6 mm was loaded into four extractors, filled with 80% ethyl alcohol until a “mirror” was formed. Extraction in the first extractor was carried out at room temperature, extraction in the second extractor - at 37 °C, in the third - at 45 °C, in the fourth - at 70 °C. Extraction at temperatures above 70°C was not carried out, because the volatility of ethanol increases sharply. The obtain thickened extracts were analyzed.

It has been established that the process is slow during the extraction of not crushed and coarsely crushed raw materials. Cycloartane triterpenoids are extracted faster from crushed raw materials with a particle size of 2-6 mm, but the extract is cloudy and difficult to clarify. As follows from the experimental results, when the cycloartane triterpenoids are extracted with 80% ethanol, the extraction rate increases with increasing temperature and the solvent consumption decreases. Extraction at a temperature of 70°C accelerates the depletion of raw materials, but the resulting extract contains a large amount of accompanying substances. It is difficult to isolate the number of cycloartane triterpenoids from such an extract. Satisfactory results were obtained when extracting raw materials at room temperature (20-30°C).

When studying the hydromodule, extraction was carried out using various ratios of the extractant - raw material, while the optimal hydromodule was 1:5.

FLAVONOIDS OF *Inula salicina*

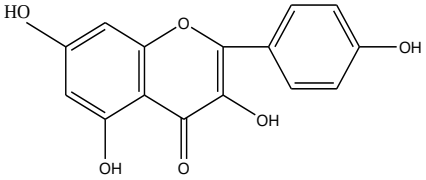
N.M. Yuldasheva, B.J. Komilov, K.A. Eshbakova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: doctorofacademi@gmail.com

The chemical components of flavonoids of the aerial parts of *Inula salicina* (*Asteraceae* family) growing in Uzbekistan were studied by column chromatographic methods, and the following compounds (kaempferol, quercetin) were isolated [1].

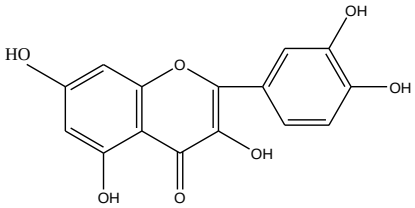
The isolated compounds were determined using ^{1}H and ^{13}C NMR spectra, their structure was compared with the samples by physicochemical and spectral parameters (UV, IR and PMR).

Kaempferol (**1**), $C_{15}H_{10}O_6$, yellow crystals, mp 276–277°C (EtOAc). ^{1}H, NMR-spectra (600 MHz, DMSO, δ, ppm, J/Hz): 6.20 (1H, d, J = 2.0, H-6), 6.46 (1H, d, J =2.0, H-8), 6.98 (2H, d, J = 8.5, H-3′,5′), 8.10 (2H, d, J =8.5, H-2′,6′), 9.40 (1H, s, 4′-OH), 10.9 (1H, s, 3-OH).



Kaempferol

Quercetin (**6**)**,** $C_{15}H_{10}O_7$, mp 305–307 °C (EtOAc). ^{1}H NMR (600 MHz, DMSO *δ*, ppm, J/Hz): 7.71 (1H, d, J=1.8, H-2'), 7.53 (1H, dd, J = 1.8; 9.0, H- 6'), 6.89 (1H, J = 9.0, H-5'), 6.40 (1H, d, J=2.4, H-8), 6.18 (1H, d, J=2.4, H-6), 12.48 (1H, 5-OH). ^{13}C NMR (150 MHz, DMSO *δ*, ppm): 160.02(C-2), 135.68 (C-3), 176.79 (C-4), 160.68 (C-5), 98.13 (C-6), 163.85 (C-7), 93.30 (C-8), 156.10 (C-9), 102.96 (C-10), 121.90 (C-1'), 115.55 (C-2'), 145.02 (C-3'), 146.76 (C-4'), 115.02 (C-5'), 119.92 (C-6').



Quercetin

Kaempferol and quercetin were first isolated from *Inula salicina*.

Reference:

1. Flora Uzbekistan. T. 6, Acad. Nauk UzSSR, Tashkent, 1962, 399 p.

FLAVONOIDS OF *Oxytropis rosea*

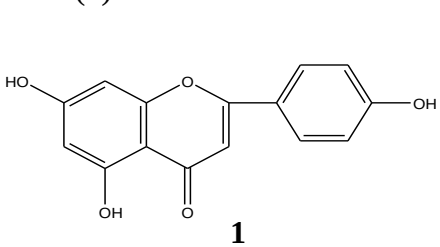
Sh.A. Sulaymonov[1], B.D. Komilov[2], K.A. Eshbakova[2], G.O. Mamajanov[1], Sh.V. Abdullayev[1]

1) Namangan State University, Namangan, Uychi st., 316, 160119
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: e_komila@yahoo.com

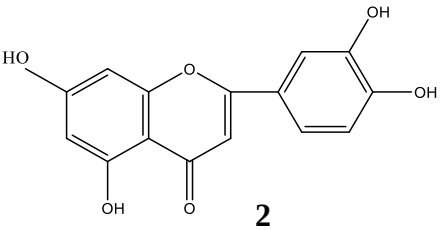
There are 606 species of *Oxytropis rosea* in the world flora. Of which there are 28 species in Uzbekistan and about 15 species in the Fergana Valley. It blooms in May and june, bears fruit in june and july. About more than 127 substances have been isolated from *Oxytropis* species given in the literature. Some species of this plant have been used in medicine since ancient times to treat colds, skin tumors and tumors, as well as various types of bleeding. In addition, it has been shown to be effective against inflammation, neuroendocrine effects, and immune disorders.

Crushed and air-dry raw material (2000 g) was extracted exhaustively with 70% alcohol at a room temperature. The combined extracts were distilled in vacuo, the thickened residue was diluted with water (1:1) and shaken successively with extraction gasoline, chloroform, ethyl acetate, and *n*-butanol.

The ethyl acetate extract was chromatographed on a silica gel column in a chloroform-methanol (25:1-6:1) gradient system. As a result of chromatographic separation, four compounds apigenin (**1**), luteolin (**2**), kaempferol (**3**) and rhamnocitrin-3-O-β-glucoside (**4**) were isolated from the chloroform fraction.



1



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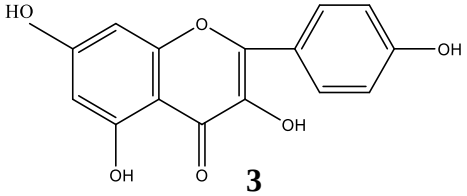

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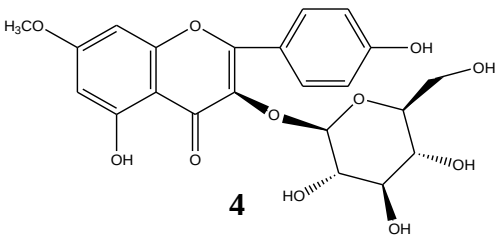


4

Compounds **1**-**4** from *O. rosea* were isolated for the first time.

Apigenin and luteolin have anti-carcinogenic and anti-inflammatory properties.

Rhamnocitrin-3-*O*-β-isoramninoside protects against DNA damage in human lymphoblastoid cells and enhances antioxidant activity.

STEROLS OF *Oxytropis rosea*

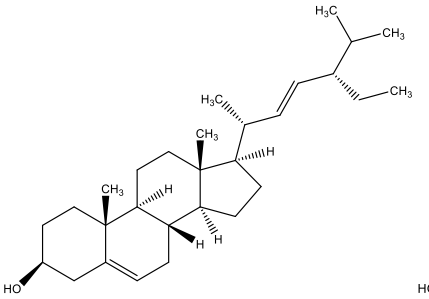
Sh.A. Sulaymonov[1], B.D. Komilov[2], K.A. Eshbakova[2], G.O. Mamajanov[1]. Sh.V. Abdullayev[1]

1) Namangan State University, Namangan, Uychi st., 316, 160119
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: e_komila@yahoo.com

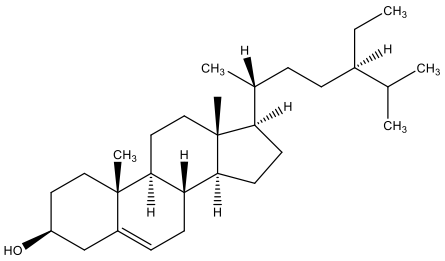
Oxytropis rosea plant were collected on the mountain and foothill slopes of the Kasansay district of the Namangan region, and this species was identified by O. Turgunov, a researcher at the Institute of Botany of the Academy of Sciences of Uzbekistan, by comparing the collected plants with the herbariums of the institute.

Crushed and air-dry raw material (2000 g) was extracted exhaustively with 70% alcohol at room temperature. The combined extracts were distilled *in vacuo*, the thickened residue was diluted with water (1:1) and shaken successively with extraction gasoline, chloroform, three acetate and *n*-butanol.

The ethyl acetate extract was chromatographed on a silica gel column in a chloroform-methanol (25:1-6:1) gradient system. As a result of chromatographic separation, four compounds β-stigmasterol (**1**), β-sitosterol (**2**), stigmasterol-3-*O*-β-glucoside (**3**), sitosterol-3-*O*-β-glucoside (**4**) were isolated from the chloroform fraction.



1



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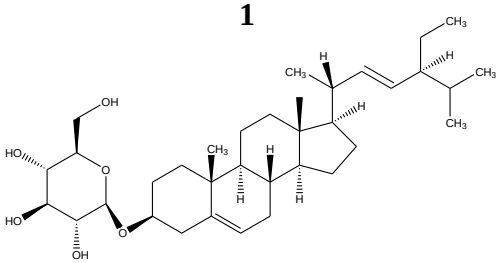

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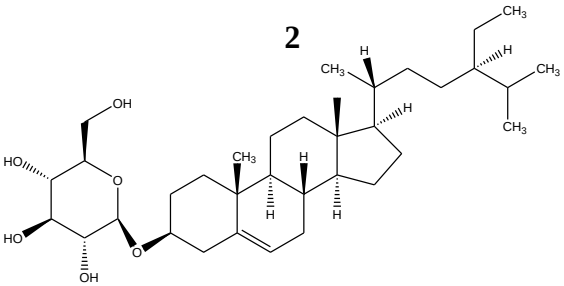

4

Compounds **1-4** from *O. rosea* isolated for the first time.

Many researchers have shown that β-sitosterol has a high antioxidant activity, activates apoptosis in leukemic cancer cell lines, and inhibits the expression of the Trx/TrxR1 protein.

DETERMINATION OF THE AUTHENTICITY OF ESCIN IN THE PREPARATION ESSILAR BY TLC METHOD

Sh.M. Agloxodjayeva[1,2], A.D. Toshpolatova[1], S.Z. Nishanbaev[1,2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent,
e-mail: sabir78@rambler.ru
2) Tashkent Pharmaceutical Institute, Uzbekistan,
e-mail: agloxodjayevashaxnoza@gmail.com

Thin layer chromatography (TLC) is a fast, easy to use and versatile separation method suitable for both qualitative and quantitative analysis. It is ideal for rapid analysis of mixture components, sample screening and reaction monitoring. The high tolerance to different types of sample matrices and the ability to separate multiple samples in parallel guarantee the high economics of the TLC method.

Development of a method for determining the authenticity of escin in the Essilar preparation by TLC.

The object of our study is the preparation "Essilar" solution for infusions, produced by Temur Med Farm LLC, Uzbekistan, is an original combined composition, the active ingredients of which are l-arginine hydrochloride and escin, used as an antiemetic. TLC was used to determine authenticity. On the start line of the chromatographic plate "Merck", "Silicagel 60 F_{254}" with a layer thickness of 0.25 mm, size (10×20 cm), apply 25 μl of the test solution and 25 μl of a solution of escin standart solution. The plate is dried in air for 10 min, placed in a chamber with a mixture of solvents: glacial acetic acid - water – n-butanol (1:1:2) and chromatographed in an ascending manner. When the solvent front passes about 10 cm from the start line, the plate is removed from the chamber and dried in air for 20 min. Chromatograms are sprayed with a solution of 70% sulfuric acid and kept in an oven at a temperature of 130°C to 135°C for 5 minutes. A violet-brown spot should appear on the chromatogram of the test solution at the level of the spot on the chromatogram of the reference solution.

Preparation of the test solution. 10 ml of the drug solution is placed in a 50 ml round-bottom flask with a stopper, which has a capillary for air inflow, and the solvent is distilled off to a dry residue in a boiling water bath under vacuum. The dry residue is dissolved in 0.5 ml of methanol.

Preparation of working standard solution (WRS) of escin. 180 mg of escin (Eur. Ph., Br. Ph., Ph. USA., Chin. Ph.), in terms of 100% substance, are dissolved in methanol, the volume of the solution is adjusted with the same solvent to 10 ml and stirred. 1 ml of the resulting solution is placed in a 10 ml volumetric flask and the volume of the solution is adjusted to the mark with methanol.

A solution of 70% sulfuric acid. To 20 ml of purified water, carefully, with stirring, add 30 ml of concentrated sulfuric acid.

A technique for determining the authenticity of escin in the preparation "Essilar" by TLC has been developed. Authentication results in a purplish-brown spot at the level of the reference solution spot.

CONCENTRATIONS OF FREE AMINO ACIDS IN THE ORGANS OF *Capparis spinosa*

K.Ch. Kurbonov, J.F. Ziavitdinov, U.J. Ishimov, Sh.J. Fazliddinov

Laboratory of cell technologies of vegetable and plant growing, A.S. Sadykov Institute of Bioorganic Chemistry, Uzbekistan Academy of Sciences

Caper (*Capparis spinosa L.)* is a common member of the genus *Capparis*, a xerophytic shrub with a remarkable adaptability to harsh environments widely spread in the southern Europe, the Mediterranean region, in the Caucasus, India and Central Asia. Various organs of the plant are known to contain stachydrine (1.2%), flavonoids (0.32-0.44%), nitrogenous compounds (23-29%) and ascorbic acid (012-0.15%). The work was initiated to comparatively study concentrations of free amino acids in *Capparis spinosa* species widely spread in southern Aralkum and the one growing in the regions by the Zerafshan, a river in the Samarkand region of Uzbekistan.

The crushed samples of the above-ground organ of the plant were extracted by means of the distilled water. Proteins and peptides of the extract were precipitated using 10% trichloroacetic acid to be centrifuged. The supernatant was dried by lyophilization. To determine concentrations of amino acids in the dried supernatant, the phenylthiocarbomoyl derivatives of the amino acids were synthetized. The derivatives were identified using Agilent 1200 Series Chromatograph (Agilent Technologies, USA) on the 75 x 4.6mm Discovery HS C18 column. The findings can be seen in the Table.

Table. Concentrations of non-essential and essential amino acids in leaves and roots of *Capparis spinosa*

	Concentrations of non-essential amino acids (mg/g)										
	Asp	***Glu***	***Ser***	***Gly***	***Asn***	***Gln***	***Cys***	***Ala***	***Pro***	***Tyr***	**Total**
1*	0.24	-	0.13	0.03	0.65	1.04	0.44	0.06	0.3	0.2	**3.09**
2*	0.08	-	0.08	0.02	0.43	0.34	0.53	-	0.38	0.11	**1.97**
3*	0.91	0.38	0.59	3	3.72	1.05	1.92	-	0.46	1.1	**13.13**
4*	0.07	-	012	0.63	0.79	0.52	0.54	-	0.09	0.11	**2.87**
	Concentrations of essential amino acids (mg/g)										
	Thr	***Arg***	***Val***	***Met***	***Ile***	***Leu***	***His***	***Trp***	***Fln***	***Lys***	**Total**
1*	0.46	0.11	0.,27	1.34	0.17	0.38	0.08	0.18	0.1	0.76	**3.85**
2*	0.34	0.05	0.09	1.02	0.18	0.41	0.06	0.07	0.02	0.95	**3.19**
3*	0.88	0.98	0.71	1.2	0.41	0.94	0.35	1.38	1.04	1.35	**9.24**
4*	0.46	0.31	0.41	0.87	0.2	0.44	0.08	0.09	0.06	0.85	**3.77**

Note:1* - *C. spinosa leaves* (Southern Aralkum) 2*-*C. spinosa roots* (Southern Aralkum), 3*-*C. spinosa leaves* (Samarkand region), 4*- *C. spinosa* roots (Samarkand region)

The biosynthesis of the sulfur-containing amino acids was demonstrated to increase as a response to abiotic stress in the plants. Concentrations of cysteine (0.44-0.53mg/g) involving to the synthesis of glutathione indispensable for the elimination of the oxidative stress caused by the abiotic one were found significantly reduced as compared to those in the tolerant species (1.92-0.53mg/g); no traces of glutamine were found. Methionine is involved in the initial stages of biosynthesis of aliphatic glucosinolates; our findings demonstrate that concentrations of methionine in the plants growing in the Southern Aralkum, that is in the conditions of high soil salinity, were increased as a response to the stress (1.02-1.34 mg/g), while the concentrations in question were found unchanged in the salt-tolerant species (0.87-1.2 mg/g).

VITAMINS FOUND IN LEAVES AND FRUITS OF *Lycium ruthenicum* GROWING IN THE SOUTHERN ARAL SEA REGION

S.Sh. Abdirahimova, Sh.S. Olimjonov, J.F. Ziavitdinov

A.S. Sadykov Institute of Bioorganic Chemistry, Uzbekistan Academy of Sciences,
e-mail: sayoraabdirahimova@gmail.com

Plants belonging to the *Solanaceae* family are known to contain peptides, proteins, alkaloids, glycosides, vitamins and many other bioactive substances. Worldwide, attention of many researchers is attracted to the manifestations of hormonal, antimicrobial, antiviral and anticancer activities that can be seen as typical of the compounds.

The work was initiated to identify vitamins containing in the samples of various organs of *Lycium ruthenicum* Murr., belonging to the *Solanaceae* family, and to determine their concentrations.

To determine concentrations of the B group vitamins, including B1, B2, B3, B6, B9 as well as those of K and C, the crushed powders of plant organs were extracted by the distilled water to be centrifuged at 6,000 rpm. The supernatants were selected; the proteins and peptides were precipitated by means of 10% trichloroacetic acid. To separate the sediments, the solutions were centrifuged at 6,000 rpm. The supernatants were neutralized by 0.1M NaOH adding to the necessary volume. High performance liquid chromatography was used to determine concentrations of vitamins in the neutralized extracts.

The extracts obtained from the leaves and fruits of the plant under study were analyzed. Presence of vitamins in each sample was identified by comparing the elution times of experimental samples to those of the standard column-analyzed vitamins; the concentrations were calculated using the trend equations by fitting the appropriate peak areas for vitamins in the chromatograms. The findings can be seen in the Table.

Table. Concentrations of water-soluble vitamins in the samples of the *Lyceium ruthenicum* leaves and fruits (μg/g, M±n, n=3)

Plants	C	PP	B1	B6	B9	B2
	Concentrations of water-soluble vitamins, μg/g					
Lycium ruthenicum leaves	-	-	0.184	1.803	12.691	0.389
Lycium ruthenicum fruits	0.309	-	-	1.747	10.442	0.419

Samples of the *Lycium ruthenicum* leaves and fruits were analyzed for presence and concentrations of water-soluble vitamins, to name ascorbic acid and PP, as well as the B group vitamins, including B1, B2, B6 and B9. The leaves and fruits of the plant were found not to contain any concentrations of PP; ascorbic acid was found in the fruits only. Concentrations of B9 were found significantly higher than those of other vitamins under study.

CARBOHYDRATE PERCENTAGE COMPOSITION IN SOME SPECIES OF *Atriplex* PLANT GENUS WIDELY SPREAD IN THE SOUTHERN ARAL SEA REGION

S.Sh. Abdirahimova, Sh.J. Fazliddinov, E.R. Nazirova, J.F. Ziavitdinov

A.S. Sadykov Institute of Bioorganic Chemistry, Uzbekistan Academy of Sciences,
e-mail: sayoraabdirahimova@gmail.com

The Aral Sea desiccation is known to result in the desertification of the whole Aral Sea region. Of high significance are the studies on biology and ecology of species widely distributed in the region, on biochemical composition of promising medicinal plants and identification of bioactive compounds in them for research to be conducted aiming at using them in the pharmaceutical industry.

Atriplex is a plant genus of about 250 species, known by the common names of saltbush and orache, belonging to the subfamily *Chenopodioideae* of the family *Amaranthaceae s.l.* widely spread in the Southern Aralkum.

The work was initiated to determine carbohydrate percentage composition in *Atriplex pratovii* Sukh and *Atriplex tatarica* L.

Atriplex pratovii Sukhor. is an annual herbaceous plant reaching the height of 30-120cm. It has the erect branched stem covered with the silvery hairs and large smooth (with folds in some places) leaves arranged in a row having solid edges and well-developed ridges.

Atriplex tatarica L. is a branched annual herbaceous plant reaching the height of 60-100 cm flowering and fruiting in August-September. The leaves are alternately triangular-ovoid or oblong-ovoid.

A number of researchers have studied lipid composition of the *Atriplex lentiformis* plants growing at various temperatures, concentrations of chemical elements found in *Atriplex pratovii* Sukhor, some bioactive compounds found in *Atriplex halimus* as well as antioxidant activity of the latter.

Table. Carbohydrate percentage composition of *Atriplex tatarica* and *Atriplex pratovii* (%) (M±m, n=5)

Plants	Carbohydrate percentage composition (%)				
	Fructose	Glucose	Sucrose	Maltose	Total
Atriplex tatarica	0.6±0.16	0.55±0.11	0.13±0.10	-	1.29±0.06
Atriplex pratovii	1.17±0.06	0.81±0.14	0.31±0.01	-	2.29±0.03

As it can be seen, there was different carbohydrate percentage composition in the *Atriplex pratovii* (Table). Thus, fructose percentage (1.17±0.06) was higher than those of glucose (0.81±0.14) and sucrose (0.31±0.01), while the total sum of carbohydrates was 2.29±0.03%.

In the *Atriplex tatarica*, the total sum of carbohydrates was 1.29±0.06%, while there was no significance difference in the carbohydrate percentage compositions of fructose (0.6±0.16) and glucose (0.55±0.11); the sucrose percentage composition was found low (0.13±0.10). No traces of maltose were found in either plant. Thus, in *Atriplex pratovii*, the carbohydrate percentage was found two times higher than in *Atriplex tatarica.*

SURFACE ACTIVITY OF *Rumex* SPECIES

N.M. Ashirmatova[1], Kh.I. Khasanova[1], R.R. Maxkamov[2], Sh.K. Samandarov[2], K.A. Eshbakova[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: e_komila@yahoo.com
2) Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan

The study of colloid-chemical properties of substances with biological surface-active properties isolated from plants is very important, because today the demand for biological surface-active substances obtained from natural, ecologically harmless and renewable raw materials is increasing. In particular, it is widely used as an emulsifier, stabilizer, plasticizer, flocculant and filler in pharmaceuticals, cosmetics, perfumery, food, detergents and other industries.

Surface tension is one of the colloid-chemical properties of substances with biological surface-active properties. That is, the ability to reduce surface tension by adsorbing to the phase boundary between two liquids, gas and liquid, liquid and solids.

R. *confertus, R. pomiricus, R. syriacus, R. aquaticus* and *R. tianschanicus* above-ground and root parts were extracted in 70% alcohol and the obtained extracts were divided into extraction extraction benzene, chloroform, ethyl acetate and n-butanol fractions in the order of increasing polarity.

Critical concentrations and surface tensions of micellar formation of biological surfactant samples extracted from plants were determined (Table 1).

Table 1

№	Samples isolated from plants	Critical concentration of micelle formation (kg m^{-3})	Surface tension σ(mN/m^{-1})
1.	*Rumex confertus*	3,51	30
2.	*Rumex pomiricus*	2,24	35
3.	*Rumex syriacus*	4,39	28
4.	*Rumex aquaticus*	4,56	35
5.	*Rumex tianschanicus*	4,13	57

As can be seen from the results in the table, extracts isolated from plants significantly reduced the surface tension of water from 72.8 mN m^{-1} to ~ 28.0-57.0 mN m^{-1}. This indicates that the extracts contain molecules with a complex diphilic structure.

Extracts isolated from these plants are well soluble in water, do not have a toxic and pungent smell, and exhibit positive biological surface activity in aqueous solutions, which allows them to be used as emulsifiers, stabilizers, and plasticizers in detergents and the pharmaceutical industry.

ANTIBACTERIAL AND ANTIMICROBIAL ACTIVITY OF EXTRACTS AND FRACTIONS OF MEDICINAL PLANTS *Rumex halaezii, Rumex syriacus*

N.M. Ashirmatova[1], K.A. Eshbakova[1], B.D. Mamarasulov[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: e_komila@yahoo.com
2) Institute of Microbiology of the Academy of Sciences of Uzbekistan, Tashkent, Republic of Uzbekistan

Plants belonging to the genus *Rumex* make up the *Polygonaceae*. family with more than 200 species. It is distributed mainly in the northern temperate regions. Mostly perennial herbs with strong taproots, lanceolate inflorescences and enlarged spiral-triangular fruits. The name "*Rumex*" comes from the Greek word for "spear" and refers to the shape of its leaves. Varieties belonging to the *Rumex* species occupy a valuable placein the world.

In addition, the antimicrobial fraction and activity of *R. holaezii* and *R. syriacus* leaves and roots extracts against test strains were determined (Table 1).

Antibacterial activity of R. *holaezii* and *R. syriacus* roots extracts and leaves extracts by well diffusion method.

Table 1

Pathogen test strains / Diffusion mm	*R. holaezii*		*R. syriacus*		Positive control canamycin	Negatie control (DMSO)
	roots extract 70% ethanol	leaf extract 70% ethanol	root extract 70% ethanol	leaf extract 70% ethanol		
E. coli	0 ± 00	0 ± 00	0 ± 00	0 ± 00	21 ± 0.13	0 ± 00
B. subtilis	6 ±1.02	6 ± 0.13	6 ± 1.21	8 ± 0.16	24 ± 1.43	4 ± 0.32
P.aureginosa	8 ± 00	6 ±1.10	10 ± 00	12 ± 00	26 ± 1.47	5 ± 0.36
S. aureus	6 ± 1.42	11 ±1.32	16 ± 0.14	19 ± 00	22 ± 1.38	4 ± 0.27
C. albicans	14 ± 0.7	8 ± 0.21	12 ± 0.11	13 ± 0.04	21 ± 1.36	6 ± 0.14

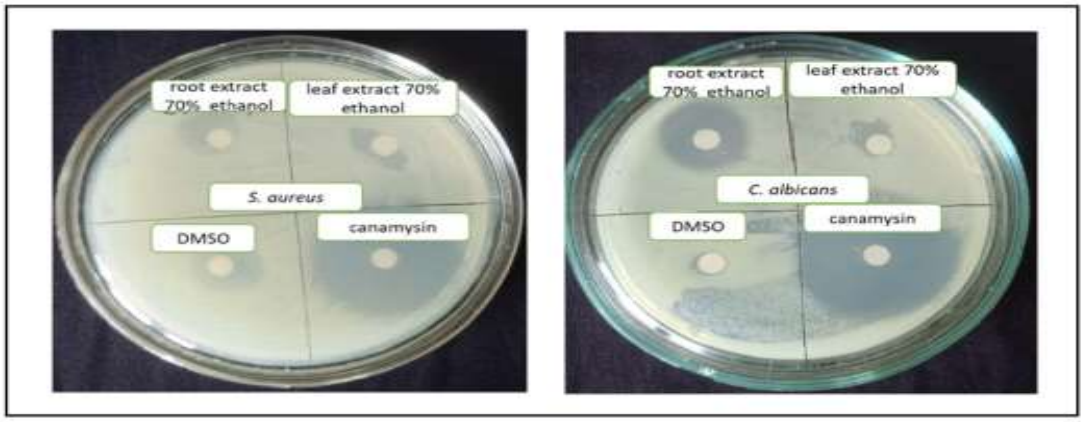

Figure 1: Antimicrobial activity of *R. holaezii, R. syriacus* plants in root and leaf extracts

ISOLATION OF THE TOTAL PROTEINS OF *Arundo donax* ROOT AND THEIR ANTIMICROBIAL ACTIVITIES

Kh.Kh. Dolimov[1], F.B. Eshboev[1], I.J. Jalolov[2], M.M Mirzaolimov[2], A.A Abdumamatov[2], U.A. Dolimova[2], Sh.S Azimova[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Fergana State University

Arundo donax is perennial plant belonging to the *Poaceae* family, *Arundinoideae* subfamily. *Arundo donax* is considered one of the medicinal plants, and according to tradition, rhizomes are used in the treatment of chest, dental diseases, cystitis, diuretic diseases, and a mixture of roots and honey is used in the treatment of cancer. The stem contains tannins, up to 48% sugar and lactic acid, up to 6% proteins and 3% fats, and the amount of alkaloids is 0.46% of the dry biomass of the plant. However, there is not enough information about the proteins isolated from the root of this plant and their biological activities. Therefore, the purpose of this research was to isolate common proteins from the root of the plant and study of their antimicrobial activity.

During the research, total proteins were isolated from the root of *Arundo donax*. For this, 100 g of the root of the plant was taken, crushed in a homogenizer and extracted using a 0.2 M solution of NaOH. Proteins in the obtained extract were precipitated using a saturated solution of ammonium sulfate and dialyzed to remove various ions from the composition. After dialysis, the amount of proteins was determined in Lowry's method and it was found that 100 g of root contains 1 g of protein.

After that, the antimicrobial activity of the isolated proteins was evaluated using five species of microorganisms: Gram-positive bacteria *Bacillus subtilis* (RKMUz - 5) and *Staphylococcus aureus* (ATCC 25923); Gram-negative bacteria *Escherichia coli* (RKMUz - 221) and *Pseudomonas aeruginosa* (ATCC 27879); the fungus *Candida albicans* (RKMUz - 247). According to the results of the antimicrobial activity, the proteins of *Arundo donax* root did not show antimicrobial activities against selected microorganisms.

D-PINITOL FROM *Astragalus amygdalinus* PLANT

S.Z. Aglamov, M.A. Agzamova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: saidolimxon2605@gmail.com

Nowadays, the problem of obtaining non-toxic or harmless drugs from natural sources has become very urgent.

Biologically active compounds of plants of the genus *Astragalus* have a number of pharmacological activities. In eastern Turkey, in Anatolia, the aqueous root extract *Astragalus* is traditionally used against leukemia and as a wound healing agent. Studies of plants of this genus have shown that on the basis of the released active glycosides, the possibility of creating drugs and dietary supplements is increasing. Pinitol is accepted as a hypoglycemic medium and was patented for the first time in USA [1].

The purpose of our research is to phytochemically investigate the *Astragalus amygdalinus* plant.

Astragalus almond, Astragalus amygdalinus Bunge *(Fabaceae*) is native in Central Asia.

During the studies, such methods as extraction (air raw materials were extracted with ethanol), CC (column chromatography), IR spectroscopy and NMR, TLC were obtained two substances: β-*D*-Glucopyranoside β –sitosterol and *D*-3-*O*-Methyl-chiro-inositol [2].

From the plant *Astragalus amygdalinus*, these compounds are isolated for the first time.

β-*D*-Glucopyranoside β -sitosterol, which was identified with an authentic sample by TLC and Rf.

D-3-*O*-Methyl-chiro-inositol or *D*-pinitol: IR of the absorption frequency of the functional groups of the compound, ν, cm^{-1}: 3390-3296 (OH), 1652 (C=O), 1613-1556 (C=C), 1310-1246 (C–O–C).

NMR ^{1}H (400 MHz, C_5D_5N, δ, ppm): 3.81s (3H, OCH_3), 4.18 t (1H, CH), 4.30 m (1H, CH), 4.41m (1H, CH), 4.66 t (1H, CH), 4.78 m (1H, CH), 4.83 m (1H, CH). NMR ^{13}C (100 MHz, C_5D_5N, δ, ppm,): 85.77 (CH), 74.63 (CH), 74.13 (CH), 73.70 (CH), 73.03 (CH), 72.23 (CH), 60.71 (OCH_3).

Chloroform and butanol fractions were examined and showed no fungicidal and growth-stimulating activity.

Studies of this compound from the plant *A. amygdalinus* are ongoing.

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POLYSACCHARIDES OF THE AERIAL PART OF *Pisum sativum*

R.K. Rakhmanberdyeva[1], Z.Y. Samandarova[2], A.E. Eshbekov[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: zarifasamandarova0105@gmail.com
2) National University of Uzbekistan named after Mirzo Ulug'bek

Peas - *Pisum sativum* - a genus of annual and perennial herbaceous plants of the legume family (Fabaceae), is widely used as a food and fodder crop.

The purpose of this work is to isolate the carbohydrate complex from the aerial part of *Pisum sativum*, collected in the Jizzakh region during the flowering period, to establish the physicochemical properties and monosaccharide composition.

To do this, air-dry raw materials were crushed and treated with ethanol to remove low molecular weight compounds. The alcohol extract revealed the presence of glucose, fructose and sucrose. To extract the polysaccharides, the plant residue was successively extracted with water, oxalate buffer, and alkali. As a result, water-soluble polysaccharides (WSPS) were isolated from the aqueous extract, pectin substances (PS) from the oxalate extract, and hemicellulose (HMC) from alkaline extract with yields of 4.9; 4.65; 3.15% respectively.

Water-soluble polysaccharides are white amorphous powder, highly soluble in water. The monosaccharide composition is represented by galactose, glucose, arabinose, rhamnose and uronic acid. The IR spectrum of WSPS contains absorption bands characteristic of polysaccharides: ν_{max}, 3298, 1746 (C=O), 1590, 1413, 1100, 913, 668 cm^{-1}.

After the separation of WPPS from the meal with a mixture of equal volumes of 0.5% solutions of oxalic acid and ammonium oxalate at 70°C, PS was extracted. PS-amorphous powder of beige color, dissolves well in water, forming a thick solution with a relative viscosity of 7.14. Galactose, arabinose, rhamnose, and uronic acid were identified in PS hydrolyzate.

Titrimetric analysis established that the content of free carboxyl groups (K_f) in HP is 9.0%; esterified carboxyl groups (K_e) - 23.90%; the degree of esterification (S_e) is 72.6%. Therefore, PS is a highly esterified pectin.

The IR spectrum has characteristic absorption bands for carboxypolysaccharides: ν_{max}, 3424, 1740 (C=O), 1627, 1444, 1320 (-OCH_3), 914, 825 cm-1.

After extracting PS with 5% KOH solution, hemicellulose (HMC) was isolated with a yield of 3.15%. The monosaccharide composition of HMC is represented by galactose, arabinose, xylose, rhamnose and uronic acid. The dominant monosaccharide in HMC is xylose, i.e. the main polysaccharide is xylan, which is characteristic of this type of biopolymers.

Thus, the presence of alcohol-soluble sugars, water-soluble polysaccharides, pectin substances and hemicelluloses in the aerial part of *Pisum sativum* has been shown. Their monosaccharide composition was established and IR spectra were studied.

FLAVONOIDS FROM THE PLANT *GERANIUM SANGUINEUM*

N.Sh. Berdiev, J.F. Ziyavitdinov, Sh.I. Salikhov

Institute of Bioorganic Chemistry named after A.S. Sadykov Academy of Sciences of Uzbekistan. e-mail: nodir2884@mail.ru

The plants of *Geraniaceae* family are widespread in the world, it includes from five to eleven genera and a total of about 750 species. Currently, 18 different species of this family were determined in the flora of Uzbekistan. In folk medicine, aqueous and alcoholic extract of *Geranium sanguineum* root has been used against cold and infectious diseases since ancient times. *Geranium sanguineum* has been used to treat inflammation, anemia, diarrhea, respiratory infections, and other ailments. Immunostimulatory and anti-inflammatory properties of flavonoids obtained from the root extract have been detected so far. Taking this into account, we aimed to analyze the flavanoids of the above-ground part of the *Geranium sanguineum* plant grown in the Tashkent Botanical Garden. For analysis, a 10 g of the ground part of the dried *Geranium sanguineum* plant was taken and extracted in 100 ml of 40% ethyl alcohol solution for 2 hours. An aliquot of the extract was filtered. Chromatography-mass spectrometry of polyphenols was performed on an Agilent Technologies LC/MS/MS Q-TOF 6420B under the following conditions: samples were dissolved in 0.1% TFA and injected into the mass spectrometer using an Agilent Technologies 1260 pump with a flow rate of 15 μl/min and Agilent Technologies Micro WPS autosampler, 2-5 μl each. Separation was performed using a Zorbax SB C18, 5 μm column (150 μm × 0.5 mm). Mobile phase: A - 0.1% formic acid, B - acetonitrile + 0.1% formic acid. The sorbed polyphenols were desorbed from the column at a flow rate of 15 μl/min with the following mobile phase gradient: concentration of solution B: 5% – 3 minutes, 80% – 25-30 minutes, 5% - 35 minutes. Ionization source – electrosprayer; dryer gas flow rate (N2) – 7 l/min, temperature 300 °C; current strength in the skimmer cone 65 V, in the fragmentator 175 V; mass detection range MS within 100 – 3000 m/z, under conditions MS/MS MS 50 – 2400 *m/z*. The ionization method is negative.

To identify the compounds, they were previously characterized using MS data, along with the interpretation of the MS/MS spectra compared to those found in the literature. The following public databases were searched during the identification process: ChemSpider (http://www.chemspider.com), SciFinderScholar (https://scifinder.cas.org), KeggLigand Database (http://www.genome.jp/kegg/ligand.html) and Phenol-Explorer (www.phenol-explorer.eu).

The resulting extract was found to contain the following individual substances: pelargonidin 3-*O*-(6"-succinyl-glucoside) 533.316 *m/z*, 5,6,7,4'-tetramethoxyflavone 343.164 *m/z*, peonidin 3-*O*-(6"-p-coumaroyl-glucoside) 609.284 *m/z*, cyanidin 3-*O*-xylosyl-rutinoside 727.38 *m/z*, 3,5-di-*O*-galloyl-4-*O*-digalloylquinic acid 799.27 *m/z*, quercetin-3-*O*-glucoside 448.15 *m/z*, geraniin 951.08 *m/z*, kaempferol 3-*O*-rhamnoside 431.37 *m/z*, betagarin 328.316 *m/z*, acanthocarpan 328.316 *m/z*, 4'-hydroxy-5,6,7-trimethoxyflavone 328.316 *m/z*, 7-hydroxy-2',4',5'-trimethoxyisoflavone 328.316 *m/z*, kaempferol 286.236 *m/z*, luteolin 286.236 *m/z*, aureusidin 286.236 *m/z*, syringetin 346.288 *m/z*, axillarin 3,6-dimethyl ether 346.288 *m/z*, 3-hydroxyphloretin 2'-*O* – glucoside 452.25 *m/z*, kaempferol 3-*O*-beta-*D*-xyloside 418.394 *m/z*, corilagin 634.452 *m/z*.

FLOWER PETAL LIPIDS OF *Crocus sativus*

Sh.R. Makhmudova, N.K. Yuldasheva, S.Z. Nishanbaev, S.D. Gusakova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: sabir78@rambler.ru

Two wild-growing species of crocus grow in Uzbekistan: *Crocus alatavicus* and *Crocus korolkovii* (family Iridaceae). *C. sativus* L. do not occur in the wild, but are cultivated in many countries (France, Holland, Turkey, Australia, etc.). Currently, work is underway on the cultivation of *C. sativus* in Uzbekistan. Since ancient times, saffron has been used for therapeutic purposes in diseases of the liver, gallbladder, dry cough and skin diseases. Bactericidal, volatile, antiseptic properties of saffron are known. Due to its color and smell, saffron is widely used in the food industry.

When the stigma-based saffron spice is obtained from *C. sativus* flowers, a large number of petals are left as waste, which are a source of protein, fiber, fats, phenolic and biologically active compounds such as flavonoids, tannins and anthocyanins. The aim of the work is stadying of lipids and fatty acids (FA) of the flower petals of *C. sativus* grown in the Jizzakh region in 2022. It was found that the petals (lilac color) contain 4.2% of total lipids, of which 1.55% are neutral lipids (NL) and 2.65% are polar lipids. Carotenoids (269.5 mg%), FA esters with aliphatic alcohols, triterpenols, and sterols, as well as free FAs, triterpenols, and sterols were found in NL. Unsaponifiable substances (10.72%) and FA were isolated from NL by alkaline hydrolysis. Paraffin hydrocarbons, carotenoids (1438.32 mg%), free triterpenols and sterols were found among NIs. Fatty acids in the form of methyl esters were analyzed by GC on an Agilent GG 8860 chromatograph. The results are shown in the table.

Table. Fatty acid composition of *C. sativus* petal, GC, % by weight

Fatty acid	Content	Fatty acid	Content
12:0-17:0	3,08	21:0	0,30
14:1, 16:1, 17:1	5,65	20:2	1,15
16:0	26,88	20:3	0,16
18:0	2,98	20:4	0,41
18:1n9	3,15	22:0	0,17
trans-18:1	1,35	22:2	0,90
18:2n6	41,85	24:0	0,54
18:3n6	10,46	24:1	0,42
20:0	0,59	$\sum_{\text{saturated fatty acids}}$	33,47
20:1	0,49	$\sum_{\text{unsaturated fatty acids}}$	66,53

Thus, the flower petals of *C. sativus* are enriched in polar lipids, carotenoids, and unsaturated fatty acids, including polyunsaturated acids with high biological activity (18:3n6, 20:3, 20:4).

QUANTITATIVE DETERMINATION OF THE AMOUNT OF CAROTENOIDS IN RAW NETTLE (*Urtica dioica*)

D.R. Gulyamova, N.A. Yunuskhodjayeva

Tashkent Pharmaceutical Institute, st. Aybek 45, Tashkent, Uzbekistan

Recently, interest in medicinal plants and the development of effective, safe and affordable medicines based on them has increased significantly throughout the world. Herbal remedies are widely used for the treatment and prevention of various diseases in medical practice. This is due to such advantages as a mild effect on the human body and minimization of side effects, which allows us to recommend over-the-counter dispensing of the developed herbal remedies. Despite the rich range of drugs of synthetic origin, plant-based drugs do not lose their popularity. In dental practice, for the treatment of inflammation in the mouth and gums, more and more preference is given to the use of herbal medicine. Phytotherapy is a method of treatment based on the use of medicinal plants and complex preparations based on them. Plants synthesize aromatic substances, most of which are phenols and their oxygen-substituting derivatives, such as tannins, useful for maintaining human and animal health.

Stinging nettle (*Urtica dioica* L., fam. *Urticaceae* - nettle) - a popular medicinal plant in domestic and foreign medicine. In our country, nettle leaves are used as a hemostatic agent. Abroad, rhizomes with roots of stinging nettle are used as raw materials in the production of effective drugs for the treatment of prostate adenoma. Stinging nettle is one of the most popular medicinal plants in traditional and folk medicine. Preparations from nettle leaves are used as a hemostatic, anti-inflammatory, and choleretic agent. At the same time, rhizomes with nettle roots are used abroad as a raw material for the production of antitumor drugs ("Prostaforton" and "Bazoton") used to treat prostate adenoma and prostatitis.

Method for determining the content of carotenoids, set out in SP XIV edition, provides for multiple extraction of pre-prepared raw materials (analytical sample with a particle size of 1 mm) with hexane, followed by filtration and measurement of the optical density of the obtained extraction at a wavelength of 450 nm. The calculation of the content of active substances is based on the sum of carotenoids in terms of β-carotene.

About 1 g of raw material (accurately weighed) is placed in a 100 ml flask with a thin section, 30 ml of hexane are added, the flask is closed with a stopper and extraction is carried out with occasional stirring for 2 hours. The extraction is filtered through a paper filter (“red band”). The test solution is prepared as follows: 2 ml of hexane extract is transferred into a volumetric flask with a capacity of 25 ml, the volume is adjusted to the mark with hexane and mixed. The optical density of the test solution is measured on a spectrophotometer at a wavelength of 450 nm in a cuvette with a layer thickness of 10 mm. Hexane is used as a reference solution.

Conclusions. The method of quantitative determination of the amount of carotenoids above the ground part of the nettle has been optimized, which provides for a single extraction of raw materials with hexane at a ratio of 1:30 for 2 hours with constant stirring. It was studied that the content of the sum of carotenoids above the terrestrial part of the nettle was 5.35 mg %.

STUDIES OF TANNIES IN THE LIQUID EXTRACT "EXTRADENT"

Sh.S. Yuldasheva, N.A. Yunuskhodjayeva, N.E. Yunuskhodjiyeva, D.R. Gulyamova

Tashkent Pharmaceutical Institute, st. Aybek 45, Tashkent, Uzbekistan

Ensuring the proper quality of medicinal products largely depends on the proper organization of control, its effectiveness and efficiency, as well as on the level of requirements laid down in the regulatory documentation (RD) and the methods of analysis used. We have developed an anti-inflammatory, hemostatic liquid extract from herbs Knotweed (*Polygonum hydropiper* L.), shepherd's purse (*Bursa pastoris*), marigold flowers (*Calendula officinalis* L.) and nettle leaves (*Urtica dioica* L.). These plants contain various biologically active substances. The purpose of our study was to study the content of tannins in the liquid extract "Extradent".

According to literary sources, we know that when determining tannins, the titrometry method is most widely used. We have developed an HPLC method for the identification and quantification of tannins using gallic acid.

Gallic acid was determined using a SHIMADZU LC-2030 Plus high-performance liquid chromatograph. Separation is carried out on a 150×4.6 mm HPLC ACE 3 C18 column with a particle size of 3 μm. Mobile phase water: acetonitrile at a ratio of 80:20, detection wavelength 272 nm, analysis time 30 minutes, pH of the mobile phase - 2.7, flow rate of the mobile phase - 1.0 ml/min, volume of injected sample - 10 ml.

Preparation of a standard solution: 5 mg of gallic acid (t.n.) are placed in a volumetric flask with a capacity of 5 ml and dissolved in a mixture of water: methanol in a ratio (9:1) adjusted to the mark to obtain a standard solution of 1 mg/ml. 2 ml of the resulting solution is placed in a volumetric flask with a capacity of 20 ml, diluted to the mark with solvent and filtered.

Preparation of the test solution: 1 ml of the liquid extract is placed in a volumetric flask with a capacity of 25 ml, dissolved with a mixture of water: methanol (9:1), adjusted to the mark with a solvent. 5 ml of the resulting solution is placed in a flask with a capacity of 20 ml and adjusted to the mark with the solvent and filtered. The retention time of 2.1 min of gallic acid in the liquid extract is comparable to the retention time of a standard sample. The content of gallic acid in the composition of the liquid extract is calculated by the following formula:

$$X = \frac{S_{isp} \times a_{st} \times V_{isp} \times P \times 1000}{S_{st} \times V_{st} \times a_{isp} \times 100} = \frac{S_{isp} \times a_{st} \times P \div V_{isp} \times 10}{S_{st} \times a_{isp}. \times V_{st}}$$

Conclusions: developed a method for the qualitative and quantitative determination of gallic acid in the liquid extract "Extradent" by HPLC. It was revealed that the content of gallic acid was 0,2% . The relative error was 1,68 %.

DETERMINATION OF FERULIC ACID IN *Ferula tadshikorum* RESIN BY HPLC

N.I. Mukarramov[1], S.F. Aripova[1], D.B. Barakayeva[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: mnuriddin@rambler.ru
2) Tashkent state Agrarian university, e-mail: barakayevadildora0@gmail.com

The article presents the results of the separation of ferulic acid from the composition of Ferula tadshikorum plant resin by high-performance liquid chromatography (HPLC) method. During the research, the composition of the main substances obtained from the resin of the methanol fraction was determined, a standard sample of ferulic acid was compared and the results were recorded.

For analysis, 10 ml of the tested resin methanolic solution at a concentration of 1 mg/ml and standard ferulic acid 1 mg/ml were prepared, which were subjected to HPLC analysis on a Shimadzu chromatograph with a UV detector at a wavelength of 320 nm. A column with silica gel (5 microns) bounds to octadecylsilane, Supelco C18, 150x4,6 mm, 5 microns, was used as the stationary phase. Elution was carried out with a mixture of acetonitrile: (water: formic acid 20 ml / 1000 ml) - 20:80 in isocratic mode at room temperature with an eluent flow rate of 0.5 ml/min.

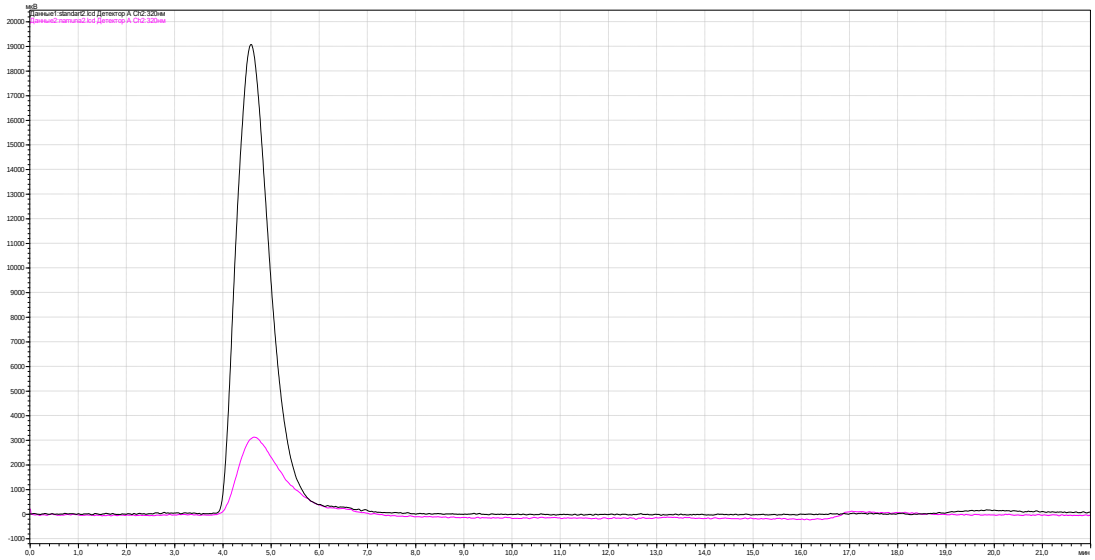

Fig.1. Chromatogram of ferulic acid from methanolic extract of resin

As a result, ferulic acid was identified on the chromatogram of fractions by the retention time, which coincided with the retention time of the standard sample of ferulic acid and was 4.6 minutes.

MOLECULAR DOCKING BASED BINDING ENERGIES OF SOME *O*-ALKYL DERIVATIVES OF GOSSYPOL

S. Yuldasheva[1,2], M. Uktamova[1,2], A.G. Eshimbetov[2], K.U. Khodjaniyazov[1,2]

1) National University of Uzbekistan, Tashkent, Uzbekistan
2) Institute of Bioorganic Chemistry, Tashkent, Uzbekistan
e-mail: hamidkhodjaniyazov@yandex.ru

Gossypol is a natural product with binaphthol-aldehyde chemical behavior. Gossypol exists in three tautomeric forms: aldehyde, ketol, and lactol. Only two of the six phenolic hydroxyls may not be affect by these transformations. These are precisely the hydroxyl groups of the gossypol molecule on the 6,6′-positions. Overexpression of epidermal growth factor receptor is known to be involved in the pathogenesis of non-small cell lung cancer (NSCLC). The resistance mutation $EGFR^{L858R=T790M}$ reduced the effectiveness of EGFR inhibitors used in clinical practice. It was shown that gossypol inhibited cell proliferation and induced apoptosis of NSCLC cells by targeting $EGFR^{L858R=T790M}$. In addition, other proteins such as human neutrophil elastase (HNE), matrix metalloproteinases (MMP 2 and 9) and tyrosinase are also involved to assess anticancer activity. Therefore, we subjected gossypol and its alkyl derivatives on these positions for molecular docking (MD) calculations to assessment binding energies after this type chemical transformation. Chemical structures of ligands, i.e. gossypol (G), its *O*6-mono- and *O*6,*O*6′-di-alkyl derivatives [alkyl is $–CH_2$-COX (X=OH, NH_2)] were constructed and 3D structures optimized using Avogadro software and subjected to MD calculations on CB-dock. The protein structures were edited by deleting all water molecules and co-crystallized ligands. Docking scores (kcal/mol) were shown in the following table.

Table

Substance	Protein (or Enzyme) purified from water and ligands				
	4RJ8	1H1B	1QIB	4H1Q	2Y9W
Gossypol	**–9.1**	–7.2	–7.6	**–8.5**	**–9.3**
G-6-O-CH_2COOH	–7.4	**–7.5**	**–8.0**	–8.2	–8.7
G-6,6′-O-di-CH_2COOH	–7.3	**–7.5**	–7.5	–8.0	–8.9
G-6-O-CH_2CONH_2	**–8.7**	**–7.3**	**–7.8**	**–8.5**	**–9.1**
G-6,6′-di-O-CH_2CONH_2	–7.5	**–7.3**	–7.6	–8.1	–8.9

The 3D structures of the proteins (or enzymes) EGFR (transferase/transferase inhibitor, PDB ID: 4RJ8 with resolution of 2.50 Å), HNE (hydrolase, ID: 1H1B, 2.00 Å) and MMP 2 (gelatinase, ID: 1QIB, 2.80 Å), MMP 9 (hydrolase/hydrolase inhibitor, ID: 4H1Q, 1.59 Å) and Tyrosinase (oxidoreductase, ID: 2Y9W, 2.30 Å) were downloaded from Protein Data Bank (PDB) server.

In conclusion, gossypol derivatives have shown potential to dock with all the five selected proteins. The present docking investigation has shown mono-substituted alkyl derivatives of gossypol are exhibited lower (stronger binding) energy for selected enzymes than di-substituted derivatives. Gossypol exhibits lower (stronger binding) energy then its *O*6-mono- and *O*6,*O*6′-di-alkyl derivatives, exception for HNE (1H1B).

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THE INTERPOLYELECTROLYTE COMPLEXES BASED ON CHITOSAN *Bombyx mori* AND STARCH

A. Abdurasulov, N. Vokhidova, S. Rashidova

Institute of Chemistry and Physics of Polymers, Tashkent, st. A. Kadyri, 7b, Republic of Uzbekistan, e-mail: abdurasulov.arslon@bk.ru

Recently, the demand for interpolyelectrolyte complexes (IPEC) based on chitosan (CS), which are effectively used in medicine, agro-industrial complexes, and other industries, is increasing. In particular, fundamental results are being achieved in obtaining biologically active preparations based on natural, environmentally safe polymers [1, 2]. Based on this, interpolyelectrolyte complexes based on chitosan *Bombyx mori* and corn starch were obtained,also their composition and physicochemical features were studied.

By the conductometric titration, method to determine the composition of CS and IPECs based on CS/starch. The hydrodynamic characteristics were studied by the dynamic light scattering (DLS) method.

In order to establish the composition of chitosan/starch-based IPECs, the effect of starch on the electrical conductivity of chitosan *Bombyx mori* solution was researched. For this reason, the initial electrical conductivity of a 0.05% solution of CS was determined and the electrical conductivity of the solution was measured during titration with a 0.05% starch solution. The result demonstrated, that the minimum conductivity was observed in the starch titration curve when the CS/Starch = 1:0.16, mole ratio. Consequently, in this ratio, CS amino groups are mutually compensated by the starch functional group, tha led to decreased the electrical conductivity solutions.

The hydrodynamic radius particle of CS, starch and their stoichiometric and non-stoichiometric IPEC was studied in their solutions. The results established, that the particle distribution is asymmetric, which indicating the formation of particles of different shapes and sizes. With increasing starch content in IPEC, at all mole ratios of CS/Starch, the sizes of nano- and microparticles increased accordingly. Perhaps, it depends on decries in concentration of charged functional groups both polymers in the reaction system leads to aggregation of IPEK particles from 200 nm to 650 nm.

In summary, stoichiometric and non-stoichiometric IPECs were obtained based on chitosan and starch. When the CS/starch = 1:0.16, it was found that the macroions react in a stoichiometric ratio, that led to toward increase the optical density of the solution and, accordingly, the particle size IPEC.

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LIPIDS OF *Calligonum junceum*

***Sh.K. Khidoyatova*[1], *N.K. Yuldasheva*[1], *S.D. Gusakova*[1], *S.G. Sherimbetov*[2], *S.Z. Nishanbaev*[1]**

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: shaxnoza_karimova_80@mail.ru
2)O.S.Sodikov Institute of Bioorganic Chemistry, Academy of Sciences of the Republic of Uzbekistan

The species *C. junceum* L. is distributed in deserts and sandy steppes of North Africa, Western Siberia, Anterior and Central Asia. Tannins, phenol-carboxylic acids, alkaloids, leucoanthocyanidins, flavonoids were found in the chemical composition of the plant. The alkaloid kalligonin with hypotensive activity has been isolated from the herb *C. junceum*, phenolic carboxylic acids of the plant have a choleretic effect, leucoanthocyanidins and a number of flavonoids exhibit antitumor activity.

For the first time, we studied the lipids of air-dry leaves of *C. junceum* collected in 2021 on the drained bottom of the Aral Sea. The yield of total lipids (TL) was 1.86% (of leaf weight). TL was divided by the CC method on silicagel into neutral lipids (NL, 0.34%), glycolipids (GL, 1.27%) and phospholipids (PhL, 0.25%). According to TLC data, sterylglycosides and esters of sterylglycosides predominated in GL, they were accompanied by cerebrosides, di- and monohalactosyldiglycerides, chlorophyll derivatives. Squalene, carotenoids, fatty acid esters (FA) with triterpenols and phytosterols, cyclic alcohol acetates, triacylglycerides, free FA, triterpenols and phytosterols were found in the NL. phosphatidylethanolamines, phosphatidylcholines (the main component), phosphatidic acid and phosphtidylinosites were found in the composition of PhL. The composition of FA lipids was determined by GC on an Agilent GC 8860 chromatograph. (table).

Table. Fatty acid composition of lipids in the leaves of *C. junceum*, GC, %, from the mass of acids

Fatty acids	NL	GL	PhL	Fatty acids	NL	GL	PhL
10:0	3,34	0,80	0,40	18:2	4,7	4,07	8,68
12:0	12,13	6,43	1,20	20:0	-	2,18	0,71
14:0	4,41	4,46	1,27	22:0	2,18	6,17	0,64
16:0	36,80	40,40	52,10	24:0	2,65	3,42	0,73
17:0	-	0,81	-	26:0	2,36	3,26	-
18:0	9,44	9,40	8,26	$\Sigma_{\text{saturated FA}}$	73,31	77,33	66,56
18:1	20,41	16,66	22,81	$\Sigma_{\text{unsaturated FA}}$	26,69	22,67	33,44
trans-18:1	3,89	1,34	1,95				

The results show that saturated fatty acids predominate in all lipid groups (mainly 16:0), the amount of unsaturated FA ranges from 22.6 to 33.44%, with most of the amount being 18:1 acid.

LIPIDS AND FATTY ACIDS OF *Salsola pestifer* SEEDS

Sh.Kh. Ibotov, N.K. Yuldasheva, S.D. Gusakova, S.Z. Nishanbaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ibotov.shohruh@mail.ru

Salt-resistant plant *Salsola pestifer* A. Nelson fam. *Amaranthaceae* is distributed in Tashkent, Fergana, Samarkand, Bukhara regions of Uzbekistan and in Karakalpakstan. It is a source of artisanal extraction of potash for making soap. The ash of the plant is used for handicraft dyeing of wool. Tetrahydroisoquinoline alkaloids with anticholinesterase and antioxidant activity have been isolated from the herb. The composition of phenolic compounds, amino acids was studied, acute toxicity and hepatoprotective effect of the *S. pestifer* herb extract were established. We studied the lipids of mature seeds of *S. pestifer* with an admixture of the aerial part, collected on saline lands of the Jizzakh region in 2022. It was found that the moisture content of raw materials is 4.9%, the content of neutral lipids (NL) is 5.22%, and polar lipids (glyco- and phospholipids) are 0.78%. In NL, triacylglycerides (the main class), hydrocarbons, esters of fatty acids (FA) with aliphatic alcohols, triterpenols and sterols, as well as free FAs, triterpenols and sterols were found. FAs were isolated from NL by alkaline hydrolysis by treatment with diazomethane, they were converted into methyl esters, which were analyzed by GC on an Agilent GG 8860 chromatograph. The results are shown in the table.

Table. Fatty acid composition of *Salsola pestifer* seeds, GC, % by weight

Fatty acid	Content	Fatty acid	Content
12:0-18:0	7.93	20:2n6	0.29
16:1	0.13	20:3n3	0.82
18:1n9	40.66	20:4n6	0.12
trans -18:1n9	1.38	21:0	0.22
18:2n6	39.50	22:0	0.47
γ-18:3n6	4.59	24:0	0.14
18:3n3	1.50	24:1n9	0.49
20:0	1.49	$\sum$ saturated fatty acids	9,62
20:1n9	0.87	$\sum$ unsaturated fatty acids	90.38

The results show that the seeds of *S. pestifer* contain an insignificant amount of lipids with a complex composition of fatty acids (20 components), which have a high total unsaturation (90.38%) and an approximately equal ratio of the dominant oleic 18:1n9 and linoleic 18:2n6 acids (1:1). The FA contains gamma-linolenic (γ-18:3n6, 4.59%), eicosatrienoic (20:3n3) and arachidonic (20:4n6) with high biological activity.

LIPIDS OF THE SEEDS OF *Alhagi persarum*

N.K. Yuldasheva, Sh.Kh. Ibotov, S.D. Gusakova, S.Z. Nishanbaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: nigorayuldasheva@myrambler.ru

Alhagi persarum Boiss. &Buhse (Persian camel's thorn, Fabaceae) is a perennial herbaceous semi-shrub widespread in the south of European Russia, Western Siberia and Central Asia. In Uzbekistan it occurs in saline wet areas of Kyzylkum, Nizhne-Zarafshan and Karshi-Karnabchul districts.

The plant is widely used in Iraq and Afghanistan as a food and medicinal plant. In folk medicine, the aerial part of A. persarum, and less often fruits and roots, is used as a diuretic and diaphoretic. Infusions, decoctions or fresh juice are used for gastrointestinal diseases. Extracts from the aerial part of *A. persarum* have antimicrobial properties.

We first studied the lipids of mature seeds of *A. persarum* collected in the saline lands of Jizzakh region in 2022. Neutral lipids (NL) from the crushed seeds of *A. persarum* were extracted in the Soxhlet apparatus in benzene (b.p. 72-800C) with the yield of 5.27%. Polar lipids (PL) were isolated from the meal by triple extraction with a mixture of chloroform and methanol (2:1, v/v) - 0,75%. Hydrocarbons, carotenoids, triacylglycerides (basic) esters of LC with aliphatic and cyclic alcohols, free fatty acids, triterpenols, and phytosterols were found in NL.

Lipophilic substances (4.0%) and fatty acids were isolated from NL by alkaline hydrolysis. According to TLC on Silufol in the solvent system hexane: ether 4:1, the main component of lipophilic substances were phytosterols. Fatty acids were converted to methyl esters by diazomethane treatment, which were analyzed by GC on an Agilent GG 8860 chromatograph. The results of the FAME analysis are given in the table.

Table. Fatty acid composition of *Alhagi persarum* seeds, GC, % by weight

Fatty acid	Content	Fatty acid	Content
14:0, 15:0, 16:0,18:0	13,57	22:1	0,13
18:1n9	12,78	24:0	0,24
18:2n6	68,57	26:0	1,99
18:3n6	1,05	12:0,16:1, 17:0	tr.
20:0	0,50	∑saturated fatty acids	16,96
20:1n9	0,51	∑unsaturated fatty acids	83,04
22:0	0,66		

It was found that the lipids contain 16 fatty acids from 12:0 to 26:0, in the sum of the unsaturated acid 18:2n6 (or ω6, 68.57%) prevails. Thus, *A. persarum* seeds are a promising source of biologically active linoleic acid.

PECTIN SUBSTANCES OF *Scutellaria adenostegia* AND *Scutellaria comosa* AND THEIR ANTIMICROBIAL ACTIVITY

A. Siddikova, R. K. Rakhmanberdyeva, M. H. Malikova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: Siddiqova1987@mail.ru, *(90)318 65 68*

From aerial parts of *Scutellaria adenostegia* and *Scutellaria comosa* by extraction with 0.5% solutions of ammonium oxalate and oxalic acid the pectin substances with yield PS-Sa- 4.3% and PS-Sc-3.5% respectively were isolated.

PS are amorphous powders of light yellow colour, completely soluble in water, forming a viscous solution with η_{rel} - 3.18 and 5.25 (p1%;0.1% H_2O). The molecular weight of the pectins is 310 and 288 kDa, respectively.

Table 1. Pectin substances of *S. adenostegia* and *S. comosa*

PS	Monosaccharide composition, %					UAc (%)	Kc,%	Ke,%	DE %
	Gal	*Glc*	*Ara*	*Xyl*	*Rha*				
PS-Sa	13.4	4.6	67.4	-	19.2	90	9.0	10.6	54.0
PS-Sc	5.6	1.0	11.7	-	5.5	85	2.7	2.16	44.4

To determine the monosaccharide composition of PS hydrolysed with 2 n H_2SO_4, 100℃, 24 h and identified mainly galacturonic acid, rhamnose, arabinose, glucose and galactose. Table 1 shows that the pectin substances differ in the quantitative content of monosaccharides. In PS-Sa the main monosaccharide is arabinose (67.4%).

By titrometric analysis the content of free (Kc) and - esterified carboxyl (Ke) groups was established (Table 1). The degree of esterification (DE) of PV-Sa was 54% and PS-Sc - 44.4%. Consequently, PV-Sa belongs to highly esterified and PS- Sc to low esterified pectins. The study of PS by IR- spectroscopy identified a number of the following characteristic absorption bands: 832 cm^{-1} characteristics of pectins having α-configuration of glycosidic bonds between D- GalA residues and 889 cm^{-1} characteristics of 1,4 type of this bond. An absorption band in the region of 1749 cm^{-1} shows the oscillation of the carboxylic group and 1370 cm^{-1} shows the presence of methoxy groups. Ionized carboxyl bound to metals is reflected by absorption bands of 1420 and 1601 cm^{-1}.

The antimicrobial activity of pectin substances against opportunistic pathogens was studied. The results showed that PV-Sa and PS-Sc effectively inhibited the growth of Pseudomonas aeruginosa 003841/114 (17 and 15 mm), Proteus mirabilis 9 (16 mm), and Bacillus subtilis VCM (13 and 14 mm), but both pectins had no inhibiting effect on the growth of *Escherichia coli* 002673/477 and *Candida albicans*. It should be noted that PS-Sa showed sensitivity to *Staphylococcus aureus* and the diameter of the growth inhibition zone was 17 mm.

Thus methoxylated pectins with antimicrobial activity were isolated from the aerial parts of *S. adenostegia* and *S. comosa*.

POLYSACCHARIDES *Convolvulus subhirsuta*

F.A. Kodiralieva, R.K. Rakhmanberdyeva

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: fatimahon.82@ mail.ru, *(99)971-09-84*

Convolvulus, a genus of plants of the family *Convolvulaceae*. Stems are rambly or erect. Leaves are simple. Flowers have funnel-shaped, brightly colored corollas.

The carbohydrate complex of roots and aerial part organs of *Convolvulus syhirsitus* plants has been studied. The presence of alcohol-soluble sugars, water-soluble polysaccharides, pectin substances and hemicelluloses has been established. The IR spectra of the isolated polysaccharides were also studied.

As a result of this study it was found that alcohol-soluble sugars of root and aerial part of the plant *Convolucus syhirsitus* are represented by hexose - glucose, ketosaccharides - fructose and sucrose.

The yield of water-soluble polysaccharides (WSPS) was 4.0% in the aerial part and 1.74% in the roots. The isolated polysaccharides are amorphous powders of beige colour, well soluble in water, giving staining with iodine solution, indicating the presence of starch type glucan in the studied raw material.

Galactose, glucose, arabinose and xylose were identified in the monosaccharide composition of water-soluble polysaccharides.

The yield of pectin substances (PS) was 3.6 % in the aerial part and in the roots - 0.34% PS is an amorphous powder of white colour, well soluble in water. The PS solution gives with iodine a hardly noticeable quickly disappearing blue staining.

The monosaccharide composition of pectin substances was shown to be represented by galacturonic acid, galactose, glucose, arabinose and in small amounts xylose.

The yield of HMC was 10.0% (aerial part) and 2.4% (root), respectively. Hemicelluloses are amorphous beige powder, insoluble in water, well soluble in dilute alkalis.

As a result of chromatographic analysis the presence of glucuronic acid, galactose, arabinose, xylose, in smaller amounts glucose was found in the composition of hemicelluloses.

PS and HMC are also characterised by the presence of arabinose and xylose. This is characteristic of HMCs based on xylenes.

Thus, the presence of WSPS, PS, HMC in the plant *Convolvulus syhirsitus* was established. It is shown that these biopolymers predominate in the aerial part.

POLYSACCHARIDES OF THE AERIAL PART OF *Gentiana olivieri*

F.A. Kodiralieva[1], Ch.T. Toshtemirova[2], R.K. Rakhmanberdieva[1], N.S. Normakhamatov[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: fatimahon.82@ mail.ru, (99) 971-09-84
2) Tashkent Pharmaceutical Institute, Tashkent, Uzbekistan,
e-mail: toshtemirovac@gmail.com

Gentiana olivieri is a perennial plant. The stem is straight or ascending, up to 30 cm tall; naked, light green. The rhizome is thin, with cord-like roots. Stems at the base up to 5 cm densely covered with remnants of fibrous sheaths of old leaves, straight or slightly ascending. Grows on dry mountain slopes. It is widely found from foothills to highlands; in open areas, among herbaceous and tree-shrub vegetation, at an altitude of 300-3700 m and distributed in Central Asia, southern Transcaucasia.

The qualitative composition and quantitative content of Gentiana olivieri polysaccharides collected from the Samarkand region were studied.

Water-soluble polysaccharides (WSPS), pectin substances (PS), and hemicelluloses (HMC) have been isolated from Gentiana olivieri, and the monosaccharide composition has been established. The results showed that the monosaccharide composition of polysaccharides belong to the galactans.

Alcohol-soluble sugars according to chromatographic analysis are represented by glucose, sucrose. Water-soluble polysaccharides were extracted with water. The raw material was extracted with water at room temperature 20-22 °C and WSPS was isolated. Also, pectin substances (PS) and hemicelluloses (HMC) were successively isolated. The content and monosaccharide composition of the selected polysaccharides are given in table.1.

Table 1. Yield of polysaccharides and their monosaccharide composition

View	Type PS	Yield, %	The ratio of monosaccharide residues						UA, PC
			Rha	Ara	Xyl	Man	Glc	Gal	
Gentiana olivieri	WSPS	5.0	1.1	18.6	2.1	1.0	9.7	37.5	+
	PS	5.8	1.0	17.2	1.2	1.3	7.1	25.8	+
	HMC	2.1	0.7	15.7	1.4	1.9	5.5	21.4	+

WSPS and PS are amorphous powders, readily soluble in water.

Pectin substances were white powders with a creamy tint. PS were characterized by a high content of arabinose and galactose. In the hydrolysates of pectin substances, along with neutral monosaccharides, galacturonic acid was present.

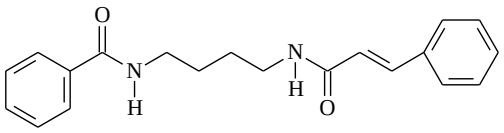
COMPONENTS FROM THE PLANT *Haplophyllum latifolium*

Z. Ch. Abraeva[1], A. R. Khurramov[1], B. Nazarov[2], Kh. A. Rasulova[1], Kh. M. Bobakulov[1]

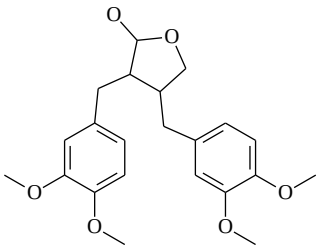
1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: zuhro.chorievna@mail.ru
2) Samarkand State University Samarkand region, Uzbekistan 140104

Plants of the genus *Haplophyllum* A. Juss. (Rutaceae family) are represented on a global scale by about 150 species distributed from the Mediterranean to Western Siberia. There are 23 species of *Haplophyllum* growing on the territory of Central Asian countries. Plants of this genus attract the attention of researchers as potential sources of biologically active substances contain quinoline, furanoquinoline alkaloids and amides, which are promising and rich in sources of coumarins, flavonoids, lignans and essential oils.

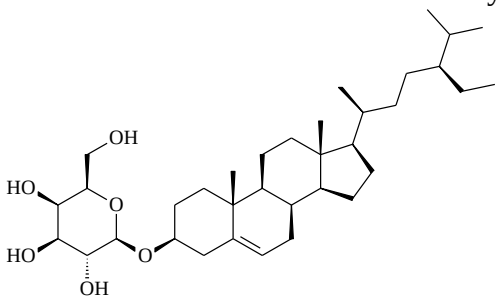
Haplophyllum latifolium Kar. & Kir. (whole-leaved broadleaf) is a perennial herb that grows in the Tashkent, Samarkand and Kashkadarya regions. The aerial part of the H. latifolium plant collected in the Tashkent region was extracted with ethanol. Gasoline, chloroform, ethyl acetate and ethanol fractions were obtained from the ethanol extract. As a result of separation of the ethyl acetate fraction of H. latifolium on a column, were obtained kusurokinin with a temperature of 183-184°C and haplamid 172-173°C as well as substances haplamidin with a temperature of 139-140°C, dimethylmatairesinol and daucosterol. The chemical structure of isolated compounds was elucidated by studying their spectral data of ^{1}H and ^{13}C NMR, as well by HSQC, HMBC and COSY experiments followed by comparison with literature data.



Haplamidin



Dimethylmatairesinol



Daucosterol

1-*O*-METHYLEMODIN AND STIGMASTEROL COMPOUNDS FROM THE UNDERGROUND PART OF RUMEX PAMIRICUS

G.D. Shermatova[1], K.A. Eshbakova[2], Sh.Sh. Sagdullaev[2], B.S. Mirzaev[1]

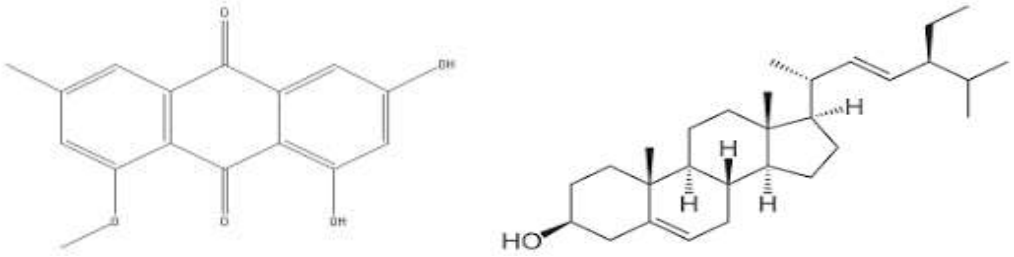
1) "TIIAME" National Research University, 100000, Tashkent, 39, Kari-Niyaziy str.,
e-mail: gdshermatova@gmail.com
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

The basis of the technology for the isolation of 1-*O*-Methylemodin and Stigmasterol (Fig.1) compounds is the extraction of raw materials with various organic solvents followed by chromatographic purification. Classical extraction methods (percolation and maceration) are time-consuming and laborious.

The herb *Rumex pamiricus* Rech. f. belongs to the family of Polygonaceae and there are over 250 types on the earth and 16 types in Uzbekistan.

The roots of the herb *Rumex pamiricus* dried at room temperature, in shade. The pounded herb roots were first subjected to extraction in chloroform, then three times in 70% acetone hydrous solution. The acetone extract was distilled under vacuum; the remaining water solution was subjected to extraction with ethyl acetate. Ethyl acetate extracts were collected and were dehydrated by adding anhydrous salt Na_2SO_4. The dehydrated extract was filtered, its concentration increased under vacuum, the total phenols were precipitated by adding pure hexane to the condensed extract. The created precipitate was washed, and filtered and the extracted total phenols of chloroform and ethyl acetate fractions constituted 3.4% of the herb dry weight.

The chloroform fraction subjected with column chromatography on KSK silica gel, eluted with a mixture of extraction benzene–ethyl acetate: (50:1, 40:1, 30:1, 20:1 and 10:1). The structure of 1-*O*-methylemodin and stigmasterol was established on the basis of the analysis of the data of MS (Mass spectrometry), ^{1}H and ^{13}C NMR spectra (Nuclear Magnetic Resonance), and of the DEPT (Distortionless Enhancement of Polarization Transfer), HSQC (Heteronuclear Single Quantum Coherence) and HMBC (Heteronuclear Multiple Bond Correlation) experiments. Qualitative analyses of major phenolics by TLC (Thin Layer Chromatography) analysis were also evaluated.



1 **2**

Fig. 1. Chemical structures of isolated compounds **1–5**: 1-*O*-methylemodin (**1**), stigmasterol (**2**).

GERFINE - NEW ALKALOID FROM *Haplophyllum griffithianum*

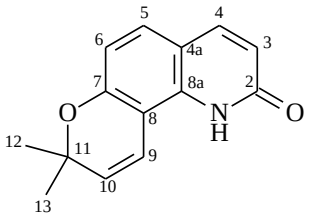
D.R.Kodirova, Kh.A.Rasulova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: dilobar555@mail.ru

The pharmacological studies of alkaloids and their derivatives isolated from plants of *Haplophyllum* genus *(fam. Rutaceae*), which are unique source of various alkaloids, showed that they are low toxic and have wide spectrum of pharmacological action. Most of them possess by inhibitory action on CNS, sedative, sleeping, anticonvulsant, estrogen and other effects.

As a result of research of total alkaloids with yields 0,4% and 0,58% respectively, which isolated from the aerial part and roots of *H. griffithianum* collected in Sanchardaksoy, Nilu village, (Surkhandarya province). The known alkaloids skimmianine, dictamnine, dubinine, dubamine, a gerfitin with m.p. 91-93°C, gerfitinin with m.p. 91-93°C and a new bases – gerfin were isolated for the first time from the aerial part, and skimmianine, dictamnine, dubinine and sterols with m.p. 76-78°C, and 60°C – from the roots. The structure of gerfine (I) was proved by spectral data.

Gerfine (**1**): ESI-MS *m/z* 227 (M^+), $C_{14}H_{13}NO_2$, ($CHCl_3$:MEOH, 9:1) (R_f 0.70).



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PROTEIN SUBSTANCES OF VARIOUS ORGANS OF *Capparis spinosa* CULTIVATED IN THE REPUBLIC OF UZBEKISTAN

Sh.Kh. Rakhimova, L.G. Mezhlumyan, A.Z. Sadikov, Sh.Sh. Sagdullaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
e-mail: shahnoza2380@mail.ru

All over the world, widespread *C. spinosa* plants are used in various sectors of the national economy, including medicine. The plant contains a large number of biologically active substances with anti-inflammatory, antioxidant, blood coagulating actions and other properties. Also in the food industry, pickled buds and unripe fruits of this plant are widely used as food additives, since it is known from the literature that these vegetative organs are rich in high-quality protein substances. The demand for pickled buds and unripe fruits of this plant is growing year after year, in this regard, in many countries of the world, including Uzbekistan, this plant has been cultivated and large plantations of growth have been created.

The purpose of our study is to study the content of protein substances in various organs of *C. spinosa* cultivated in the Republic of Uzbekistan. The object of the study was such vegetative organs of the plant as roots, buds, flowers, seeds and unripe fruits. The colorimetric method using Nessler reagent determined the quantitative protein content in these plant organs. The results of studies on the determination of protein substances in the above-mentioned plant organs are given below.

Total protein content in various vegetative organs of *C. spinosa* plants

№	The name of the organ	The content of protein substances from the mass of air-dry raw materials, %	Nitrogen content from the absolute mass of protein, %
1	Roots	11,54	1,84
4	Buds	23,32	3,73
5	Flowers	14,71	2,35
2	Seeds	17,77	2,84
3	Unripe fruits	20,44	3,27

As can be seen from the data obtained, a significant amount of protein substances contains buds and unripe fruits. We have isolated samples of protein substances from dried buds and from immature fruits and transferred them for pharmaco-toxicological studies.

THE USE OF A NEW DENSITY GRADIENT "GLEDOL" FOR LYMPHOCYTE ISOLATION FROM PERIPHERAL BLOOD

R.K. Rakhmanberdyeva[1], D.M. Saidkhojaeva[1], D.A. Rakhimov[2], V.N. Syrov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
2) Tashkent Institute of Chemical Technology

Aqueous-insoluble polysaccharide-gledol with Mm 40 kDa was obtained from the seeds of *Gleditsia triacanthos* by water-extraction. The gledol was used as part of a density gradient for the isolation of blood lymphocytes. For this purpose, a contrast agent was added to an aqueous solution of gledol to obtain a clear solution with a density of 1.077.

In medical practice, a synthetic copolymer ficoll consisting of sucrose and epichlorohydrin is used. We carried out a comparative study of gledol with its imported analog, Ficoll 400 (Pharmacia, Sweden). - synthetic copolymer.

Table

Comparative quantitative characteristics of lymphocyte suspensions, %

Characteristics characteristic cell suspensions, % / Gradient	Ficoll - verogranin	Galactomannan-verrographin
Cell yield	40-60	40-60
Erythrocyte admixture,%	0-10	0-10
Other cell admixture (granulocytes: neutrophils, segmented cells), %	5	5
Cell viability	90-95	90-95

The results have shown that gledol is not inferior to ficoll in the deposition of immunocompetent blood cells. Gledol allows the isolation of viable peripheral blood lymphocytes; 35% of leucocyte suspensions can be isolated, of which 90% are lymphocytes, the admixture of other cells (neutrophils, segmented nuclei, etc.) is 10%. Gledol is used in the determination of membrane marker characteristics and functional activity of blood lymphocytes.

The advantage of Gledol is that it is simple and easy to use, and that it is a domestic reagent of plant origin. Gledol as a diagnostic agent, is intended for immunological and cytological investigations in diagnostic centres and scientific research establishments.

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CHARACTERISTICS OF *Vitis* L. PLANT

A.Q. Azimova, A.U. Turaqulov, A.Kh. Islamov

Mirzo Ulugbek National University of Uzbekistan;
Institute of Bioorganic Chemistry named after academician A.S. Sodikov of the Academy of Sciences of the Republic of Uzbekistan; 100125 Tashkent city Mirzo Ulugbek street, 83

The flora of our country - Uzbekistan, is unique in its wealth of useful, medicinal, decorative plant species. These types of plants have been identified by the peoples of different regions for years and have been used in the treatment of many diseases. In this regard, it is important that Vitis L., in the local language, the fruitful, beautiful, healing and sweet varieties of the vine have been used for daily needs for many years. The reason why grapes are recognized by the doctors of the world is that they are expectorants, sweat removers, remove poisons and infections, kill bacteria, break stones in the body, and stop blood. It has been effective in expanding, improving liver function, nourishing heart muscles, purifying and increasing blood [1-3].

The leaves and fruits of the vine have been used by our people since ancient times. It can be said that at the same time it maintains its level of importance. As evidence of our opinion, we can cite the amount of micro- and macroelements contained in black currant grape leaves. According to the analysis, the amount of 44 elements in the grape leaf was determined, K (3080.545 mg/g), Mg (3673.335 mg/g), P (1094.805 mg/g), S (870.156 mg/g), Na (616,776 mg/g), Ti (757,207 mg/g), Ca (8518,182 mg/g), the amount of elements was found to be more than others.

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AMINO ACID COMPOSITION OF SPECIES OF THE GENUS *Atriplex* L.

X.U. Khalbekova

Institute of Bioorganic Chemistry, Academy of Sciences of Uzbekistan
M. Ulugbek street, 83

The cultivation of halophyte plants can contribute to the creation of highly productive long-term pasture communities on secondary saline lands, as well as their effective use as medicinal raw materials, since the chemical composition of this family is very diverse and unique. It is represented by various amino acids, carbohydrates, phenolic compounds (flavonoids, isoflavones, xanthones, tannins, etc.), essential oils, etc.

In this regard, studies of the component composition of plants growing in the extreme climatic conditions of the chul are promising, for this it is necessary to determine the main classes of biologically active substances, one of which are amino acids, which are the main structural units of the human body and play a huge role in the biosynthesis of biologically active compounds, proteins and peptides.

The largest number of plant cover species of saline soils in Uzbekistan belongs to the *Chenopodiaceae* family, many of whose representatives have valuable fodder potential and are medicinal and they are extremely promising for use in the ecological restoration and increase in the productivity of degraded pastoral lands in the arid regions of the world. In this regard, the choice of plants that are potentially promising species for study was also determined: *Atriplex aucheri* Moq. and *Atriplex tatarica* L. *(*Chenopodiaceae family*)*, growing in the conditions of the dried bottom of the Aral Sea, to identify the features of the intake and accumulation of amino acids by plants of the genus Atriplex in conditions of technogenic pollution and evaluate the possibilities of agricultural practices for obtaining environmentally friendly products.

The young leaves of *Atriplex* species are valuable sources of vitamins and are used in spring (instead of spinach) as green leafy vegetables. The leaves contain organic acids (*A. laciniata* L.), coumarins and flavonoids (*A. rosea* L.), alkaloids (*A. halimus* L.), and phosphatidylglycerol (*A. prostrata* Baucher ex DC.). Determination of free amino acids in the form of their PTC derivatives was carried out by the method of Steven A. and Cohen Daviel J. In the studied species of the genus *Atriplex*, 20 free amino acids were identified, of which 10 are essential - threonine, arginine, tyrosine, valine, methionine, isoleucine, histidine, tryptophan, phenylalanine, lysine, leucine.

Both species had the highest content of free methionine. Arg, Cys, and Trp also dominated in *A. aucheri*, while Pro, Phr, and Ala dominated in *A. tatarica*. The studied plants of the genus *Atriplex* are of particular interest both in scientific and ecological terms, which allows us to consider them as promising for introduction into culture in the Aralkum, and the assumption that plants have a selective ability to accumulate chemical elements has been experimentally confirmed. It has been established that the more microelements with a wide range of concentrations are combined in one plant, the greater the ecological amplitude of the growth of this plant and, as a result, the higher its adaptive capacity in conditions of technogenic pollution of new valuable drugs of combined action. The work was supported by grant No. AL-632204135 (Ministry of Innovative Development of the Republic of Uzbekistan).

SELECTION OF OPTIMAL CONDITIONS FOR OBTAINING A LIPOLYTIC ENZYME FROM THE SEEDS OF *Nigella sativa*

T.A. Khudoiberdiev, Sh.Sh. Shomakhamatov, Yu.I. Oshchepkova

Institute of Bioorganic Chemistry named after A.S. Sadykov of the Academy of Sciences of Uzbekistan, Republic of Uzbekistan

At present, the use of low-waste technologies, increasing their growth and increasing the cost of phytopreparations is becoming more and more relevant for pharmaceutical production. It is possible to achieve this goal by taking into account additional biological groups and possibilities of medical preparations application. Along with other entered into practice microbial, plant and animal proteases, amylases, pectinases, lipolytic enzymes are widely used.

Lipolytic enzymes (lipases) are a group of enzymes that catalyze the reactions of hydrolytic cleavage of fats with the formation of mono- and diglycerides and free fatty acids, with the greatest affinity of the enzyme to the ester bonds located on the outer part of the triglyceride molecule. The seeds of *Nigella sativa*, family *Rananculaceae*, in addition to valuable oil containing a complex of active substances and antimicrobial peptides, also contain a lipolytic enzyme.

After degreasing the crushed seeds of *Nigella sativa*, the isolation of lipolytic enzyme was carried out. During the isolation, physicochemical properties such as the effect of pH and temperature on the stability of the enzyme were studied. To determine the pH optimum of lipolytic enzyme extraction was carried out with water in the pH range of 8-12, since in the range of these values the lipolytic activity of the enzyme is 110-115 thousand units/g, with the optimum at pH 10-11 (140-150 thousand units/g).

For research, the pre-crushed seeds were degreased over hexane in a Soxhlet apparatus for 72 hours. The meal was dried and 13 g portions were prepared for the experiments.

During the studies, the activation time was varied in the range from 6 to 24 hours. To determine the optimum activation temperature, activation was carried out in the range of 35^0C - 40^0C. It is known that the dependence of lipolytic activity on temperature is explained by the fact that, on the one hand, this factor affects the protein part of the enzyme, leading to its denaturation and a decrease in the level of activity, on the other hand, the increase in temperature increases the reaction rate of formation of the enzyme-substrate complex.

From the obtained results, it was determined that the pH optimum for the extraction of the studied lipolytic enzyme is in the range 10.5±0.02 - 11.0±0.01, and the highest yield of the target product is observed at pH = 10.5, when activated 37 degrees for 24 hours was 0.45 g (3.46% of the feedstock). The yield of the target product decreases with increasing activation time. In this regard, we can conclude that the most optimal activation time is 24 hours.

CHEMICAL STRUCTURE OF THE POLYPHENOL COMPOSITION OF THE LEAVES OF PONTIAN HAWTHORN *Crataegus pontica*

K.V. Raimova, N.G. Abdulladzhanova, A.D. Matchanov

Institute of Bioorganic Chemistry named after acad. A.S. Sadykov Academy of Sciences of the Republic of Uzbekistan, Mirzo Ulugbek str., 83, Tashkent, 100125 (Republic of Uzbekistan).

The chemical composition (polyphenols) of the leaves of the plant *Crataegus pontica* K. Koch has been studied. The process of isolating polyphenols from plant raw materials includes several stages: extraction of raw materials, processing of the extract with organic solvents, evaporation, precipitation of the sum of polyphenols, purification. The increase in the efficiency of the use of raw materials is achieved mainly at the first stage – extraction. The yield of the sum of polyphenols was studied depending on: the composition of the extractant, the extraction modulus, the multiplicity of extraction, the ratio of raw materials - extractant, temperature, thickening conditions, treatment of the aqueous residue with organic solvents, the conditions of precipitation of the sum of polyphenols and their drying. As a result, optimal conditions for the isolation of polyphenols from plant raw materials were selected, and the found condition obtained the sum of polyphenols from the autumn leaves of *Crataegus pontica* K.Koch with a yield of 4.5%. Chromatographic study of the isolated fractions revealed that the polyphenols of the ethyl acetate fraction are mainly represented by monomeric catechins, flavonolams and tannins. As a result, flavan-3-ols were isolated in the individual state. The isolated flavan-3-ols have been identified as (+)-catechin, (-)-epicatechin. The remaining compounds were separated on a Sephadex LH-20 column using chloroform-methanol in various ratios (chloroform:methanol in a ratio of 4:1) as an eluent, and a number of individual compounds were isolated. Using a complex of physicochemical methods, including: IR spectrum, UV spectrum, ^{13}C NMR, HPLC, mass spectrometry, the obtained product was analyzed. In this regard, the purpose of our work is to study the chemical composition of phenolic compounds in the leaves of the *C. pontica* plant and to determine the structure of the isolated substances by physicochemical methods. The structures of the isolated compounds were determined using physicochemical methods. As a result, more than 12 polyphenols were isolated from the leaves of *C. pontica*, such as quercetin-3-*O*-β-*D*-galactopyranoside (hyperoside), gallic acid, quercetin-3-rutinoside, 3, 5, 7, 3', 4'- pentaoxyflavone (quercetin), 2-(3,4-dimethoxyphenyl)-7methoxy-3,4-dihydro-2H-chromene-3,4,5,6-tetrol, apigenin-6-*C*-glycoside, procyanidin B, (+)-catechin (5,7,3',4'-tetraoxyflavan-3-ol), (-)-epicatechin (5,7,3',4'-tetraoxyflavan-3-ol), ellagic acid, 1-*O*-galloyl-4-*O*-catechin-β-*D*-glucose and caffeic acid ester with 2,3-dihydroxyglutaric acid. From these, the last two substances were first isolated from this plant.

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THE CONTENT OF TOTAL AND ACID-INSOLUBLE ASH CONTENT IN THE RESIDUES OF LICORICE ROOTS

B. B. Abduazimov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77

Biomass is mainly composed of organic and inorganic materials [1]. The main organic compounds of biomass are cellulose, hemicellulose, and lignin [2]. Besides organic matter, biomass contains various ash-forming elements such as Si, Ca, Mg, K, Na, P, S, Cl, some Al, Fe, Mn, and traces of other elements. The ash content of the biomass can be processed depending on the presence of minerals in the soil in which plants grow. Minerals are consumed by plants and are found in all organs and tissues. When the ash content is high, there is a chance that the material has been contaminated from outside. This indicates an improper collection and storage procedure.

Total ash and acid-insoluble ash contents are important indices to illustrate the quality and purity of herbal medicine.

Total ash includes "physiological ash" which is formed from the plant tissue itself, and "non-physiological ash» which often results from contaminants adhering to it in contact with soil and sand.

Acid-insoluble ash is defined as ash that is insoluble in an acid, specifically in a dilute H_2SO_4 solution. It is a part of the total ash that is generated by incinerating dry test material. Ash is inorganic matter, but acid-insoluble ash consists mainly of silica.

In order to convert the residues of licorice root into value-added products, it was necessary to determine the ash content. In accordance with the methodology for determining the ash content specified in the Uzbek Pharmacopoeia [3], the total ash content and the content of acid-insoluble ash in medicinal plants are determined using the method of calcination, which requires charring the samples until a constant weight. The procedure is very complex, laborious, and time-consuming.

The total ash content of licorice root residues was 5.09%, and the acid insoluble ash content was 4.52%, according to quantitative analysis. About 88.8% of the ash is acid-insoluble ash, which consists of silica. A small amount of salts of other microelements (11.2%) can probably be explained by their displacement into a liquid during extraction or a slight contamination of roots during the collection and storage of licorice roots.

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POLYSACCHARIDES OF *Ficus carica*

M.A. Kuronboeva, K.S. Zhauynbaeva, A.A. Azamatov, F.M. Tursunkhodzhaeva

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
e-mail: kzhauynbaeva@inbox.ru

The plant *Ficus carica* L. (family Moraseae) is widely distributed in the Republic of Uzbekistan. It is cultivated in all regions, especially in the Ferghana Valley. Furocoumarins were found in the leaves (in dry - up to 2%) psoralen and bergapten, which have a photosensitizing effect, like hogweed. In medical practice, the drug "Psoberan" from fig leaves is approved for the treatment of skin diseases - vitiligo and alopecia areata. However, little is known about the biological activity of the polysaccharides of this plant in the literature [1-3].

In this regard, the study of *F. carica* L. polysaccharides was of great interest.

We isolated water-soluble polysaccharides (WSPS) from air-dry raw materials with a yield of 3.5%, which are an amorphous cream-colored powder, readily soluble in water, η_{rel} = 1.1 (with 1% H_2O). The molecular weight is 43 kDa. In the VRPS hydrolyzate, gas-liquid chromatography (GC) revealed galactose, xylose, arabinose, rhamnose, and glucose. The content of uronic acids was determined by the carbazole method, it is 34%. Therefore, the original VRPS is a mixture of neutral and acidic polysaccharides. In the IR spectra of VRPS there were characteristic absorption bands at 3282,1568,1405, 1260, 1086, 891, 787, 657$см^{-1}$.

The biological activity of *F. carica* VRPS was studied in a model of formalin arthritis. At the same time, VRPS showed the most pronounced anti-inflammatory effect at a dose of 150 mg/kg p/o (58%), inferior to the effect of ketoprofen at a dose of 5 mg/kg p/o (70%) and superior to diclofenac at the same dose (50%).

Thus, *F. carica* VRPS is a heterogeneous polysaccharide that is of interest as a potential source of anti-inflammatory agents.

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MULTIFUNCTIONAL POLYSACCHARIDE HYDROGELS FOR WOUND HEALING

A.A. Boydedayev[1], B.I. Muhitdinov[1,2], D.M. Amonova[1], A.S. Turaev[1], Y.Huang[2], I.Y. Mexmonov[1], B.A. Sindarov[1], M.O. Kalonova[1,3], L.U. Makhmudov[1], H. Wang[2]

1) Institute of Bioorganic Chemistry, Uzbekistan Academy of Sciences, Mirzo Ulugbek St. 83, 100125 Tashkent, Uzbekistan
2) Shanghai Institute of Materia Medica, Chinese Academy of Sciences, 501 Hai Ke Road, 201203 Shanghai, China
3) National University of Uzbekistan, 4 University St. 4, 100174 Tashkent, Uzbekistan

The wound healing processes include complex biological and physiological mechanisms such as hemostasis, inflammation, proliferation, and remodeling. Wound healing is frequently considered a serious social problem in burned and diabetic patients especially. However, there are very limited therapeutic materials in use and thus effective wound-healing materials are still have been required. Polysaccharides usually are considered suitable biopolymers for developing wound healing materials with their unique biocompatibility, biodegradability, and high water uptake and retention properties. Among others, hyaluronic acid is a structural and functional biopolymer, largely presents in pericellular coatings and extracellular matrix, an important ingredient of almost all tissue, and plays an important role in wound healing.

In this study, hyaluronic acid hydrogels containing the chitosan oligosaccharide and β-glucan polysaccharide were developed. The hydrogel formulation was structured by crosslinking the polysaccharide chains with chitosan oligosaccharides. The hydrogels prepared were structurally analyzed with IR spectroscopy, differential scanning calorimetry (DSC), and SEM observation methods. The wound-healing activities of the samples were studied dorsal wound rat model.

In the IR spectra of the hydrogel samples changes in the peaks from amide (I/II/III) were observed at 1310-1558 cm^{-1}, confirming the crosslinked structure of the samples. The DSC curves of the hydrogel samples differed from that of the initial polysaccharide samples showing an endothermic absorption peak at 40-100°C, and exothermic absorption peaks around 270-350°C due to differing chemical and physical composition of the samples. The SEM observations of lyophilized hydrogels clearly demonstrated that the hydrogels possess irregular macropores and wavy morphological structures. In the wound permeability evaluations executed in the dorsal wound rat model, the β-glucan containing hyaluronic acid-based hydrogel demonstrated a more progressive wound healing effect (wound closure 100%) compared to the control (wound closure 52.3%) or the hydrogel without β-glucan (wound closure 86.7%) at day 14.

In conclusion, we through this study developed hyaluronic/chitosan/β-glucan hydrogel for wound treatment applications. The composite hydrogel developed demonstrated promising wound-healing activity in the animal model. The composite hydrogel is expected to be multifunctional with respect to its applicability together with other supporting or therapeutic payloads. The composite hydrogel is under study for evaluation of detailed pharmacological properties.

HYALURONAN-BASED HYDROGELS WITH HEMOSTATIC PROPERTIES

A.A. Boydedayev[1], B.I. Muhitdinov[1,2], D.M. Amonova[1], A.S. Turaev[1], Y.Huang[2], I.Y. Mexmonov[1], B.A. Sindarov[1], M.O. Kalonova[1,3], L.U. Makhmudov[1], H. Wang[2]

1) Institute of Bioorganic Chemistry, Uzbekistan Academy of Sciences, Mirzo Ulugbek St. 83, 100125 Tashkent, Uzbekistan
2) Shanghai Institute of Materia Medica, Chinese Academy of Sciences, 501 Hai Ke Road, 201203 Shanghai, China
3) National University of Uzbekistan, 4 University St. 4, 100174 Tashkent, Uzbekistan

Conventional hemostatic materials are usually bandages and gauze that stop bleeding by direct compression. They are considered easy to manufacture and cheap. However, these traditional hemostatic materials are unbiodegradable and prone to bacterial infections in the presence of blood or tissue fluids. Therefore, developing hemostatic materials with excellent biodegradable and biocompatible properties is necessary. In this context, polysaccharide-based biomaterials have perspectives with respect to their unique biological and pharmacological behaviors.

In this work, hyaluronan-based hydrogels were developed by chemical crosslinking the macromolecular polysaccharide chain with the low molecular weight chitosan. Three hydrogel samples differing in proportions of the hyaluronic acid and chitosan crosslinker were prepared and purified by the aqueous dialysis method. The samples obtained were systematically analyzed using IR spectroscopic, X-ray diffraction (XRD), and SEM techniques. The hydrogels were further studied for the hemostatic and bioabsorbility properties in the liver resection and dorsal injection rat models.

The IR spectroscopic studies of the dried samples indicated the presence of N-acetyl group C=O bonds (1659 cm^{-1}) and carboxylate C=O bonds (1633 cm^{-1}). The crosslinked macromolecular structures in the hydrogels were confirmed by the changes in the peak intensities specific for the amide (I/II/III) bonds at 1310-1558 cm^{-1}. In the XRD analyses of the dried samples, decreases in the peaks characteristic for crystalline regions of the parent polysaccharides were detected at 2θ=16.75°-23.6°, which occurred due to the cross-linking of the polysaccharide chains. SEM images of the dried hydrogels showed irregular macropores and wavy morphological structures that are characteristic of polysaccharide-based hydrogels. In the *in vivo* evaluations, liver bleedings in the hydrogel-treated groups stopped 3.5-4.0 times faster than the control (gauze) groups indicating that the hydrogels have good hemostatic properties. Bioabsorbility biocompatibility studies showed complete absorption of the hydrogels during 17-21 days and no allergic reactions or toxic effects were observed in the animals, indicating good bioavailability and biocompatibility of the hydrogels prepared.

In conclusion, hyaluronan/chitosan crosslinked hydrogels were prepared and characterized by chemical and morphological structures. The pharmacological evaluations in the liver resection rat model indicated that the hydrogel samples prepared have hemostatic properties. The histological observations showed the hydrogels are bioabsorbable. In addition, no allergic reactions or toxic effects were observed in the animals treated with the hydrogels. The overall results demonstrated that the hydrogels developed are promising for the preparation of hemostatic materials.

ENDOPHYTES FROM LICORICE - *Glycyrrhiza glabra* AS BIOCONTROL AGENTS AGAINST *Fusarium* CAUSED DISEASES

G.U. Mardonova, D.R. Egamberdieva

National University of Uzbekistan, University street-4, 100174, Tashkent, Uzbekistan

The objective of this research was to reveal bacterial endophytes isolated from Licorise-*Glycyrrhiza Glabra Linn* plant, which have biocontrol activity against phytopathogenic fungi *Fusarium tricinctum* and *Fusarium culmorum*.

The bacterial endophytes were isolated from shoots and roots of Licorise. The endophytes were isolated after grinding of the surface sterilized roots or shoots, dilution of the cell juice in phosphate buffered saline and spreading the suspension on Nutrien Agar (NA) and Yeast Extract Mannitol (YEM). The bacterial isolates were identified using 16S rRNA gene analysis. For DNA extraction the heat treatment method was used. Extracted DNA was used as template for 16S rRNA gene analysis. Sequencing was performed using ABI PRISM BigDye 3.1 Terminator Cycle Sequencing Ready Reaction Kit (Applied Biosystems). The 16S rRNA sequences were identified using BLAST and comparisons with the GenBank nucleotide data bank from the NCBI. The grown colonies were picked up in 4 days. The endophytes were checked for in vitro antagonistic activity against phytopathogenic fungi *Fusarium tricinctum* and *Fusarium culmorum* on Petri dishes using Chapek medium. The endophytes were examined for the ability to inhibit the same phytopathogenic fungi in pot experiment.

In total 29 isolates were obtained from Licorise plants. Only 10 isolates inhibited fungi *Fusarium tricinctum* and *Fusarium culmorum* or both of them. IYB2, PYB4, IPB10, INB18 bacterial isolates were the most effective in biocontrol activity against disease caused by *Fusarium tricinctum* pot experiments. The most effective bacterial isolates having biocontrol activity against disease caused by *Fusarium culmorum* were PYB1, PNB15 and INB9. In total 10 bacterial isolates were identified using 16S rRNA gene analysis as follows: *Pantoea agglomerans* PYB1, Achromobacter sp. PNB21, *Bacterium AM0120* IYB3, *Klebsiella oxytoca* IYB1, *Enterobacter hormaechei* IYB2, *Pantoea agglomerans* PYB4, *Pantoea sp* IPB10, *Pseudomonas azotoformans* INB18, *Enterobacter ludwigii* PPB13 and *Bacillus siamensis* INB9.

№	Endophytes of Licorise	Fungal growth inhibition zone (mm)	
		Fusarium tricinctum	*Fusarium culmorum*
1	PYB1	-	5
2	PNB21	4	-
3	IYB3	3	-
4	IYB1	2	3
5	IYB2	5	4
6	PYB4	6	-
7	IPB10	7	-
8	INB18	5	
9	PPB13	-	8
10	INB9	-	5

The strains possessing high biocontrol activity towards phytopathogenic fungi can be proposed for usage as a part of biofungicides after field experiments.

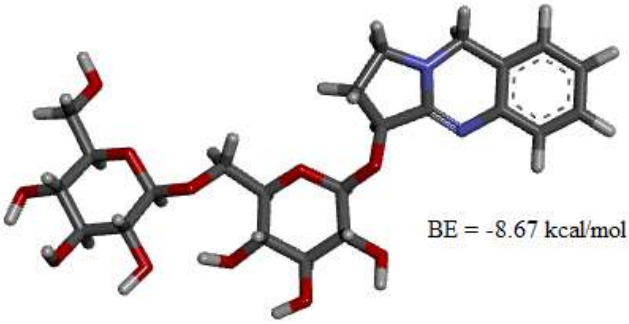
SCREENING OF NATURAL COMPOUNDS OF *Peganum harmala* AND *Glycyrrhiza glabra* AGAINST THE MAIN PROTEASE OF SARS COV-2 BY AUTODOCK PROGRAM

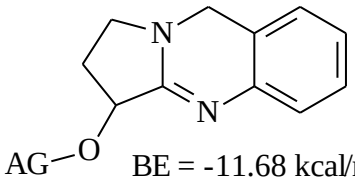
J. Joldasov[1], A. Eshimbetov[2]

1) Karakalpak State University, Nukus, Uzbekistan
2) Institute of Bioorganic Chemistry, Academy of Sciences of Uzbekistan

In Silico methods are widely used to predict new biologically active compounds [1]. Molecular docking plays important role among *in Silico* methods [1]. This method has been used to investigate the binding of many compounds to the main protease (Mpro) of SARS COV-2 [2]. On this basis, and in order to search for new antiviral compounds, a screening of natural compounds of plants *Peganum harmala L*. and *Glycyrrhiza glabra L*. was carried out. These plants are widely distributed in the territory of Karakalpakstan republic and they are used in folk medicine for many years.

For this purpose, firstly the binding energies (BE, kcal/mol) of danoprevir, ivermectin, lopinavir, oseltamivir, remdesivir and ritonavir with the main protease were studied by AutoDock molecular docking program [3]. For these compounds, the binding energy range has been determined as BE = -9 – -10 kcal/mol. The alkaloids of *Peganum harmala L*. and the steroid compounds of *Glycyrrhiza glabra L*. were then screened. The binding energies of the studied compounds were weaker than the above mentioned compounds and their BE values not entered the BE range.





BE = -11.68 kcal/mol
(AG - Aminoglycoside)

After that, hypothetical structures involving the alkaloids garmalol and peganine, and also glycyrrhetinic acid were designed to study their binding energies with the Mpro. As a result, on the basis of aminoglycoside, garmalol and peganine moieties, and also glycyrrhetinic acid three new structures (G2G, G2P and G2GA) were proposed, which have a stronger interaction (BE=-11.68, -11.35, -13.04 kcal/mol) with the main protease of SARS CoV-2. The studies carried out may encourage chemists to synthesize the designed structures and can serve as a basis for targeted synthesis.

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EXTRACTION OF FLAVONOIDS FROM THE MEDICINAL PLANT *Physalis alkekengi*

Z.A. Kadirova, Sh.S. Tashmukhamedova, Sh.N. Mingnorov, M.T. Saidova, D.K. Khojiyeva

National University of Uzbekistan named after M. Ulugbek,
e-mail: zukhra_abrarovna7@mail.ru

Physalis alkekengi from the Solanaceae family is characterized by a rich composition of biologically active substances (biologically active substances), that is, chemical substances with high physiological activity at low concentrations relative to the living organism. Among the biologically active substances synthesized and accumulated by the plant are alkaloids, steroids, flavonoids, carotenoids, polysaccharides, lectins, pectins, vitamins, fatty oils, tannins (tannins), etc. The purpose of the research is *Physalis alkekengi* is to choose the optimal conditions for extracting flavonoids from the plant and to determine the flavonoid content in the dry extract.

Research materials and methods: in the study, ethanol was used in concentrations from 40 to 90% to separate flavonoids. The obtained mass was dried in a lyophilic dryer using liquid nitrogen. The content of flavonoids in the obtained dry extracts was determined in relation to luteolin. Quantification of flavonoids was carried out in a spectrophotometer.

Discussion results: the effect of some factors on the release of flavonoids, namely the concentration of the extractant, the particle size of the raw material, the effect of the incubation time and the ratio of the raw material to the extractant in the study on the selection of optimal conditions for the extraction of flavonoids from *Physalis alkekengi* was studied. The effect of extractant (ethanol) concentration was studied to determine the completeness of flavonoid extraction from the plant, and at low concentrations (20%, 30% and 40%) flavonoid release ranged from 0.25 to 0.55 mg It was found that flavonoids were completely extracted by ethanol at a concentration of 80%. In this case, the flavonoid concentration was 1.92 mg. A further increase in the concentration of the extract did not lead to an increase in the extraction efficiency of flavonoids. The extraction time of flavonoids from 30 to 135 minutes of incubation time flavonoidl within 105 minutes while studying the effect on efficiency It was determined that ar can be completely obtained from plant materials. When choosing the degree of grinding, the diameter of plant holes is 0.5; 1.0; 2.0; 3.0; They used 4.0 and 5.0 mm raw material particles. From the obtained data, it is known that the maximum extraction of flavonoids from the plant is achieved by grinding the raw material to a particle size of 2.0 mm. is carried out (the number of flavonoids is 1.93 mg).

Conclusion: A method of extracting dry extract and flavonoid content from the plant *Physalis alkekengi* was developed. The methods of obtaining biologically active substances of the medicinal plant *Physalis alkekengi* were analyzed. The optimal conditions for obtaining flavonoids of the studied object were selected. 80% ethyl alcohol with 0 mm raw material particles was optimal for the extraction of flavonoids, and the raw material: extractant ratio was 1:100, and the extraction time was 105 minutes.

STUDY OF THE PROCESSES OF OBTAINING PECTIN FROM TWO PLANT SPECIES OF THE GENUS *Crataegus*

M.S. Zokirova[1], M.Kh. Malikova[2], E.Kh. Botirov[2]

1) Tashkent Institute of Chemical Technology, Tashkent, Uzbekistan,
e-mail: mashxuratkti@mail.ru
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substance, Academy of Science of the Republic of Uzbekistan

Crataegus is a genus of deciduous, rarely semi-evergreen tall shrubs or small trees belonging to the *Rosaceae* family, represented by more than 300 species, 10 of which grow in the mountainous and foothill regions of Uzbekistan. Representatives of the genus are widely used as an ornamental and medicinal plant, the fruits are eaten and are rich in pectin [1]. We have studied the fruits of *C. songarica* and *C. turkestanica* as a possible source of obtaining pectin substances. The output of pectin substances from the fruits of the above species is 9.6% and 11.2%, respectively.

It has been established that the pectin substances of the two studied species of *Crataégus* do not differ in their qualitative monosaccharide composition and, along with uronic acids, contain galactose, glucose, arabinose, xylose and rhamnose. There are differences in the quantitative content of these monosaccharides, however, uronic acids and arabinose are predominant.

Solutions of pectin substances from hawthorn fruits with iodine solution give a characteristic blue color, which indicates the presence of starch-type glucans.

The data of titrimetric analysis show that the pectins of the studied species of hawthorn are characterized by a high content of esterified carboxyl groups. Analysis of the IR spectra of pectin substances from the fruits of *C. songarica* and *C. turkestanica* shows that the studied biopolymers are carboxypolysaccharides with the main α–1→4 glycosidic bond in the main chain. Determination of the relative viscosity (η_{rel}) on an Oswald viscometer shows that the relative viscosity of pectin substances *C. songarica* and *C. turkestanica* are η_{rel}= 2.03 and 6.56, respectively.

Determination of the molecular weights of samples of pectin substances by the method of universal calibration gel chromatography shows that the pectin isolated from *C. songarica* consists of three components and its total molecular weight is 110,630 Da. Pectin isolated from *C. turcistanica* consists of 2 components, with the molecular weight of the first component being 100,000 Da and the second component being 10,000 Da.

The fruits of the studied species of *Crataégus* are rich in pectin substances and, according to their physicochemical parameters, they can be used in food production and medical industries.

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STRUCTURAL ELUCIDATION OF TRITERPENE GLYCOSIDE FROM THE ROOTS OF *Allochrusa gypsophiloides*

R.Z. Mamadalieva, V.U. Khujaev

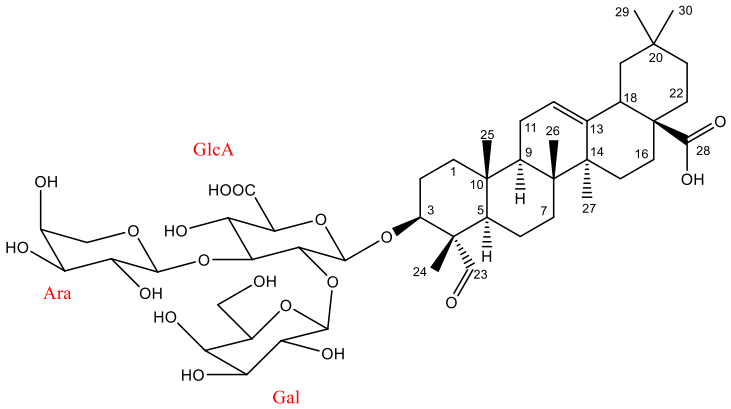
Kokand State Pedagogical Institute, Kokand 713000, Turon str. 23, Uzbekistan
e-mail: rmamadalieva@yahoo.com

Allochrusa is a genus in the *Caryophyllaceae* family, which previously was included in the genus *Acanthophyllum*. *Allochrusa gypsophiloides* (Regel) Schischk. is the best known endemic saponin-bearing plant of Central Asia. This species has been known as a valuable source of saponins in Uzbekistan and Kazakhstan and has been exported for a long time. *Allochrusa* are a rich source of triterpene glycosides with diverse chemical structures and physiological activities.

A. gypsophiloides is represented natural resource of the metabolites, especially triterpene saponins and polysaccharides. Although, there are some reports about bisdesmoside glycosides (acanthophyllosides B, C, and D) in this plant, chemical investigations have not completed on *A. gypsophiloides* yet. Therefore, the study of root material led to the isolation of one triterpene glycosides not described previously in this plant. The structural elucidation of this triterpenoid saponin was based on mass-, NMR spectroscopic techniques.

The roots of *A. gypsophiloides* were grounded and powdered afterward. The saponins were extracted using ultrasonic bath with MeOH (80%) at room temperature. The extract was then filtered and evaporated. The dried methanol extract was subjected to Diaion HP20 column chromatography, and the extract was eluted by H_2O/MeOH gradients with increasing polarity to 100% MeOH. Triterpene glycosides-containing subfractions was chromatographed and compound **1** was obtained.

Triterpene glycoside (**1**) was obtained from *A. gypsophiloides*. The structure of this triterpenoid was elucidated as gypsogenin 3-*O*-α-L-arabinopyranosyl-(1→3)-[β-*D*-galactopyranosyl-(1→2)]-β-*D*-glucuronopyranoside by comprehensive 1 D and 2 D NMR experiments, as well as high-resolution mass spectrometry. This compound was previously isolated from *Gypsophila trichotoma*.



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Triterpenes comprise one of the most interesting groups of natural products because of their high potential as pharmacological agents. On the basis of mass spectra and NMR data, one known saponin was identified for the first time in the *A. gypsophiloides* roots.

EVALUATION QUALITY OF THE DRY EXTRACT OBTAINED ON THE BASIS CELANDINE

N.B. Abdunazarova, E.S. Karieva

Tashkent Pharmaceutical Institute, Tashkent, Oybek, 45

Celandine - *Chelidonium majus L.* - belongs to the *Papaveraceae* family. Celandine grows on cool lands, among shrubs, on forest edges, in ravines, in places, in settlements, in gardens and fields. The celandine plant is found in Europe, Altai, Central Asia, Siberia and the Far East. It grows in small groups, but in some cases, it can also form thickets. Celandine loves moist and fertile soils.

The celandine plant exhibits such pharmacological effects as antimicrobial, antiviral, anti-inflammatory, antispasmodic. Dry extracts obtained from medicinal plants are used for new drugs. Based on this, a dry extract was obtained from grass celandine.

The resulting extract was evaluated according to the following parameters: appearance, exposure, weight loss on drying, moisture content, amount of heavy metals, microbiological purity and quantitative determination of the amount of alkaloids. These studies were identified using the methods presented in the following regulatory documents: "UzR SF I, RF SF XIV, IPA.1.4.1.21 "Extracts", European Pharmacopoeia, 9^{th} edition "Extracts"".

Based on the results obtained, the extract is a brown powder with a specific odor. Its authenticity was determined by carrying out quality tests on the main influencing substance, i.e. alkaloids. Under the influence of 10% sulfate and silicon tungstic acid, a white-yellowish precipitate precipitated.

According to the requirements of regulatory documents, during drying, the mass loss should not exceed 5%. In the analyzed dry extract, this index was 3.92%.

The color of the prepared solution for determining the amount of heavy metals, the color of the solution is not darker than the color of the standard solution, that is, the dry extract, which is also analyzed for this indicator, corresponds the requirements of Normative Documents.

No bacteria were found in 1 g of dry extract of *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli*. It was found that the total number of aerobic microorganisms is no more than 10^4 KOE, yeast and mold fungi - from 10^2 KOE, bile-resistant enterobacteria - no more than 10^2 KOE.

To determine the amount of accumulation of alkaloids in relation to the chelidonin contained in the dry extract of celandine, the method presented in the pharmacopoeia was used: this index was 1.3%.

According to the results of the studies, the dry extract of the celandine according to the indicators corresponds to the qualitative and quantitative requirements of the current normative documents. In the future, the dry extract is planned to be used as the basis for obtaining a wound healing and anti-inflammatory ointment.

OBTAINING A PHYSIOLOGICALLY ACTIVE SUBSTANCE FROM THE WASTE OF A COTTON CLEANING PLANT

O.O. Rakhmonov, J.S. Shukurov, A.S. Togasharov

The Institute of General and Inorganic Chemistry of AcSc RUz,
e-mail: oxunjonrahmonov94@gmail.com

Cotton defoliation is considered one of the important agrochemical measures, it allows you to immediately harvest a rich crop grown throughout the year. As a result of defoliation based on organic preparations, young bolls die before opening, the quality of the cotton fiber decreases and the oil content of the seeds decreases. This leads to the loss of 1.5÷2 centners of yield per hectare. Therefore, by adding compounds with physiological activity to the composition of inorganic defoliants, it is advisable to create new generation defoliants.

Considering the above, for the physico-chemical justification of obtaining defoliants with physiological activity, the processes of extraction of waste from a cotton cleaning plant using hydrochloric acid and neutralization of the obtained acid extracts with monoethanolamine were studied, and on their basis optimal conditions for obtaining physiologically active substances were determined.

The process of extraction of waste from a cotton cleaning plant at various concentrations of hydrochloric acid was investigated. Optimal parameters of the acidic product extraction process have been established. According to the research results, the crystallization temperature is -3.5 °C, the refractive index of light is n-1.3382, the density is 1.019 g/cm^3, the viscosity is 1.014 mm^2/C, and the pH value of the medium is 0.65.

Chemical analysis of the resulting acidic extract revealed the presence of carboxylic acids and an excess of hydrochloric acid. To obtain a physiologically active substance, the acidic extract was neutralized with monoethanolamine. For neutralization, 2.2 % monoethanolamine was used. The pH value of the resulting product was 7.0. A change in the density of solutions from 1.019 to 1.015 g/cm^3, and viscosity from 1.014 to 1.059 mm^2/s was observed.

The solution was evaporated to increase the concentration of the physiologically active substance obtained in the liquid state. The process was carried out in a rotary evaporator (RE100-Pro), equipped with a vacuum pump (diaphragm vacuum pump LH-95D/C).

Evaporation of the solution was carried out at temperatures of 70, 85 and 100°C, sampling of the solution was performed periodically at certain intervals, and after analyzing the salt content, a graphical dependence was built in coordinates.

It has been found that the higher the temperature, the higher the rate of water evaporation. The optimal temperature is 100ºC, since at this temperature, after 30 minutes, due to the evaporation of 39.45 % of water, a physiologically active substance with an active substance content of 56.2 % was obtained.

SEC LIQUID CHROMATOGRAPHY OF CISTANCHE *Salsa* POLYSACCHARIDES

Sh.Sh. Orazova[1], G.E. Berdimbetova[1], A.S. Boymirzaev[2], T.R. Egamberdiev[1], K.S. Jaunbaeva[3]

1) Karakalpak Research Institute of Natural Sciences of the Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan, Nukus
2) Namangan Institute of Engineering and Technology, Uzbekistan
Nukus, st. Berdak №41, e-mail: shaxnoza.orazova@bk.ru, *tel. (97) 474 2212*
3) S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Acaderny of Sciences of the Republic of Uzbekistan, e-mail: kzhauynbaeva@inbox.ru

In recent years, *Cistanche salsa* (C.A. May) Beck has been actively studied in the field of vision, medicine and pharmaceuticals, as it contains various biologically active substances, including polysaccharides, phenolic compounds and a large number of flavonoids. Polysaccharides differ in their structure, physicochemical properties, etc. Monosaccharide composition, type of glycosidic bond, molecular weight and solubility in water or alkali. Biological activity depends on molecular parameters and structure. An analysis of the literature showed that information on the polysaccharides of many representatives of the genus *Cistanche salsa* (C.A. May) Beck is limited or absent, so it is necessary to study the molecular weight of the polysaccharide of this genus.

The purpose of the study is to determine the physicochemical properties of polysaccharides in the aerial part of the cistanche.

For the study, the aerial part of the *Cistanche salsa* plant, collected in April 2022 in the Nazarkhan forestry of the Kipchak department of the Amudarya district of the Republic of Karakalpakstan, was taken.

Size exclusion liquid chromatography (SLC) of the obtained polysaccharides WSP and PS was performed on an Agilent 1260 Infinity high-speed liquid chromatograph (USA) with a refractometric detector. TSK GM PW XL was used as a sorbent with a linear calibration dependence in the molecular weight separation range from 1102 to 2106. The eluent flow rate was 0.8 ml/min. The volume of the injected sample is 25 μl. The chromatographic data were processed using the Windows Chemstation 7 program. A 0.1 M aqueous solution of sodium nitrate served as the eluent. Gel chromatograms of two samples consist of three fractions of polysaccharides in the aerial part of cistanche. 1 - the peak on the chromatogram characterizes pectin with a molecular weight of 12 kDa, the remaining fractions are oligosaccharides with 3 and 1 kDa, respectively. Shown are gel chromatograms of two samples obtained from the aerial part of cistanche, consisting of three chromatographic peaks of polysaccharide fractions with molecular weights of 25, 3 and 1 kDa. pectin substances isolated from the underground part of cistanche have a higher molecular weight (25 kDa) than from the aboveground part. However, in the samples of polysaccharides isolated from the aboveground and underground parts of the cistanche, there are fractions of oligosaccharides with an MM of 3 kDa and 1 kDa. To calculate the average MW of the samples, the universal Benois calibration dependence for pectin substances and pullulan standards was used. The following Mark-Kuhn-Houwink equations for pulluans were used to construct the ICP: $[\eta]=1.9\ 10\text{-}4\ M0.67$; for pectins $[\eta]= 0.18\ 10\text{-}4\ M0.99$ in water.

POLYMERIC PREPARATION FOR THE TREATMENT AND PREVENTION OF GYNECOLOGICAL DISEASES IN FARM ANIMALS

T.M. Babaev, M.M. Karimov, Z.X. Urinova

Samarkand University of Veterinary Medicine, Animal Husbandry and Biotechnology. Uzbekistan, Samarkand. 702138. e-mail: Samvmi.uz/uz

This report is devoted to the development of polymer compositions of anti-inflammatory drugs based on polycomplexes, the development of formulations and technology for the production of a polymer suspension, as well as a foaming composition for the treatment and prevention of obstetric and gynecological diseases in agricultural animals. Dosage forms of polymer compositions were prepared in the form of a suspension (CARBOKAZ), i.e., polymeric complex mixtures of preparations with a wide spectrum of antibacterial action based on azidine or diamidine and foaming tablets. The main criteria for assessing the quality of such tablets are strength, low abrasion, disintegration and abundant foaming, as well as the indifference of excipients. For abundant foaming, various water-soluble low-toxic polymers were tested, such as polyacrylamide and sodium salt of carboxymethyl cellulose (Na-CMC) with molecular weights of 7000 and 54000. As medicinal substances, a composition (diamidinetonium-furatsilin) was used, which is used in UzNIVI for the treatment of gynecological diseases of a large cattle, and as gas-forming disintegrants, a mixture of sodium bicarbonate with citric acid. As a filler, in a model tablet, glucose was used, a humectant 10% aqueous solution of polyglucin, and a lubricating agent talc. It has been established that the volume of foam formed from a model tablet reaches 12 cm^3 and decreases with an increase in the content of citric acid. The maximum foam volume is formed when the content of citric acid in the model tablet is 22.5%. The effective foaming time is 9 minutes. To increase the foam volume when combining drugs with a model tablet, we chose Na-CMC and polyacrylamide. The volume of foam formed from a model tablet when polyacrylamide is used as a moisturizer reaches up to 8.4 cm^3. With an increase in the amount of citric acid in the composition of the model, foaming decreases. An abnormal foaming pattern is observed in a 10% aqueous solution of polyacrylamide, where foaming reaches up to 40.8 cm^3, but with an increase in the amount of citric acid in the tablet to 29%, it decreases to 10.8 cm^3). Apparently, in this case, the determining role is played by a high concentration of polyacrylamide, which creates a viscous environment, which favors the formation of abundant foam. At the same time, the time of complete disintegration of the tablet also increases, which reaches 30 minutes. It should be noted that when medicinal substances are added to the model tablet, foaming decreases sharply.

And in this case, the reason for this, apparently, is a sharp increase in the viscosity of the medium, which confirms the increase in the time of complete disintegration of the tablet to 39 minutes. The above was confirmed when using polyacrylamide with a molecular weight of 54,000 as a humidifier. These data indicate that water-soluble polymers polyacrylamide and Na-CMC are suitable as additives in the preparation of foaming tablets and they have a number of advantages over polyglucin recommended in the literature.

DETERMINATION OF DEOXYNIVALENOL AND ZEARALENONE IN FOOD PRODUCTS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

A.A. Tojikulov, Kh.Kh. Kushiev, T.A. Djuraev, M.S. Khudoynazarov

Gulistan State University, Gulistan, Uzbekistan

Identification and monitoring of mucotoxins with mutagenic, teratogenic and carcinogenic properties in the food and pharmaceutical industry are topical issues. Therefore, the study of concomitant contamination of grain crops with mycotoxins, the collection and analysis of data on the degree and frequency of their detection are an important basis for assessing the risk to public health and developing measures to reduce it. This work provides information on mycotoxin contamination of wheat, corn, barley, oats and rye grains in Uzbekistan. These include mycotoxins deoxynivalenol (DON), toxin T-2 (T-2), zearalenone (ZON), fumonicins B1 and B2 (fw1, fw2), aflatoxin B1 (AFL B1), otatoxin a (OTA), which are often found in plant grains. In this study, samples of plant grains (corn, rice, barley and wheat) were analyzed using high-performance liquid chromatography (HPLC) spectrometric method for the presence of DON and ZON damage. DON and ZON are two of the five most important natural mycotoxins secreted by *Fusarium* fungi. According to the results of the analysis, a quantitative limit of toxins was established based on the established order. At the same time, the limit of the amount is from 40 to 100 μg/ml for grain and from 5 to 50 μg/ml for the zone.

Chromatographic analysis has performed in Agilent 1260 Infinity II Rapid Resolution Liquid system. In this case, the pump G7111A 1260 Quat Pump VL, vialsampler G7129A 1260 is an autosampler, the UV-VIS array detector G7115A 1260 DAD and G7121A 1260 FLD were used in Chem Station program. For better dissolution of solutions, an ultrasonic bath "Guangdong gt ultrasonic" was used. HPLC pump flow rate 0,8 ml/min, thermostat temperature 30°C, DON mobile phase; Acetonitrile/water in a ratio of 50:50, ZON mobile phase in a ratio of 70:30 at 0,8 ml/min, injection volume 5 mcl, DON 210 nm, and ZON 240 nm in DAD detector, Infinity Lab Poroshel 20 EC-C18 (150 mm x 4,6 mm, 4 microns (Agilent Technologies USA) analytical report on the program" Chemstation".

It has been observed that the correlation coefficient is greater than 0.99 based on hummingbird reference samples. The standard linearity and correlation coefficients adopted for the drawn ZON and DON using calibration solutions are defined as 0,99999 for ZON and 0.99981 for DON (Table 1). In standard samples of the linearity curve of the method for ZON at different four levels of 5,10,20 and 25 μg/ml, with a quantitative limit for ZON at three levels of 20, 40 and 100 μg/ml, a calibration curve was obtained.

Based on the results obtained, we have noted that ZON was found only in barley grains with a quantitative index of 3.56 μg/ml. While the quantitative DON index of rice, corn, and wheat participating in the studies were found in plant grain samples, it was noted that they contained 6.8 μg/ml in rice, 174.34 μg/ml in corn and 67.2 μg/ml in wheat. This will be cost-effective in safety and quality assurance programs.

ANTIMICROBIAL ACTIVITIES OF EXTRACTS OF ENDOPHYTIC FUNGI ISOLATED FROM *CIRSIUM VULGARE*

F.B. Eshboev, A.A. Abdurashidov, Kh.Kh. Dolimov, M. Tojieva, J.M. Abdurakhmanov, M. Murodova, A. Saydalieva, E.G. Yusupova, G.A. Piyakina, Sh. S. Azimova

S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, 100170, Tashkent, Mirzo Ulugbek str. 77

Antibiotic resistance is an important issue due to the frequent use of antibiotics for treatment common bacterial infections, indicating that we are running out of effective antibiotics. Endophytes are known to produce a diverse range of natural products, which could prove to be a consistent and successful source of drugs. Thus, the study of endophytic microbes has great potential within the pharmaceutical industry. Therefore, the aim of the research was study of antibacterial and antifungal activities of the extracts of endophytic fungi isolated from *Cirsium vulgare.*

For the isolation of endophytic fungi, the *Cirsium vulgare* leaves were surface sterilized and leaves were cut into 0.5 cm × 0.5 cm pieces and placed on agar media supplemented with antibiotic and incubated at 28 ± 2 °C until fungal growth was initiated. The fungal isolates were cultured into (5 × 250 mL) conical flasks containing potato dextrose broth for 15 days at 28 °C with 180 rpm of continuous shaking. After that, fungal mycelia were extracted three times with an equal volume of ethyl acetate (EtOAc). The EtOAc extracts were evaporated to obtain crude EtOAc extracts. Finally, antimicrobial activities of EtOAc extracts of fungal isolates from *Cirsium vulgare* against *Staphylococcus aureus* (ATCC 25923), *Bacillus subtilis* (RKMUz - 5); *Pseudomonas aeruginosa* (ATCC 27879), *Escherichia coli* (RKMUz - 221) and the yeast *Candida albicans* (RKMUz - 247) were carried out.

In this study, two fungal isolates isolated from the *Cirsium vulgare* leaves and antimicrobial activities of their EtOAc extracts were conducted. According to the results, the extracts of isolate I, and isolate II were showed appreciable (12-15 mm) and pronounced (9-10 mm) activities against Gram-positive Bacteria *Staphylococcus aureus* and *Bacillus subtilis* respectively. The extracts were showed appreciable (10-13 mm) activities against Gramm negative bacteria *Pseudomonas aeruginosa*. However, the extracts were not showed activities against *Candida albicans*. Nowadays, we are working on the molecular identification of active isolates and the chemical composition of the fungal extracts.

CLONNING OF RECOMBINANT PLASMID pPICZαA-TP, ENCODING THE THYMIDINE PHOSPHORYLASE IN *Pichia pastoris* YEAST

J.M. Abdurakhmanov, S.A. Sasmakov, Sh.Sh. Hasanov, O.N. Ashirov, F.B. Eshboev, Kh. Dolimov, S. Gaynazarova, Sh.S. Azimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: jaloliddin0919@mail.ru, +998971579944

Nowadays, viral, bacterial infections, as well as oncological diseases are the most important health problems in the world. The use of modified nucleosides to solve these problems is hotly debated by the world's leading scientists. Many preparations based on modified nucleosides are obtained by methods of multi-stage chemical synthesis, which has a number of significant drawbacks. At the same time, the biotechnological method for the synthesis of nucleosides using genetically engineered nucleoside phosphorylases makes it possible to replace chemical synthesis with enzymatic synthesis. These enzymes simultaneously catalyze the hydrolysis and transglycosylation of carbohydrate-containing heterocyclic compounds. For this purpose, bacterial cell lysates or purified recombinant enzymes are used such as uridine-UP, thymidine-TP, pyrimidine (PyNP), purine nucleoside phosphorylase (PNP) or N-deoxyribosyltransferase (N-DRT). Recent research results have shown that *Escherichia coli* thymidine phosphorylase (*Ec*TP, EC 2.4.2.4) can be successfully used for the biocatalytic derivatization of heterocyclic nitrogen containing bases.

Particularly promising is the production of the thymidine phosphorylase enzyme using the *Pichia pastoris* yeast expression system, which is free of endogenous and pyrogenic compounds and has a high ability to synthesize recombinant protein. Based on this, the aim of this work is to clone a recombinant plasmid encoding *Escherichia coli* thymidine phosphorylase (*Ec*TP) in the *Pichia pastoris* expression system.

During our research, cDNA - thymidine phosphorylase (deoA gene, insert), 1326 bp in size, was amplified by PCR using genomic DNA isolated from *Escherichia coli* strain cells RKMUz – 221 as a template using the following primers (a patent application has been filed for these primers):

1) Forward – 5’- XXXXXXXTTCATGTTGTTTCTCGCACAA -3’

2) Reverse – 5’- XXXXXXXAGATTATTCGCTGATACGG -3’

In the process, FastDigest *EcoRI* and FastDigest *XbaI* (Thermo Scientific, USA) enzymes were used as restriction enzymes and eventually, based on the transfer vector pPICZαA the recombinant plasmid DNA pPICZαA-TP (4862 bp) containing cDNA (deoA gene, 1326 bp) of the thymidine phosphorylase (*Ec*TP) of *E. coli* were constructed.

So, the cloned new plasmid pPICZαA-TP can be used for expression of recombinant thymidine phosphorylase (*Ec*TP, EC 2.4.2.4) enzyme in *Pichia pastoris* yeast.

Fund: The study was carried out within the framework of project F-FA-2021-360, Ministry of Innovative Development of the Republic of Uzbekistan.

CLONNING OF RECOMBINANT PLASMID pPICZαA-PNP, ENCODING THE PURINE NUCLEOSIDE PHOSPHORYLASE (PNP) IN *PICHIA PASTORIS*

J.M. Abdurakhmanov, S.A. Sasmakov, Sh.Sh. Khasanov, O.N. Ashirov, F.B. Eshboev, Kh. Dolimov, T. Sadullaev, A. Yarilkaganova, S. Gaynazarova, Sh.S. Azimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: genlab_icps@yahoo.com

Modified nucleosides are heterocyclic nitrogenous bases of natural or synthetic origin containing monosaccharides - cyclic pentoses. Nucleoside analogs can be synthesized by chemical or enzymatic methods, or a combination of these methods. The enzymatic transglycosylation / (or) hydrolysis reaction is usually carried out at 50°C to inhibit other enzymes such as deaminases. At this temperature, some nucleoside phosphorylases retain most of their activity. It has been shown in the literature that *Escherichia coli* purine nucleoside phosphorylase (EC 2.4.2.1) is currently successfully used for the biocatalytic preparation of N-β-*D*-ribofuranosyl derivatives of heterocyclic nitrogen-containing bases.

The use of microorganisms producing nucleoside phosphorylases for the synthesis of modified nucleosides of biological and pharmaceutical importance has proved to be highly effective. At present, one of the most advanced expression systems that allow to obtain recombinant proteins on an industrial scale is the yeast system of *Pichia pastoris*. Considering the above information, the aim of this work is to clone a recombinant plasmid encoding *Escherichia coli* purine nucleoside phosphorylase (PNP) in the *Pichia pastoris* expression system.

Purine nucleoside phosphorylase cDNA (deoD gene, insert), size of 720 bp was amplified by PCR using as a template genomic DNA isolated from cells of *Escherichia coli* strain RKMUz - 221 (the strain was obtained from the collection of industrial microorganisms of the Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan) using the following primers (a patent application has been filed for these primers):

1) Forward – 5'- XXXXXXXATGCTACCCCACACATTAATGC -3'
2) Reverse – 5'- XXXXXXTTACTCTTTATCGCCCAGCAGAAC -3'

The amplificon (insert) was purified by precipitation with 0.5 M magnesium chloride (in final concentration 0.05 M) and 96% ethanol (in final concentration 70%).

One μg of the transfer vector pPICZαA and PCR amplificates were sequentially treated with FastDigest *EcoRI* and FastDigest *XbaI* restrictases (Thermo Scientific, USA). Ligation of the pPICZαA vector with the target gene - purine nucleoside phosphorylase was carried out in a volume of 10 μl in a molar ratio of 1:3, respectively, using recombinant T4 DNA Ligase (Invitrogen).

In conclusion, the cloned new plasmid pPICZαA-PNP can be used for expression of recombinant purine nucleoside phosphorylase (PNP, EC 2.4.2.1) enzyme in *Pichia pastoris.*

Fund: The study was carried out within the framework of project F-FA-2021-360, Ministry of Innovative Development of the Republic of Uzbekistan.

OBTAINING RECOMBINANT BACULOVIRUSES IN Bac-to-Bac® PLATFORM

Sh.Sh. Khasanov, M.Sh. Shukurjonov, J.M. Abdurakhmanov, O.N. Ashirov, F.B. Eshboev, S.A. Gaynazarova, S.A. Sasmakov, Sh.S. Azimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: genlab_icps@yahoo.com

Usually, for construction of recombinant baculoviruses for highly efficient expression of a foreign gene the cDNA of this gene is ligated with plasmid DNA containing a viral DNA fragment. Also, the target cDNA is inserted under the control of a strong viral polyhedrin gene promoter [1]. To obtain a recombinant baculovirus the insect cells are infected simultaneously with the recombinant plasmid and wild-type baculovirus. Recombination between homologous sequences of viral and plasmid DNA leads to the replacement of the polyhedrin gene in wild-type viral DNA with plasmid sequences containing foreign cDNA [2]. Today, these processes cause several difficulties. We have chosen the relatively easy-to-use Bac-to-Bac® platform. The Bac-to-Bac® Baculovirus Expression System provides a rapid and efficient method to generate recombinant baculoviruses. This method is based on site-specific transposition of an expression cassette into a baculovirus shuttle vector (bacmid) propagated in Escherichia coli.

In our experiments, we obtained a recombinant baculovirus (bacmid) using the *Escherichia coli* host strain DH10Bac™ and the pFastBac™ genetic construct containing a baculovirus vector (bacmid) and a helper plasmid. We generated recombinant baculoviruses using the MAX Efficiency® DH10Bac™ chemically competent cells (Transform Aid Bacterial Transformation Kit). The LB agar plates containing 60 μg/ml kanamycin, 7 μg/ml gentamicin and 15 μg/ml tetracycline used to select DH10Bac™ recombinant transformants. To verify the presence of gene of interest in the recombinant bacmid the PCR assay is performed. The size of obtained recombinant bacmid DNA is greater than 135 kb.

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COMPONENTS OF THE BAC-TO-BAC® BACULOVIRUS EXPRESSION SYSTEM

M. Shukurjonov, Sh. Khasanov, J. Abdurakhmanov, O. Ashirov, S. Gaynazarova, N. Tosheva, S. Sasmakov, Sh. Azimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: genlab_icps@yahoo.com

Nowadays, the Bac-to-Bac® Baculovirus Expression System facilitates rapid and efficient generation of recombinant baculoviruses. Recombinant proteins produced by baculovirus expression systems are almost indistinguishable from their natural analogs by their functional properties, i.e. they have the correct post-translational modification, and at the same time this system is characterized by high quantitative product yield. Using insect baculoviruses cells for protein expression is safe for humans or other mammals, since they are not pathogenic [1-2]. The Bac-to Bac® Baculovirus Expression System takes advantage of the site-specific transposition properties of the Tn7 transposon to simplify and enhance the process of generating recombinant bacmid DNA.

In our experiments, we started selecting the DH10Bac™ Escherichia coli strain to be used as a host for our System component pFastBac™ vector. DH10Bac™ cells contain a baculovirus vector (bacmid) with a mini-attTn7 targeting site and a helper plasmid. After the pFastBac™ expression plasmid is transformed into DH10Bac™ cells, transposition occurs between the mini-Tn7 element in the pFastBac™ vector and the mini-attTn7 target site in the bacmid to generate recombinant bacmid. This transposition reaction takes place in the presence of transposition proteins provided by the helper plasmid. This greatly simplifies subsequent research.

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GROWTH AND MAINTENANCE STUDIES OF VERO CELL LINES

N. Tosheva, Sh. Khasanov, J. Abdurakhmanov, O. Ashirov, S. Sasmakov, E. Yusupova, Sh. Azimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: genlab_icps@yahoo.com

Vero cells are derived from the kidney of the African green monkey and are one of the most frequently used continuous mammalian cell lines in microbiology and molecular and cell biology research. Vero cells have been licensed in the United States for production of both live (rotavirus, smallpox) and inactivated (poliovirus) viral vaccines, and throughout the world Vero cells have been used for the production of a number of other viruses, including Rabies virus, Reovirus and Japanese encephalitis virus. The protocols outlined in this appendix detail procedures for the routine growth and maintenance of Vero cells in a research laboratory setting. In our study, we investigated the growth conditions of Vero cell lines under laboratory conditions.

For long-term storage, Vero cells are stored in liquid nitrogen or at -80°C. We investigated the optimal conditions for growing Vero cells obtained from frozen stocks.

The vial (cryovial) of Vero cells was rapidly thawed by gently swirling in a 38°C water bath. We transferred the Vero cell suspension from a cryovial to a 15 ml conical tube containing 5 ml DMEM supplemented with FBS. Pelleted cells were centrifuged at 300 × g for 4 min at room temperature. The supernatant was removed and 5 ml of DMEM supplemented with 10% FBS was added. After freezing, Vero cells are best recovered in a small (25 sm^2 or 50 sm^2) tissue culture flask. We used 25 sm^2 flasks, resuspended the cells in 5 ml medium. The flasks were incubated in an incubator at 37°C with 5% CO2. Cells are monitored daily. The media is changed every 2-4 days. When cells reach more than 90% confluent monolayer, cells are transferred to new tissue culture flasks.

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INFLUENCE OF MELTING TEMPERATURE (TM) ON THE EFFICIENCY OF PCR REACTION IN GENE EXPRESSION STUDY

A.A. Makhnev, A.B. Baimirzaev, E.A. Makhneva, D.R. Mansurov, Kh.Z. Nasriddinov, O.B. Alimukhamedova, G.A. Piakina

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

The study of gene expression allows us to understand what biochemical processes occur in the body, how they are associated with various diseases (oncological, genetic) and the mechanism of action of drugs. For this, quantitative real-time PCR analysis is used using fluorescently labelled oligonucleotides or intercalating dyes. The level of gene expression is assessed by the values of threshold cycles (Ct) - the cycle at which the growth of the fluorescent signal occurs. The earlier the threshold cycle occurs, the higher the gene expression level.

The reliability of quantitative assessment of the level of expression of the studied genes depends on the efficiency and accuracy of the developed PCR analysis. One of such factors affecting the accuracy of PCR analysis is correctly selected primers, but, in addition, the melting temperature (Tm) of a specific DNA region being detected has a great influence on the analysis efficiency.

To study the effect of the GC composition of the amplified product on the efficiency of the PCR reaction, two pairs of primers for the GAPDH gene were designed, the expression level of which is determined to normalize the data in the study of various biological processes in the cell. Using the insilico method in the UGENE software, the first pair of primers GAPDHF002, CAAGAAGGTGGTGAAGCAGG; GAPDHR002, AGCGTCAAAGGTGGAGGAGT was designed to amplify a 118 bp gene region. with a melting point of 84 °C, the second pair of primers GAPDHF002, TGTTCCAATATGATTCCACCCA; GAPDHR002, TGGAAGATGGTGATGGGATTT amplify a 97 bp DNA fragment. with a melting point of 77 °C. Quantitative PCR analysis was performed using the designed primers and SYBRGreen intercalating dye on RNA samples isolated from cancer cultures of Hep cells (human hepatocellular carcinoma).

As a result of the obtained data on the value of threshold cycles (Ct) of PCR analysis, it was found that during amplification of the DNA region of the GAPDH gene with a melting temperature of 77 °C, the growth of the fluorescent signal occurs at the 8th threshold cycle (Ct). While during amplification of the DNA region with a melting temperature of 84 °C, the fluorescent signal increases at the 12th threshold cycle (Ct). This shows that the efficiency of the PCR reaction is higher when amplifying DNA products with a lower melting point. Thus, it has been established that in order to obtain more accurate results when studying gene expression by PCR analysis, it is important to take into account not only the sequence and temperature of the designed primers, but also the melting temperature of the DNA region being amplified.

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SYNTHESIS OF PARAMAGNETIC PARTICLES COATED WITH SIO_2 LAYER FOR DNA/RNA ISOLATION FROM BIOLOGICAL OBJECTS

A.A. Makhnev, A.B. Baimirzaev, E.A. Makhneva, D.R. Mansurov, Kh.Z. Nasriddinov, O.B. Alimukhamedova, S.A. Ikramov, Sh.S. Asimov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

The synthesis of paramagnetic particles coated with a layer of SiO_2 is a promising technology widely used in DNA/RNA isolation methods for molecular diagnostics of infectious and genetic diseases. The application of a paramagnetic sorbent makes it possible to reduce the complexity of the stages of nucleic acid isolation and to automate the process. The efficiency of DNA/RNA extraction by paramagnetic particles is directly affected by the SiO_2 surface layer. Therefore, to study the sorption properties of the paramagnetic sorbent, we synthesized magnetic particle A coated with one layer of SiO_2 and magnetic particle B after three reactions of SiO_2 synthesis.

The synthesis of paramagnetic particles was carried out according to the following protocol: 0.277 g of $FeSO_4 \cdot 7H_2O$, 0.541 g of $FeCl_3 \cdot 6H_2O$ were dissolved in 5 ml of distilled water, then 2 g of PEG-115 was added and the volume was adjusted to 10 ml with water. Incubated at room temperature for 30 min on a shaker with a rotation speed of 100 rpm. Subsequently, 3 g of urea was added to the solution and incubated for additional 1 hour at 50°C on a shaker with a rotation speed of 100 rpm. After incubation, 1.5 ml of 30% ammonia solution is gradually poured into the solution with stirring. As a result, Fe_3O_4 particles with paramagnetic properties were formed. The particles were washed with 50% ethanol. To synthesize the SiO_2 layer on the surface of the magnetic particles, TEOS (tetraethylorthosilicate) was used for the Stöber reaction. After the reaction, the paramagnetic particles were washed three times with 50% ethanol, and the Stöber reaction was carried out again.

The analysis of the sorption properties of the synthesized paramagnetic sorbent was carried out by isolating DNA from the *E. coli* cell culture using solutions of the SOREX-DNA commercial kit (ICPS, Uzbekistan) according to the instructions. The isolated bacterial DNA was analyzed by gel electrophoresis in 0.7% agarose gel.

As seen in fig. 1, in samples 1–4, a high-molecular fragment of genomic DNA is observed, while in samples 5 and 6 this DNA fragment is absent.

Thus, it has been established that the thickness of the SiO_2 surface layer affects the sorption properties of the paramagnetic sorbent.

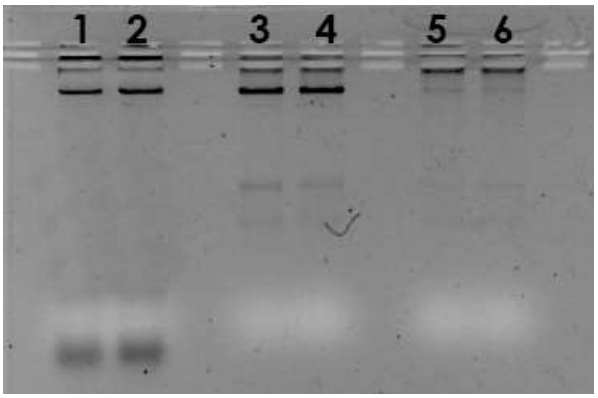

Figure 1. Gel electrophoresis of isolated *E. coli* genomic DNA

1,2 – genomic DNA isolated using Silicagel 5/40 sorbent

3,4 – genomic DNA isolated using a paramagnetic sorbent with a 3-fold coating of SiO_2 5,6 - genomic DNA isolated using paramagnetic sorbent with 1x SiO_2 coating

SCREENING FOR PHOSPHATE-SOLUBILIZING WHEAT RHIZOBACTERIA (*Triticum aestivum*)

G.X. Kadirova, M.S. Sadullayeva, T.S. Xusanov, T.E. Shonaxunov

Institute of Microbiology of the Academy of Sciences, Tashkent, Uzbekistan;
e-mail: kadirovagul@mail.ru

Soil fertility and sustainable agriculture are crucial for ensuring global food security. The majority of soils with high sorption capacity have scarce phosphorus (P) resources that fall far short of what agriculture needs, it is not enough agricultural fertility and productivity. Agricultural soils typically have a phosphorus content of 0.05%, of which only 0.1% is accessible to plants. Biological phosphate solubilization, which is carried out by soil microorganisms and facilitates the conversion of sparingly soluble phosphorus compounds into forms accessible to higher plants, is one of the potential approaches for increasing the phosphorus nutrition of agricultural crops.

The objective of this study is to identify and screen wheat (*Triticum aestivum* L.) phosphate-solubilizing rhizobacteria (FSR) for the capacity to produce acids.

More than 50 isolates (pure cultures) of FSR were found in the root zone of wheat (*Triticum aestivum* L.), which was grown in the Tashkent and Kashkadarya regions of the Republic in the cultivars "Asr," "Yaksart," and "Thunder." The dynamics of growth and development were demonstrated by 20 of the isolates isolated in pure culture, who were able to dissolve tricalcium phosphate on the Pikovsky nutritional medium with an indicator, generating a transparent zone. It has been determined that the *Acinebacter, Clostridium, Enterobacter, Pseudomonas, Bacillus, Exiguobacterium*, and *Serratia* genera contain the most active FSR strains. It is known that one of the main mechanisms recognized as responsible for the release of available forms of phosphorus by plants in the soil is the production of organic acids and an increase in the activity of acid phosphatases. Therefore, the next stage of the research was to determine the formation of total titratable acids by active FSR. It has been established that all studied FSR form organic acids, but the most active acid-forming cultures are *Acinebacter pittii* 1K, *Bacillus cereus* 11K, *Acinebacter pittii* 2K, *Enterobacter cloacae* 9K, *Exiguobacterium* sp.12K, *B. cereus* 16K, *Serratia marcescens* 21K, *E. cloacae* FA, *Pseudomonas aeruginosa* 23A, *P. aeruginosa* 28A, *E. cloacae* 34A and *B. subtilis* 35A. It should be noted that in the most active PS strains *S. marcescens* 21K and *P. aeruginosa* 23A, the total amount of titratable acids for 15 days remains at the level of 28.4 mg/ml to 36.0 mg/ml and from 14.6 to 32.4 mg/ml. Today, improving phosphate bioavailability for crop productivity is the main objective for sustainable agricultural development. Isolated local strains of FSR are extremely effective as biofertilizers in this situation because they boost phosphorus' bioavailability to plants, support sustainable agriculture, and enhance soil fertility and crop yields.

MICROORGANISMS IN SALINE SOIL AND THEIR ECOLOGICAL SIGNIFICANCE

R. Kuralova[1], M. Narmukhamedova[2], A. Usmonkulova[2]

1) Doctoral student at the Department of Biology of Gulistan State University
2) Institute of Microbiology of the Academy of Sciences, Tashkent, Uzbekistan

We can see that the beneficial microorganisms in the soil serve as the main medium in providing the nutrient elements necessary for plant growth and development, which in turn, is important in improving the ecological condition of the soil. However, their such properties and possibilities have not yet been fully utilised, especially in conditions of saline soil. Based on this, in this study, it is important to identify the types of microorganisms in the composition of saline soil.

This research work was carried out in the field of the farm "Boyovut zakhmatkash yeri" in Bayovut district of Syrdarya oblast. So, a soil sample from a layer of 0-30 cm of the saline farm field was taken with the aim of microbiological analysis and identification of endemic microorganisms.

Clean colonies of corresponding microorganisms growing on the surface of the nutrient medium were separated and identified according to morphological-cultural and biochemical features [1, 2]. According to the results obtained, the soil sample contained *Rodococcus, Bacillus, Sphingomonas, Pseudomonas* genus bacteria types and fungi of *Mucor* genus.

In the examined soil sample, microorganisms that grew in high titer were identified by generation and type using the classical microbiological and MALDI-Toff spectrometry method.

According to the results of the completed scientific research, it was noted that the contents of nitrogen fixator, phosphomobilizing agent, nitrification bacteria and actinomycetes in the examined soil sample are very low. At the same time, it was found that saline soil contains microorganisms of biological and ecological significance. These include *B. subtilis* type. The strains of this bacterium have been used in agriculture, medicine, veterinary fields. The strains of this bacterium is importance in increasing the resistance of plants to abiotic factors, including saline and pathogenic organisms, and in creating new biological preparations on its base. This in turn can help improve the biological and ecological characteristics of saline soils by increasing their fertility.

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PEPTIDES OF THE THYMOPTIN

U.J. Ishimov[1,2], Sh.S. Olimjonov[1], A.M. Ne'matova[2], J.F. Ziyavitdinov[1]

1) Institute of Bioorganic Chemistry, Academy of Sciences Republic of Uzbekistan, Tashkent
2) Tashkent chemical technological institute Republic of Uzbekistan, Tashkent.
e-mail: uchkunishimov@gmail.com

Currently, one of the priority areas in the development of effective drugs is the search and isolation of biologically active substances, in particular, of a protein-peptide nature, acting in extremely low concentrations.

Thymoptin, widely used to correct human immunity, consists of a mixture of acidic peptides isolated from the thymus of lambs or calves. The main thymoptin peptide, α1-thymosin, consists of 28 amino acid residues and has an MM of 3065 Da. Another high-abundant, β4 - thymosin, consists of 43 amino acid residues has an MM of 4982 Da. Thymopoetin consisting of 49 amino acid residues has an MM of 5561 Da.

To carry out thymoptin peptide mapping, the substance was fractionated by RP-HPLC on an Agilent Technologies 1200 instrument (USA) using a Nucleosil 5 C_{18} column (4.6 mm x 250 mm) in the isocratic mode of 97% acetonitrile in water. As a result, 6 individual peptides were obtained, which were eluted from the column in the time interval of 2-6 min.

The molecular weight of major peptides with retention times in the column of 2.54 (I), 2.71 (II), and 5.75 (III) min was determined on an Agilent Technologies 6530B Chip-HPLC-Q-TOF mass spectrometer. The molecular ion of the peptide - I was found at m/z 3065.5008, the peptide - II m/z 4919.4830, and the peptide - III m/z 5561.956. After trypsinolysis, MS/MS analyzes were performed and the exact molecular masses of fragment and daughter ions were determined. The obtained mass spectra were interpreted using the Mass COT and Spectrum Mill programs. As a result of the chromato-mass-spectrometric studies, the following fragmentary peptides were established: for peptide I with m/z: EVVEEAEN – 917.3978, SDAAVDTSSEITTK – 1406.6645, EKK – 385.2325, DLK– 356.206;

For peptide II with m/z: PDMAEIEK -913.4215, FDKSK- 605.3173, SDK - 331.1612, ETIEQEK– 857.4131, LKK – 369.274, NPLPSK – 636.3595, TETQEK – 716.3341, QAGES–490, 2023;

For peptide III with m/z: SQLVANNVTLPAGEQRK–1824.9926, SQFLEDPSVLTK–1363.7104, DVYVQLYLGTLTAVKR–1839.0375, GKLK–445.3133.

Using the Blast database, the complete primary structure and the name of the isolated major peptides of the Timoptin substance were established:

Peptide I – SDAAVDTSSEITTKDLKEKKEVVEEAEN – α1 - thymosin.

Peptide II – SDKPDMAEIEKFDKSKLKKTETQEKNPLPSKETIEQEKQAGES – β4 - thymosin.

Peptide III - SQFLEDPSVLTKGKLKSQLVANNVTLPAGEQRKDVYVQLYLGTLT-AVKRThymopoietin.

NOVEL ANTIOXIDANT PEPTIDES FROM THE CAMEL MILK HYDROLYSATES

U.J. Ishimov, Asrorov A.M, J.F. Ziyavitdinov

Institute of Bioorganic Chemistry, Academy of Sciences Republic of Uzbekistan, Tashkent
e-mail: uchkunishimov@gmail.com

Milk peptides have strong biological activities. Camel milk protein composition is different from those in cow, buffalo, sheep, goats, donkey and mare based on casein and raw protein proportion. In the present study, camel milk proteins were hydrolyzed using trypsin. The digested camel milk samples were then fractionated and further their antioxidant activities were determined using 2,2-diphenyl-1- picrylhydrazyl (DPPH) and 2,2′-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid ($ABTS^+$). Antioxidant activity test guided-fractionation allowed isolation of the three antioxidant peptides using ultrafiltration (3000 Da membrane), gel filtration chromatography, and RP-HPLC.

Camel milk was defatted by centrifugation at 10 000 rpm for 15 min using a high-speed centrifuge. Skimmed milk protein was hydrolyzed with trypsin enzyme under optimal conditions for 4 hours. The yield of isolated peptides made 82%. Camel milk peptides were fractionated and purified using a C18 Agilent column (ZORBAX 300SB-C18 25.0 cm × 9.4 mm, 5 μm; USA). Elution was monitored with an ultraviolet (UV) detector at 224 nm. The amino acid sequence and molecular weight of the separated peptide fractions were determined on an Agilent Technologies 6530B Chip-HPLC-Q-TOF mass spectrometer. The obtained mass spectra were interpreted using Mass COT and Spectrum Mill programs. As a result of chromato-mass spectrometric studies, the following fragment peptides were identified: F-1 - RLDGQGRPRVWLGR, F-2 - TPDNIDIWLGGIAEPQVKR and F-3 - VAYSDDGENWTEYRDQGAVEGK with MW 1665.94, 2122.13 and 2489.09 Da, respectively. The amino acid sequence search in databases showed that the peptides were novel.

The DPPH and $ABTS^+$ scavenging activities of three individual peptides (F-1, F-2, and F-3) were determined. IC_{50} values on DPPH were 1.9 for F-1, 1.2 for F-2, 0.6 mg/mL for F-3. Results on $ABTS^+$ made 2.4, 1.8 and 0.9 mg/mL respectively. F-3 exhibited higher DPPH and ABTS scavenging activity than other fractions.

OPTIMISATION OF ISOLATION OF PEPTIDES FROM *Latrodectus mactans* VENOM

Z.Zh. Mirakhmetova, N.R. Mukhamedov, M.B. Kayumov, Sh.Ya. Mirzaakhmedov

Institute of Bioorganic Chemistry, 100125, Tashkent, Mirzo Ulugbek str. 83.
e mail: mirzaakhmedov@mail.ru

Latrodectus mactans, known as a black widow is a venomous species of spider in the genus *Latrodectus*. Its venom contains small molecular mass compounds, peptides, and proteins. The venom arsenal can be used as a source of potential biologically active compounds which promise therapeutic application. Proteins of black widow venom are studied well. However, peptides of the venom are less studied so far.

Therefore, it is the subject of interest in our studies related to isolation, identification, and biological activity study of the peptides from venoms of spiders, scorpions, snakes, and reptiles. The aim of the research is the optimization of separation and isolation conditions of low molecular weight peptides from black widow venom. The following tasks were conducted: 1) studying of solubility of the venom; 2) depositing of proteins and peptides mixture; 3) ultrafiltration and/or gel-filtration of the venom in parallel manner and its precipitate; 4) comparative analysis of the fractions by HPLC.

The venom was dissolved in water, acidic (0.1 and 0.2 M ammonium acetate pH 4), and basic (0.1 and 0.2 M ammonium bicarbonate pH 8) buffers to check its solubility. The solubility was almost the same in the case of all three types of solvents. We selected acetate buffer as a solvent for further steps. Because low pH prevents hydrolysis of the components of venom by proteolytic enzymes. The deposition of proteins and peptides was conducted by adding ethanol to the solution of the venom. 60% of ethanol against water (v:v) was enough to precipitate.

Ultrafiltration was carried out using ultrafiltration membranes 10 kDa and 3 kDa sizes. >10 kDa, <10->3 kDa, and <3 kDa fractions of the venom and its ethanol precipitate were obtained. The fractions were lyophilized and stored at -20 ^{o}C.

Sephadex G-25 was used for gel filtration and five fractions were obtained in the result. The first fraction was of very high intensity which corresponds to proteins with large molecular masses, and the rest fractions of low intensity are considered to be peptides and low molecular weight compounds.

HPLC analysis of the venom, its ethanol precipitate and ethanol part and the fractions obtained by parallel ultra- and gel-filtrations was carried out using the C-18 column in the gradient mode of MeCN against 0.1 % TFA. HPLC profiles of all samples were analyzed using Origin software. The results indicated that peaks of high intensity with retention times 2.3, 13.7, 14.4, and 16.2 minutes belong to the low molecular weight compounds in the ethanol part. Therefore, it was found that working with ethanol precipitate which is free of low molecular weight compounds is preferred. HPLC profile of the ultra-filtration fractions of the precipitate did not demonstrate a significant difference from the precipitate itself or each other. In the case of gel-filtration fractions of 2, 3 and 4 had an increase of some peaks on their HPLC profile.

It can be concluded that working with peptides of black widow venom precipitated by ethanol lets us get rid of low molecular weight organic compounds and the separation of peptides by gel-filtration is more efficient compared to using ultra-filtration membranes.

PRIMARY STRUCTURE OF THE INSECTOTOXIN FROM THE SCORPION VENOM *Mesobuthus eupeus*

Sh.J. Fazliddinov[1,2], J.F. Ziyavitdinov[1], N.J. Sagdiev[1], U.J. Ishimov[1,2], Sh.Ya. Mirzaakhmedov[1]

1) Institute of Bioorganic Chemistry, 100125, Tashkent, Mirzo Ulugbek street 83.
2) Tashkent chemical technological institute, Tashkent. e-mail: Jamolitdin@mail.ru

Recently, special attention has been paid to the identification of insect-selective toxins that can be used to create recombinant biopesticides as an alternative to highly toxic chemicals for pest control. The aim of our work was to isolate and establish the structure of insectotoxin from the venom of the scorpion *Mesobuthus eupeus* subspecies.

According to RP-HPLC analysis, the whole venom of scorpion *M. eupeus* is a multicomponent mixture containing at least 65-70 different protein-peptide components. Non-toxic mucoproteins (<10% by weight of the total venom) were removed from the whole venom solution by centrifugation. The supernatant was separated by size exclusion chromatography on a TSK HW-55f gel column and cation exchange chromatography on a CM-TSK 650M. As a result of chromatographic separation, 17 fractions were obtained. Each fraction was preliminarily desalted and then tested for biological activity. Fraction ME-4-2 had the highest activity against mealworm larvae. In next step, the ME-4-2 fraction was separated by RP-HPLC on an Agilent Technologies 1200 instrument (USA) using a Nucleosil 5C18 column (4.6 mm x 250 mm) in a linear gradient of 0.1% TFA solution and acetonitrile. Detection was performed at 226 nm. As a result, 14 individual peptides were obtained, numbered as ME-4-2-1, ME-4-2-14. Fraction ME-4-2-7 at a dose of 5 mkg/g caused instantaneous paralysis of cockroaches, mealworms and bollworms. Therefore, the insectotoxin from the venom of the *M. eupeus* scorpion was given the designation BucalT.

The molecular mass of the toxin was determined on an Agilent Technologies 6530B Chip-HPLC Q-TOF MS/MS mass spectrometer and was 3830.16 Da. The molecular mass after reduction and carboxymethylation made 4232.75 Da. The difference of 402.59 Da led to the conclusion that BucalT contains eight cysteine residues, which confirms the results of the amino acid analysis. As a result of amino acid analysis, the following ratio PTC derivatives were found in the insectotoxin BucalT: Gly - 4, Ala - 3, Asx - 5, Glx - 1, Ser - 1, Met - 3, Thr - 2, Pro - 2, Cys - 8, Leu - 1, Phe - 2, Arg - 2, Lys - 2.

When determining the primary structure of BucaIT using automatic amino acid sequencing using the Edman method, the following sequence was determined:

MCMPCFTTDANMARKCSDCCGGNGKCFGPQCLCNRA

The C-terminal residue, Ala, was determined from the difference in the molecular mass of the sum of amino acids 1-35 and the total molecular weight of BucaIT insectotoxin.

Research to determine the disulfide bonds in the BucaIT insectotoxin molecule is going on.

EXPRESSION OF RECOMBINANT EXOINULINASE *Helianthus tuberosus* IN *Pichia pastoris* GS115

Kh.Kh. Dolimov[1], B.U. Zokirov[2], D.S. Ulashev[2], F.S. Umurqulova[2], Ch.F. Rakhmonova[2], G.S. Sobirjonova[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: genlab_icps@yahoo.com
2) Shahrisabz branch of Tashkent Institute of Chemical Technology st. Shahrisabz Street, 20, 181306 Shahrisabz
e-mail: tktishf@mail.ru

Today, there are more than 470 million people worldwide with diabetes and 2.1 million people die every year. Diabetes is one of the leading causes of blindness, kidney failure, heart attacks, stroke and lower limb amputations. However, more than 70% of people with diabetes do not have access to prevention and healthy nutrition. Currently, the world uses fructose monosaccharide obtained from ground pear (*Helianthus tuberosus*) for healthy nutrition and prevention of this disease.

At the present time, inulin, which is a valuable ingredient of Jerusalem artichoke (*Helianthus tuberosus*), is hydrolyzed to fructose only by yeast enzymes. However, recent studies have shown that native *Helianthus tuberosus* inulinase is 1.5 times more active than the yeast inulinase enzyme. Based on this, to use of the native artichoke inulinase on a technological scale remains an urgent task. In the course of our research, we studied the change in the expression level of *Helianthus tuberosus* recombinant exoinulinase in *Pichia pastoris* yeast depending on time, the amount of methanol in the nutrient medium and the secretion level of the target protein (Table 1).

Table 1. Changes in the expression level of *Helianthus tuberosus* recombinant exoinulinase depending on the methanol amount and time

Methanol concentration (%)	Incubation time	Dilution rate	ELISA results (OD-450 nm)	Amount of target protein (mg/ml)
0.5	48	1:30000	1.504	0.811
	72	1:30000	1.996	1.11
	96	1:30000	1.78	0.96
1	48	1:30000	1.517	0.823
	72	1:30000	2.05	1.115
	96	1:30000	1.79	0.967
1.5	48	1:30000	1.501	0.803
	72	1:30000	1.802	1.017
	96	1:30000	1.74	0.937
Standard sample (commercial inulinase, “Evergreen Chemical Factory Co., Ltd”, China)		1:10000	≥ 3000 (out)	≥1.5
		1:30000	2.915	1.5
Negative control (*Pichia pastoris* yeast lysate)		---	0.087	---

The table shows that the highest level of enzyme expression occurs at the 72 hours of cultivation when 1.0% methanol is added to the nutrient medium every 24 hours. Nevertheless, we can observe a very close result at 72 hours of cultivation, when every 24 hours 0.5% methanol is added to the nutrient medium. The difference between these two results does not justify the cost of methanol. In this regard, we determined that the methanol amount - 0.5% and the duration of cultivation - 72 hours are the optimal conditions for the expression of recombinant *Helianthus tuberosus* exoinulinase in *Pichia pastoris* GS115.

CLONING OF THE DREB2A GENE FROM THE DESERT PLANT *Halocnemum strobilaceum*

D.M. Rizayev, S.G. Sherimbetov, B.Sh. Adilov, S. Kurganov, J.F. Ziyavutdinov

A.S. Sadykov Institute of Bioorganic Chemistry, Uzbekistan Academy of Sciences

Abiotic stresses, such as drought, high salinity and cold are common adverse environmental conditions that significantly influence plant growth and productivity worldwide. Absacisic acid, a phytohormone, (ABA) plays an important role in physiological and developmental responses as well as in coordination of various stress signal transduction pathways in plants. DREBs (dehydration responsive element binding) are important plant transcription factors (TFs) that regulate the expression of many stress-inducible genes mostly in an ABA-independent manner and play a critical role in improvement of the abiotic stress tolerance of plants by by interaction with a DRE/CRT cis-element present in the promoter region of various abiotic stress-responsive genes.

The study of the DREB group of genes involved in drought tolerance and salt tolerance of plants naturally growing in the drained part of the Aral Sea used for defensive planting and sand-fixing, as well as in-depth analysis of the molecular genetic and biochemical characterization of these genes is one of the topical issues of ecological genetics and plant stress resistance.

At present, scientists of the Institute of Bioorganic Chemistry named after Academician O.S. Sadykov by Laboratory of cell technologies of vegetable and plant growing are studying the DREB2A gene playing key roles in plant stress responses drought and high salinity in some plant species belonging to the *Chenopodiaceae* family growing under stressful conditions in the desert regions of our republic. From the halophyte plant *Halocnemum strobilaceum*, a part of the HsDREB2A gene was isolated and the nucleotide sequence was determined.

A partial-length HsDREB2A gene, (GenBank ID: OQ373010), was isolated from Halocnemum strobilaceum plant. The gene is 464 bp in length and encodes a putative polypeptide of 154 amino acids.

Although the partial sequence of HsDREB2A shared only moderate identity with known DREB proteins in other plant species, it contained a conserved AP2/EREBP domain. We used the Multiple Sequence Alignment program to determine the AP2/EREBP domains. The DNA-binding domain in *Halocnemum strobilaceum* proteins such as APETALA2 and EREBP is located amino acids 4–67, and the DNA binding site is amino acids 6–33.

These observations provide additional evidence that the sequence we obtained encoded a DREB family gene.

For the first time, we cloned the gene HsDREB2A from *Halocnemum strobilaceum* using the polymerase chain reaction method. The 464-bp long HsDREB2A gene encoded a putative protein that consisted of 154 amino acid residues. Based on these results, it is possible to obtain new drought-resistant varieties and lines in the future and introduce them into practice.

ISOLATION AND CHARACTERIZATION OF THERMOPHILIC BACTERIA FROM HOT SPRING IN OLTINSOY VILLAGE, NAVOIY REGION, UZBEKISTAN

N.N. Shodiev[1], S.A. Abdusamatov[1], A.I. Kulonov[2], K.V. Kondrasheva[2], K.D. Davranov[2]

1) National University of Uzbekistan named after Mirzo Ulugbek, 100174, Tashkent, Uzbekistan
2) Institute of Microbiology, AS of Uzbekistan, 100128, Tashkent, Uzbekistan
e-mail: nozimbek.shodiyev@bk.ru

Organisms that grow at high temperatures are known as thermophiles and typically associated with solar, geothermally, industrially or biologically heated environments. In general, they are divided into three categories according to their cardinal growth temperatures: thermophiles (35-70^{0}C), extreme thermophiles (55-85^{0}C), and hyperthermophiles (75-130^{0}C).

Enzymes found in thermophilic organisms are excellent sources of enzymes that can withstand high temperatures and carry out reactions efficiently. The discovery of extremophiles has been a remarkable impetus for biotechnology industries. The products secured from extremophiles such as proteins, enzymes (extremozymes) and compatible solutes have great biotechnological potential. The inherent stability of thermostable enzymes, which have been isolated mainly from thermophilic or thermotolerant organisms, has made them suitable candidates for a number of commercial applications.

The main goal of our research is to find new strains of thermophilic bacteria and to determine their biotechnological potentials. It started with taking samples from hot springs in the village of Oltinsoy, Khatirchi district, Navoi region of Uzbekistan. In this case, water and sediment samples were taken from different parts of hot springs (mainly the beginning of the spring, 1-2 and 3-4 meters away from the basin), measuring temperature and pH values. The sterile samples were grown in M-162 nutrient medium and a total of 6 isolates were isolated. During the experiment, unknown cultures were incubated in M-162 nutrient medium in a thermostat at 60°C for 2-5 days. Colony diameter, morphology and colony structure were recorded after 5 days of isolates. Colonies of bacterial isolates are characterized by the following characteristics: color, shape, height, border, diameter, surface, transparency and texture. In our next experiments, the isolates were stained by Gramm's method. It was observed that 3 out of 6 isolates were gram positive and the remaining 3 were gram negative. Because of importance to determine the enzyme activity of thermophilic bacteria, enzyme activity such as Amylase, Protease, Gelatinase and Lipase was studied. Initially, our isolates were grown in liquid nutrient media for 2-3 days and inoculated on substrates grown in solid nutrient media. The results showed that strains 57W, 57S, 60W and 60S grown in specially selected M-162 medium showed high activity against Protease enzyme. None of the other strains showed activity against the remaining enzymes.

In conclusion, it was shown that only 4 of the 6 isolated strains have a high activity against Protease enzyme, and this indicator is very low in the other strains. In our next researches, we plan to identify the isolates by studying them at the molecular level and to study more the biotechnological potentials of the strains with high activity.

Bacillus subtilis IMRUZ-7 - THE ACTIVE PRODUCER OF ALCALINE PROTEASE

V.V. Shurigin[1], U.R. Rajabov[1], A.G. Abdurakhmonov[1,2], K. Davranov[1,2]

1) Institute of Microbiology of the ASc RUz, Tashkent, 100128, Uzbekistan
2) National University of Uzbekistan, Tashkent, 100174, Uzbekistan

Proteases (KF-3.4.1.) are the most important industrial enzymes. Microbial alkaline proteases are of particular interest because they can be used in the manufacture of detergents, food, pharmaceuticals and leather. It is known that the amount of the produced enzyme strongly depends on the strain and its growth conditions. Among bacteria, *Bacillus* spp. are specific producers of extracellular alkaline proteases. Microbial proteases, especially from species of the genus *Bacillus*, have traditionally occupied a dominant industrial enzyme market share in worldwide enzyme sales, being widely used in detergent formulations.

The aim of our research was to isolate and select the most active alkaline protease-producing bacterial strain and to study the optimal conditions for protease production by the isolated bacterial strain.

As a result of the research, we isolated proteolytic bacteria from the soil of slaughterhouses in the Tashkent and Bukhara regions of Uzbekistan. One of the best alkaline protease producers, isolate IMRUZ-7, was chosen to optimize the culture conditions for protease production. The bacterial isolate IMRUZ-7 was identified as belonging to the species *Bacillus subtilis* based on the determination of the nucleotide sequence of the 16S rRNA gene. The 16S rRNA gene sequence of the isolated bacterium was deposited in GenBank under the number OP023837, and the strain itself was named *Bacillus subtilis* IMRUZ-7.

The nature of the growth of the strain *B. subtilis* IMRUZ-7 on MPA: the daily culture is grayish-white colonies, the edges of the colonies are uneven, the surface is bumpy, the consistency is viscous. Microscopic examination revealed Gram-positive motile rods 0.5-0.6 x 3-5 μm. The strain ferments sucrose, lactose, glucose, fructose, galactose, maltose, does not ferment raffinose, rhamnose, inositol, sorbitol, dulcite. The strain hydrolyzes starch, casein, produces catalase, reduces nitrates, forms hydrogen sulfide, indole does not form.

It was revealed that starch is the best cheap source of carbon, and corn broth – nitrogen for cultivation of *Bacillus subtilis* IMRUZ-7 and protease production. These components can be used as part of an inexpensive nutrient medium for the production of protease.

The maximum growth of the strain was observed when growing in a liquid nutrient medium with pH 8 containing starch (1%) and corn broth (0.5%) in flasks rotating at 155 rpm for 24 h at 45°C. At the same time, the optical density of the culture at a wavelength of 600 nm was 1.306, and the protease activity was 343.236 u/ml

The optimum pH and temperature for enzyme activity were determined to be 9.0 and 60°C, respectively. Since the thermoactivity and pH stability of proteases are of great importance for industrial use, the enzymatic properties of the *B. subtilis* IMRUZ-7 protease indicate the potential use of this bacterium and its protease for various industrial purposes.

ANTIFUNGAL ACTIVITY OF ENDOPHYTIC BACTERIA FROM SOYBEAN

M.Z. Alimova[1], V.V. Shurigin[2]

1) National University of Uzbekistan, Tashkent, 100174, Uzbekistan
2) Institute of Microbiology of the ASc RUz, Tashkent, 100128, Uzbekistan

Plant diseases are one of the major barriers to high yields, but they can potentially be biologically controlled with PGPR and endophytic bacteria. Some of the mechanisms that PGPR and endophytic bacteria use to counteract the harmful effects of phytopathogens include: production of fungal cell walls degrading enzymes such as lipase, β-1,3-glucanase, chitinase, and protease; synthesis of hydrogen cyanide, which inhibits cytochrome C oxidase, as well as other important metalloenzymes; synthesis of siderophores, which can prevent or reduce the proliferation of pathogens by reducing the amount of iron available to pathogens, etc.

The aim of our research was to isolate endophytic bacteria from soybean (*Glycine max*), screen them for antifungal activity, and study the biocontrol properties of isolated bacteria.

In total 20 isolates (SOEN-1 - SOEN-20) of endophytic bacteria were isolated from the roots and stems of soybean. The isolated isolates were tested for their ability to inhibit the growth of phytopathogenic fungi *Fusarium oxysporum* and *Fusarium solani* (Figure). The isolates SOEN-2, SOEN-9, SOEN-11, SOEN-15, and SOEN-20 inhibited phytopathogenic fungi more effectively than other bacterial isolates and therefore were selected for further study.

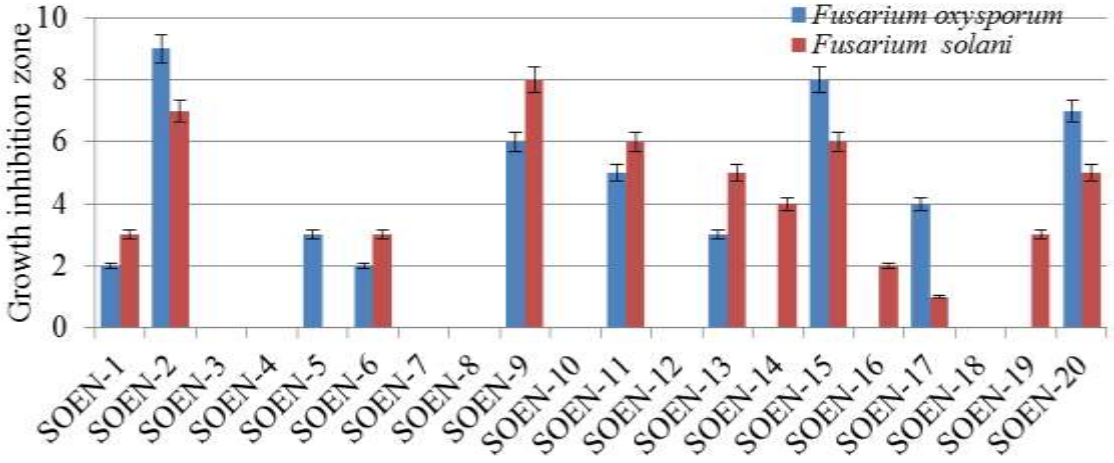

Fig. Growth inhibition of phytopathogenic fungi by endophytic bacteria from soybean (on Petri dishes)

Selected bacteria were tested for their antifungal properties. It was revealed that all 5 isolates had certain antifungal properties. The isolate SOEN-2, which previously showed the highest antifungal activity, was able to produce lipase, protease, glucanase, chitinase, and HCN. The isolate SOEN-9 produced lipase, protease, chitinase, and siderophores, while SOEN-15 produced protease, glucanase, chitinase, and HCN. The isolates SOEN-11 and SOEN-20 had only 3 out of 6 tested antifungal properties.

PRENUCLEATION CLUSTERS OF FLAT PERYLENE MOLECULES

D. Husanova[1], J. Ochilov[1,2], U. Khalilov[1,3]

1) Laboratory of Thermal Physics of Multiphase Systems, Arifov Institute of Ion-Plasma and Laser Technologies, Academy of Sciences of Uzbekistan, Durmon yuli str, 33, 100125, Tashkent, Uzbekistan, e-mail: dilfuzahusanova75@gmail.com,
2) National University of Uzbekistan named after Mirzo Ulugbek University str. 4, 100174, Tashkent, Uzbekistan, e-mail: juratochilov@gmail.com,
3) Research Group PLASMANT, NANOLabCenter of Excellence, Department of Chemistry, University of Antwerp, Universiteitsplein 1, 2610, Antwerp, Belgium, e-mail: umedjon.khalilov@uantwerpen.be

In spite of tremendous efforts, the pre-nucleation processes of organic nanocrystals (ONC) are still difficult to understand. This study investigates the formation processes of pre-nucleated clusters of three flat perylene (PERLEN08 - $C_{20}H_{14}$, WUFJEM - $C_{21}H_{14}O$ and RELVUC - $C_{22}H_{24}O_2$) molecules using reactive molecular dynamics (MD) simulations. The results show that two dimer structures, i.e., “face-to-face” and “face-to-edge” molecular structures were formed in the first stage of the accumulation of flat perylene ($C_{20}H_{12}$, $C_{21}H_{14}O$ and $C_{22}H_{24}O_2$) molecules in a vacuum. In particular, in the case of PERLEN08 clustering, the molecules combine based on face-to-face and later face-to-edge (T-shaped) positions, while in the cases of WUFJEM and RELVUC, molecules combine in a more face-to-face (parallel) position due to hydrogen bonding. In addition, due to the number of hydrogen bonding, the degree of clustering of RELVUC molecules is higher than that of WUFJEM molecules. Subsequently, dimers gradually convert to trimers, tetramers and finally a cluster (Fig. 1). During the simulation, clusters aggregate to form a bigger amorphous structure, which eventually leads to the formation of a crystal nucleus. Such onset of crystal nucleation can be explained by the non-classical nucleation theory. In overall, the obtained results help to understand the mechanisms of the first steps of growth of organic nanocrystals based on different type of flat perylene molecules in a vacuum environment.

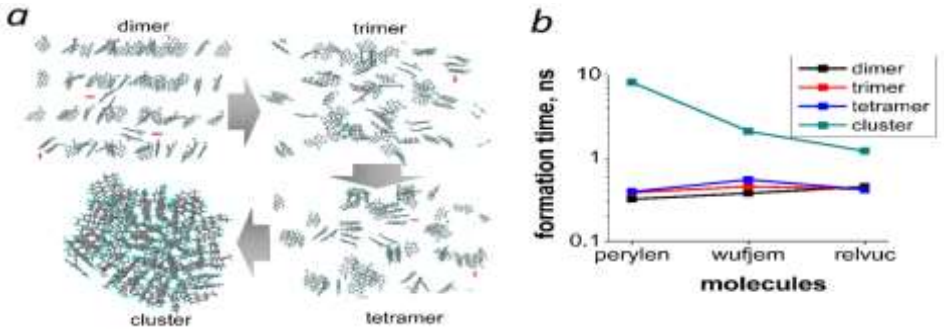

Fig. 1. (a) The evolution of the cluster formation of flat perylene molecules. (b) Cluster formation time as a function of molecule types.

RESISTANCE OF NODULAR BACTERIA OF LOCAL SOYBEAN VARIETIES TO SALT STRESS

M.I. Egamberdiyeva, Z.S. Shakirov

Institute of the Microbiology of AS RUz, Tashkent, 100128, 7B A. Kadyri str.
+998 90 974 74 35

Soil salinity is considered to be a scourge for plant growth and crop productivity worldwide. Approximately 1125 million hectares of land throughout the world is affected by high levels of salt due to intensive agriculture and desertification processes. Increasing salinity tolerance for the world's two major crops, wheat and soybean, is an important goal, as the world's population is increasing more rapidly than the area of agricultural land. Seed germination and seedling growth of soybean, as with other crops, has been found to be negatively affected by salinity stress. As a consequence, plant tolerance to salt, mainly to the sodium cation (Na+), is a desirable trait to be selected for in cultivated crop plants. To overcome salinity stress, tolerant varieties can be developed through agronomy and breeding or advanced molecular techniques, but these are time-consuming and highly expensive. In this regard, one of the alternative approaches to achieve normal plant growth under salt stress is the efficient utilization of soybean nodule bacteria.

The study salinity resistance of bacterial isolates from different soybean varieties was determined *in vitro*. For this, a nutrient medium was prepared with a 2% agar pea extract containing a different quantity of NaCl: 200, 400, 800, 1000, 1200, 1400, 1600, 1800, and 2000 mM. These nutrient media were poured into Petri dishes and incubated at 28°C for 24 hours. After that, local strains of bacteria О4-4, Н18-2, Уз5-1, Б16-1, Д24-1, М5-1, П12-4, С7-2, Г8-2, Ту8-2, Х12-1 and Т30-1 were seeded on prepared nutrient media and incubated at 28°C for 4 days. The growth of bacteria has been recorded.

A day after the cultivation of young bacteria on media with different salinities, the growth of all bacteria was observed at a salinity of 200–800 mM NaCl. Weak growth of all bacteria was observed at 1200-1400 mM NaCl on the 2nd day of cultivation under salinity conditions. Culture М5-1 stopped growing at 1400-2000 mM NaCl salinity on the 3rd day of cultivation. The remaining bacteria were observed to grow to a certain extent. In particular, normal growth of Н18-2, Б16-1, Д24-1, П12-4, Х12-1 and Т30-2 cultures was found. Although cultures О4-1, С7-2, G8-2, and Ту8-2 cultures at 2000 mM NaCl salinity growth was observed.

Based on the obtained results, it can be concluded that the nodule bacteria isolated from local soybean varieties are resistant to high salinity levels, and in the cultivation of local soybean varieties treated with these nodule bacteria in medium salinity soils, the plant is susceptible to salinity. It helps to increase the resistance and allows to get a high yield.

BIODEGRADATION OF POLYETHYLENE TEREPHTHALATE (PET) BY PETASE ENZYME

M.M. Nazirov, I.M. Khalilov

Institute of Microbiology of the Academy of Science of the Republic of Uzbekistan, 7b Abdulla Qadiri Street, Tashkent 100128

Polyethylene terephthalate (PET) is a common polymer that is widely used in a variety of consumer products such as water bottles, food packaging, and synthetic fibers. PET is convenient due to its inertness, resistance to moisture and chemicals, and low cost. However, PET is one of the main sources of plastic waste pollution because it is non-biodegradable and can persist in the environment for hundreds of years.

In recent years, there has been increasing interest in the use of PET biodegradation methods. One promising approach involves the use of PET-degrading enzymes, such as PETase, produced by certain types of bacteria.

Research has shown that enzymes can be very effective in breaking down PET. For example, in 2016, a bacterium known as *Ideonella sakaiensis*, isolated from samples taken from a plastic bottle recycling plant in Sakai, Japan, was found to use PETase to break down PET into monomers. This discovery led to further research into the use of PETase as a means of biodegrading PET.

PETase is an enzyme capable of breaking down PET into its components, including terephthalic acid and ethylene glycol. This enzyme works by breaking the ester bonds that hold PET together, causing the polymer to depolymerize.

A potential application of PETase is the development of biodegradable PET products. By introducing PETase into the production process, it will be possible to create PET products that are naturally biodegradable in the environment and to reduce the amount of plastic waste produced.

Another potential application of PETase is PET processing. Nowadays, PET is usually recycled by melting it down and using it to create new products. However, this process requires energy and can lead to the formation of harmful byproducts. By using PETase to break down PET, a more efficient and environmentally friendly recycling process can be created. Even in 2020, it was found that 90 percent of PET can be broken down into monomers in 10 hours using the PETase enzyme.

Despite the potential benefits of PETase, there are several problems associated with its use. For example, the PETase enzyme is very sensitive to changes in pH and temperature, and a drop in pH is observed when PET decomposes. This leads to enzyme inhibition. To solve this problem, in 2022, Hongyuan Lu and a number of scientists discovered through machine learning-aided engineering that N233K/R224Q/S121E/D186H/R280A mutations can remain active in a wide pH and temperature range of the PETase enzyme. This makes it possible to process PET polymer from PETase enzyme on an industrial scale using genetically modified bacteria.

In conclusion, PETase is a promising tool for PET biodegradation. The use of PETase can have an important tool in the development of biodegradable PET products and PET recycling. Through continued research and development, PETase can become a valuable tool to reduce plastic pollution and create a more sustainable future.

BIODIVERSITY OF COTTON RHIZOSPHERE BACTERIA

N.A. Sherbekova[1], Q.T. Normurodova[1], S.I. Zakiryayeva[2]

1) National University of Uzbekistan named after Mirzo Ulugbek, 100174, Tashkent, Uzbekistan
2) Institute of Microbiology, AS of Uzbekistan, 100128, Tashkent, Uzbekistan

One of the important issues that need to be solved in the whole world today is to provide the world's population with quality food and quality clothing products.

Cotton plant is grown in a lot of countries around the world. Cotton fiber serves as an important natural textile fiber, and also cottonseed is an important source of food and oil.

The interaction of plants with symbiotic and beneficial rhizobacteria microorganisms is important in the development of plants because it provides them with appropriate nutrition and regulators, protects them from pathogenic microorganisms, and adapts them to stressful conditions. It is no secret that in most cases, the qualitative description of the arable layer determines the activity of the soil microflora.

Therefore, the purpose of the research is to study the diversity of cotton rhizosphere bacteria grown in saline soils of Syrdarya region in Uzbekistan.

During the conducted research, cotton rhizosphere samples were brought from Gulistan district of Syrdarya region in spring, summer, and autumn seasons and their biodiversity was studied. As a result, more than 30 strains of rhizobacteria were isolated from cotton rhizosphere. 15 cultures were isolated from the spring season, 10 from the summer season, and 12 from the autumn season. The morpho-cultural characteristics of these cultures were studied and identified using the MALDI TOF mass-spectrometry method.

As a result of studying the size, mobility, shape, and size of colonies, optical properties, color, surface layer, edges, structure, and consistency of each isolated bacterial strain, it was determined that they belong to the genera *Enterobacter, Bacillus* and *Lactobacillus*. At the same time, the strains of rhizobacteria were studied to the type using MALDI TOF mass-spectrometry method, and as a result, 3 of the rhizobacterial cultures were *Enterobacter cloacae* and *Bacillus cereus*, one of them was *Lactobacillus malefermentans, B. wakoensis, B. subtilis, B. megaterium* and *Cedecea davisae*, and two strains were *B. simplex*, five ones were found to belong to *B. endophyticus species.*

Enterobacter cloacae was found as the dominant species in cotton rhizosphere in the spring season, while *B. endophyticus* was the dominant species in the summer season.

To conclude, more than 30 strains of rhizobacteria were isolated from the cotton rhizosphere in spring, summer, and autumn, and as a result of their identification using the MALDI TOF mass-spectrometry method, it was found that 3 of them belong to the genera *Enterobacter*, 13 to *Bacillus*, 1 to *Lactobacillus* and *Cedecea.* It was observed that Enterobacter cloacae species were abundant in cotton rhizosphere in spring. *B. endophyticus* species were found throughout the season.

ISOLATION OF MICROORGANISMS AND THEIR USE IN THE PROCESS OF DEGRADATION OF PESTICIDES

D.I. Kosimov, L.I. Zaynitdinova, A.M. Mavjudova, R.B. Ergashev

Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan, 7B A. Kadyri str., Tashkent, Uzbekistan

Pesticides are extremely toxic chemicals, and their use is increasing year by year. This causes an increase in the amount of pesticide residues in soil, water and other objects, and as a result, environmental pollution. As a result of intensive use of pesticides in violation of the norms and rules of their use, soils are exposed to particularly strong destructive effects. The natural processes of soil self-cleaning cannot cope with such a volume of pollution, because the local microflora is inhibited as a result of high soil toxicity. Therefore, it is important to isolate destructive microorganisms and use them in the treatment of contaminated soils.

Isolation of microorganisms was done using gray soil treated with pesticides (cypermethrin, chlorpyrifos, etc.). Soil samples were taken from a depth of 0-15 cm. First, the soil was dried in laboratory conditions, then it was cleaned from various plant residues, small stones and other inclusions and passed through a stainless steel sieve with a diameter of 2 mm. One kg of soil was additionally contaminated with a mixture of chlorpyrifos + cypermethrin pesticides, and in order to enrich this soil with microorganisms, it was treated with the liquid part of the sludge of the biogas plant, and then it was kept in a thermostat at 30 ° C for one month to adapt the microorganisms to the pesticide environment. A total of 17 microorganism isolates were isolated. As a result of their growth and high biomass production in pesticide environments, isolate No. 3 showed the best performance and was selected for further research. In laboratory conditions, the morpho-cultural characteristics of this isolate were studied, and MALDI-TOF MS analysis was carried out, and the nucleotide sequence was determined based on 16 S rRNA. The obtained results showed that this bacterium belongs to the species *Ochrobactrum intermedium*. This strain was registered in the NCBI database with the corresponding number (GenBank: OL587509.1.).

Further studies were conducted to determine the degradation of chlorpyrifos (100 mg/kg) and cypermethrin (40 mg/kg) pesticides based on Ochrobactrum intermedium PDB-3 strain. Researches were conducted in sterile soils for a period of one month. Soil samples were taken for chromatographic analyses, initially, after 15 and 30 days. Bacteria-free soil contaminated with pesticides was used as a control.

The obtained results showed that the chlorpyrifos pesticide with an initial concentration of 100 mg/kg on the basis of *Ochrobactrum intermedium* PDB-3 strain was reduced to 20.7 mg/kg within one month, and the degradation rate was 79.3%. No cypermethrin residues were detected in soil samples taken at the end of the study, and it was found that cypermethrin with an initial concentration of 40 mg/kg was completely degraded within 30 days.

EVALUATION OF THE EFFECT OF BIOGENIC SILVER NANOPARTICLES ON WHEAT GROWTH

R. B. Ergashev, L. I. Zaynitdinova, R. N. Juraeva, N. A. Lazutin.

Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan, Tashkent, 7B str. A. Kadyri

Nanosilver is the most studied and used for biosystems. It is mostly used for its antimicrobial and antifungal properties. Recently, attempts have been made to use biogenic silver nanoparticles in agriculture to improve plant growth and increase yields, but this issue is still poorly understood and requires further research.

Plants are a major component of the ecosystem and a critical source of food for humanity, so understanding the impact of AgNPs on plant growth and development is critical to assess potential environmental risks to food safety and human health. Very little is known about the positive or negative effect of nanoparticles on plant cells and the plant organism, and these data are very contradictory.

In connection with the foregoing, the search for ways to increase the yield of agricultural plants is relevant, and one of the possibilities is the use of nanoparticles synthesized by microorganisms. We have conducted studies on the production of AgNPs using microorganisms and their application to increase the germination and germination of wheat seeds to further increase yields.

Using microorganisms belonging to various genera, silver nanoparticles were obtained, which were characterized using UV spectroscopic methods and AFM studies. It was established that the studied strains had the ability to synthesize AgNPs of oval and spherical shape and size from 5 to 100 nm. The obtained solutions containing AgNP were used for presowing treatment of wheat seeds. It has been established that the soaking of wheat seeds with biogenic AgNPs increases their germination energy in a day up to 52% (in the control - 38%), after 3 days - 98% (in the control sample 82%). Also shown is a stimulating effect on the growth of roots and stems of the plant in terms of such indicators as the length of the stem and root, weight. The results of stimulation of growth processes under the action of nanobiosilver may indicate an increase in oxidative phosphorylation and photosynthesis, as well as the mobilization of the plant antioxidant defense system.

The maximum increase in the mass of dry matter of the roots was observed when seeds were treated with cultures in the presence of silver NPs and amounted to 0.032-0.034 g, and the aerial part 0.028-0.031 g. In all variants of the experiment, the maximum stimulation of biomass accumulation was observed in the roots.

Our studies have demonstrated the positive effect of treating wheat seeds with nanoparticles synthesized by microorganisms. When wheat seeds were treated with the obtained biogenic nanoparticles, an increase in seed germination, stem height, root length, dry matter mass of roots and aerial part of seedlings was observed.

FABRICATION OF CARBOXYMETHYLCELLULOSE ELECTROSPUN/POLYVINYLALCOHOL NANOFIBERS FUNCTIONALIZED WITH SILVER NANOPARTICLES

K.E. Yunusov, A.A. Ataxanov, A.A. Sarimsakov, S.Sh. Rashidova

Institute of Polymer Chemistry and Physics, Uzbekistan Academy of Sciences, Uzbekistan, 100128, Tashkent, str. Abdulla Kadyri. 7"b". e-mail: polymer@academy.uz

Silver nanoparticles (AgNPs) have been applied in antimicrobial, antibacterial medical textiles, wound dressings, antimicrobial catheters, medical masks, tissue engineering scaffolds, and water purification due to their strong bacteriostatic and bactericidal effects as well as broad-spectrum antimicrobial activities. AgNPs can be obtained via various approaches such as chemical reduction of silver salt in solution, irradiation, and biological reduction.

In the first stage of the investigation, the formation of AgNPs in 1 wt.% of sodium-carboxymethylcellulose with DS 0.85 and DP 400 (Na-CMC) and polyvinylalcohol (PVA) solutions was carried out by photochemical reduction of silver ions (Ag^+). It has been established that adding PVA and Ag^+ to a Na-CMC solution increases the viscosity of the solution owing to the decreased solubility of Ag^+CMC^- complexes generated due to the formation of coordination bonds between the carboxylate groups (-COO^-) of Na-CMC macromolecules and Ag^+. Then, the reaction sequence is according to the Mott-Gurney mechanism.

It is observed that the Na-CMC nanofibers are smooth with an average diameter of 103±30 nm. After treatment with $AgNO_3$ solution as well as UV radiation, many AgNPs were deposited on the surface and in the network of the nanofibers, indicating successful reduction and restoration of Ag^+ ions into metallic Ag NPs (Fig. 1b). However, the average diameter of the CMC/Ag NPs with sizes approximately 89 ± 23 nm was smaller than the CMC fibers, probably owing to the known ability of CMC to dissolve freely in the water.

In conclusion, the solutions of different concentrations were obtained, and studied physicochemical properties of the composition solution of sodium-carboxymethylcellulose/polyvinyl alcohol/silver nanoparticles for obtaining nanofibers by electrospinning. Nanofibers were obtained by electrospinning from sodium-carboxymethylcellulose/polyvinyl alcohol/silver nanoparticles solutions, and their morphological properties and dimensions were studied using a scanning electron and atomic force microscope. The result confirmed that from the solution it can be obtained the formation of nanofibers with a size in diameter of 50-160 nm.

The obtained membranes on the base nanofiber could be used as air antimicrobial filtration material.

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OXIDIZED NANOCELLULOSE AND ITS APPLICATIONS

M.M. Kuzieva, A.A. Atakhanov

Institute of Polymer Chemistry and Physics, Uzbekistan Academy of Sciences, Tashkent, Uzbekistan, e-mail: makhliyokuziyeva92@gmail.com

Nanocellulose (NC) is the most abundant natural polymer and versatile starting material for chemical modification for obtaining products with various applications. The oxidation of nanocellulose results in derivatives with improved properties, including the products with new, specific features that can be used for medical and pharmaceutical purposes. Due to its biocompatibility and biodegradibility, the oxidized cellulose (6-carboxycellulose) is widely used as a hemostatic agent, as a barrier for the prevention of postsurgical adhesion, in bandage products for covering different wounds, as an excipient in the production of tablets, various gels and pharmaceutical suspensions.

In this work, the possibility of NC oxidation in a more accessible way under mild conditions using potassium dichromate in an acidic medium was shown. The oxidation of NC proceeds at C6 carbon without the destruction of the pyranose ring of cellulose and the number of carboxyl groups of the ONC is 1.21–1.36 mmol/g. The appearance of a new peak (1721 cm^{-1}) in the FTIR- spectra related to the C=O group was observed.

The thermal stability of oxidized nanocellulose (ONC) decreased compared to NC. It is revealed that an increasing of the oxidation process duration leads to decreases in the degree of crystallinity and thermal stability. Based on the results of the X-ray structural analysis, the sizes of both the crystallites and the unit cells of NC and ONC are calculated, where a decrease in size in one direction and an increase in size in the other two directions of measurement are observed. Theoretical calculations were carried out, and a model was created for the hydroxyl groups available for oxidation at carbon C6, which amounted to approximately 5% of the total number of hydroxyl groups of the elementary units in the crystallite. It was calculated that 60% of the available hydroxyl groups at carbon C6 were oxidized to carboxyl groups. The change of ONC degree of crystallinity (DC) from 88.0% to 82.5% was revealed and the sizes of the unit cells of both NC and ONC were calculated.

By using AFM and DLS it was shown that the oxidation process leads to a decrease in the particle size and a change in the shape of the particles from acicular to spherical, while the particle size distribution becomes monodisperse. The ONC samples are able to accumulate charge on their surfaces. The ONC formed by potassium dichromate oxidation has potential application as an environmentally friendly and cost-effective nanomaterial in energy-related fields.

The AFM study showed that NC particles have an acicular shape with a width of 20–80 nm and a length of 180–600 nm. The oxidation process leads to a decrease in the size of particles with a width of 50–120 nm and a length of 150–400 nm and partial destruction of the acicular shape of NC with a transition to a spherical shape. An increase in the time of the oxidation process leads to the formation of agglomerates of spherical particles with a size of 20–60 nm.

ONC was synthesized using potassium dichromate as an oxidizing agent. Data analysis shows that oxidized nanocellulose products have wide application in industry, in particular in medicine.

PREPARATION OF CELLULOSE NANOFIBERS USING ELECTROSPINNING

A.A. Atakhanov, N.Sh. Ashurov, S.Sh. Rashidova

Institute of Polymer Chemistry and Physics, Uzbekistan, Tashkent

Cellulose fibres and nanofibres have gained interest because of the high strength and firmness, biodegradability and renewability [1]. The manufactures of polymer nanofibres via electrospinning technique have been perceived as a persuasive system for producing fibres with submicron diameters by electrostatic forces [2].

In this work, the possibility of preparing cellulose nanofibres using electrospinning method was investigated.

The condition of electrospinning was following: the distance between the needle tip and collector was set to 14 cm. The collector used was aluminum foil with the width of 21 cm. The inner diameter of the needle was 0.353 mm. Injection rate of the spinning solution was 0.03-90 mkl/min. The collecting time is 120 min, voltage 0.5-30 kV. After electrospinning, the obtained cellulose fibres were peeled from the collector and vacuum-dried at 60^0C for 1 h. Electrospinning system (NanoNC eS-robots, South Korea) was used for the fabrication of nanofibers. The relative humidity and temperature during the spinning process was 60% and 25°C, respectively.

The optic microscopy method showed that nanofibres are formed with different diameters (nano and micro sizes). Atomic force microscopy studies have also confirmed the formation of nanofibers with diameters ranging from nanometers to micrometers.

IR spectroscopic studies of cellulose nanofibers showed that nanofibres are characterized by spectra typical of cellulose, however, new absorption bands are observed.

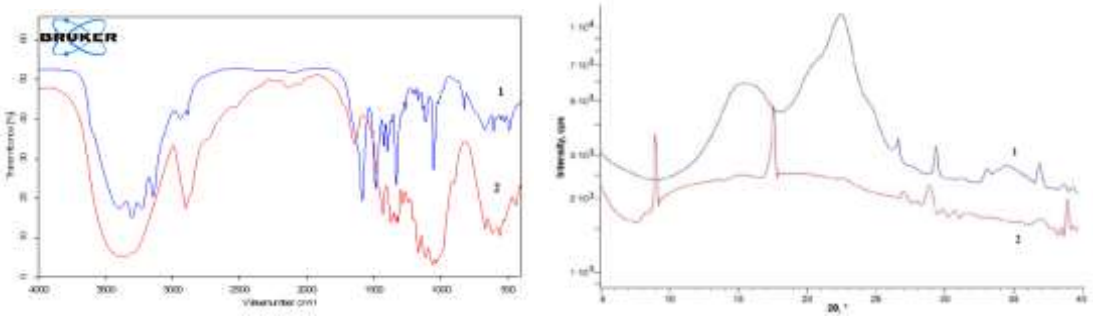

Fig.1. FTIR spectra and X-Ray diffractograms of cellulose (**1**) and cellulose nanofibers (**2**)

It was found by X-ray diffraction analysis that the original cellulose has a type I polymorph (characteristic peaks at 2θ = 14.9°, 16.3°, 22.5° and 34.6°. After dissolving cellulose in a solvent and subsequent regeneration, electrospun cellulose fibers more amorphous, and the remaining crystalline parts are type II polymorphs

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PREPARATION AND RESEARCH OF MICROCRYSTALLINE CELLULOSE AND NANOCELLULOSE FROM LICORICE ROOT CELLULOSE

D.J. Ergashev, ***M.Q. Saidmuhammedova,*** **A.A. Atakhanov**

Institute of Polymer Chemistry and Physics, Uzbekistan Academy of Sciences, Tashkent, Uzbekistan, e-mail: polymer@academy.uz

In recent years, researches on the creation of new types of products and introduction of production technologies in world practice are being carried out at a rapid pace.

At this point, microcrystalline cellulose (MCC) and nanocellulose (NC) derivatives, a modified form of cellulose, which is considered the most widespread and renewable natural polymer on earth, are receiving great attention.

In this work, MCC and nanocellulose NC were obtained from licorice root cellulose by acid hydrolysis method.

MCC extraction from licorice root cellulose was carried out under the conditions of 4 12% of nitric acid (HNO_3), temperature 100-110°C, modulus 1:10, duration of hydrolysis 30-90 minutes as a hydrolyzing agent.

The results of the conducted research show that with increasing acid concentration and duration of hydrolysis, the degree of polymerization of MCC, depending on the acid concentration, the degree of polymerization (DP) of MCC obtained from licorice root cellulose decreases from 500 to 250. It was observed that the yield decreased to 70% and the degree of crystallization (DC) changed from 56% to 71% in MCC obtained from licorice root cellulose due to the hydrolysis of a certain part of the amorphous area in the cellulose.

NC from licorice root cellulose were obtained by hydrolysis in aqueous solutions of sulfuric acid (H_2SO_4) with different concentrations: acid concentration 40, 50, 55, 60, 65%, temperature 25-50°C, module 1:10 duration 60-120 minutes and It was carried out under conditions consisting of ultrasonic dispersion for 30 min.

The results of the conducted research show that the DP of NC decreased from 360 to 150 due to the increase of acid concentration, hydrolysis temperature and duration of hydrolysis, acceleration of the hydrolysis process. Due to the fact that a certain part of the amorphous area of the cellulose structure in licorice root cellulose undergoes hydrolysis and passes into the solution, it was found that the output yield of NC decreased and DC changed from 59% to 81% when the acid concentration was increased from 40% to 60%. A further increase in acid concentration had a negative effect on the DC of the NC samples, that is, the degree of crystallinity of the NC sample obtained in a 65% acid solution was 68%, which was explained by the increase. caused by the effect of the acid concentration on the crystal structure of cellulose.

The possibility of obtaining MCC and NC from licorice root cellulose under different conditions was studied and it was shown that the structure and properties of MCC and NC depend on the hydrolysis conditions.

EVALUATION OF THE ANALGETIC EFFECT OF GLABTAN IN THE "HOT PLATE" MODEL

G.G. Rakhmonova, R.N. Rakhimov, Q.R. Baratov, R.Ab. Yakubova, N.A. Tagayalieva, N.G. Abdullajanova

Institute of Bioorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan, Tashkent 100125 st. Mirzo Ulugbek 83. e-mail: ibchem@uzsci.net

Polyphenolic compounds occupy a special place in modern medicine due to their high pleiotropic efficacy. They are widely distributed in almost all plants and have strong antioxidant potential due to their unique molecular structure. The staff of our institute isolated a sum of polyphenols from *Rhus glabra* plants, which was conditionally named Glabtan. This drug was chosen for screening biological activity due to its high water solubility and low toxicity.

The purpose of this study was to test the analgesic activity of Glabtan using the Hot Plate test.

The Hot Plate test is based on behavioral responses controlled by supraspinal structures in response to pain. The experiment was performed on healthy mature female white laboratory mice, quarantined for 10-14 days, weighing 20±2,0 g, 6 mice per group. Glabtan was injected into the stomach of mice of the 1st, 2nd, 3rd, 4th groups at doses of 25, 50, 100 and 200 mg/kg, and the control group was injected with an equal volume (0,2 ml) of distilled water. After 1 hour, the animals were placed on a metal surface heated to 52°C, surrounded by a transparent cylinder. The time interval from the moment the animals were placed on the heated plate to the appearance of such reactions as licking and pulling up the hind legs, and jumping was recorded.

In the experiment, the analgesic efficacy of Glabtan at doses of 25, 50, 100 and 200 mg/kg compared with the control was 25 mg/kg – 34,2%, 50 mg/kg – 91,4%, 100 mg/kg – 67,8 % and 200 mg/kg - 20% of indicators were revealed. When comparing the analgesic efficacy of Glabtan at the doses used in the experiment, the analgesic efficacy at a dose of 50 mg/kg was 1,3 times higher than that of 100 mg/kg and 4,5 times higher than that of 200 mg/kg ($p=0,01$). Similarly, when comparing doses of 100 and 200 mg/kg, pain reduction rates were higher at a dose of 100 mg/kg with a statistically significant difference ($p=0,05$).

The study drug Glabtan at a dose of 50 mg/kg had the highest 91,4%, at a dose of 100 mg/kg 67,8%, and at a dose of 200 mg/kg 20% had the lowest 20% analgesic efficacy. Since the effectiveness of Glabtan at doses of 50 and 100 mg/kg exceeded 50%, it was concluded that this drug has an analgesic effect. It should be noted that Glabtan has a positive effect on pain reduction at relatively low doses.

Thus, the Glabtan preparation, consisting of the sum of polyphenols isolated from the Rhus glabra plant, has the highest analgesic efficacy of 91,4% at a dose of 50 mg/kg.

DFT INVESTIGATION CHITOSAN-STABILIZED Cu/Ag NANOPARTICLES

I.N. Nurgaliev, N.J. Burkhanova, S.Sh. Rashidova.

Institute of Polymer Chemistry and Physics of the Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan
e-mail: ilnarvodnik@gmail.com

Clusters are atomic or molecular agglomerated constituted by few or many identical or different atoms. The possibility of modulating the properties of bimetallic clusters, in particular polymer metal complexes (PMCs), for example, bionanocomposites based on polysaccharides and metal nanoparticles (BNCs), has been studied from a theoretical and experimental point of view in order to achieve the goals. It has been established that the antibacterial effect is a size-dependent property of nanoparticles (NPs). BNCs based on chitosan (ChS) are widely used in many cases and biological applications, for example, wound healing, biosensors, and treatment of burns and cancer [1].

The aim of this work was quantum-chemical calculations of the interaction of the monomeric form of ChS with metal nanoclusters, as well as the stability of Cu/Ag bimetallic structures.

We calculated gas-phase optimized geometries of ChS, ChS–Ag and ChS–Ag–$(H_2O)_3$. From calculation results it is clear that ChS unit is stabilized by different types of intramolecular H-bonds viz. O-H---O-H, O-H--Oring, and N-H–O-H. Bond length of H-bonds ranges from 2.30 Å to 2.50 Å with one exceptionally elongated N-H—O-H bond (2.60 Å). Zero imaginary frequency ensures minimum energy state for the molecule. To identify the most probable site on glucosamine for Ag adsorption, different site-dependent complexations were studied. Theoretical investigalions shows the most stable gas-phase complex of ChS and Ag. The amino and hydroxyl groups are responsible for stabilization and complexation of Ag nanoparticles with ChS.

The next calculations are the bimetallic clusters of Cu_3Ag_m composition ($3 \leq m \leq 20$) tend to present the segregated subcluster pattern. As the amount of Ag atoms increases, the clusters have a tendency to present similar structures to a core-shell with some copper atoms exposed, which can be noted in the oscillations obtained in the mixing energy analysis. The geometries of larger clusters tend to be the result of the fusion of simpler cluster structures. In particular, the Cu_3Ag_{10} cluster has an icosahedral structure, while the Cu_3Ag_{15} and Cu_3Ag_{20} clusters have structures that resemble a fusion of two icosahedrons, which partially explains why these structures are also stable, because icosahedral structures are naturally stable. The Density Functional Theory calculations of the most stable clusters Cu_3Ag_{10}, Cu_3Ag_{15} and Cu_3Ag_{20} reveal that these have an electronic behavior similar to their pure Ag analogues.

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PHYSICOCHEMICAL CHARACTERISTICS OF CELLULOSE - CONTAINING SILVER NANOPARTICLES FOR AIR FILTRATION

K.E. Yunusov, A.A. Sarymsakov, M.M. Mirxolisov o`g`li, S.Sh. Rashidova

Institute of Polymer Chemistry and Physics, Uzbekistan Academy of Sciences, 100128, str. A. Khadyri 7 "b", Tashkent, Uzbekistan, e-mail: polymer@academy.uz

Silver nanoparticles (AgNPs) have an extremely large specific surface area, which increases when in contact with bacteria, viruses, and fungi. This significantly increases their bactericidal activity by decreasing the sizes of AgNPs and by increasing their surface area to volume ratio.

The aim of this investigation is to prepare and physicochemically characterize textile biomaterials obtained from cotton fiber containing AgNPs stabilized with sodium-carboxymethylcellulose (Na-CMC).

Cellulosic fibers of cotton fabric (c/f) and purified Na-CMC with a degree substitution (DS) 0.85 and degree polymerization (DP) 400 were used as polymer matrices to obtain textile biomaterials. An aqueous solution of $AgNO_3$ was used to form AgNPs in Na-CMC solutions. To form stabilized AgNPs, 0.1–0.4 wt.% aqueous solutions of purified samples of Na-CMC were used. The investigation, of the formation of AgNPs in 0.2-0.4 wt.% solutions of Na-CMC with DS of 0.88 and DP of 600 was carried out by photochemical reduction of Ag^+. The reaction sequence according to the Mott-Gurney mechanism is represented as follows:

The AFM images showed that at low concentrations of Ag^+, spherical polydisperse AgNPs with sizes of 2-8 nm were formed. With increasing Ag^+ concentration after photolysis, spherical monodisperse AgNPs with sizes of 5-35 nm were obtained.

Based on the results, the following conditions were determined for the formation of homogeneous, spherical, and stable AgNPs with sizes of 5-35 nm: UV irradiation for 30 minutes and solution concentrations of 0.2 wt.% Na-CMC and 0.0086 wt.% $AgNO_3$. Investigations showed that spherical AgNPs with sizes of 5-35 nm were present in Na-CMC, whereas 0.0086 wt. % AgNPs sized 2-30 nm formed in cotton fabric, exhibiting high bactericidal activity. Cellulose-contained biomaterials could be used as face masks for air filtration.

This work was supported by project Uzbekistan-Belarus MRB-2021-548 (Creation of fibre containing materials modified with organic and polymer-inorganic coatings for various functional purposes) for the years 2022-2023 by the Ministry of Innovative Development of the Republic of Uzbekistan.

SEPARATING CYTISINE DERIVATIVES IN THIN LAYER OF CHITOSAN-SILICA NANOHYBRID SORBENT

D.Sh. Shakarova., Ch.K. Begimkulova., A.B. Ibragimov.

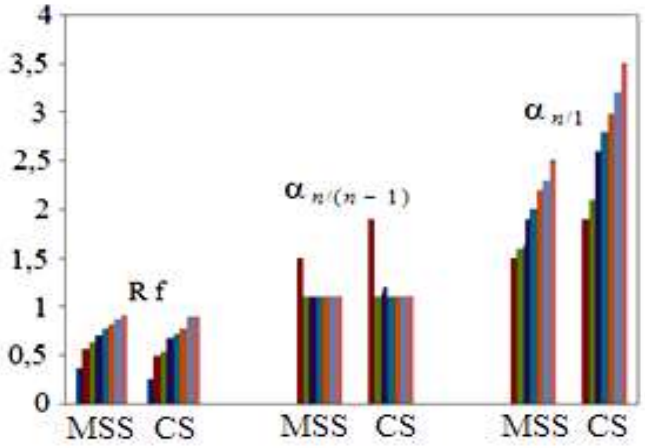
Institute of General and inorganic chemistry, Academy of Science of the Republic of Uzbekistan, Republic of Uzbekistan, Tashkent

There are a variety of sorbents (aluminum oxide, silica gel, and modified silica gel by various grafted alkyl and functional groups) are used for analysis by thin layer chromatography. Despite the variety of derivative sorption materials, the improvement of existing and the search for new sorbents does not lose its relevance.

In particular, nanohybrid polymer–silica sorbents are obtained by the sol-gel method with the inclusion of biopolymers into the hydrolytic polycondensation of polyethoxysilane oligomer are of interest. The inclusion of chitosan in this process seems to offer much promise and chitosan is an ionogen polysaccharide containing a functional - NH_2 and - $CONH_2$ groups capable of interacting with silanol groups of silica formed during the sol-gel process.

The aim of this work was to investigate the possibility of using synthesized chitosan/silica sorbent for the separation of cytisine alkaloid and some of its derivatives.

For separating cytisine and its derivatives, we used the chitosan–silica nanohybrid sorbent (CS) and microspherical silica (MSS) gel with 5 μm as a reference. Chromatography in thin layers of these sorbents showed high separation selectivity. (Fig. 1).



On the chitosan–silica nanohybrid sorbent's selectivity was higher than on MSS. These results suggest that the chitosan–silica sorbent should be given preference and recommended for controlling the synthesis of alkaloids, their identification, and preparative separation of the components of reaction mixtures.

CRUDE EXTRACTS ANTIBACTERIAL AND ANTIFUNGAL ACTIVITY OF SIX FUNGAL ISOLATES FROM ORCHIDS *Zeuxine strateumatica* AND *Spiranthes hongkongensis*

N. Bibikov[1], F. Eshboev[2]

1) Lomonosov Moscow State University, Moscow, Russia
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Interest towards antimicrobial activity of plant-associated fungi is explained by its unpredictable strain-specificity and influent on plant's medical properties (Gouda et al., 2016). Studies of fungal microbiome in previously unexplored plant hosts or locations bring strains with activity often conditioned by presence of novel chemical compounds (Singh et al, 2021). Thus, studying activity of unusual isolates has considerable potential for application in medicine and pharmacology.

Six strains of endophytic fungi were isolated from orchids *Zeuxine strateumatica* and *Spiranthes hongkongensis* collected in Shenzhen, China. Cultures were isolated by placing root fragments on agar plates. Using ITS region sequencing isolated fungi were identified as *Ceratobasidium* sp[1], *Curvularia lunata*, *Scytalidium circinatum* from *Z. strateumatica* and *Ceratobasidium* sp[2], *Nigrospora* sp., *Talaromyces* sp. from *S. hongkongensis*. Among six isolates four are ascomycetous endophytes and two orchid mycorrhizal strains of genus *Ceratobasidium.* Ethyl acetate extracts of the fungi were prepared, dried, and redissolved in methanol. Antimicrobial activity was tested using disc-diffusion method against five test cultures: gram-positive bacteria *Bacillus subtilis* and *Staphylococcus aureus*, gram-negative bacteria *Escherichia coli* and *Pseudomonas aeruginosa* and *Candida albicans* yeast.

Ascomycetous endophytes show activity against test strains. The broadest activity is shown by *Talaromyces* sp. isolate against all test cultures. The highest activity is shown by *S. circinatum* strain against three bacterial strains. Mycorrhizal fungi show no activity against test cultures (see table 1).

Table 1

Diameter of inhibition zones of studied isolates. N/A – activity not detected

	Inhibition zone diameter, mm				
	B. subtilis	*S. aureus*	*E. coli*	*P. aeruginosa*	*C. albicans*
Ceratobasidium sp[1]	N/A	N/A	N/A	N/A	N/A
C. lunata	6	9	8	7	N/A
S. circinatum	14	15	N/A	13	N/A
Ceratobasidium sp[2]	N/A	N/A	N/A	N/A	N/A
Nigrospora sp.	6	10	N/A	9	**7**
Talaromyces sp.	10	12	9	12	**7**

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STUDY OF GENE EXPRESSION OF DNA AND HISTONE METHYLATION AND DEMETHYLATION ENZYMES IN RAT STOMACH CELLS

I.T. Yakubov, J. Yusufjanova

National University of Uzbekistan named after Mirzo Ulugbek, Tashkent,
e-mail: iskandar2014a@gmail.com

The study of new genes in gastric epithelial cells by transcriptomic methods makes it possible to determine their functions and develop new methods for the diagnosis and treatment of gastrointestinal diseases. Until now, the functions of about 10% of the genes in the stomach cells remained unknown.

In contrast to DNA mutations, epigenetic modifications are reversible and, hence, suitable for pharmacological interventions. Reversible histone methylation is an important process within epigenetic regulation, and the investigation of its role in cancer has led to the identification of lysine methyltransferases and demethylases as promising targets for new anticancer drugs.

The aim of this work is to identify unknown genes in the rat stomach transcriptome and to study the expression of genes of histone methylation and demethylation enzymes in various organs and cells of the rat stomach.

In this work, the rat stomach transcriptome database was used, which were deposited for public access to the Gene Expression Omnibus National Center for Biotechnology Information database under access numbers GPL1439, GSM30415, GSM30416, GSM30417, GSE3518, GSM80287, and GSM80288.

Earlier, using the method of analysis of oligonucleotide microchips, together with scientists from the University of California at Los Angeles, more than 41,372 transcripts of rat stomach cells were identified. Of these, the functions of 37,698 (91.12%) transcripts were known, and the functions of approximately 3,676 (9.88%) genes remained unknown. The names and systematic numbers of 2725 genes from 3676 (74.13%) unknown transcripts in the rat stomach transcriptome were identified using the stomach transcriptome database and the BLAST-nucleotide program. At the same time, the names of 948 (25.87%) genes in remained unknown. The identified genes were classified into several groups: various enzymes, small and long non-coding RNAs, ribosomal and mitochondrial proteins, zinc-binding domain containing proteins, oncogenic proteins, receptors, cytoskeletal proteins, histone methylation and demethylation enzymes, and others.

For the first time, we determined the gene expression levels of the following enzymes: lysine demethylase 1B (Kdm1b), lysine demethylase 2A (Kdm2a), lysine demethylase 4B (Kdm4b), methyltransferase-like 11B (Mettl11b), RB-binding protein 5, histone lysine-methyltransferase complex subunits (Rbbp5), methylictose dioxygenase 3 (Tet3). Different isoforms of lysine demethylase had different levels of gene expression. Isoforms 1B and 4B showed the highest levels of gene expression (8299±1493 and 7448±1266, respectively), while isoform 2a showed lower levels of expression (1543±200). The ratio of gene expression levels in highly purified parietal and enterochromaffin-like cells did not actually change.

Further study of the expression of genes and proteins of the enzymes of methylation and demethylation of rat gastric histones makes it possible to find out the functions of these enzymes in the stomach in various pathologies of the gastrointestinal tract.

DEGREE OF DEACETYLATION OF CHITOSAN PRODUCED FROM *Artemia parthenogenetica* CYST OF THE ARAL SEA

B.P. Karlybaeva, G.E. Berdimbetova, I.J. Erinyazova, P.M. Kudainazarova

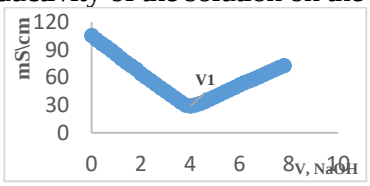
Karakalpak Research Institute of Natural Sciences, Karakalpak branch of the Academy of Sciences of Uzbekistan, Karakalpakstan

Chitin is a linear aminopolysaccharide consisting of *N*-acetyl-2-amino-2-deoxy-*D*-glycopyranose units. Chitosan (CH) is formed by N-deacetylation of the chitin molecule. Usually, completely deacetylated chitosan does not exist in nature. The degree of deacetylation (DDA) chitosan is equal to the ratio of the number of glucosamine units (m) to the total number of monomer units in the polysaccharide molecule. The DDA of CH is an important factor that not only determines the mole fraction of deacetylated units in its polymer chain, but also strongly affects its solubility, viscosity, ion exchange capacity, flocculation ability, and amino acid reaction.

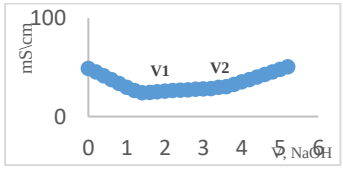
There are a number of methods for determining the degree of chitosan deacetylation, including: methods of infrared (IR), ultraviolet (UV), nuclear magnetic resonance (NMR) spectroscopies, potentiometric and conductometric titrations can also be determined using elemental analysis and many other methods. It should be noted that NMR is a more advanced method for determining DDA of CH. Only the cost of this device, as well as the reagents required for sample preparation, limit its use. And such methods as acid-base, potentiometric and conductometric titration methods are economically more accessible for the determination of DDA of chitosan.

The purpose of this work is to determine the degree of deacetylation of chitosan obtained from cysts of Artemia parthenogenetica of the Aral Sea by conductometric titration.

The DD chitosan was determined by conductometric titration using an EC 215 instrument (HANNA Instruments, Germany). For this, 0.2 g (200 mg) of chitosan was dissolved in 20 ml of 0.1 N HCl solution. The resulting solution was titrated with 0.5 M NaOH solution, adding 0.2 ml every 30 seconds with constant stirring. The amount of NaOH required for titration of the acid bound to amino groups was determined from the graph of the dependence of the electrical conductivity of the solution on the volume of NaOH.



(a)



(b)

Fig.1. Conductometric titration curve of a blank solution of 0.1 N HCl and 0.5 M NaOH (a) and CH solution (b)

The first inflection of the titration curve corresponds to an excess amount of hydrochloric acid, and the second one corresponds to the concentration of amino groups in a sample of chitosan. The calculation of DDA was carried out according to the formula:

$$DDA = \frac{203{,}2*100}{\frac{42+1000*m}{C_{NaOH}*V_{NaOH}}} \quad (2)$$

where m is the mass of chitosan in a sample, g; C_{NaOH} – exact concentration of NaOH solution, mol/dm3; V_{NaOH} - volume of NaOH solution used for titration of amino groups, cm^3; 203.2; 42.0; one hundred; 1000 - conversion factors.

Thus, according to the results of conductometric titration, it was determined that the DDA of the obtained chitosan from the cyst of *Artemia parthenogenetica* is 84%.

FERMENTATION OF THE METHYLOTROPHIC YEAST *Pichia pastoris* FOR RECOMBINANT PROTEIN EXPRESSION

O.N. Ashirov, T.X. Sadullayev, A.M. Yarilkaganova, J.M. Abdurakhmanov, Sh. Sh. Khasanov, X.N. Niyozov, S.A. Sasmakov, Sh.S. Azimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: oybek2425@mail.ru

Methylotrophic yeast *Pichia pastoris* is considered one of the widely used microorganisms for the production of heterologous proteins.

Pichia pastoris cells growing in a Petri dish with MD medium were inoculated into BMGY medium in two 250 mL flasks. The seeded cells were grown for 24 h at 30 °C until the optical density (OD_{600}) was 2-6. For the reproduction of *Pichia pastoris*, mainly substrates such as glucose, glycerol and oleic acid, but also methanol can be used. Generally, a 3-step fermentation process is used for protein expression in the *P. pastoris* system. At the first stage, 4% glycerol is used to increase the biomass. The second phase is the phase of glycerol saturation. Phase III is the initiation or induction phase of recombinant protein expression with methanol, which differs according to each expression phenotype. In this phase, the target protein is expressed. The goal of the first two stages is to produce enough cell biomass

First, to start the fermentation process, 9.0 L BSM saline medium containing 4% glycerol was placed into the fermenter and sterilized at 121 °C for 20 min. After the temperature in the fermenter was cooled to 30 °C, the pH was raised to 5.0 using 25% ammonia. In addition, 4.35 ml of PTM1 saline solution per liter of nutrient medium was added to the medium. After that, 500 ml of cell culture grown for 24 hours was put into the fermenter and the total fermentation volume was 10 l. The rotation speed of the fermenter was 600 rpm, the amount of dissolved oxygen (DO) in the nutrient medium was 30%, and the temperature was adjusted to 30°C. Thus, the first stage (phase) of the fermentation process began. At the end of the above process, the glycerin contained in the nutrient medium was completely absorbed. This indicator was determined by the increase in the amount of dissolved oxygen in the environment by 100%. After that, 50% glycerol containing 12 ml of PTM1/l was taken in the pre-sterilized container and 18.15 ml per liter of nutrient medium was added, i.e. 181.5 ml per 10 L volume. In this case, the amount of soluble oxygen in the fermenter should not fall below 20%. Phase III is the methanol fed-batch culture or induction phase, which differs according to each expression host phenotype. In our case, the phenotype is Mut^+, so we added 2% methanol in relation to the total volume of the fermenter since the literature says 1%.

RIBOSOME-INACTIVATED PROTEINS (RIPS) OF THE BLACK ELDER *Sambucus nigra*

Kh.T. Agzamkhuzhaeva, Yu.I. Oshchepkova*

A.S. Sadykov Institute of Bioorganic Chemistry Academy of Sciences of the Republic of Uzbekistan, *e-mail: joshepkova05@rambler.ru

Ribosome-inactivating proteins (RIPs) belong to a class of enzymes found in plants, fungi, algae, and bacteria. RIPs exhibit N-β-glycosylase rRNA activity, which leads to cleavage of an adenine residue in the conserved 28S rRNA site. Cleavage of this single N-glycosidic bond is irreversible and interferes with association between elongation factors and the ribosome, causing inhibition of protein synthesis. This inactivation occurs by removing a specific adenine residue from the highly conserved (sarcin/ricin) loop of large ribosomal RNA. *Sambucus,* belonging to the Adoxaceae family and native to Europe, Asia, America and Africa, contains a complex mixture of different types of RIPs and related lectins. The presence of RIP and lectins was studied mainly in *Sambucus ebulus L.* (dwarf elderberry), *Sambucus nigra L.* (European elderberry), *Sambucus sieboldiana Blume ex Graebn.* (Japanese elder) and *Sambucus racemosa L.* (red elder).

The aim of this work is to study the composition of ribosome-inactivating proteins from the bark and berries of the black elderberry *Sambucus nigra L.*, growing on the territory of the Republic of Uzbekistan.

The composition of ribosome-inactivating proteins in the bark and berries of black elderberry *Sambucus nigra L.*, collected in the Botanical Garden of the Republic of Uzbekistan, was studied. To identify the isolated compounds on a Bruker MicroFlex spectrometer, a mass spectral MALDI-TOF of the protein composition obtained from the bark was carried out and proteins were found in the mass range of 61–63.0 kDa, corresponding in mass to RIP-2. The repeated mass spectral MALDI-TOF showed that incubation with DTT (50 mM) leads to the disappearance of the signal in the mass range of 61-63.0 kDa and an increase in the signal in the range of 30-32 kDa, which corresponds to the breakdown of RIP-2 into two subunits and indicates the disulfide nature of the isolated RIPs. According to HPLC-MS/MS sequencing, the presence of 9 RIP-2 was found in the bark sample. Based on the obtained amino acid sequences using the CLUSTAL O (1.2.4) program, the amino acid sequence of the identified type 2 RIPs was compared and similar and conserved residues were identified, which will further help identify new RIPs. In the course of the studies, the tryptic peptide LSLVVLQMVSEAAR containing the RIP active site motif (EAAR) was identified with a high degree of probability. Mass spectral data on this fragment will allow further identification of other RIP-1/2 from other samples of natural origin. 2 RIPs were isolated from berries, one of which is in a reduced form containing one chain. Establishing the amino acid sequence in the isolated RIP from black elderberries with a molecular mass of 62337 Da confirmed our hypothesis of identification by the tryptic peptide containing the RIP active site (EAAR). Thus, in the course of the studies, a tryptic peptide containing the RIP active center motif (EAAR) was identified with a high degree of probability. Mass spectral data on this fragment will allow further identification of other RIP-1/2 from other samples of natural origin. The obtained data of De novo sequencing of the LSLVVLQMVSEAAR peptide will allow identification of RIP from other sources.

LOW MOLECULAR METABOLITES OF FUNGI. 13,22-DIMETOXYSTACHIBOTRIN FROM *Stachybotrys chartarum*

S.F. Aripova[1], L.S. Kamalov[2], S. Tojieva[2], I. Nakhatov[2]

1) S.Yu. Yunusov Institute of Chemistry of Plant Substances. AS RUz,
2) Karshi State University, Uzbekistan. e-mail: kamolov.luqmon@mail.ru

As a result of studies carried out in our country, information was obtained on the distribution of fungi of the genus *Stachybotrys*, their morphology, ultrastructure, cytology, biotechnology of cultivation on cellulose-containing nutrient media, ensiling of such solid plant waste as guzapoya, rice straw, corn stalks. *Stachybotrys chartarum* produces a number of low molecular weight compounds. A technique has been developed for the isolation and separation of the sum of extractive substances - waste products of the fungus *Stachybotrys chartarum* grown under laboratory conditions on various nutrient media.

Cause and formulation of the problem, purpose of the work: The purpose of the study is the selection of active local strains of micromycetes, forming 13,22-dimethoxystachibotrin and stachibotral, the study of their morphological cultural properties, the creation of a complex biological product based on promising local strains that protect against fungal phytopathogens.

Results/conclusions: Studied 3 strains of fungi of the genus *Stachybotrys* isolated from the rhizosphere of agricultural crops of serozem soils of Tashkent region and available in the collection of the laboratory. As a result of studying the cultural morphological features, the identification of the strains of *Stachybotrys chartarum* was carried out and it was recommended to cultivate in a nutrient medium supplemented with 2% sucrose and 2% molasses. As a result of screening the selected microorganisms, new local strains of *Stachybotrys chartarum* were obtained and identified with antimicrobial activity, antagonistic properties against phytopathogens and forming a wide range of 13,22-dimethoxystachibotrin and stachibotral in a liquid culture medium.

The optimal nutrient medium was selected for the selected strains (the influence of various carbon sources) and the cultivation conditions for the production of the greatest amount of 13,22-dimethoxystachibotrin and stachibotral under submerged conditions.

An analysis of the spectral data of the isolated substances and the products of their chemical transformations showed that they are all new, based on the same skeleton, consisting of 23 carbon atoms, which is a condensed system of the sesquiterpenoid of dryman with benzofuran.

Conclusion / Application. The scientific significance of the research results lies in the fact that the formation of a wide spectrum of antibiotics, more precisely 13,22-dimethoxystachibotrin and stachibotral, was noted in the culture liquid by selected local strains of the fungi *Stachybotrys chartarum*, the results obtained make a great contribution to the development of scientific research in our republic aimed at using environmentally fresh drugs.

CHARACTERISTICS OF THE RELAXING ACTION OF 5-(4-AMINOPHENYL)-1,3,4-OXADIAZOL-2(3H)-THIONE

Yu.T. Mirzaeva[1], D.S. Ismailova[2], P.B. Usmanov[1], B.J. Elmuradov[2], O.A Tursunova.[3]

1) Institute of Biophysics and Biochemistry at the National University of Uzbekistan, Tashkent, Uzbekistan
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan
3) Andijan State University, Andijan, Uzbekistan
*e-mail: ymirzayeva@mail.ru

We have found that oxadiazole – D-111 exhibited marked vasorelaxant activity and significantly inhibited the contraction of rat aortic rings induced by KCl and phenylephrine (PE) study the effect of oxadiazole – D-111 action 5-(4-aminophenyl)-1,3,4-oxadiazol-2(3H)-thione (D-111)) on the contractile activity of rat aortic smooth muscle cells (SMC). It is shown that the synthetic compound triazole-D-111 has a relaxing effect.

In this regard, we carried out studies on the effect of oxadiazole -D-111 on the contractile activity of SMC of the rat aorta to establish the dependence of the relaxant activity of oxadiazole D-111 on its structure. The studies were carried out on the isolated preparations of the rat aorta, the contractile activity of the aorta was assessed in the isometric mode using a tension sensor (FT.03, Grass, USA) and a camera base. The experimental chamber was perfused with oxygenated carbogen (95% O_2, 5% CO_2) in the Krebs solution at a constant temperature of 37˚C.

The relaxant effect of this triazole was dose-dependent, and with an increase in its concentration, the suppression degree of the contractions of aortic preparations induced by hyperpotassium solutions increased markedly. To further clarify the mechanism of action of oxadiazole, experiments were performed on the dependence of the relaxant effect of D-111 on the concentration (50-250 μM) of Ca^{2+} ions in the incubation medium. In particular, in the presence of 250μM D-111, the addition of 2.5 mM CaCl2 to the calcium-free solution caused a contraction of the aorta preparation, which was 69,9±4,1% less than the contraction recorded in the absence of the oxadiazole. In these experiments, an increase in the concentration of $CaCl_2$ (0,5 mM- 2.5 mM) in the incubation medium was accompanied by a stepwise increase in the force of contraction of the aorta due to the penetration of Ca^{2+} ions through the L-type Ca^{2+} channels.

The results of these experiments convincingly indicate that the relaxant effect of the test compound oxadiazole D-111 under conditions of KCl-induced contracture is associated with the suppression of the transport of Ca^{2+} ions from the extracellular medium to the SMC cytoplasm through voltage-dependent Ca^{2+} channels of the plasmalemma.

EVALUATION OF INSECTICIDAL POTENTIAL OF 1,3,4-OXADIAZOL-2-THIONS

S.M. Turaeva, D.S. Ismailova, M.Sh. Ibragimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: saidaicps@gmail.com

One of the dominant cotton pests in Uzbekistan is the cotton bollworm. Cotton bollworm, a widespread dangerous pest, is a polyphage that damages many fodder and technical plants. The main period of its harmfulness occurs during the development in the caterpillar phase, which develops inside the buds, flowers, ovaries, and fruit elements of cotton. It is reported that, on average, 88,000 tons of raw cotton crops are lost in the country annually due to the cotton bollworm [1].

A big problem in the use of chemicals is the development of pest resistance to them with constant use. The search for new types of insecticides with high activity, and low toxicity, and preventing the emergence of resistance and low residue content has become an urgent task for scientific researchers.

Alkyl derivatives of 5-(*p*-aminophenyl)-1,3,4-oxadiazol-2-thione are reported to be highly toxic to sap-sucking pests such as *Macrosiphum rosae* and *Aphis pomi* [2].

In this regard, the study aims to assess the insecticidal potential of 1,3,4-oxadiazol-2-the derivatives against the quarantine pest - cotton bollworm (*H. armigera*) in the natural conditions of the Tashkent region.

To evaluate the biological effectiveness of 2-benzylthio-5-(4-aminophenyl)-1,3,4 oxadiazole, laboratory experiments were carried out on the cotton bollworm caterpillar.

According to the results of the studies, it was shown that the effectiveness of the studied substance at a dose of 0.1 mg/ml was 65.5% at a 24-hour incubation, and at a 48-hour incubation - 69.0% against the caterpillar *H. armigera*. Under the influence of the insecticide Bagira 20%, the efficiency reached up to 68.0% and 72.0%, respectively.

Field trials showed that the biological effectiveness of 2-benzylthio-5-(4-aminophenyl)-1,3,4 oxadiazole on day 7 was higher than 56.0% compared to control and 11.0% compared to insecticide BI -58. When spraying plants with the test substance, the efficiency for 14-21 days remained up to 58.0% -58.5%.

Thus, the insecticidal potential of 1,3,4-oxadiazol-2-thione derivatives was 10.5% higher than that of the BI-58 insecticide and 18.5% higher than that of Entospilan.

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BIOLOGICAL ACTIVITY 2-ALKYLTHIO-5-AMINO-1,3,4-THIADIAZOLES

P.A. Nurmakhmadova, T.T. Toshmurodov, S.M. Turaeva, A.A. Ziyaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: nurmaxmadova1994@mail.ru

At present to obtain high and stable yields, the use of highly effective insecticides to protect crops from insect pests is a necessary condition. Due to the constant resistance of insects to the insecticides used, their assortment has to be regularly updated and preparations with a specific mode of action for insects are used. [1].

It is known from the literature that 1,3,4-thiadiazole derivatives have a different spectrum of biological activity. Among the representatives of the thiadiazole series, compounds are exhibiting antimicrobial, antifungal, antiviral, antitumor, herbicidal, and insecticidal activity [2].

The apple aphid (*Aphis pomi*) is a member of the aphid family (*Aphidae*). *Aphis pomi* damages apple, pear, quince, hawthorn, mountain ash, and many other crops. Aphids pierce leaves, buds, shoots, and ovaries with their proboscis, very rarely fruits, and suck out the juice, which leads to twisting of leaves and shoots, deformation and death, small fruit, and deterioration of the general condition of trees.

Successful control and improvement of measures to protect the apple tree from this pest is possible only based on experimental data on the characteristics of the life cycle, economic importance in specific conditions, and the use of new means of control.

In this regard, the study of the insecticidal activity of 1,3,4-thiadiazole derivatives is of interest for the creation of new effective insecticidal preparations against sucking pests such as aphids, thrips, whiteflies, etc.

The insecticidal activity of the synthesized 2 alkylthio-5-amino-1,3,4-thiadiazoles was studied under laboratory conditions against the *Aphis pomi*. The systemic insecticide Karbofos 50% e.c. was chosen as a reference. (a.s. malathion).

According to the results of laboratory screening, it was found that substances T-1, T-2, T-3, T-4, T-8, and T-10 in all (0.1, 0.01, and 0.001%) concentrations are highly toxic (90.0% - 100%) for adults *Aphis pomi*. The lowest efficiency (13.3%-50.0%) was observed during incubation with substances T-4, T-5, T-6, T-9, T-11, T-13 at doses of 0.1, 0.01 and 0.001%. In the reference variant, the mortality of *Aphis pomi* reached 90.0%, and in the control variant, the mortality of *Aphis pomi* was not detected.

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NEUROTROPIC ACTIVITY OF 5-(*P*-AMINOPHENYL)-4-AMINO-1,2,4-TRIAZOLE-3(2H) - THIONE POTASSIUM SALT

S.D. Rakhimboev, Z.I. Sanoev, S.Z. Rashidov, I.T. Abdinazarov, T.T. Khamroev, D.S. Ismailova, B.J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: zafarsano19@mail.ru

1,2,4-Triazole is one of the most significant nitrogen-containing scaffolds in the field of medicinal chemistry due to its diverse biological properties. Among the azoles, triazoles are the most stable compounds and are difficult to cleave. 1,2,4-Triazoles act as important pharmacophores by interacting with biological receptors with high affinity due to their dipole character, hydrogen bonding capacity, rigidity, and solubility. The 1,2,4-triazole nucleus is stable to metabolism and acts as an important pharmacophore by interacting at the active site of a receptor as a hydrogen bond acceptor and as a donor. Due to its polar nature, the triazole nucleus can increase the solubility of the ligand and significantly improve the pharmacological profile of the drug. Diverse substitution at the C5 position has been associated with the promising activity of synthesized oxindole derivatives such as progesterone antagonist, vasopressin antagonist, anti-Alzheimer, phosphate inhibitor, kinase inhibitor, neuroprotection, NMDA blocking, and anticancer, antioxidant, antibacterial, and anti-HIV activity.

Taking into account the above, the neurotropic activity of the 5 - (*p*-aminophenyl)- 4 - amino-1,2,4-triazole-3(2H)-thione of potassium salt was studied using several preclinical research methods under experimental conditions. Neurotropic activity was carried out on white mongrel laboratory mice with a body weight of 20-24 g and rates with a body weight of 180-220 g. stored in quarantine for 14 days in a vivarium. In experiments, the studied compound was administered orally at doses of 10; 30 and 60 mg/ kg, in these doses increasing motor activity in rats by 2.0; 2.2 and 1.75 and research activity by 1.2; 1.2 and 1.7, respectively, in relation to the control group by the "open field" method. However, tremors were caused in white mice and the opposite M-cholinolytic activity was caused in relation to tremor and salivation when subcutaneous arecoline was administered at a dose of 10 mg/kg, as well as a weakening at doses of 10 and 30 mg/ kg of motor activity caused by the action of phenamine at a dose of 7 mg/kg under the skin, while at a dose of 60 mg/kg, the motor activity increased.

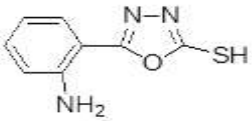
Thus, the results obtained in the conducted preliminary screening studies suggest that in the future a wide range of scientific studies maybe conducted to study the neurodepressive, sedative and other biological properties of the substance under study.

COMPARATIVE ACUTE TOXICITY OF DERIVATIVES WITH 1,3,4-OXADIAZOLE-2-THIONE NUCLEUS

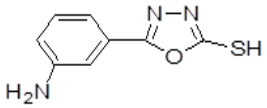
S.Z. Rashidov, Z.I. Sanoev, S.D. Raximboev, I.T. Abdinazarov, T.T. Khamroev, D.S. Ismailova, B.J. Elmuradov.

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: sohib.rashidov@bk.ru

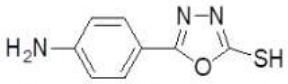
There were four different known isomers of oxadiazole, such as of 1,2,4-oxadiazole, 1,2,3-oxadiazole, 1,2,5-oxadiazole and 1,3,4-oxadiazole. Among them, 1,3,4-oxadiazoles and 1,2,4-oxadiazoles are well known and more widely studied by researchers because of their wide range of chemical and biological properties. The presence of toxophoric –N = C–O– linkage in 1,3,4-oxadiazole ring might be responsible for their potent pharmacological activities. Among these, substituted 1,3,4-oxadiazoles are of considerable pharmaceutical interest. 1,3,4-Oxadiazoles have become important symptoms in the development of new drugs. Derivatives of the oxadiazole nucleus (1,3,4-oxadiazoles) show various biological activities, such as antibacterial, antimycobacterial, antitumor, antidepressant, antiviral and antioxidant activity, etc., as reported in the literature.



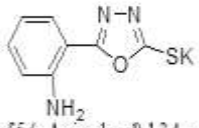
5-(*o*-Aminophenyl)-1,3,4- oxadiazole-2-thione



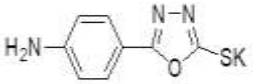
5-(*m*-Aminophenyl)-1,3,4- oxadiazole-2-thione



5-(*p*-Aminophenyl)-1,3,4- oxadiazole-2-thione



Potassium salt of 5-(*o*-Aminophenyl)-1,3,4- oxadiazole-2-thione



Potassium salt of 5-(*p*-Aminophenyl)-1,3,4- oxadiazole-2-thione

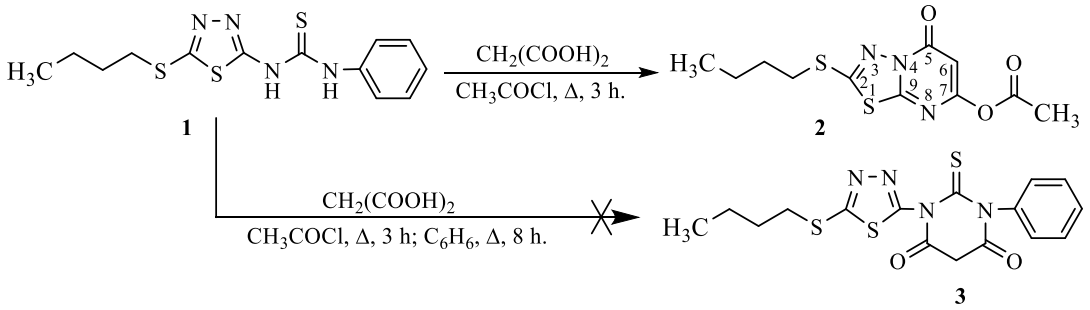
The acute toxicity of the studied substances was determined on white mongrel laboratory mice with a body weight of 22-24 g. In the conducted studies, the acute toxicity of the studied substances (LD_{50}) was as follows; 5-(*o*-aminophenyl)-1,3,4 - oxadiazole-2-tione - 4558 mg/kg, 5-(*m*-aminophenyl)-1,3,4-oxadiazole-2-thione - 1535 mg/kg, 5-(*p*-aminophenyl)-1,3,4- oxadiazole-2-thione - 3490 mg/kg, potassium salt 5-(*o*-aminophenyl)-1,3,4-oxadiazole-2-thione - 2725 mg/kg, potassium salt 5-(*p*-aminophenyl)-1,3,4 - oxadiazole-2-tione - 1975 mg/kg. A noteworthy aspect of these indicators was that when the amino group (NH_2) in the ring was in the ortho, meta and para positions showed less toxicity in relation to cases, up to 2,97 and 1,31 times, respectively. It was also noted that the derivatives in the ortho- and para positions were noted to be less toxic than their potassium salt by 1,67 and 1,77 times, respectively.

HETEROCYCLIZATION OF 2-ALKYLTHIO-1,3,4-THIADIAZOLE-5-PHENYLTHIOUREAS WITH MALONIC ACID

T.T. Toshmurodov, A.A. Ziyaev, K.K. Turgunov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Mirzo Ulugbek Str. 77, 100170, Tashkent, Uzbekistan
e-mail: ttt1609@mail.ru

In our previous work [1,2], we reported the synthesis of several new 2-alkylthio-1,3,4-thiadiazole-5-phenylthiourea derivatives. Based on these compounds, we studied the reaction of 2-butylthio-1,3,4-thiadiazole-5-phenylthiocarbamate (**1**) with malonic acid in order to synthesize new biologically active biheterocyclic compounds containing 3-phenyl-2-thioxodihydropyrimidine-4,6(1H,5H)-dione fragment. The result of the reaction showed, the expected product - 1-(5-(butylthio)-1,3,4-thiadiazol-2-yl)-3-phenyl-2-thioxodihydropyrimidin-4,6(1H,5H)-dione (**3**) was not obtained, conversely, a new compound based on condensed 1,3,4-thiadiazolopyrimidine heterocycle - 2-(butylthio)-5-oxo-5H-[1,3,4]-thiadiazolo[3,2-a]pyrimidine-7-ylacetate (**2**) was obtained in good yield.



For the reaction, equal amounts of reagent **1**, acetyl chloride and malonic acid were taken, and dry was benzene used as solvents. The reactions were carried out at the boiling temperatures of the solvent for 8 and 3 hours respectively. In the experiment in benzene, no product was obtained, but in the reaction in acetyl chloride, compound **2** was in successfully synthesized in good yield (73%). The structure of the new compound was proved by spectral methods (^{1}H- and ^{13}C-NMR, mass spectrum) and XRD method (Fig. 1) and the mechanism of product formation was proposed.

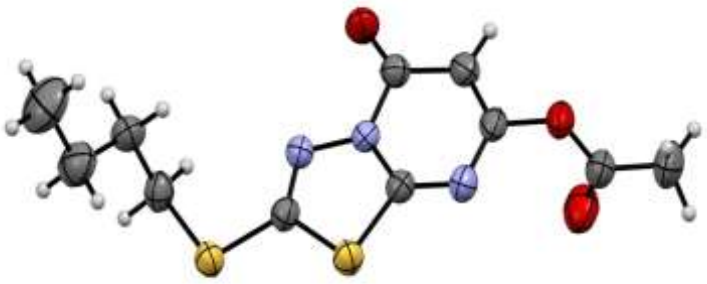


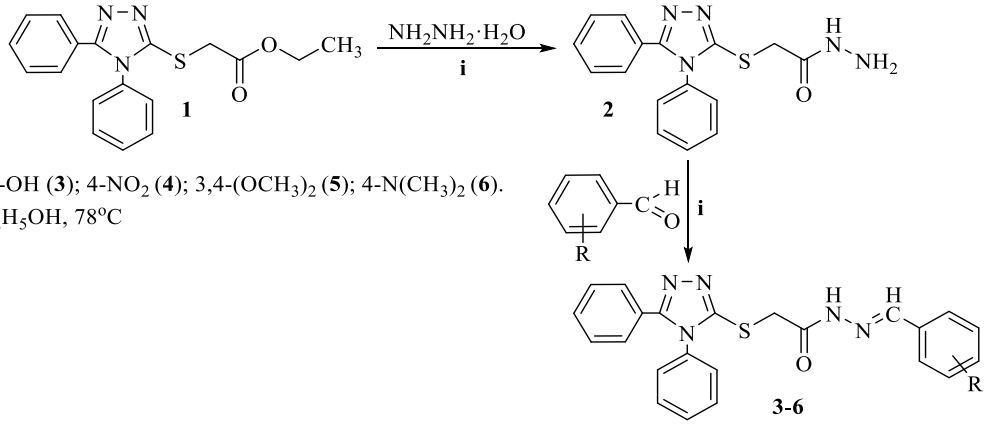
Figure 1. Structure of **2** in the crystal.

SYNTHESIS OF N-(*R*-PHENYL)-(4,5-DIPHENYL-1,2,4-TRIAZOL-3-YLTHIO)ACETOHYDRAZONES AND THEIR CYTOTOXIC ACTIVITY

A.A. Ziyaev[1], E.O. Terenteva[1], B.N. Babaev[2], T.T. Toshmurodov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Mirzo Ulugbek Str. 77, 100170, Tashkent, Uzbekistan
e-mail: aziyaev05@rambler.ru
2) National University of Uzbekistan

Recently, derivatives of 1,2,4-triazoles and their thio-analogues - 1,2,4-triazole-3-thiones have received much attention due to their chemical and different biological activity. Drugs containing a 1,2,4-triazole cycle such as fluconazole, itraconazole, voriconazole, triazolam, alprazolam, etizolam, etc. are widely used in medical practice [2]. In order to search for new biologically active derivatives of 1,2,4-triazole, we have synthesized N-(R-phenyl)-(4,5-diphenyl-1,2,4-triazol-3-ylthio)acetohydrazones (3-6) and their cytotoxic activity was studied:



By reacting equimolar amounts of ethyl ester[(4,5-diphenyl)-1,2,4-triazol-3-ylthio]acetic acid (1) with hydrazine hydrate in ethanol, hydrazide[(4,5-diphenyl)-1,2,4-triazol-3-ylthio]acetic acid (2) was synthesized in high yield (89%). Further, by condensation of 2 with aromatic aldehydes at a molar ratio of reagents of 1:1.2 with boiling in an alcoholic solution, the corresponding acetohydrazones (3–6) were obtained in 79–87% yields. The cytotoxic properties of the compounds were determined by the in vitro MTT method [2] on cell cultures of cervical epithelial carcinoma HeLa, breast adenocarcinoma HBL-100, laryngeal adenocarcinoma HEp-2, and T-lymphoblastic leukemia CCRF-CEM; Cytostatic Cisplatin-Naprod (India) was used as a positive control. According to the test results, the inhibition of cell growth of the studied compounds in relation to the HEP-2 and HBL-100 lines varied within 47-59%, while their activity was minimal on other cells.

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IR-SPECTROSCOPIC ANALYSIS OF THE COMPLEX COMPOUND OF ZINC NITRATE WITH BENZAMIDE

L.A. Sharipova[1], F.Q.Mamatova[1], M.R.Ibragimova[2], T.A.Azizov[2]

1) Jizzakh Polytechnic Institute,
2) IGIC AS Ruz

It is known that as humanity develops, science and technology advances, and the population increases worldwide, the demands of people for water, clean air, land resources, and food are increasing. Today, the demand for environmentally friendly, natural and safe products has increased.

One such method is the mechanochemical method, which does not require different solvents either in the synthesis stage or in cases of extraction of the main product. A steel ball with a diameter of 20 mm and a mass of 67 grams was used for the mechanochemical reaction in a ball mill. In the synthesis of complex compound of zinc nitrate, at the beginning of mixing, the substances come to the same homogeneous state (liquid state), that is, molecules of crystallization water are separated and ligand molecules are coordinated instead. During 7-9 cycles of mixing, it becomes sticky. When mixing was continued, it became a dry powder in 15-17 cycles. To synthesize the complex compound, zinc nitrate and benzamide were taken in 1:2 molar ratio.

Absorption areas of IR spectra were recorded on a spectrometer IR Tracer-100 (500-4000 cm^{-1}) of "SHIMADZU" company. In the IR spectrum of the complex compound $[ZnL^{8}_{2}\cdot(NO_3)_2]\cdot H_2O$, it can be seen that the frequency of the C=O valence vibration of the benzamide molecule has decreased from 1659 cm^{-1} to 1643 cm^{-1}. And the frequency of C–N bond valence vibration in benzamide molecule increased from 1450 cm^{-1} to 1486 cm^{-1}. Hence, it showed that the benzamide molecule is coordinated through the oxygen atom of the carbonyl group. In the IR spectrum of the uncoordinated benzamide molecule, the ring vibration is observed at 1577 cm^{-1}, which increased to 1604 cm^{-1} in the complex state (Fig.1). In the region of 3350 cm^{-1}, an absorption line corresponding to the crystallization water molecule in the complex compound was observed.

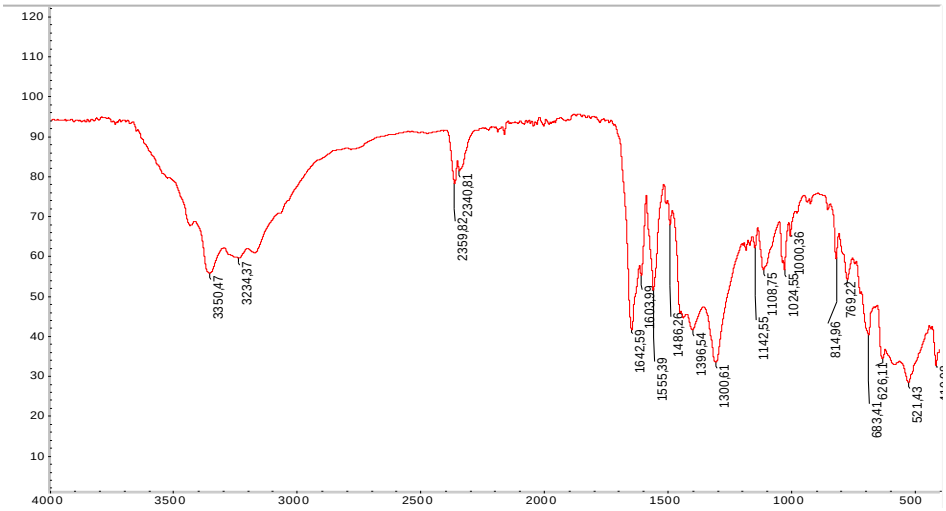


Figure 1. IR spectrum of complex compound $[ZnL^{8}_{2}\cdot(NO_3)_2]\cdot H_2O$

SYNTHESIS OF NOVEL *MONO*-SUBSTITUTED TRIAZINE, CONTAINING A FARMACOPHORIC QUINAZOLINE RING

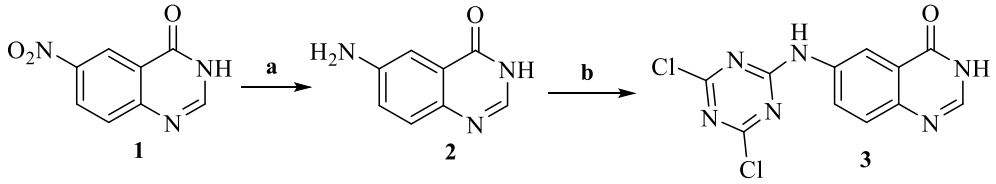
F. A. Zulpanov,[1] B. J. Elmuradov,[1] D. M. Ruziboev,[1]
B. A. Sobirov[2], J. O‘. Muyassarov[3]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: zulpanovf@gmail.com
2) Mirzo Ulugbek National University of Uzbekistan, Faculty of Chemistry
3) Samarkand State University, University blv. 15, Samarkand 140104, Uzbekistan

Triazine derivatives are widely used as weed control agents. Most of them are selective herbicides. At present, preparations based on metamitron and metribuzin are approved for use. For a long time, triazines (*atrazine*, *simazine*, *propazine*, *promethrin*, *ametrine*, etc.) occupied a leading position in terms of production and use in world agriculture and were very widely used in our country. Since 2007, *atrazine* has not been included in the list of herbicides recommended for use, but in world practice it is still used in corn and sorghum crops.

Derivatives of *sim*-triazines are characterized by systemic and contact action. The selectivity of their action is associated with the transformation of chlorine-substituted into the corresponding hydroxy-substituted compound, which is not toxic to cultivated plants. The mechanism of herbicidal action of most 1,3,5-triazine derivatives is based on inhibition of the Hill reaction and blocking of water photolysis.

In the course of our research, we synthesized 6-nitroquinazolin-4-one (**1**) and reduced the nitro group with tin(II)-chloride dihydrate ($SnCl_2 \cdot 2H_2O$) to obtain the corresponding 6-aminoquinazolin-4-one (**2**) in 65% yield required for the reactions:



a) **1**:$SnCl_2$ $2H_2O$ (1:3), EtOH, HCl, 0-2 ^oC, 1 h; 20-24 ^oC, 1 h; 60-65 ^oC, 2 h.
b) **2**:Cyanuric chloride (1:1), K_2CO_3, acetone, 50-55 ^oC, 2 h.

Reaction of 6-aminoquinazolin-4-one (**2**) with cyanuric acid in a ratio 1:1 gives targeted *mono*-substituted 6-((4,6-dichloro-1,3,5-triazin-2-yl)amino)quinazolin-4(3H)-one (**3**) in excellent yield (93%). Melting point of **3** is 348-350°C. Experiments on the synthesis of di- and trisubstituted triazines are ongoing.

Structure of the product has been proven using physical methods of the research.

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TARGETED SYNTHESIS OF 3-ALKYL-6-NITROBENZOPYRIMIDIN-4-ONES

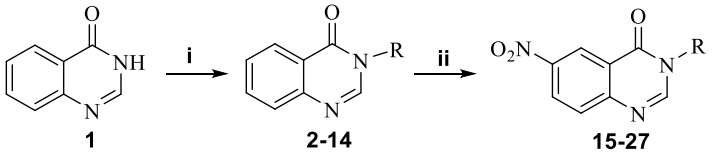
F. A. Zulpanov,[1] B. J. Elmuradov,[1] D. M. Ruziboev,[1]
B. A. Sobirov[2], J. O‘. Muyassarov[3]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: zulpanovf@gmail.com
2) Mirzo Ulugbek National University of Uzbekistan, Faculty of Chemistry
3) Samarkand State University, University blv. 15, Samarkand 140104, Uzbekistan

Compounds containing a condensed pyrimidine ring are widely used in agriculture and medicine. They are widely used in the treatment of cardiovascular, diabetes, cancer and viral diseases. In recent years, drugs such as *imatinib*, *erlotinib*, and *afatinib*, created on the basis of benzopyrimidine derivatives, have been used against tuberculosis and cancer. They are approved by the Food and Drug Administration (FDA) in the United States. Today, the demand for low-toxic drugs containing a new type of pharmacaphor group in the molecule is increasing year by year [1,2].

Taking into account the above points, it is very important to carry out the targeted synthesis of substances containing the potentially biologically active benzopyrimidine ring and their chemical modification, as well as to determine their physico-chemical and biological properties and create new drugs based on this.

In the course of our research, we synthesized the desired benzopyrimidin-4-one (**1**) in the presence of formamide with *o*-aminobenzoic acid, and carried out its alkylation reaction with various normal and *iso*-structured alkyl halides, and 3-alkylbenzopyrimidin-4-ones (**2-14**) were obtained in high yields:



1 **2-14** **15-27**

i) RX, KOH, EtOH; **ii**) HNO_3+H_2SO_4.

R= **2,15**, Me; **3,16**, Et; **4,17**, Pr; **5,18**, Bu, **6,19**, *iso*-Bu; **7,20**, *tret*-Bu; **8,21**, amyl; **9,22**, *iso*-amyl; **10,23**, hexyl; **11, 24**, heptyl; **12, 25**, octyl; **13,26**, nonyl, **14, 27**, Bn.

In order to expand the synthetic potential of the synthesized 3-alkylbenzopyrimidin-4-ones, we performed electrophilic substitution (nitration) reactions in their aromatic ring. The reactions were carried out at low temperature in the presence of a nitrating mixture (HNO_3/H_2SO_4). As a result, 3-alkyl-6-nitrobenzopyrimidin-4-ones (**15-27**) were synthesized in excellent yields. Their structure was confirmed by IR, NMR spectroscopy and X-ray structure analysis.

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SYNTHESIS AND PROPERTIES OF CHITOSAN CITRATE *Bombyx mori*

Z.I. Ibodullaeva, K.K. Pirniyazov, S.Sh. Rashidova

Institute of Chemistry and Physics of Polymers, Tashkent, st. A. Kadyri, 7b, Republic of Uzbekistan, e-mail: polymer@academy.uz, *tel: (8-10-998-71) 241-85-94*

In this work, obtaining the synthesis of chitosan citrate *Bombyx mori* based on citric acid and chitosan by the suspension method. Its physicochemical and antimicrobial properties against *Fusarium oxysporum*, which causes diseases of mulberry trees, have been studied. The resulting chitosan citrate based on chitosan *Bombyx mori* (CS) and citric acid (CA) has a larger suppression zone compared to all variants against *Fusarium oxysporum* mulberry culture, which makes it possible to use it in presowing seed treatment at a ratio of CS: CA components of 4:1. IR spectroscopy and X-ray diffraction analysis established the structural characteristics of chitosan citrate *Bombyx mori*.

In order to obtain biologically active complexes of chitosan with citric acid, the synthesis was carried out at a temperature of 25^0C by varying the ratio of the initial components of chitosan and citric acid. The duration of the synthesis is 60 minutes. Acetone of chemically pure grade was used as a desiccant. The amount of citric acid in the composition of chitosan citrate was determined by alkaline titration in the presence of the phenolphthalein indicator. The complexation was carried out by the suspension method of mixing the components of chitosan and CA at a ratio of 1:1, 2:1, 3:1, 4:1. The degree of binding of citric acid was determined based on the ratio (M_{CA}) exp. / (M_{CA}) calc. The results obtained are presented in table.

Table

Influence of the ratio of the initial components of chitosan and CA on the degree of binding citric acid

№	Sample name	Content N, %	Content, %	Degree of binding, %	Productivity, %
1	CS initial	8,21	-	-	-
2	CS: CA 1:1	4,54	57,0	55,0	52,0
2	CS: CA 2:1	5,71	32,7	71,7	80,0
4	CS: CA 3:1	6,30	31,3	96,0	85,7
5	CS: CA 4:1	7,12	26,1	96,2	82,8

The results obtained show that with an increase in the ratio of chitosan compared to citric acid, the content of citric acid in the composition of the obtained chitosan citrate decreases by reducing the proportion of citric acid in the reaction system. It was found that with an increase in the ratio of chitosan, the yield of the final product and the degree of binding of citric acid increase. Note that after the establishment of an equivalent ratio of amino groups of chitosan and carboxyl groups of citric acid (at a ratio of components of chitosan: CA 3:1), the degree of binding and the yield of final products change slightly.

UV-SPECTROSCOPIC STUDIES CHITOSAN SULFATE *Bombyx mori*

V.N. Rakhmanova, M.A. Muslimova, N.S. Ashurov, S.S. Rashidova

Institute of Chemistry and Physics of Polymers ASRU, 100128, Tashkent, A. Kadyri str. 7 b, e-mail: polymer@academy.uz

It is known that chitosan does not dissolve in water and this to a certain extent limits its practical application. The production of water-soluble chitosan derivatives expands its range of applications in biomedicine. One of the ways of obtaining water-soluble chitosan derivatives is its interaction with acids of different nature. In recent years, the interest in these objects sharply increased thanks to numerous studies, which showed that when switching from micro- to nano-particles there occurs qualitative change in many physical and chemical properties of substances, the nature of kinetics of chemical processes and particles flowing on the surface.

In this work, the nanoparticles of sulfochitosan were obtained and their structural properties were investigated via UV-Spectroscopy.

The results obtained via UV-Spectroscopy show that with the increase of substitution degree in chitosan sulfate a noticeable change of absorption band happens within the range of 200-220 nm and 270-280 nm which may be related with n-π* and n-σ* transitions of nitrogen electrons and oxygen of the original chitosan as well as substituted sulfogroups S=O.

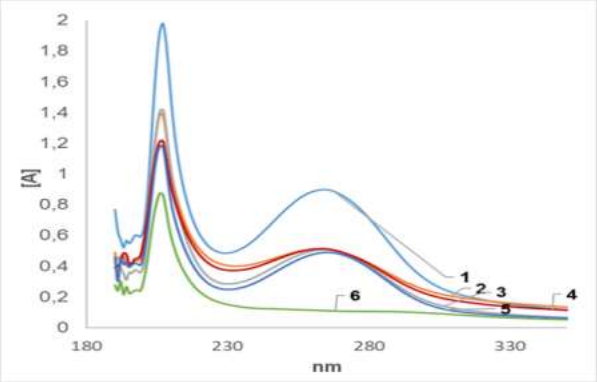


Fig. UV spectra of samples SHZ : 1 – HZ:HSK 1:2; 2 – 1:3; 3 – 1:4; 4 – 1:6; 5 – 1:8; 6 – 1:10.

Changes in absorption bands may be related with the formation of covalent links between chitosan amino groups and chlorosulfonic acid, which leads to a decrease in electronic transitions n-σ* of an unshared pair of nitrogen electrons. It should be noted that with a component ratio of 1:10 the low molecular weight fractions of chitosan sulfate were formed as a result of a strong destruction of macromolecules. Decrease in band intensity within the range of 270-280 nm was detected.

Thus, the research results suggest that the most optimal conditions for the production of chitosan sulfate Bombyx mori with a high degree of substitution and low destruction are duration 3 hours, chlorosulfonic acid:chitosan ratio of 6:1 and the temperature of 50^{o}C. It was established that when stored during 1 month, the samples of chitosan sulfate solutions with varying degrees of substitution will stay stable.

Ferula tadshikorum ROOT STOCKS ON BABATAG

T.Sh. Khushatov, A.E. Egamberdiyev, S.F. Aripova., A. Nigmatullaev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: xushatovtohir@gmail.com , *phone: +998974644964*

Herbal medicines have been used since ancient times against various diseases. In recent times, compounds of natural origin have become increasingly important due to the presence of a huge number of physiologically active phytocomponents in them and the wide chemical diversity that they possess. The increased demand for herbal preparations is associated with the relatively safe use of herbal preparations due to their availability and less toxicity. In several resolutions of the President of the Republic of Uzbekistan, it is noted "To ensure the development of technologies for the production of medicines necessary for medicine and agriculture by processing raw ferula". Based on the chemical components, namely the terpenoids of the plant *F. tadshikorum* and the identified biological activity, work is underway to develop technology and prepare for the introduction of a number of effective medicines for medicine. *F. tadshikorum* Pimenov is a perennial, monocarpic, strongly and unpleasantly smelling herbaceous plant of the celery family - *Apiaceae*. In Uzbekistan, *F. tadshikorum Pimenov* grows in Kashkadarya, Surkhandarya, and other regions. In folk medicine of the East, the use of *F. tadshikorum Pimenov* is known as an antiparasitic, antispasmodic, and expectorant, for tuberculosis, syphilis, and malignant tumors, and other properties. It is known from the literature that in the East, the resin is used as a spice, obtained from fresh ferula roots by cutting. Currently, industrial preparations of this resin, which is exported in tons as a spice to India, Iran, Pakistan, Afghanistan, lead to the depletion of the reserves of this plant. Therefore, the conservation of natural resources of this plant is an urgent problem. In 2021-2022, we examined the habitats of *F. tadshikorum* Pimenov on Babatag: the vicinity of SS. Karankul, Sharildy, Kaplansay, Beshstalba and Kurka. It grows in the semi-savannah and shilyak belts; in bluegrass, barley, pistachios, almonds, along the edges of maple forests, in groups of double-leaved, joster, cherry, sapling, it is often an edificator or sub-edificator; on loess and fine earth-gravelly slopes, limestones, variegated flowers at an altitude of 1100-1800 m above sea level.

To determine the reserves on the ground, accounting areas of 10 square meters in size were laid. From 4 to 7 plants grew on average on the laid sites. The wet weight of the roots was 2.6 kg, the dry weight was 0.780 kg, and in terms of 1 hectare, 780 kg. As a result of surveys, thickets of plants were found in an area of 27 hectares. On the identified arrays, the total stock of dry roots was 21.06 tons. Based on fieldwork, it was found that the reserves of *F. tadshikorum* Pimenov in Uzbekistan, where there were practically significant commercial thickets due to their increased exploitation, have been severely undermined in recent years. The places of the former distribution of this type of ferula are visible to the naked eye, since the surface of the soil is literally dotted with pits left after harvesting the resin of the roots.

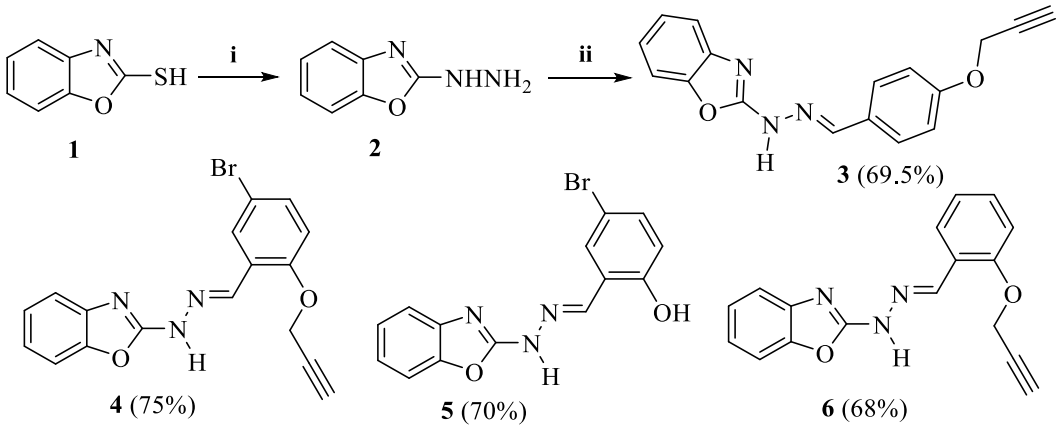
To further develop the export potential of the raw material *F. tadshikorum* Pimenov, as well as to preserve biodiversity, it is necessary to create artificial plantations in the places of natural growth of this plant species. Over the past 3-4 years, according to the data provided by farmers, they have planted more than 3,500 hectares of plantations in the places of natural growth of this species by sowing seeds.

SYNTHESIS OF THE NOVEL HYDRAZONES BASED ON 2-HYDRAZINOBENZOXAZOLES AND THEIR INHIBITION ACTIVITY

Z.J. Pulatova, I.S. Ortikov, B.J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: 7ulhumor@gmail.com

One of the important issues today is the easy synthesis of potentially active heterocyclic compounds, and the search among them for less toxic, pharmacologically active compounds, and the targeted synthesis of promising substances, as well as the creation of effective drugs based on them. Among such active heterocyclic compounds, we can cite 2-hydrazinobenzoxazole (**2**) and its derivatives as examples. Many of their derivatives are potentially biologically active substances and are being synthesized as anti-inflammatory, anti-diabetic, anti-cancer agents [1,2]. Compound **2** can be easyly obtained (**i**) from 2-mercapto-benzoxazole (**1**) and hydrazine hydrate:



Information on the synthesis of 2-hydrazinobenzoxazole derivatives can be found in the literature, but we can see that in most of them, the yield of the products is very low, or the reaction conditions are very difficult. Therefore, the development of easy and convenient methods of synthesis of this class of compounds is very relevant from the point of view of both theoretical and practical organic chemistry. Reactions with some substituted aromatic aldehydes (**ii**) based on 2-hydrazinobenzoxazole (**2**) were carried out under solvent and catalyst-free conditions. As a result, corresponding hydrazones (**3-6**) were obtained in good yields. The synthesized hydrazones possess good inhibition activity.

The structure of the synthesized substances was proved based on the results of IR-, ^{1}H and ^{13}C NMR spectroscopies.

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TARGETED SYNTHESIS OF HYDRAZIDES, CONTAINING A PHARMACOPHORIC - BENZOXAZOLE CYCLE

Z.J. Pulatova, I.S. Ortikov, B.J. Elmuradov

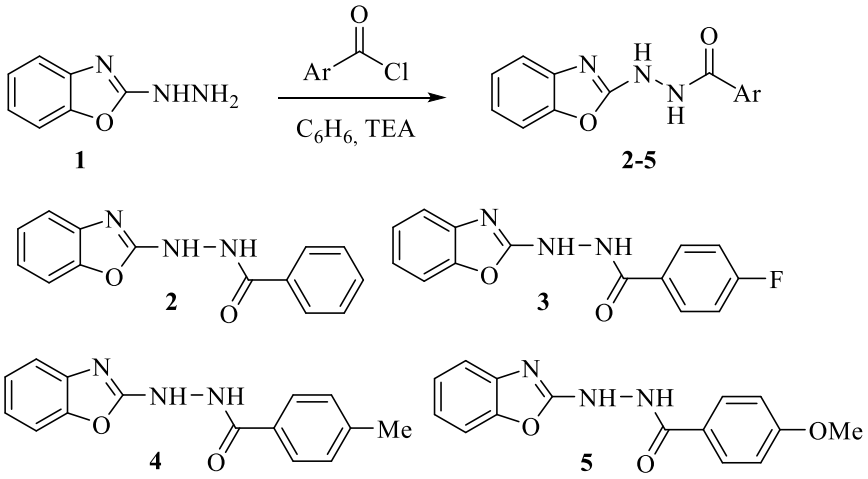
S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: 7ulhumor@gmail.com

Benzoxazole derivatives are important heterocyclic organic compounds, with which research began many years ago. One of the main reasons for this is explained by the fact that they have important biological and pharmacological activities [1]. This class of compounds includes analgesics, antivirals, fungicides, anticancer, bactericides, and anthelmintics [2].

It should also be noted that various biologically active substances have been found among hydrazides. For example, they include anti-tuberculosis (isoniazid, ftivazid), plant growth regulators (maleic acid hydrazide) – as retardants.

Our main goal in this work is to search for an efficient synthesis method of 2-hydrazinobenzoxazole (**1**) and to carry out acylation reactions of the obtained compound with some aromatic acid chlorides.

To achieve these goals, we carryied out acylation reactions of 2-hydrazinobenzoxazole (**1**) with acid chlorides containing various substituents under simple and convenient conditions and it was synthesized the corresponding hydrazides (**2-5**) in good yields:



Reactions were carried out in the presence of triethylamine in benzene solution.

The structure of the synthesized hydrazides (**2-5**) was proved using IR-, ^{1}H and ^{13}C NMR methods and confirmed based on the results of elemental analysis.

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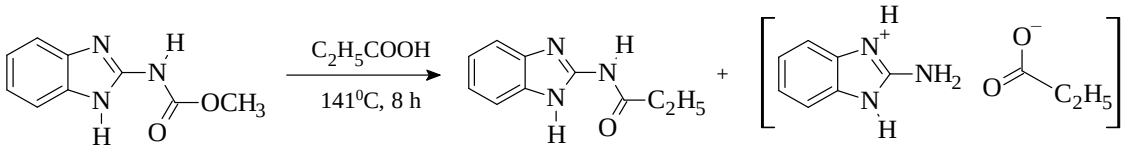
SYNTHESIS AND CRYSTAL STRUCTURE OF INTERACTION PRODUCTS OF 2-METHOXYCARBONYLAMINO-BENZIMIDAZOLE AND PROPIONIC ACID

S.S. Saidov,[1] B.I. Avazova,[2] A.Sh. Abdurazakov,[1] R.Ya. Okmanov[1]

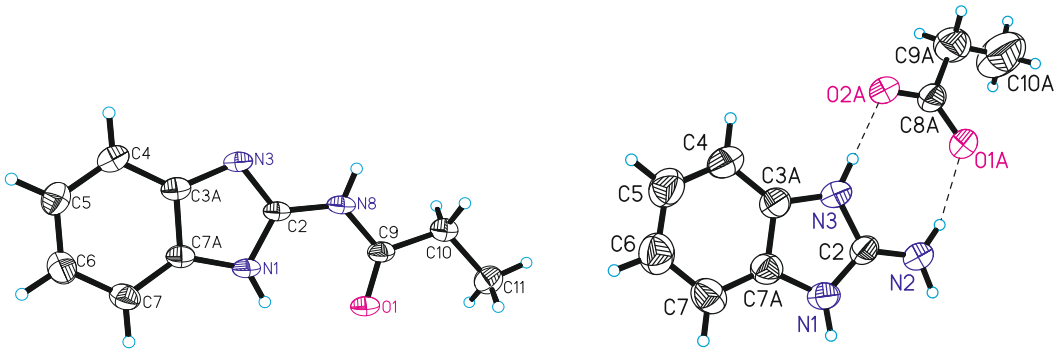
1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: sarvar-saidov-1989@bk.ru
2) Urgench State University. Kh. Alimdjan str., 14, Urgench city, 220100, Uzbekistan

Previously, we studied the reactions of 2-methoxycarbonylaminobenzimidazole (**1**) with benzoic acid. The reaction was carried out by boiling equimolar amounts of reagents, dimethylformamide was used as a solvent. As a result of the reaction, 2-benzoylaminobenzimidazole and a salt of 2-aminobenzimidazole with benzoic acid were obtained [1]. Continuing similar studies, the interaction of the initial 2-methoxycarbonylaminobenzimidazole with aliphatic - propionic acid was studied, propionic acid was used in excess as a reagent and solvent to obtain products 2-propionylaminobenzimidazole (**2**) and salt of 2-aminobenzimidazole with propionic acid (**3**) with a yield of 42.4%, 53.6% respectively.



1 **2** **3**

For reliable refinement of the structure, X-ray structural analysis was performed.



2 **3**

Figure 1. Molecular structures of the compounds 2 and 3, including atom labelling. Intramolecular H-bond is shown with dashes lines

Reference

1. A.Sh. Abdurazakov, S.S. Saidov, R.Ya. Okmanov, Sh.Kh. Kubaev, B.Zh. Elmuradov. *Egypt. J. Chem.* 2021, Vol. 64, No. 5 pp. 2247 – 2252.

SYNTHESIS OF BENZO[4,5]IMIDAZO[2,1-*B*]QUINAZOLIN-12(5*H*)-ONE

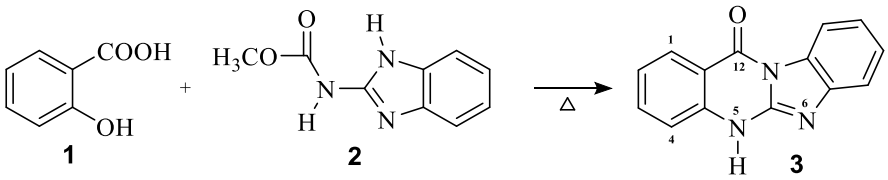
S.S. Saidov[1], B.I. Avazova[2], Sh.Kh. Kubaev[1], R.Ya. Okmanov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: sarvar-saidov-1989@bk.ru
2) Urgench State University. Kh. Alimdjan str., 14, Urgench city, 220100, Uzbekistan

Benzimidazoles are heterocyclic aromatic organic compound which have been an important pharmacophore and privileged structure in medicinal chemistry. Many substituted benzimidazoles have considerable interest as compounds with a wide spectrum of biological activity and low toxicity.

Recently we have studied the interaction of 2-methoxycarbonylaminobenzimidazole with benzoic and various aliphatic carboxylic acids of *normal* or *iso*-structure. In this case, the formation of mainly the corresponding acid amides was found [1].

Continuing similar studies, in this work we curried out interaction of 2-methoxycarbonylaminobenzimidazole (**2**) with 2-hydroxybenzoic acid (salicylic acid, **1**) boiling in DMF of equimolar amounts of starting materials, and formation of a new annulated product – benzimidazo-quinazolinone (**3**) was observed (Scheme 1):



Scheme 1. Synthesis of benzo[4,5]imidazo[2,1-*b*]quinazolin-12(5*H*)-one

Based on the product (**3**) obtained, it can be assumed that during the reaction, takes place regioselectively interaction of exocyclic amino group of the pre-formed 2-aminobenzimidazole and carboxylic group of benzoic acid (**1**) to form benzoic acid amide; then intramolecular cyclization of this intermediate (amide) in acidic medium occurs with the formation of the target annelated heterocyclic product (**3**).

For reliable refinement of the structure, X-ray structural analysis was performed:

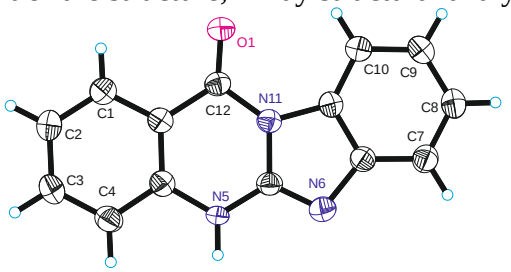


Figure 1. Molecular structure of benzo[4,5]imidazo[2,1-*b*]quinazolin-12(5*H*)-one, including atom labelling. Displacement ellipsoids are draw at the 30% probability level.

Reference

1. A.Sh. Abdurazakov, S.S. Saidov, R.Ya. Okmanov, Sh.Kh. Kubaev, B.Zh. Elmuradov. *Egypt. J. Chem.* 2021, Vol. 64, No. 5. P.2247-2252.

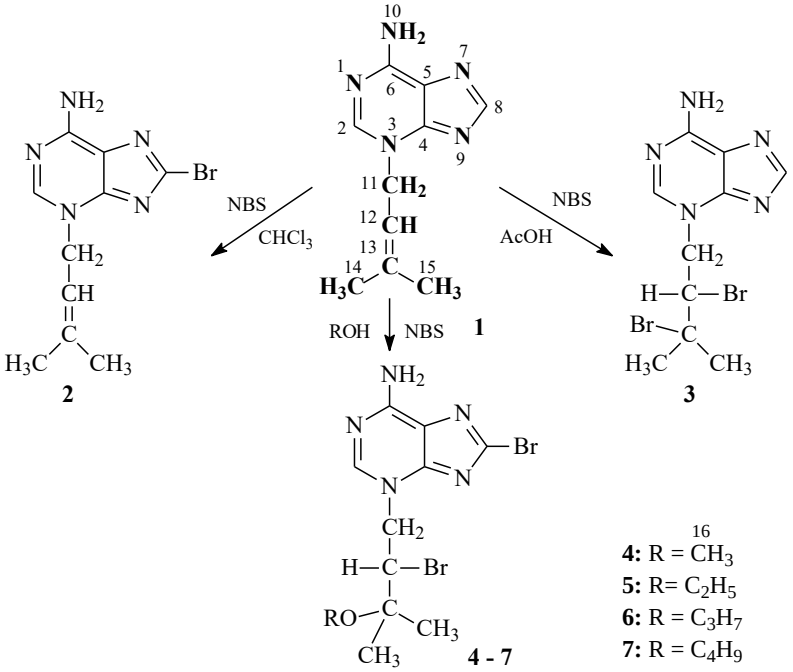
BROMINATION OF TRIACANTHINE

Sh.B. Rakhimov, V.I. Vinogradova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: rshukhrat70@mail.ru

Continuing the study of the triacanthine reactivity, its bromination reactions with N-bromosuccinimide in various solvents were carried out in order to obtain new, biologically active substances. Chloroform, acetic acid, and a number of alcohols (methyl, ethyl, propyl, and butyl) were used as solvents.

It was found that the direction of bromination depends on the used solvent. The formation of a stable bromonium cation in polar solvents leads to compounds **3-7**, whereas in chloroform, product **2** with a more stable σ-complex predominates.



The structure of the obtained compounds was proved by the data of chromatomass, ^{1}H, ^{13}C NMR spectra and X-ray diffraction.

BENZYLATION OF TRIACANTHINE

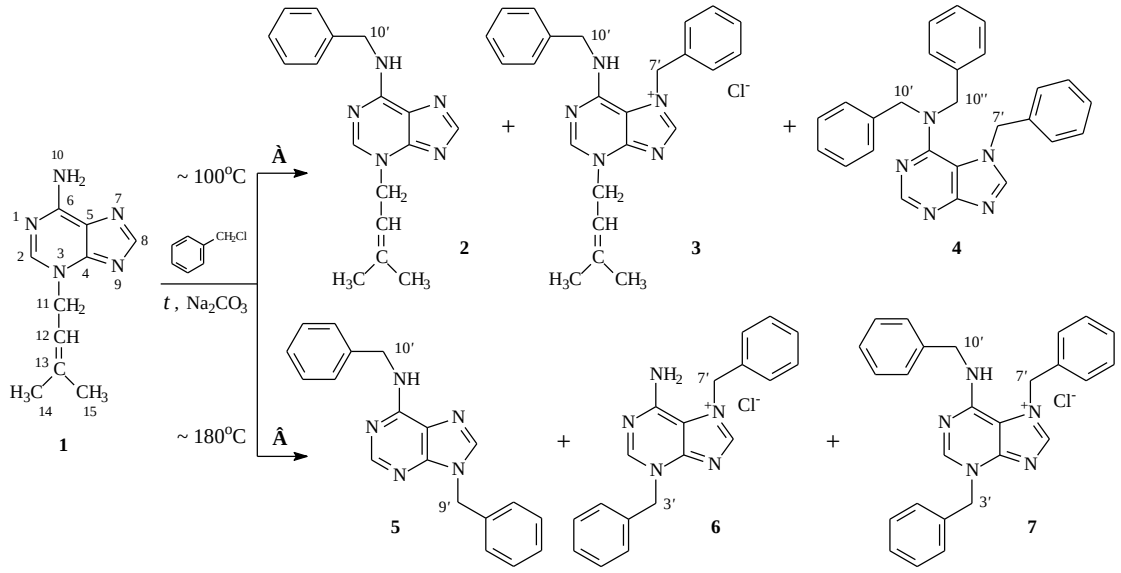
Sh.B. Rakhimov, V.I. Vinogradova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: rshukhrat70@mail.ru

Continuing the study of the reactions of triacanthine, we carried out the benzylation of triacanthine with benzyl chloride. The reactions were carried out by two methods: the reaction mixture was heated on a water bath (7 h, ~100°C, method A) or boiled (1 h, ~180°C, method B).

In the reaction according to method A, three products were formed, 6-N-benzyl- (**2**), 6N, 8-dibenzyltriacanthine (**3**), and tribenzyladenine (**4**). The use of high temperature (~180°C, method B) led to the preparation of differently substituted adenine derivatives (**5-7**).

Compounds **3, 6, 7** are N^+-7 quaternary salt.



The structure of the obtained compounds was proved by the data of chromato-mass, ^1H, ^{13}C NMR spectra, and X-ray diffraction.

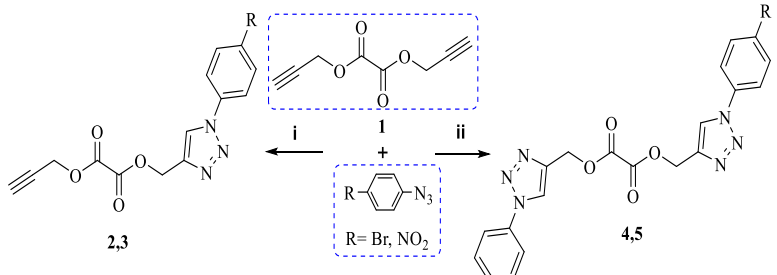
SYNTHESIS OF NEW 1,2,3-TRIAZOLE DERIVATIVES BASED ON OXALIC ACID DIPROPARGYL ESTER

N.G. Nurillaeva,[1,2] I.S. Ortikov,[1,3] Zh.U. Bobokhuzhaev[2], I.A. Abdugafurov[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ortikovilxomjon@gmail.com
2) National University of Uzbekistan.
3) Chirchik State Pedagogical University of Tashkent region

Nowadays, 1H-1,2,3-triazoles are the most studied compounds, and in recent years, articles of this class have been published in prestigious journals. The main reasons for this are the novelty and convenience of the synthesis method, high pharmacological activity, and low toxicity. At present, reactions going through azide and alkyne cycloaddition are also used in polymeric materials [1]. Among 1,2,3-triazoles, there are many preparations with herbicidal, fungicidal, insecticidal activity; there are many substances with anti-inflammatory, anti-diabetic, anti-microbial activity [2]. Therefore, it is very important to synthesize new derivatives of 1,2,3-triazoles, to determine their structure and biological activity.

It is known that synthesis of 1,2,3-triazole derivatives based on aliphatic monocarboxylic acid propargyl ethers has been studied in detail [3]. However, the synthesis of 1,2,3-triazoles based on saturated dicarboxylic acid dipropargyl ethers has not been studied in detail. In our research work, we conducted experiments based on oxalic acid, the first representative of dicarboxylic acids. First, dipropargyl oxalate (**1**) was synthesized by etherification of oxalic acid with propargyl alcohol. The corresponding mono- (**2,3**) and bis-1,2,3-triazole derivatives (**4,5**) were synthesized by cross-ringing the obtained ether with *para*-bromo and *para*-nitrophenylazides. Experiments were carried out by heating a mixture of ester and azide in a ratio of 1:1 or 1:2 in a toluene solution in the presence of catalyst of copper (I) iodide for 8 hours.



The structures of the obtained triazole derivatives (**2-5**) were confirmed using IR and 1H NMR spectra.

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CATALYTIC SYNTHESIS OF 1,4-DISUBSTITUTED 1,2,3-TRIAZOLES BASED ON ORTHO-PROPARGYLOXYBENZALDEHYDE AND SOME AROMATIC AZIDES

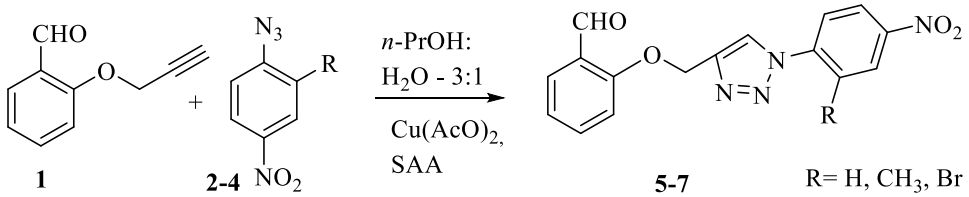
I.S. Ortikov[1], I.A. Abdugafurov[2], B.Zh. Elmuradov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) National University of Uzbekistan. e-mail: ortikovilxomjon@gmail.com

Nowadays, one of the important task is targeted synthesis of promising substances based on the reaction of potentially active heterocyclic compounds, especially five- and six-membered ring substances containing two or more heteroatoms, with electrophilic and nucleophilic reagents and creating effective biologically active drugs based on them. In particular, scientific research is being carried out on obtaining new derivatives of 1,2,3-triazoles using modern organic synthesis methods.

It is known that organic azides undergo a 1,3-bipolar cycloaddition reaction with substances containing triple bonds and form a 1,2,3-triazole ring. It was discovered by M. Meldal and B. Sharpless a catalytic method of cyclization, which today is called as “click chemistry”. Scientists received the Nobel Prize in 2001 and 2022 for this research. The fact that the authors were awarded 2 times for the method of azide-alkyne cycloaddition shows that there is a high interest in this direction [1-3].

We started our research by alkylating salicylaldehyde with propargyl bromide and synthesized the corresponding ortho-propargyloxybenzaldehyde (1). It was studied the cyclization reaction of 1 with 4-nitrophenylazide, 2-methyl-4-nitrophenylazide, 2-bromo-4-nitrophenylazide (**2-4**). Experiments were carried out in the presence of catalysts $Cu(AcO)_2$ and sodium ascorbate (SAA) in the ratio: *n*-PrOH : H_2O (3:1).



The progress of the reaction was monitored by TLC and the optimal conditions for the formation of 1,2,3-triazoles were determined. The structure of the obtained triazole derivatives (**5-7**) was confirmed by IR and ^1H NMR spectra. Compounds, consisting formyl group can serve as synthons for further researches.

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AMIDOALKYLATION OF 6H(BROMO, CHLORO)-BENZOXAZOLIN-2-ONES

M.I. Olimova, A.R. Khurramov, B.Zh. Elmuradov

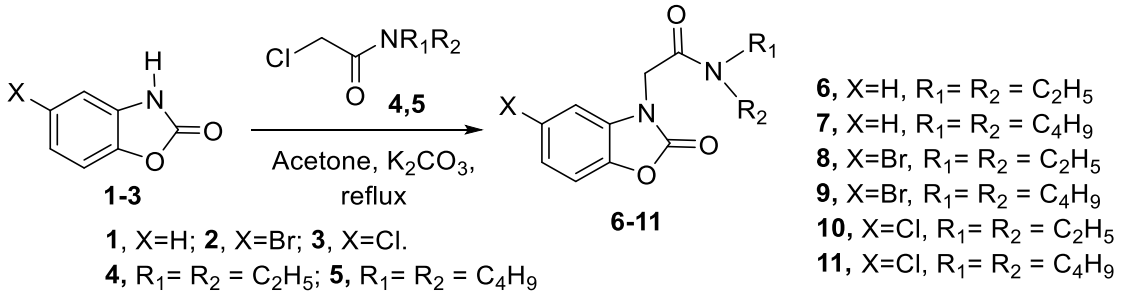
S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Benzoxazoles are found in a variety of natural products and routinely find use in pharmaceutical research. They are generally made by condensation of a 2-aminophenol with a carboxylic acid. Therefore, this scaffold is often described as the building blocks for the synthesis of various pharmacologically relevant molecules.

The increased interest in benzoxazole derivatives is due to their high biological activity and wide spectrum of action. Among of 2,3-substituted benzoxazolin-2-ones, there are substances that have antitumor, hypotensive, antispasmodic, antipsychotic, antibacterial effects, as well as herbicidal, fungicidal and growth-stimulating activity [1-4].

Continuing research on the synthesis and chemical transformations of 6H(bromo, chloro)-benzoxazolin-2-one, it seemed interesting to us to study the alkylation of 6H(bromine, chlorine)-benzoxazolin-2-ones with chloroacetic acid amides, since this reaction not described in the literature.

In order to synthesize new potentially active derivatives of benzoxazoles, in this work, we carried out reactions of 6H(bromo, chloro)-benzoxazolin-2-ones (**1-3**) with chloroacetic acid amides (**4,5**) in the presence of triethylamine using stoichiometric amounts of reagents failed to give positive results. However, when K_2CO_3 was used as a dehydrohalogenating agent, 1-(N,N-dialkylamido)methyl-6H(bromo, chloro)-benzoxazolin-2-ones (**6-11**) were synthesized in good yields.



1, X=H; **2**, X=Br; **3**, X=Cl.

4, $R_1 = R_2 = C_2H_5$; **5,** $R_1 = R_2 = C_4H_9$

The structure of the synthesized compounds was confirmed by the data of IR-, ^1H NMR spectroscopy and mass spectrometry.

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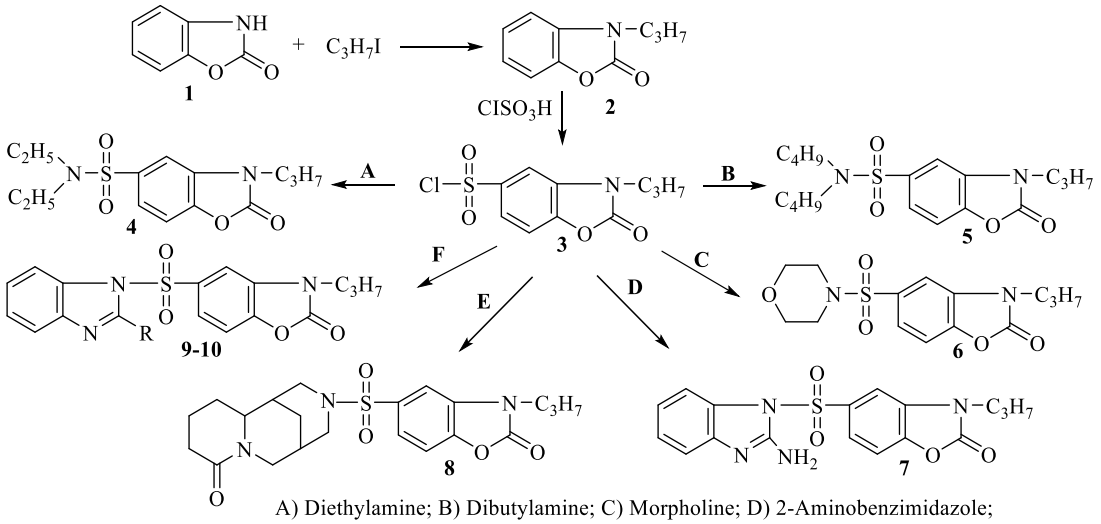
SYNTHESIS OF 5-CHLOROSULFONYL-N-PROPYLBENZOXAZOLINE SULFONAMIDES

M.I. Olimova, B. Zh. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Since the synthetic compounds of benzoxazolin-2-one (**1**) have a wide range of biological activities, the synthesis of various important synthetic analogues has become the main goal of many researchers. One of the most widely used compounds in the production of biologically active compounds are substituted benzoxazolines. Benzoxazoline compounds include antimalarial, antiparasitic, antimicrobial [1], antiviral [2], anticancer [3] and many other biologically active compounds.

The analysis of scientific sources shows that the synthesis of sulfonamides (**4-10**) is not reported in the literature. We have propylated of benzoxazoline (**1**) under alkaline conditions, which gives of N-propylbenzoxazoline (**2**). Its chlorosulfonylation occured by electrophilic substitution and corresponding 5-chlorosulfonyl-N-propylbenzoxazoline (**3**) was obtained. When the synthesized compound **3** was reacted with aliphatic and heterocyclic amines of different basicity in the presence of potash, it was observed that corresponding sulfonamides (**4-10**) were formed in good yields:



A) Diethylamine; B) Dibutylamine; C) Morpholine; D) 2-Aminobenzimidazole; E) Cytisine; F) Alkylbenzimidazole; R = C_3H_7, C_4H_9

The structure of the synthesized compounds was confirmed by the data of IR-, ^1H NMR spectroscopy and mass spectrometry.

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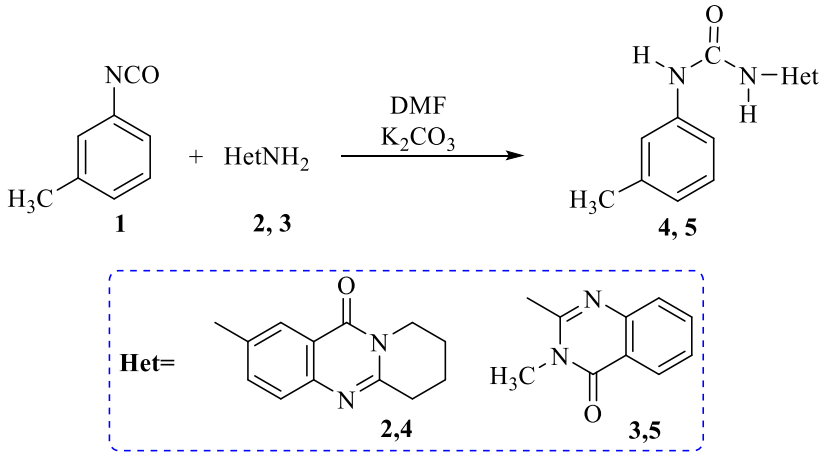
SYNTHESIS OF NEW POTENTIALLY ACTIVE HYBRID 1-ARYL-3-HETERYLUREAS

G.N. Kudratov, I.S. Ortikov, B.J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: b_elmuradov@mail.ru

Along with cancer and cardiovascular diseases, infectious diseases caused by fungi and microbes are among the serious and even fatal diseases [1,2]. For this reason, scientists are regularly conducting scientific research on the creation of new drugs for the above diseases. Among synthetic organic compounds, various substituted urea derivatives are used as anti-inflammatory, cytotoxic and central nervous system diseases [3]. Therefore, it is an important task to synthesize new derivatives of various substituted urea and to create effective drugs based on them against various diseases.

In this research work, the synthesis of 1,3-disubstituted ureas was carried out based on the reaction of m-tolyl isocyanate (**1**) with various heterocyclic amines containing an amino group: 2-aminomackinazolinone (**2**) and bicyclic 2-amino-3-methyl-quinazolin-4-one (**3**). The reaction was carried out by mixing of 1:1 ratio of isocyanate and amino compounds in a solvent medium:



The reaction was carried out at room temperature in DMF in the presence of potash, products (**4,5**) separated by extraction method and products were obtained in high yields (**4** - 87%, **5** - 77%) and their structure was confirmed using IR, 1H and ^{13}C NMR spectra.

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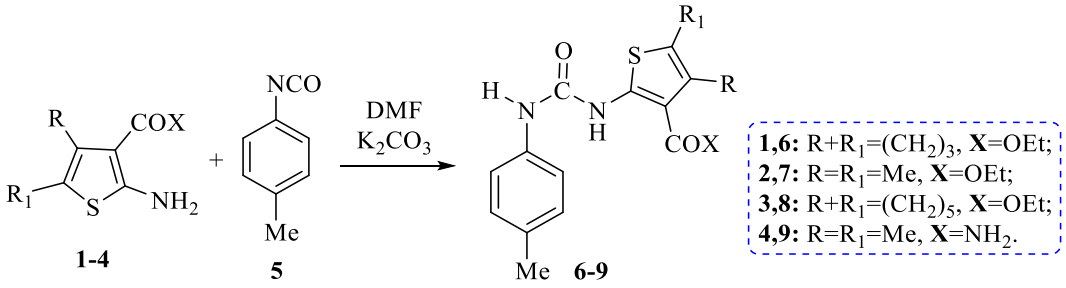
SYNTHESIS OF NEW UREA DERIVATIVES BASED ON 2-AMINOTHIOPHENE ESTERS (AMIDE) AND *p*-TOLYLISOCYANATE

G.N. Kudratov, A.U. Berdiyev, I.S. Ortikov, B.J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: b_elmuradov@mail.ru

Currently, the creation of synthetic drugs effective against various viral diseases is one of the important problems in modern medicine. Medicines prepared on the basis of urea derivatives are used effectively in the field of agrochemistry, against tuberculosis, microbes and various diseases [1-3].

In our work, we aimed to synthesize 4,5-disubstituted-2-aminothiophene derivatives with various functional groups based on the Gevald reaction, and synthesize substituted ureas based on the reaction of nucleophilic addition of the obtained products with *p*-tolylisocyanate, 2-amino-4,5-trimethylenethiophene-3-carboxylic acid ester (**1**), 2-amino-4,5-diethylthiophene carboxylic acid ethyl ester (**2**), 2-amino-4,5-pentamethylenethiophene-3-carboxylic acid ethyl ether (**3**) and 2-amino-4,5-dimethyl thiophene carboxylic acid amide (**4**) were synthesized and nucleophilic addition of them with *p*-tolyl isocyanate (**5**) was carried out. As a result, N,N'-disubstituted urea derivatives (**6-9**) were isolated in high yields:



The reaction was carried out by mixing of 1:1 ratio of 2-aminothiophene derivatives and isocyanate in a solvent medium. The reaction was carried out at room temperature in the presence of potash in DMF solution, and the products (**6-9**) were extracted and isolated in high yields (**6**-76%, **7**-74%, **8**-81%, **9**-78%). The structure of the synthesized urea derivatives confirmed by IR, ^{1}H and ^{13}C NMR spectra.

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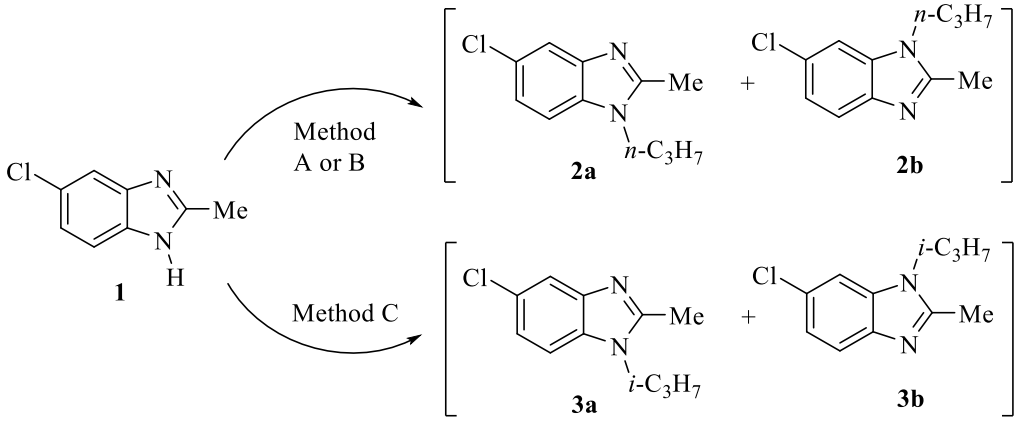
SYNTHESIS OF POTENTIALLY ACTIVE ISOMERIC ALKYL-BENZIMIDAZOLES

B. B. Jurayev, I. S. Ortiqov, B. J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: jorayevbaxromjon75@gmail.com

It is known that, among heterocyclic compounds, benzimidazole and their derivatives occupy an important place in terms of theoretical and practical importance [1]. As a result of the research, the analysis of the literature shows that various derivatives of benzimidazoles have high activity against cancer, anthelmintic drug, anti-malarial, anti-tuberculosis, and against viruses [2]. Some of the synthesized compounds, for example *Omeprazole*, *Bendamustine*, *Maribavir* are used as effective anti-cancer and anti-viral agents [3].



Method A: **1**:C_3H_7Cl:K_2CO_3 - 1:1,5:1, acetone, 56^{0}C, 10 h (Yield: **2a**+**2b**, 58%);
Method B: **1**:C_3H_7Cl:NaOH - 1:2:1, ethanol, 78^{0}C, 6 h (Yield: **2a**+**2b**, 67%);
Method C: **1**:*i*-C_3H_7Br:NaOH - 1:3:1, ethanol, 78^{0}C, 8 h (Yield: **3a**+**3b**, 72%)

We also carried out alkylation reactions of 2-methyl-5-chlorobenzimidazole in order to protect the active proton on the nitrogen atom. Propyl chloride and *iso*-propyl bromide were used as alkylating agents and reactions were carried out in different ways. In the first method (**A**), the reaction carried out in the presence of acetone/potash; in the second method (**B**), in the presence of ethanol/NaOH; in the third method (**C**), in the presence of ethanol/NaOH, but experiments were carried out for different time durations, with different ratios of reagents. The structure of obtained isomeric dialkyl products (**2a**, **2b**; **3a**, **3b**) analyzed by methods of ^{1}H and ^{13}C-NMR spectroscopy and fully proved.

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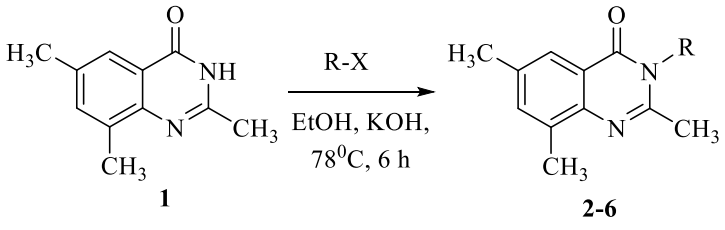
CHEMOSELECTIVE ALKYLATION OF 2,6,8- TRIMETHYLQUINAZOLIN-4-ONE

U.M. Yakubov, N.B. Pirnazarova, I.A. Obidova, D.M. Ruziboev, B.J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ubaydullo13@mail.ru

Quinazolinones are an interesting class of heterocyclic compounds that are important in medicinal chemistry. Compounds of this class have been shown to exhibit pharmacological activity such as antimicrobial [1], anti-inflammatory [2] antioxidant [3] and anticonvulsant [4]. In addition, compounds of this class are chemically interesting.

In order to protect the 3N-endocyclic amino group of 2,6,8-trimethylquinazolin-4(3H)-one (**1**), alkylation reactions with various alkyl halides were carried out. As alkyl halides (R-X): ethyl and butyl bromides, amyl, hexyl and heptyl iodides were used:



1 **2-6**

№	R	X	Yield (%)
2	C_2H_5	Br	76
3	C_4H_9	Br	79
4	C_5H_{11}	I	82
5	C_6H_{13}	I	76
6	C_7H_{15}	I	80

Reactions were carried out by boiling a mixture of reagents - **1**:R-X:KOH - 1:1.2:2 at the 78^0C for 6 hours, and 2,6,8-trimethyl-3-alkylquinazoline-4(3H)-ones (**2-6**) were synthesized in good yields (76-82%).

It should be noted that the yield of alkylation products (**2-6**) is much higher, and with the increase of the alkyl chain, a decrease in the melting points of compounds are observed. This is an important property in homologous series of organic compounds.

The structure of the synthesized compounds (**2-6**) was proved by IR and NMR spectra.

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SYNTHESIS OF TARGETED SULFONYLUREAS IN THE SERIES OF BICYCLIC 3-ALKYLQUINAZOLONES

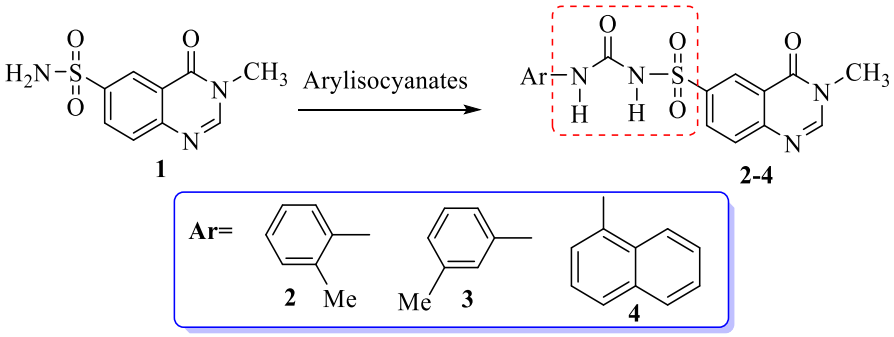
S. M. Allabergenova, U. M. Yakubov, B. J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ubaydullo13@mail.ru

It is known that many harmless, highly active synthetic drugs are being developed in the fields of agriculture and pharmacology. Among of them, the active substances, which are necessary for industry, agriculture and pharmaceuticals, derivatives of substituted urea and sulfonylureas containing various functional groups are found. Its derivatives are used in industry as paints, corrosion inhibitors, selective herbicides, fungicides in agriculture, organocatalysts in petrochemicals.

Nowadays, the use of chemical protection agents in agriculture is increasing. The global market share of agrochemicals is worth 60 billion dollars a year and continues to grow. Herbicides take the largest share, 40-60% in different parts of the world, depending on crop dominance. Sulphonylureas are the class of herbicides with the highest biological activity. Chlorsulfron, the first representative of this class of compounds, was produced by the DuPont company in 1982. The use of sulfonylureas in low doses (10-100 g/ha), high selectivity, and safety for humans and animals increase the demand for compounds of this class. Therefore, it is very urgent to carry out targeted synthesis and chemical modification of new, potentially biologically active compounds containing sulfonylurea residues, to determine their physical, chemical and biological properties, to create new preparations based on selected candidate substances.

It is known from the literature [1], that there are various methods of synthesizing sulfonylureas, one of which is the reaction of compounds containing a sulfonamide group with isocyanates. Therefore, we studied interaction of 3-methyl-4-oxo-3,4-dihydroquinazoline-6-sulfonamide (**1**) with *o*-, *m*-tolylisocyanates and 1-naphthylisocyanate in acetone in the presence of potash and synthesized novel corresponding sulfonylureas (**2-4**) of bicyclic quinazolones in good yields:



The structure of the synthesized sulfonylureas (**2-4**) was proved by IR and NMR spectra.

Reference

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SYNTHESIS OF BIOACTIVE COMPOUNDS OF LOCAL BACTERIA AT DIFFERENT CONCENTRATIONS OF HEAVY METAL IONS

A. Usmonkulova[1], G. Kadirova[1], M. Narmukhamedova[1], D. Turaqulova[2]

1) Institute of Microbiology of the Academy of Sciences, Tashkent, Uzbekistan;
2) Tashkent State Technical University; e-mail: usmonkulova.aziza@mail.ru

Cadmium (Cd) and nickel (Ni) are among the most toxic metals and high levels of Cd and Ni in soil have been observed in several studies to slow down plant growth, mainly biomass, chlorophyll content and photosynthetic properties. Beneficial soil bacteria are promising targets for reducing Cd and Ni toxicity and increasing plant tolerance to heavy metal stress.

In this study stimulating properties of plant productivity under conditions of heavy metal stress were studied. Exopolysaccharid, Auxin and gibberellin synthesis at different concentrations of heavy metal ions were determined.

Pseudomonas aeruginosa, Enterobacter cloacae, Bacillus licheniformis, Enterobacter ludwigii, Bacillus simplex strains were used as research objects. Bacteria were grown for 3-7 and 14 days in peptone broth added in concentrations up to added 57.3 mg/l, 95.7 mg/l and 191.4 mg/l and 2.44 mg/l, 4.1 mg/l and 8.2 mg/l to the medium of heavy metals ($NiSO_4 \times 7H_2O$ and $CdCl_2 \times 2.5\ H_2O$). Indole-3 acetic acid (IAA) and gibberellin synthesis of bacteria was periodically determined for 3, 7 and 14 days according to the spectrophotometric method recommended by Berrios et al. Synthesis of exopolysaccharides by the strains was determined for 3, 7 and 9 days.

Pseudomonas aeruginosa synthesized auxin 4, 4.8, 5.3 times higher amount compared to control and *Enterobacter ludwigii, Bacillus licheniformis, Bacillus simplex* synthesized auxin in equal amount compared to the control at different concentrations of Cd cation (2.4, 4.1, 8.2 mg/l). Gibberellin synthesis in the strains decreased with increasing concentration of heavy metals (Cd(II) and Ni (II)). *Pseudomonas aeruginosa* synthesized 375 μg/ml gibberellin in the control and 390 μg/ml in the Ni^{2+} 95.7 mg/ml concentration on the 7^{th} day of cultivation, and *Enterobacter ludwigii* 375 μg/ml in the control and 380 μg/ml in the Cd^{2+} 4.2 mg/l concentration on the 3^{rd} day of cultivation. During experiments aimed at determining the synthesis of exopolysaccharides in *Bacillus atropheus* (4) and *Enterobacter ludwigii* (11) strains grown for 14 days at concentration of 8.2 and 24.6 mg/l Cd(II) cation, EPS synthesis on the 7^{th} and 14^{th} days of cultivation was increased to 26, 28 mg/l and 6, 11 mg/l. *Pseudomonas aeruginosa* (18) strain produced 78 mg/l EPS at the concentration of 24.6 mg/l Cd(II) cation on the 7^{th} day of cultivation.

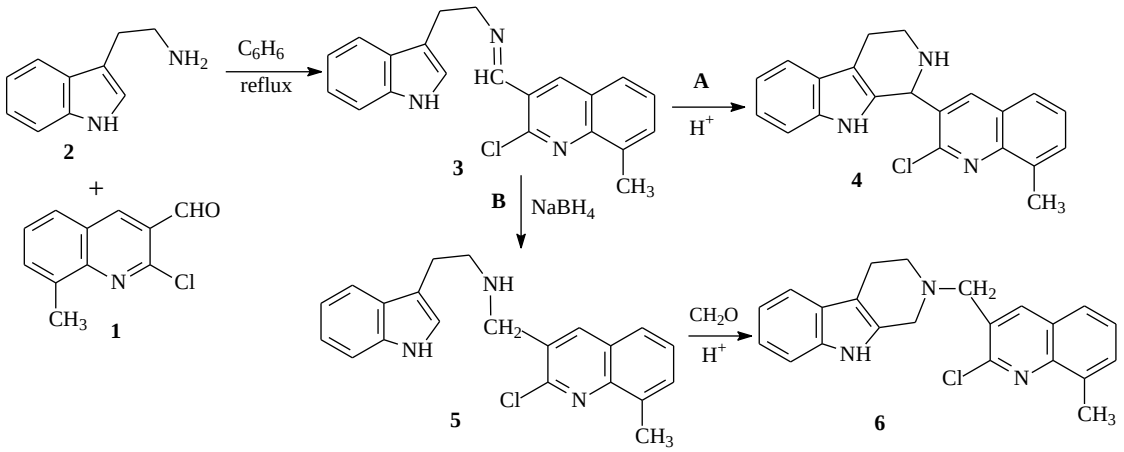
Using microorganisms tolerant of high concentrations of heavy metals and their activity, bioremediation of ambience contaminated with heavy metals is possible. Increased synthesis of phytohormones and exopolyccharides under heavy metal stress conditions indicate that these microorganisms are promising objects in the future.

SYNTHESIS OF NOVEL HYBRIDE MOLECULES CONTAINING INDOLE AND QUINOLINE CYCLES

U.A. Kurbanov[1], Sh.N. Zhurakulov[1,2], V.I. Vinogradova[1], T.S. Kholikov[2]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) National University of Uzbekistan named after Mirzo Ulugbek

Quinoline alkaloids are of particular importance because they are important biologically active compounds. Currently, many quinoline alkaloids are used in medicine as drugs. For example: drotaverine is a phosphodiesterase-4 inhibitor used to relieve spasms of the smooth muscles of the gastrointestinal tract. Levorphanol is used in the treatment of moderate to severe pain. In order to obtain various biologically active substances based on quinoline alkaloids, the reaction of 2-chloro-3-formyl-8-methyl quinoline (**1**) with tryptamine (**2**) was carried out. The reaction of 2-chloro-3-formyl-8-methyl quinoline with tryptamine had been carried out in benzene for 3 hours. As a result of the reaction, imine N-(2-(1H-indol-3-yl)ethyl)-1-(2-chloro-8-methylquinolin-3-yl)methanimine (**3**) was formed. In **method A**, having heated the imine resulted in the presence of an acid for 4 hours gave compound 1-(2-chloro-8-methylquinolin-3-yl)-2,3,4,9-tetrahydro-1*H*-pyrido[3,4-b]indole (**4**). **Method B:** The resulting imine was treated with $NaBH_4$ to give the amine **5**. The amine N-((2-chloro-8-methylquinolin-3-yl)methyl)-2-(1*H*-indol-3-yl)ethan-1-amine (**5**) was reacted with formaldehyde in an acidic medium (H^+) to obtain 2-((2-chloro-8-methylquinolin-3-yl)methyl)-2,3,4,9-tetrahydro-1*H*-pyrido[3,4-b]indole (**6**).



The structure of the synthesized substances was confirmed by IR, ^1H and ^{13}C NMR spectra.

SYNTHESIS OF PHYTOHORMONES BY CYANOBACTERIA UNDER SALINITY CONDITIONS

A. Usmonkulova, G. Kadirova, A. Abdullayev

Institute of Microbiology of the Academy of Sciences, Tashkent, Uzbekistan;
e-mail: usmonkulova.aziza@mail.ru

It is known that most of the irrigated agricultural lands are losing their productivity due to soil salinity. This situation, in turn, has a negative impact on the amount of food products grown in agriculture. Therefore, to alleviate this, it is necessary to use natural biopreparations created on the basis of microorganisms free from chemical synthesis compounds and products. Cyanobacteria are oxygen-evolving photoautotrophs with worldwide distribution in every possible habitat, and they account for half of the global primary productivity. Because of their ability to thrive in a hostile environment, cyanobacteria are categorized as "extremophiles" [1]. Cyanobacteria synthesize a range of bioactive compounds that show plant growth promoting potential, and nowadays, cyanobacterial inoculants have been frequently utilized as a biofertilizers in the agricultural fields [2].

In this study, the synthesis of phytohormones (auxin and gibberellin) of local cyanobacterial cultures was observed during 3–9–14 days at 300–500–800 mM NaCl concentrations. According to the results of the studies, auxin was produced in very modest amounts at 800 mM salinity, and the amounts produced by the *N. calcicola 32* and *A. variabilis 28* strains increased by 3–4 times on the ninth day of cultivation compared to other days. The amount of auxin produced of cyanobacterial strains was found to be 2 times higher in the control comparison to 300 mM NaCl concentration and to decrease with increasing. *A. variabilis 28* strain in particular produced 30 mkg/ml of auxin under control conditions, 14 mkg/ml at 300 mM NaCl, and 8 mkg/ml at 500 mM NaCl. At various NaCl concentrations, the gibberellin synthesis of selected local cyanobacterial strains was observed for 3–9–14 days. It was discovered that in three days of growth, the *N. calcicola 32* and *A. variabilis 28* strains released about three times as much gibberellin under salinity circumstances and in the control option as compared to other days. On the third and ninth days of cultivation at a concentration of 300 mM NaCl, *N. calcicola 32* strain and *Anabaena variabilis 28* strain were found to synthesis gibberellin in amounts of 29 and 15 and 11 and 6 mkg/ml, respectively.

Synthesis of phytohormones by cyanobacteria at different concentrations of salinity means that these microorganisms are promising objects for agriculture. biopreparations created on the basis of local strains of cyanobacteria, in particular Nostoc and Anabaena genera, synthesize useful substances for plants and increase soil fertility.

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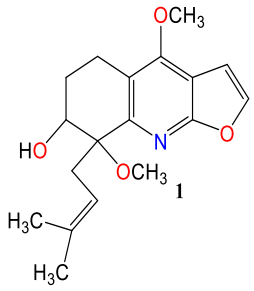
ISOLATION OF 1,4-BIS(3,4-DIMETHOXYPHENYL) TETRAHYDRO-1*H*,3*H*-FURO[3,4-C] FURAN FROM PLANT SEEDS OF *Haplophyllum perforatum*

A.U. Ubaydullaev[1], Sh.N. Zhurakulov[1,2], V.I. Vinogradova[1], K.K. Turgunov[1,3]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) National University of Uzbekistan named after Mirzo Ulugbek,
3) Turin polytechnic University in Tashkent, Tashkent 100095 Uzbekistan.
e-mail: ubaydullayev-aziz@mail.ru

More than 25 alkaloids were isolated from the seeds of *Haplophyllum perforatum* and their structure was studied. Different biological activities of the isolated alkaloids have been determined. For example, alkaloid skimmianine exhibits analgesic, sedative and estrogenic activities, haplophyllidine alkaloid is also of special importance due to its effect on the central nervous system, showing sedative and pain-relieving properties. *Haplophyllum perfaratum* plant seeds collected from Jizzakh region were extracted in 70% alcohol and then the alcohol was distilled. The remaining aqueous layer was extracted in benzine. Haplophyllidine (**1**), haplomine (**2**) and 1,4-Bis(3,4-dimethoxyphenyl)tetrahydro-1*H*,3*H*-furo[3,4-c]furan (**3**) were isolated from the benzene layer. The structures of the isolated substances were fully confirmed by IR, ^{1}H and ^{13}C NMR spectroscopic methods and their crystal structures were determined using X-ray structural analysis. The isolated substance (**3**) was first identified and isolated from the seeds of the plant *Haplophyllum perfaratum*. This isolated substance is a homologue of Yangambin - 1,4-Bis(3,4,5-trimethoxyphenyl)tetrahydro-1*H*,3*H*-furo[3,4-c]furan. Yangambin is a natural compound extracted from the bark of Acacia yangambini, and yangambin has anti-tumor and anti-inflammatory activities.



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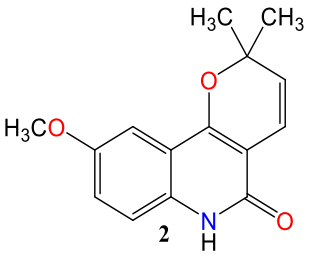


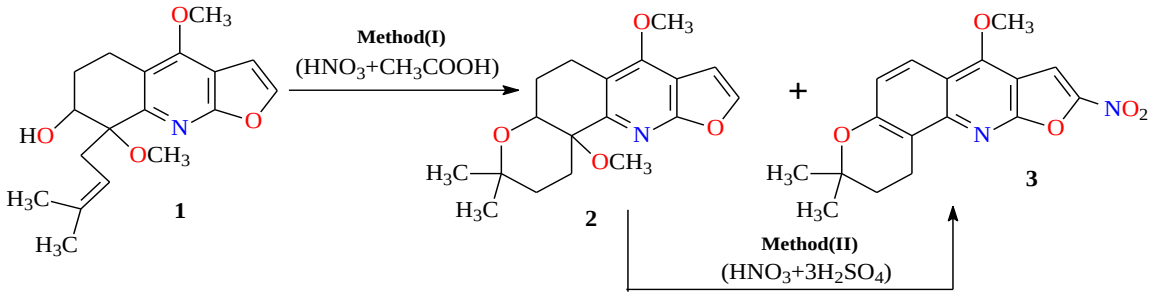
2

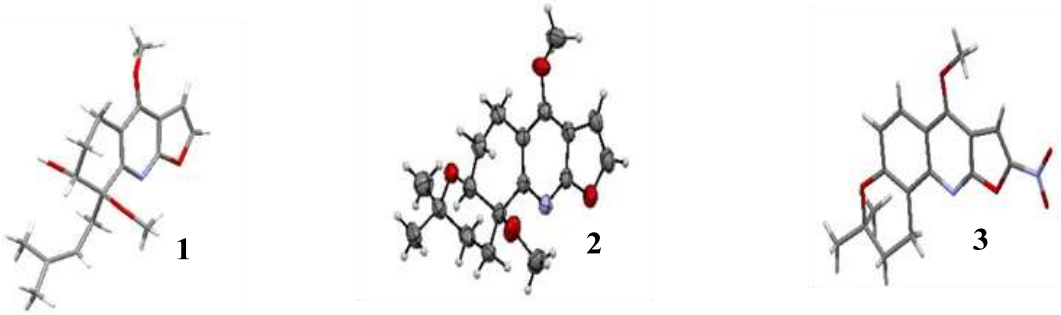
NITRATION REACTIONS OF QUINOLINE ALKALOIDS ANHYDROPERFORINE AND HAPLOPHYLIDINE

A.U. Ubaydullaev[1], Sh.N. Zhurakulov[1,2], V.I. Vinogradova[1], K.K. Turgunov[1,3]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) National University of Uzbekistan named after Mirzo Ulugbek,
3) Turin polytechnic University in Tashkent, Tashkent 100095 Uzbekistan.
e-mail: ubaydullayev-aziz@mail.ru

Quinoline alkaloids are of particular importance due to their unique medicinal properties and being added as additives to drugs against many diseases. For example: Quinine and Quinacrine are used effectively to treat the parasites that cause malaria. Carteolol is used to treat arrhythmia and glaucoma. Rosoxacin is used in the treatment of respiratory tract, urinary tract, gastrointestinal tract, central nervous system and bacterial infections. Considering these properties of quinoline alkaloids, nitration reactions of anhydroperforin and haplophyllidine alkaloids synthesized on the basis of haplophyllidine alkaloid isolated from the seeds of *Haplophyllum perforatum* plant were carried out in two methods. **Method(I):** haplophyllidine (**1**) alkaloid was dissolved in concentrated acetic acid and nitration mixture (HNO_3+CH_3COOH) was added while stirring. The reaction was carried out at a temperature of 65-70℃ for 6 hours. As a result of the reaction, a mixture of substances anhydroperforin (**2**)and 7-methoxy-3,3-dimethyl-9-nitro-2,3-dihydro-1H-furo[2,3-b]pyrano[2,3-h]quinolone (**3**) (2:1) was formed. **Method(II):** anhydroperforin (**2**) was dissolved in concentrated acetic acid and nitration mixture (HNO_3+$3H_2SO_4$) was added while stirring. The reaction was carried out at 65℃ for 4 hours. The progress of the reaction was monitored using the TLC method. The structure of the product was fully proven using ^1H and ^{13}C NMR spectroscopic and X-ray structural analysis methods.





QUERCETIN AMINOMETHYLATION WITH TETRAHYDROISOQUINOLINE DERIVATIVES AND BIOLOGICAL ACTIVITY OF THEIR CONJUGATES

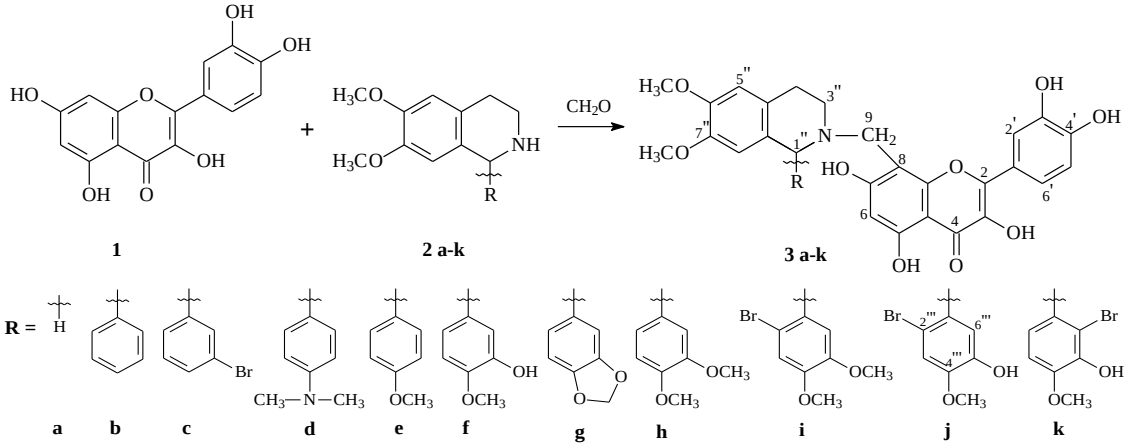
Sh. N. Zhurakulov[1,2], D.A. Narbutaeva[1], A.M. Karakulova[1], F.M. Tursunkhodzhaeva[1], V.I. Vinogradova[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: j.sherzod.78@mail.ru
2) National University of Uzbekistan named after Mirzo Ulugbek, Universitetskaya st., 4, 100174 Tashkent, Uzbekistan

Plant flavonoids have antibacterial, anti-inflammatory, anticancer, capillary-stabilizing properties associated with antioxidant, membrane-stabilizing effects, and other properties, which makes them quite valuable synthons for chemical modifications, biological activity studies, and development of new drugs.

The best known and available flavonoids are quercetin (QV, **1**) and dihydroquercetin (DHQ). Continuing our work on the synthesis of bimolecular compounds containing fragments of flavonoids and isoquinolines, it was studied the Mannich reaction QV (**1**) involving formaldehyde and 6,7-dimethoxy-1,2,3,4-tetrahydroisoquinolines of various structures.

The interaction of quercetin (QV) with 1-aryl-(or H)-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinolines by the Mannich reaction synthesized heterocyclic monosubstituted conjugates of QV in 75-96% yield. It should be noted that, in contrast to a similar reaction with dihydroquercetin, that use of quercetin-isoquinoline-formaldehyde in a ratio of 1:2:2 leads to the reaction progress only at the position 8.



Scheme. Reaction of QV with 6,7-dimethoxy-1,2,3,4-tetrahydroisoquinolines **2 a-k.**

The structure of the obtained substances was proved on the basis of IR, mass, ^{1}H and ^{13}C NMR spectra.

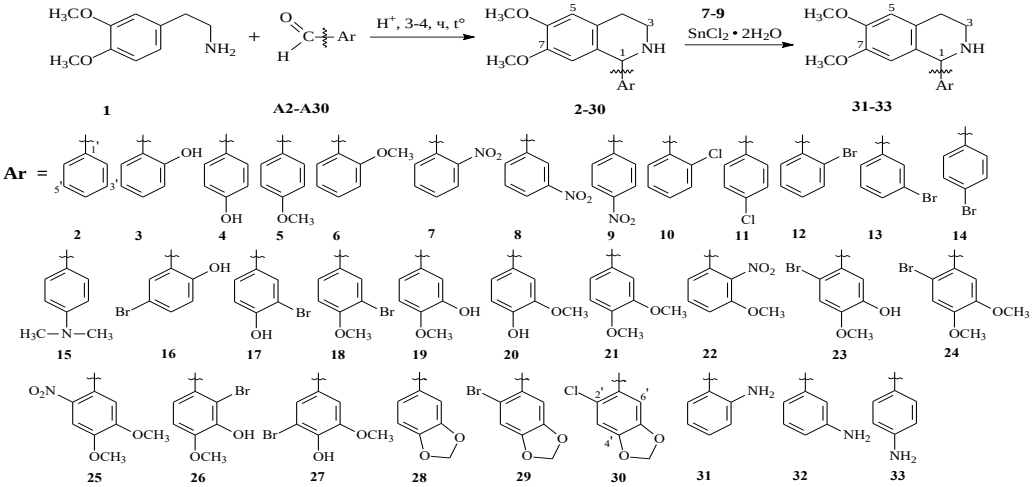
Among the synthesized conjugates, compounds **3d–3g** were found much more effective in hypoxia and antioxidant than the initial substances, including quercetin, which indicates the prospects for further obtaining such conjugates and studying their biological properties.

EFFECT OF 33 DERIVATIVES OF 1-ARYL-6,7-DIMETHOXY-1,2,3,4-TETRAHYDROISOQUINOLINE ON THE LOCOMOTOR ACTIVITY OF INTACT AND AMPHETAMINE-TREATED MICE IN THE OPEN FIELD

A.A. Azamatov, F.M. Tursunkhodzhaeva, Sh.N. Zhurakulov, V.I. Vinogradova, K.K. Akhmedzhanov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Nowadays, studies at creation of effective modulators of the neurotransmitter systems of the brain attract scientists' attention. Alcohol is considered the most common exogenous toxin causing encephalopathy. The dopaminergic system plays a role in the development of various mental and movement disorders. Studies have shown that the preference for alcohol is accompanied by an increase in the activity of the dopaminergic system in the brain. In this regard, the search for agonists and antagonists of dopamine release can be considered an urgent task in the creation of both anti-alcohol drugs and drugs for the treatment of neurodegenerative diseases. We have studied the effect of 33 derivatives of 1-aryl-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinoline (Structure I) on the locomotor activity of intact animals, as well as on the locomotor activity of amphetamine in the open field conditions. The test substances were administered at a dose of 1 mg/kg orally 1 hour before the start of the experiment. Amphetamine was administered at a dose of 5 mg/kg subcutaneously in one hour after the administration of the test substances.



Amphetamine antagonists include substances **31** and **20**, which reduced the locomotor activity of amphetamine by 64 and 33%, respectively. Substances **22** and **13** had no significant effect on amphetamine-induced hyperactivity. Other substances enhanced the activity of amphetamine to varying degrees. Substance **9** was the most active among them. The structure-activity relationship was analyzed.

So, among the studied substances, we found agonists and antagonist affected on the release of dopamine in the brain caused by the action of amphetamine, which indicates the prospects of chemical modifications made in the phenyl group of this series of compounds in further development of remedies against alcohol consumption and Parkinson disease.

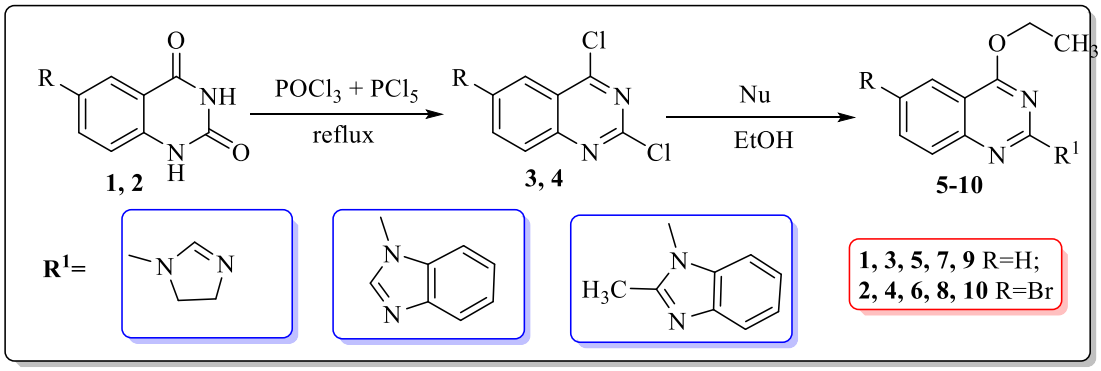
SYNTHESIS OF 6H(Br)-2,4-DICHLOROQUINAZOLINES AND DIRECTION OF NUCLEOPHILE SUBSTITUTION REACTIONS

R.Z Khudoykulova, I.S. Ortikov, B.J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Currently, the increase in drug resistance of various disease-causing microorganisms requires the creation of new classes of drugs [1]. Among derivatives of quinazoline and quinazolinones with different functional groups, it is known from the literature that they exhibit high activity against harmful microorganisms. In addition, compounds of this class are used for anti-obesity, pain relief, and anti-cancer [2,3].

In our study, we obtained the corresponding 2,4-dichloro-6H(bromo)quinazolines (**3,4**) by reaction of 6H(bromo)quinazoline-2,4-diones (**1,2**) with chlorinating agents ($POCl_3$+PCl_5). We carried out nucleophilic substitution reactions with secondary heterocyclic amines: imidazole, benzimidazole and 2-methylbenzimidazole. In our previous studies, experiments were conducted with aliphatic and cyclic secondary amines in ethanol, and 2,4-disubstituted quinazoline derivatives were obtained. In these experiments, when we studied the obtained products, we saw that the active chlorine atom in position 4 was not replaced by amine, but replaced by ethanol obtained as a solvent, forming the 4-ethoxy group. and it was observed that the heterocyclic amine was replaced by the chlorine atom in position 2. We can explain this by the low basicity of heterocyclic amines and the high activity of the chlorine atom in position 4 for ssubstitution.



Reactions of 2,4-dichloro-derivatives were carried out in 3,4:Nu - 1:2 ratio in ethanol (80^0C) by heating for 6 hours, and new products were obtained in good yields (**5**-60%, **6**-67%, **7**-70%, **8**-69%, **9**-68%, **10**-64%) were obtained. The structure of the obtained substances was confirmed based on the results of IR, ^{1}H and ^{13}C NMR-spectra and X-ray structural analysis.

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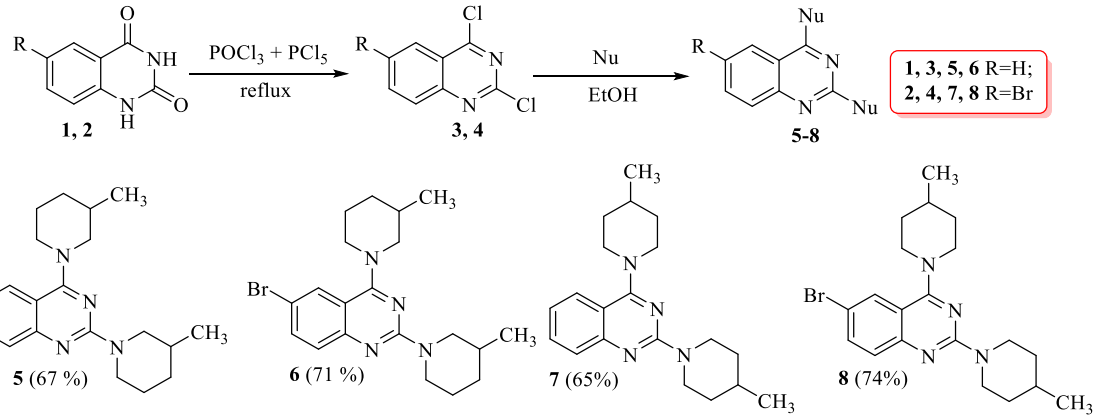
SYNTHESIS AND INTERACTION OF 6H(Br)-2,4-DICHLOROQUINAZOLINES WITH METHYL-PIPERIDINES

R.Z. Khudoyqulova, I.S. Ortikov, B.J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Quinazoline and quinazolinone derivatives have been studied for a long time due to the ease of synthesis and high biological activity. They show good activities in various diseases (antimalarial, antioxidant, antidiabetic) [1-3]. Therefore, the development of easy and convenient methods for the synthesis of new biologically active 2,4-disubstituted quinazoline derivatives with different functional groups is one of the important issues.

The purpose of this research work is to determine the improved synthesis methods of the synthesis of 2,4-dichloro-6H(bromo)quinazolines, to carry out nucleophilic substitution reactions with piperidenes. For this, 6H(bromo)quinazoline-2,4-diones (**1,2**) were first reacted with chlorinating agents ($POCl_3$+PCl_5) to give corresponding 2,4-dichloro-6H(bromo)quinazolines (**3,4**). 2,4-Symmetric disubstituted quinazolines (**5-8**) were synthesized from starting 2,4-dichloro-derivatives (**3,4**) by nucleophilic substitution reactions with secondary amines: 3-methylpiperidine and 4-methylpiperidine:



Experiments were conducted by heating mixture of 2,4-dichloroquinazolines (**3,4**) and piperidines in a 1:3 ratio in an absolute ethanol (80°C) for 6 hours, and corresponding compounds **5-8** were synthesized. The structure of the obtained substances was confirmed based on the results of IR, ^{1}H and ^{13}C NMR-spectra.

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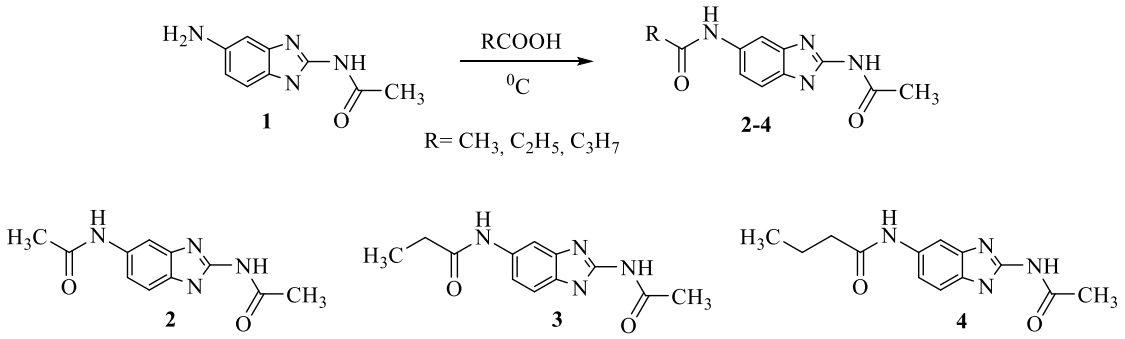
REACTION OF N-(5-AMINO-1H-BENZO[d]IMIDAZOL-2-YL) ACETAMIDE WITH CARBOXYLIC ACIDS

Sh.X. Kubayev, S.S. Saidov, R.K. Karimov, A.Sh. Abdurazakov, B.J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: sarvar-saidov-1989@bk.ru

Over the past 30 years, the chemical industry in our country has been radically reformed in accordance with modern requirements, and the volume of output of chemical enterprises has increased several times. Due to the wide range of biological activity, nitrogen-containing heterocyclic compounds are at the forefront in terms of production volume among other organic compounds. In this regard, a special place is occupied by 2-aminobenzimidazole (2-AB) and its derivatives. The importance is the scientific research aimed at obtaining new products, the search for biologically active substances among the compounds obtained [1].

To further expand of synthesis analogues of N-(5-amino-1H-benzo[d]imidazol-2-yl) acetamide, the acylation reaction was carried out with various aliphatic carboxylic acids, such as propionic, butyric, isobutyric acids under identical conditions with glacial acetic acid.



In the continuation of research in this direction, the acylation of N-(5-amino-1H-benzo[d]imidazol-2-yl)acetamide with aromatic carboxylic acids was studied. The reaction was carried out at an equimolar ratio of reagents, the reaction was carried out at the boiling point of acids, for 2 hours.

It is determined that in this case takes place acylation of 5-NH2 group and structure of the synthesized compounds is confirmed by modern physicochemical methods IR, 1H, NMR, 13C NMR spectroscopy, mass spectrometry.

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ALKYLATION REACTIONS OF QUINAZOLIN-4-ONE DERIVATIVES

R.K. Karimov[1], A.Sh. Abdurazakov[1], M.E. Ziyadullaev[2], A.A. Gapparova[2].

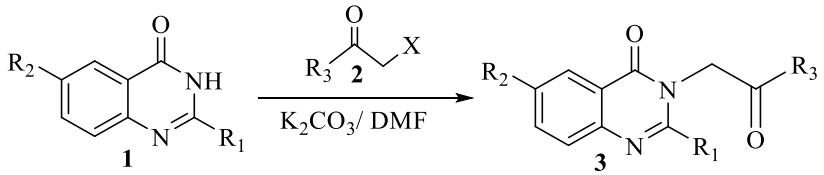
1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Chirchik State Pedagogical University 111700, Tashkent region, Chirchik, Amir Temur Street, 104, Uzbekistan

Scientific research aimed at synthesizing quinazolin-4-one alkaloid and its derivatives, creating production technologies and expanding the fields of application is being carried out in leading scientific centers and laboratories of the world [1-2].

As a result of the research carried out in this direction, the synthesis of the quinazolin-4-one compound and its various substituted derivatives, as well as the scientific literature on their biological activity were analyzed, and the following alkylation reactions were carried out based on them.

Usually alkyl halides, alkenes, epoxy compounds, alcohols, aldehydes, ketones, ethers, sulfides, diazoalkanes can be included. Bases, mineral acids, Lewis acids and zeolites are used as alkylation catalysts. Alkylation reactions of quinazolin-4-ones can be carried out on two reaction centers, i.e., on the nitrogen atom in the position 3 or the oxygen atom in the position 4.

It is known that the alkylation of substituted quinazolin-4-one and its various aliphatic and aromatic halogen ketones and the presence of potassium carbonate in the DMF medium at temperatures from 40°C to 130°C lead to the formation of quinazoline ketones.



X=Cl, Br; R_1= H, CH_3; R_2= H, Br, NO_2; R_3= CH_3, $C(CH_3)_3$, C_6H_5

The IR, ^1H, ^{13}C NMR spectra of the synthesized compounds were studied, and scientific research is being conducted on their biological activity against various bacterial strains.

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TARGETED SYNTHESES OF SOME NOVEL (E)-1-(4-CHLOROBENZYLIDENE)-2-HETERYLHYDRAZINES

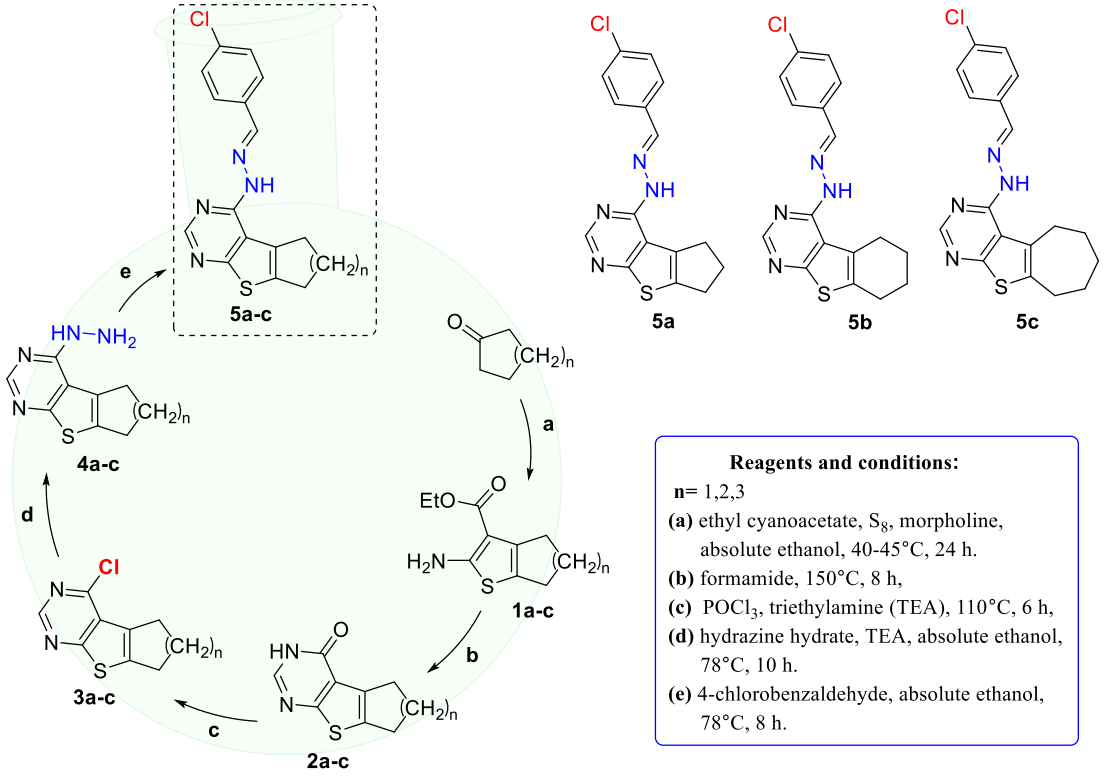
A.U. Berdiev, I.S. Ortikov, B.Zh. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Thienopyrimidines (TPs) is a biologically important heterocyclic compounds and attracting attention in medicinal chemistry research since last two decades due to its diverse range of biological activities. An intensive literature review on TPs and its derivatives revealed that they were found to possesses different biological activities such as antitumor, antimicrobial, anti inflammatory, tyrosine kinase and phosphodiesterases and most of them were patented.

Moreover, TPs have fascinated importance in medicinal chemistry, exhibiting pharmacological and therapeutic properties such as antidepressant, antihypertensive, herbicidal and plant growth regulatory properties. Particularly, 4-substituted amino and hydrazino-TPs was determined excellent, almost equivalent to that of standards (compared to as potent anticancer drugs), where the presence of electron donating substituent on both sides of thienopyrimidine ring enhances the activity and electron withdrawing groups decrease. Also, 4-chlorothieno[2,3-d]pyrimidine is one of the intermediates for synthesizing anticancer drugs.

In view of the biological importance and the past research of the TPs and its derivatives, it is worthwhile to synthesize some novel (E)-1-(4-chlorobenzylidene)-2-heterylhydrazines (**5a-c**):



A systematic approach to the synthesis of targeted compounds was described above.

SYNTHESIS OF NOVEL THIENOPYRIMIDINE-BENZIMIDAZOLE HYBRIDE MOLECULES

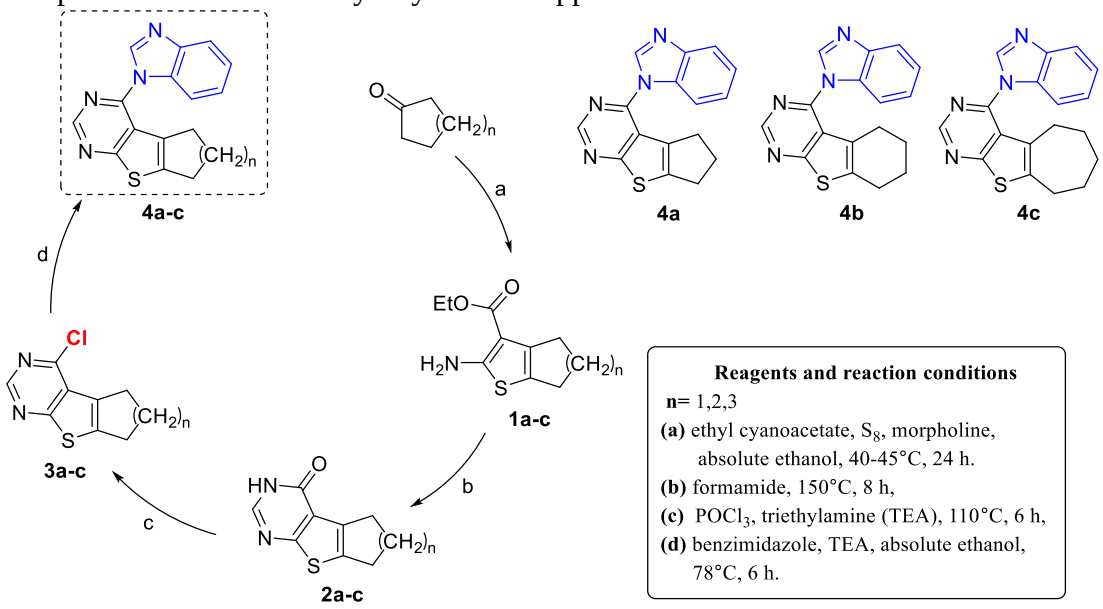
A.U. Berdiev., I.S. Ortikov., B.Zh. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Thieno[2,3-d]pyrimidines (TPs) derived molecules have been reported to possess multiple biological activities, including inhibitory activity against the interaction between DNA repair proteins Rev7 and Rev3L, HCVreplication, the transcription factor Nrf2 and kinases. Therefore, the construction of the TP backbone has drawn attention in the organic synthesis community.

Currently, the best reported synthesis of TPs requires stoichiometric catalysts and multiple steps, including a Knoevenagel condensation, followed by a Gewald reaction, and heat-promoted cyclization.In subsequently experiments, the reaction of the obtained TPs with phosphorus oxychloride ($POCl_3$) in the presence of tertiary amines (TEA) replaced the oxygen of the carbonyl group in the position 4th with a chlorine atom. Their susceptibility to nucleophilic substitution reactions suggests that they are one of the most important synthons for modern organic synthesis.

Literature survey revealed that incorporation of different groups in TP heterocyclic ring enhanced antibacterial and antifungal activity. Encouraged by the diverse biological activities of novel TP derivatives, it was decided to prepare a new series of derivatives of TP core. In the present work 5,6-polymethylene-4-chloro TPs **(3a-c)** were reacted with relevant heterocyclic amine in absolute ethanol to form 4-heteryl TPs **(4a-c)**, which were synthesized by nucleophilic substitution of different multisubstituted 4-chloro TPs with benzimidazole to get target compounds. The synthesis of respective compounds was achieved by a systematic approach is outlined in the follow:



Structure of all synthesized compounds was confirmed by IR, ^{1}H and ^{13}C NMR spectroscopy. Further these compounds are subject for biological activity.

ON THE SYNTHESIS OF CHITOSAN METAL COMPLEXES BOMBYX MORI WITH MANGANESE IONS (II)

K. Ergashev, N. Vokhidova, S. Rashidova

Institute of Chemistry and Physics of Polymers Academy of Scientific of Uzbekistan, Tashkent 100128, Uzbekistan, e-mail: eqandiyor@mail.ru

Undoubtedly, the versatility of chitosan (CS) makes it possible to use it as a polymeric ligand in complexation with d-metal ions. Manganese belongs to the family of d-elements and in most cases the Mn^{2+} coordination number is 6, it has an octahedral and tetrahedral system. Manganese plays an important role in living organisms, affecting the growth of living organisms, hematopoiesis, and the function of the gonads [1]. In this regard, taking into account the biocompatibility, biodegradability, and bioactive properties of chitosan, the synthesis of its metal complexes with metal ions leads to the production of metal complexes with special properties.

The purpose of the research is to obtain metal complexes (MC) based on *Bombyx mori* chitosan with Mn^{2+} ions, as well as to study their physicochemical properties. For the synthesis of MC, 0.1 M solutions of CS (MM=196×10^3, DD=82%) and $MnCl_2\times4H_2O$ were used. Firstly, at 30±2ºC, the pH of CS solutions was adjusted to pH=5 with 1 M NaOH and titrated with a solution 0.1 M $MnCl_2\times4H_2O$.

The reaction mixture was vigorously stirred for one hour. The resulting MC was precipitated with acetone and dried in a lyophilizer to constant weight.

In the UV spectrum of chitosan, there are absorption bands at λ max 220 nm and 300 nm for acetamide and amino groups, respectively. In the spectrum of CS:Mn^{2+} metal complexes, the absorption bands of manganese ions at λmax=270-320 nm overlap with the absorption band of chitosan functional groups, which leads to an increase in intensity in this zones. In the spectrum of CS:Mn^{2+} complexes, with a decrease in the CS content, one can observe a shift in the absorption region towards low absorption bands of Mn^{2+} (λ=211→205 nm). The UV spectra show absorption bands at λmax=270-320 nm, which are characteristic of n-p-electronic transitions associated with the formation of the Mn-N covalent bond.

By Ostromyslensky-Djob method established, that under the chosen synthesis conditions, the chitosan macromolecule interacts with manganese ions (II) in 6:4 and 9:1 molar ratio, respectively. The results obtained are of interest for the creation of medical preparations.

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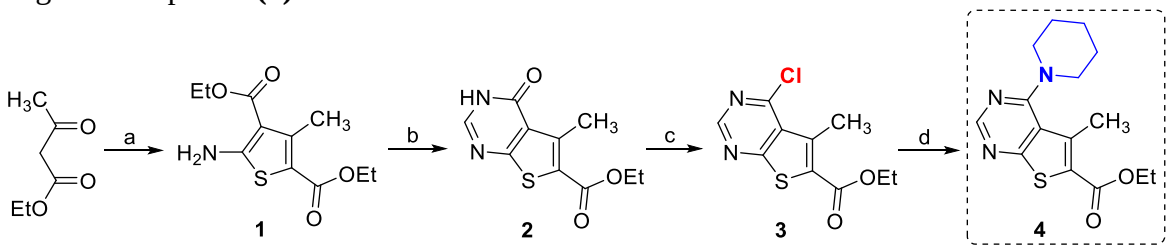
SYNTHESIS, CRYSTAL STRUCTURE AND HIRSHFELD SURFACE ANALYSIS OF NEW DERIVATIVE OF THIENO[2,3-D]PYRIMIDINE

A.U. Berdiev[1], M.O. Hakimov[2], Ch.J. Elmuradov[3], I.S. Ortikov[1], K.K. Turgunov[1,4]

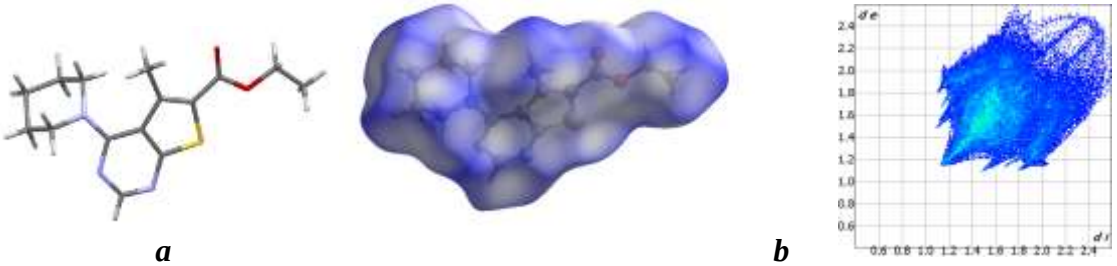
1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Namangan State University, Namangan 160136, Uzbekistan
3) Karshi State University, Karshi 180119, Uzbekistan
4) Turin Polytechnic University in Tashkent, Tashkent 100095, Uzbekistan

Many thieno[2,3-d]pyrimidine (TP) derivatives were reported as phosphodiesterase inhibitors, also exhibited good H_1 receptor antagonistic activities, 4-amino derivatives showed insecticidal and acaricidal activities. Numerous TPs have been proved to use in case of cerebral ischemia, malaria, tuberculosis, Alzheimer's and Parkinson's diseases.

In this context, TP containing piperidine fragment with similar structural qualities would be projected to result in newer molecular systems with increased efficacy. Definitely, piperidine template has been known to express considerable antimicrobial, antitubercular and anticancer activities. A systematic approach to the synthesis of targeted compound **(4)** was described follow:



Reagents and reaction conditions: n= 1,2,3 **(a)** ethyl cyanoacetate, S_8, morpholine, absolute ethanol, 40-45°C, 24 h. **(b)** formamide, 150°C, 8 h, **(c)** $POCl_3$, triethylamine (TEA), 110°C, 6 h, **(d)** piperidine, TEA, absolute ethanol, 78°C, 6 h.



a ***b***

Using modern X-ray structural analysis and the Hirshfeld surface analysis method, it is possible to identify an important hydrogen bond in molecular crystals. X-ray structural analysis of piperidin-1-yl derivative of thieno[2,3-d]pyrimidine (**4**) shows that compound was found to crystallize in the monoclinic system (P21, Z= 4). The piperidine ring adopts a chair conformation (a). Hirshfeld surface analysis of the intermolecular contacts reveal that the most important contributions for the crystal packing are from H···H (52.9%), H···C/C···H (11.2%), O···H/H···O (9.6%), H···S/S···H (9.7%) and H···N/N···H (12.5%) (b). Also, Structure of synthesized compound was confirmed by IR, ^{1}H and ^{13}C NMR spectroscopy.

SYNTHESIS, CRYSTAL STRUCTURE AND HIRSHFELD SURFACE ANALYSIS OF (1-(2-METHYL-4-NITROPHENYL)-1H-1,2,3-TRIAZOL-4-YL) METHYL 2-HYDROXY BENZOATE

I.S. Ortikov[1], M.O. Hakimov[2], Ch.J. Elmuradov[3], A.G. Tojiboev[4]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Namangan State University, Namangan, e-mail: hakimov1094@yahoo.com
3) Karshi State University, Karshi 180119, Uzbekistan
4) University of Geological Sciences, Tashkent

The 1,2,3-triazoles comprise an interesting class of heterocyclic compounds, with diverse applications in biological and material chemistry [1]. In particular, 1,2,3-triazoles containing a carbonyl or carboxyl group in their structures have received considerable attention [2]. In this work, triazole derivative synthesized from 2-methyl-5-nitrophenylazide and 2-oxypropargylbenzoates by azide-alkyne cycloaddition method in the presence cupper (I) salt (catalyst) [3]. The growth of suitable crystals in the latter study prompted the present structural analysis.

One of the advances in modern X-ray structural analysis is the Hirshfeld surface analysis method [4] has become an important tool in providing information about the contribution of weak intermolecular forces to the molecular alignment of molecular crystals. The crystal structure of the title compound was determined by single crystal X-ray structural analysis (Fig. 1). In order to study intermolecular interactions in the crystal, Hirshfeld surface analysis was conducted.

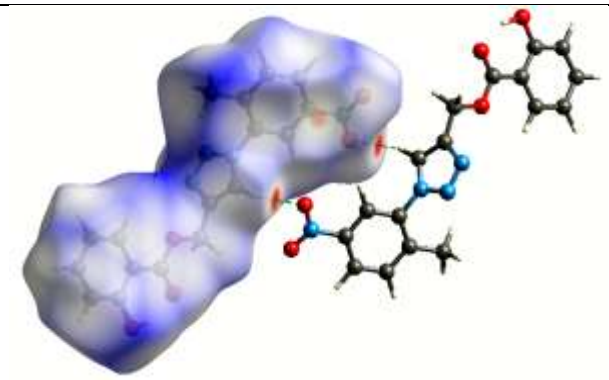


Fig. 1. View of the three-dimensional Hirshfeld surface of title compound mapped over d_{norm}

The Hirshfeld surface analysis was performed with Crystal Explorer 21.5 [4], the details of the pictorial output (Fig. 1). In the crystal, neighbouring molecules are linked that are part of the hydrogen-bonded chains are included with the N—H···O (2.58 Å) and C—H···O (2.41 Å) interactions shown by green dashed lines. The Hirshfeld surface analysis revealed the most contribution to molecular parking:

H···H, H···C/C···H, O···H/H···O, and H···N/N···H contacts.

In conclusion, Hirshfeld surface analysis indicates that the most important contributions to the crystal packing stem from H···H (39.1%) and O···H/H···O (20.0%) interactions.

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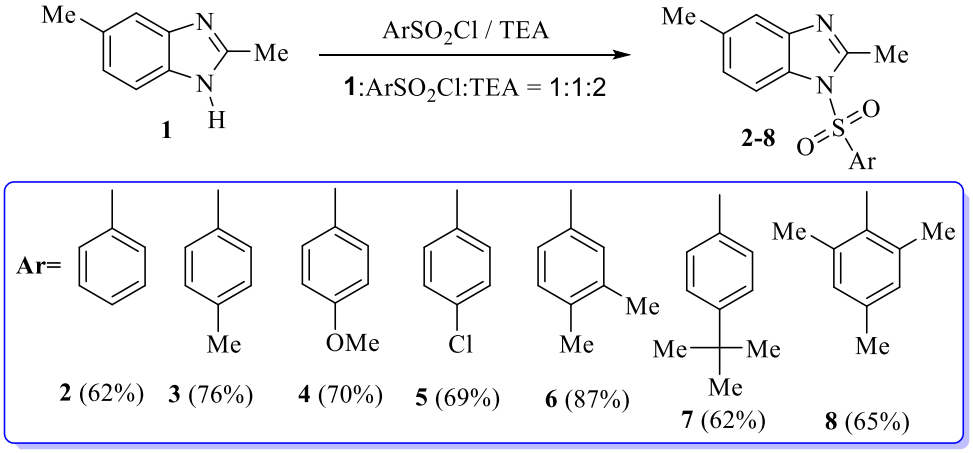
A SIMPLE AND CONVENIENT METHOD FOR ARYLSULFONYLATION OF 2,5-DIMETHYLBENZIMIDAZOLE

K. Abdireymov, B. J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Benzimidazoles and their derivatives have a wide spectrum of biological activity. For example, among heterocyclic compounds containing a benzimidazole skeleton, there are a number of effective drugs that are recommended for use in agriculture (*albendazole, carbendazim, benomyl*) and medicine (*dibazole*). Therefore, conducting targeted research on the synthesis and study of the biological activity of substituted benzimidazoles is of both theoretical and practical interest [1-3].

In this work, we curried out interaction of 2,5-dimethylbenzimidazole (**1**) with substituted arylsulfonyl chlorides. The aim of this work to study "*structure-biological activity*" relationship of the synthesized arylsulfonyl derivatives of benzimidazoles:



Arylsulfonylation of 2,5-dimethylbenzimidazole (**1**) with substituted arylsulfonyl chlorides curried out in the presence of triethylamine at room temperature for 4 hours. As results we have synthesized corresponding N^1-arylsulfonyl-2,5-dimethyl-benzimidazoles (**2-8**) in good yields. The resulting products are potentially active compounds.

The structure of the obtained products (**2-8**) was confirmed by results of ^1H, ^{13}C NMR spectroscopy and mass-spectrometry.

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4.

OBTAINING ACARICIDES BASED ON OBTAINING INDENE FROM A SECONDARY PRODUCT PRODUCED IN NATURAL GAS PROCESSING AND THEIR BIOLOGICAL ACTIVITY

F. Z. Burkhev[1], Q. J. Rustamov[2]

Gulistan State University, Laboratory "Experimental biology"[1]
Republican Center for the fight against termites[2]
Email: farkhod_2020@mail.ru

Heavy pyrolysis oil, which is considered a secondary product in natural gas processing, is a complex multi-component mixture, a number of works are underway to process it. Thermal processing (fractional processing) (T_{boil}=181°C) under 165-185°C temperature conditions enabled producing indene containing liquids. During the studies, it was found that the mixture obtained contains complexes composed of methyl and ethyl-containing derivatives of indene and aromatic compounds that contained various radicals. The initial fraction of pyrolysis oil containing indene was influenced by Na metal to form a sodium compound of indene. The resulting compound was transformed into a sodium salt of indene–1 carbonic acid in a toluene medium. Various etherification reactions were conducted to obtain ethers based on the indene ring. Taking into account the use of ethers obtained on the basis of indene as acaricides, the effect of the obtained preparation “Inden–1” on red spider mite that cause serious damage to agricultural crops was studied at the Republican Center for the fight against termites at the Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan.

The analysis of the obtained values of the biological effectiveness of the experimental and etalon preparations by the ratio of the preparation and solvent gave the following result: to combat red spider mites, 2ml of the A1 preparation was added to 100 ml of water and treated a certain number of insects. The calculations showed that on day 3 after the exposure to the preparation, the effectiveness was 48.2%, 54.1% - after 7 days and 72.3% - after 14 days. At the same time, the insects were treated by adding 2 ml of the drug B1 to 20 ml of water. The calculations showed that the results were 46.2% on day 3 of the experiment, 80.6% on day 7, and on day 14 - 95.2%. The insects were treated with the B1 preparation at 2 ml of it to 100 ml water ratio; from the calculations point ov view, the values of biological efficiency in 3 days was 45.7%, on day 7 of the experiment - 54.7% and in 14 days = 72.9%. For the purposes of identifying the limits of affecting, the efficiency at adding 2 ml of B1 preparation to 500 ml water in 3 days was 22.2%, in 7 days - 32.3% and on day 14 - 51.8%.Then treatment was conducted by adding 5 ml of C1 preparation to 500 ml water. In 3 days the 21.6%, on day 7 - 32.4%, and in 14 days - 51.0% efficiency was registered.

We used 1.8% Abamectin solution as a reference substance. We prepared a standard sample by adding 8 ml of the solution to 500 ml water. Treatment with the standard sample showed that on day 3 od the experiment the efficiency value was 44.85, on day 7 - 81.4% and on day 14 of observations - 95.2%.

It was demonstrated that the highest efficiency value was achieved at the experiment when 2 ml of the preparation was resolved in 20 ml water to use against red spider

mites. It was identified that using this preparation for agricultural crop fileds would meet the admitted criteria.

STUDY OF CYTOTOXIC ACTIVITY OF OXADIAZOLE DERIVATIVES

M.R. Umarova, U.B. Khamidova, E.O. Terenteva, G.A. Piyakina, G.Ya. Khashimova, D.S. Ismailova, B.J. Elmuradov, Sh.S. Azimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: genlab_icps@yahoo.com

In this work, cytotoxic activity of several products based on 5-(p-aminophenyl)-1,3,4-oxadiazol-2-thione was studied were studied. These samples were tested for cytotoxicity on 4 cancer cell lines (epithelial carcinoma of the cervix HeLa, breast adenocarcinoma HBL-100 (ATCC HTB 124) and adenocarcinoma of the larynx HEp-2 (ATCC:CCL-23), T-lymphoblastic leukemia CCRF-CEM (ATCC:CCL-19)) by the MTT method.

Substances were dissolved in DMSO (0.8% by volume) and introduced into cells at a concentration of 1 μM, 10 μM, 30 μM, 50 μM, 70 μM, 100 μM. Cell viability was determined by the ratio of living cells exposed to the test substance to the number of living cells in the control. The well-known anticancer drug cisplatin was used as the reference drug.

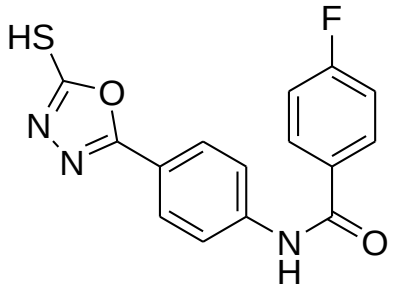


Figure 1. 4-fluoro-N-(4-(5-mercapto-1,3,4-oxadiazol-2-yl)phenyl)benzamide

Among the tested samples 4-fluoro-N-(4-(5-mercapto-1,3,4-oxadiazol-2-yl)phenyl)benzamide mono exhibited pronounced cytotoxicity (Fig 1): the IC_{50} value for breast adenocarcinoma HBL-100 cells was 30.9 μM, for cervical carcinoma HeLa cells, 54.6 μM, and for T-lymphoblastic leukemia CCRF-CEM, 31.4 μM. The laryngeal adenocarcinoma line Hep-2 was not very sensitive to the action of this derivative - the IC_{50} value was only 79.7 μM. The cytotoxic effect of this compound was preserved even against healthy cell cultures: the IC_{50} values of this compound showed a high value only in liver cells - hepatocytes. Fibroblasts and Vero B kidney cells were also very sensitive to this derivative - the values of 50% inhibition of cell growth in these lines were lower (more toxic) than in cancer cells.

The experiments reveal that the studied substances can be tested on other types of cancer cells. This is important in the search for anti-cancer agents.

CYTOTOXICITY OF 1,3,4-OXADIAZOLE-2-THIONE DERIVATIVES *in vitro*

U.B. Khamidova, M.R. Umarova, E.O. Terenteva, Kh.Z. Nasriddinov, E.G. Yusupova, D.S. Ismailova, B.J. Elmuradov, Sh.S.Azimova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: genlab_icps@yahoo.com

The cytotoxic activity of several derivatives based on 5-(p-aminophenyl)-1,3,4-oxadiazol-2-thione were studied. The cytotoxic activity of several products based on 5-(p-aminophenyl)-1,3,4-oxadiazol-2-thione was studied. The experiment were carried out on cancer cell lines - cervical epithelial carcinoma HeLa, breast adenocarcinoma HBL-100 (ATCC HTB 124), larynx adenocarcinoma Hep-2 (ATCC:CCL-23), T-lymphoblastic leukemia CCRF-CEM (ATCC: CCL-19) and healthy cell lines - fibroblasts, hepatocytes, kidney cells by MTT method. The substances' cytotoxicity was compared with cisplatin ("Cisplatin-Naprod", India). Testing was performed in triplicate, then the data was analyzed and statistically processed using Origin 8.6.

During the work, it was found that 2-chloro-N-(4-{5-[(2-oxo-2-phenylethyl)sulfanyl]-1,3,4-oxadiazol-2-yl}phenyl)acetamide showed high cytotoxicity (Fig 1.).

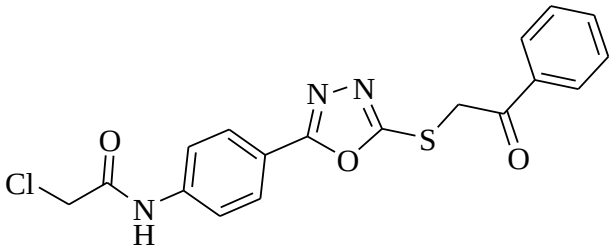


Figure 1. 2-chloro-N-(4-{5-[(2-oxo-2-phenylethyl)sulfanyl]-1,3,4-oxadiazol-2-yl}phenyl)acetamide

The IC_{50} value (concentration at which 50% of the cells die) for substance was 9.8 μM for CCRF-CEM cells, 80.1 μM for HEp-2 cells, 27.8 μM for HBL-100 cells, and 98.8 μM for the HeLa line.

The high cytotoxicity of this sample was also preserved on healthy cells of the body: the IC_{50} values of this compound were higher only on liver cells - hepatocytes. Fibroblasts and kidney cells Vero B were highly sensitive to these derivatives - the values of 50% inhibition of cell growth on these lines were lower (more toxic) than on cancer cells.

In conclusion, it can be said that the studied 2-chloro-N-(4-{5-[(2-oxo-2-phenylethyl)sulfanyl]-1,3,4-oxadiazol-2-yl}phenyl)acetamide showed a higher activity against cancer cell lines than other derivatives. This is important in the search for anti-cancer drugs in oncology.

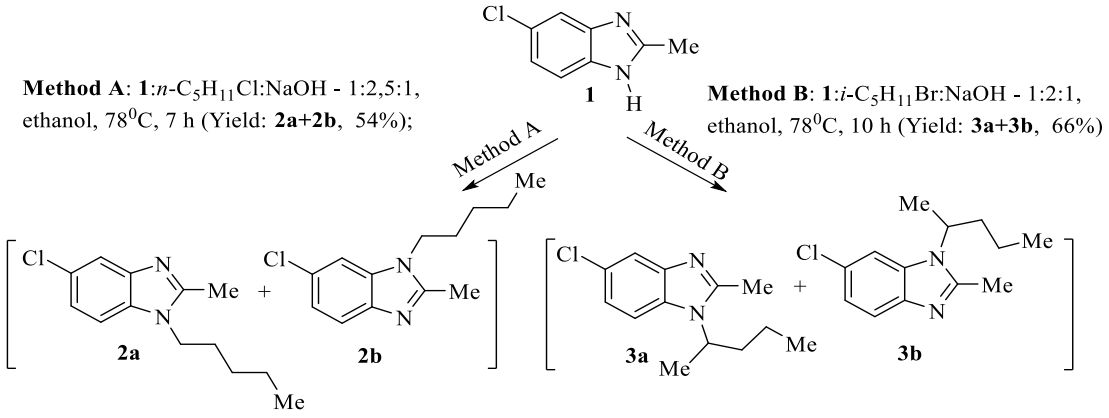
DIRECTION OF ALKYLATION REACTIONS OF 2-METHYL-5-CHLOROBENZIMIDAZOLE

B. B. Juraev, I. S. Ortikov, B. J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: jorayevbaxromjon75@gmail.com

Nowadays, benzimidazole derivatives play important role in medicine. They have many pharmacological activities such as antimicrobial, antiviral, antidiabetic and anticancer activity [1]. Benzimidazoles are remarkably effective compounds, extensive biochemical and pharmacological studies have confirmed that these molecules are effective against various strains of microorganisms [2]. Some of the synthesized compounds, for example *Benomyl, Rabeprazol, Telmisartan* are used as fungicide, anti-ulcer and anti-hypertensive agents [3].

In the present work we continued alkylation of 2-methyl-5-chlorobenzimidazole (**1**). To do that we carried out interaction of 2-methyl-5-chlorobenzimidazole (**1**) with *n*-amylchloride and *i*-amylbromide:



Reactions carried out at boiling temperature of ethanol in the presence of NaOH for 7-10 hours. As results, we have synthesized N-alkyl-5-chloro-2-methyl-derivatives (**2**a,b; **3**a,b).

The structure of the obtained isomeric dialkyl products was confirmed by ^{1}H and ^{13}C NMR spectroscopy methods.

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CATALYTIC CYCLIZATION OF ISOMERIC BROMOAZIDES AND PROPARGYL ESTER

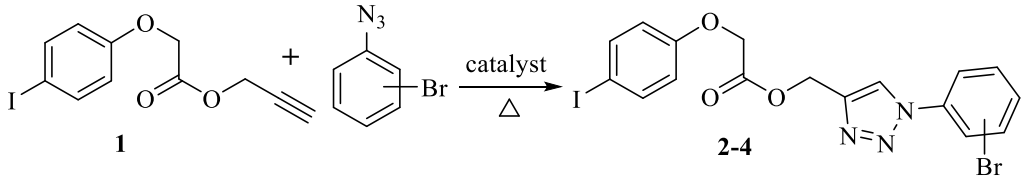
I.S. Ortikov[1], Sh.R. Khozhimatova[2], B.J. Elmuradov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: ortikovilxomjon@gmail.com.
2) Andijan Institute of Mechanical Engineering, Andijan, Uzbekistan

Among the heterocyclic pharmacologically active substances, triazole derivatives stand out for their ease of synthesis, high biological activity, and low toxicity. Currently, synthetically obtained biologically active substances occupy the main place in pharmaceuticals and agriculture. According to the analysis of literature published in recent years, among five-membered heterocyclic compounds, 1,2,3-triazole derivatives have the highest biological activity [1-2].

Our research is also focused on the synthesis, chemical transformations and biological activities of 1,2,3-triazole derivatives. For this, we use the azide-alkyne cycloaddition reaction, which is the main synthesis method of 1,2,3-triazoles [3]. We have chosen propargyl ester of monoiodoacetic acid as an object. First, the corresponding propargyloacetate ester was synthesized from monoiodoacetic acid and propargyl alcohol through an esterification reaction.

The resulting ether was alkylated with para-iodophenol and the corresponding prop-2-yn-1-yl 2-(4-iodophenoxy)acetate (**1**) was isolated. 1,3-Bipolar cycloaddition reaction of this compound with *ortho-*, *meta-* and *para*-bromophenylazides was carried out by refluxing a mixture of reagents in a ratio of 1:1 in the presence of a copper(I) bromide catalyst in toluene for 6 hours:



1 **2-4**

The reaction mixture was cooled, the precipitate was filtered, dried, and its physical constants were studied. The IR and ^{1}H NMR spectra of the substances obtained as a result of catalytic ringing were analyzed. As a result, it was determined that 1,4-isomers of 1H-1,2,3-triazole derivatives were formed (**2-4**).

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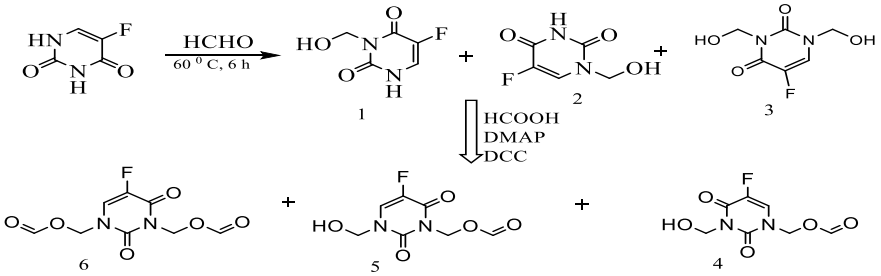
SYNTHESIS DERIVATIVES OF 5-FLUOROURACIL

Sh.E. Ochilov[1], G.S. Shakirzyanova [2], R.S. Esanov [2], A.D. Matchanov [2]

1) The National University of Uzbekistan named after Mirzo Ulugbek, Ташкент, 4, University street, Tashkent, 100174, Uzbekistan
2) Institute of Bioorganic Chemistry named after acad.A.S. Sadykov of the Academy of Sciences of the Republic of Uzbekistan 83, M.Ulugbek str.,Tashkent,100125, Uzbekistan

Nowadays, a lot of new effective drugs for treating cancer is being increased. One of the well-known medicine is Fluorouracil (5-FU) - important clinically useful anticancer drug, were sold under the Adrucil. Fluorouracil is an effective antitumor agent, but at the same time, it has a strong toxicity and poor tumor affinity. Firstly, 5-Fluorouracil was synthesized in 1957. Combination chemotherapy including 5-FU has been used extensively in the treatment of a wide range of solid tumors, but its negative effects, such as mucositis, nausea, vomiting and cardiotoxicity have often been observed [1]. Specially for solving these problems, we tried to synthesis different derivatives of the 5-FU, according to the method [2-3]:

Scheme



At the beginning of our experiment, 5-Fu was reacted with formaline (37% solution) till the mixture of *N1*-hydroxymethylene-5-fluorouracil, *N3*-hydroxymethylene-5-fluorouracil and *N*1, *N*3-dihydroxymethylene-5-fluorouracil (**1,2,3**). Without separation, the mixture was directly coupled with the appropriate formic acid to give the target compounds (**4,5,6**). The reaction were conducted in the presence of mixture two catalyzaters: *N,N'*-dicyclohexylcarbodiimide (DCC) and *N,N*dimethylpyridin-4-amine (DMAP). The synthesis of new derivatives of 5-Fluorouracil have been continued.

The structure of obtained derivates testified by: IR resolution Bruker Spectrum Invenio S-2021with ATR (4000 – 400 cm^{-1}): 3321; 1571; 3072; 1713; 1079; 1342; 2925; 1243; 1158; HPLC-Agilent Technologies 1260,(USA),column Poroshell 120 EC-C18,2.7 μm,4,6 x100 мм detector-diode matrix detector; Redtime (5-FU-3.04); 3.23; 2.90; 7.05.

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SYNTHESIS OF DERIVATIVES OF LAGOXILIN WITH PHTHALIC ANHYDRIDE

F.A. Sobirova, R.S. Esanov, A.D. Matchanov

Institute of Bioorganic Chemistry named after acad. A.S. Sadykov Academy of Sciences of the Republic of Uzbekistan, Uzbekistan, Mirzo Ulugbek str., 83, Tashkent, 100125

A number of biologically active compounds have been isolated from the plant *Lagochilus inebrians Bge*, a representative of the *Lamiaceae* family, whose aqueous decoctions and tinctures are used for various bleeding, colds and allergies, and their physico-chemical parameters and spectral properties have been determined studied. The literature also shows that the main biologically active substance of the plant *Lagochilus inebrians Bunge* is the diterpenoid lagochiline (3,16,17,18-tetrahydroxy-9,13-epoxylabdan).

Today, it is important to look for anticoagulants and hemostatic agents among 1,4-dicarboxylic acid derivatives, since the literature reports that carboxylic acid amides and hydrazides have hemostatic and anticoagulant effects. Amides and hydrazides of phthalic acid are obtained by certain methods from phthalic anhydride or tetrachlorophthalic acid. Dicarboxylic acids are also important in plant life. They have not only direct, but also secondary action. In particular, the immunobiological activity of terpenes promotes the activation of the phagocytosis process, and together with succinic acid improves the cellular and humoral control of neutrophils and macrophages. Based on these data, we set the task of carrying out the chemical synthesis of 3,16,17,18-tetrahydroxy-9,13-epoxylabdan (lagochilin), which is the main component of the plant *Lagochilus inebrians Bunge*, with some representatives of a number of dicarboxylic acids, especially phthalic, glutaric and succinic anhydrides. The chemical synthesis of lagochilin with anhydrides of dicarboxylic acids was carried out in an absolute pyridine medium at the boiling point of pyridine. The course of the reaction was monitored by the TLC method. At the end of the reaction, pyridine was neutralized with a cold solution of hydrochloric acid. Some physico-chemical parameters of the synthesized substances have been studied. At the end of the reaction, pyridine was neutralized with a cold solution of hydrochloric acid. Some physico-chemical parameters of the synthesized substances have been studied. Mono-, di-, tri-, tetra- , derivatives of lagochilin have a light yellow oily nature, insoluble in water. In our work, we took their sodium salts to ensure good solubility of esters in water. In addition, some physico-chemical parameters of the synthesized compounds were studied. in the IR - ν = (-C=O) 1750-1600; (C–O–C) 1450-1250, ν = (-OH) 3500-3000; ν = ($-CH_2$,$-CH_3$)2900-2800. When analyzing the UV spectrum of the sodium salt of lagoxylin ester based on phthalic anhydride in the water:acetonitrile (1:1) system, an intense absorption maximum appears, corresponding to the n→p* transition in the UV spectrum of phthalic anhydride. at wavelengths of 238 and 293 nm. In the UV spectrum of the sodium salt of LgTF, a “hypsochromic” shift from 293 nm to 11 nm was observed; simultaneously with a “hypsochromic” shift by 6 nm, a “hyperchromic” effect was observed at an absorption maximum at 238 nm.

SYNTHESIS OF NOVEL N^1-ARYLSULFONYL-2-ETHYL-5-METHYL-BENZIMIDAZOLES

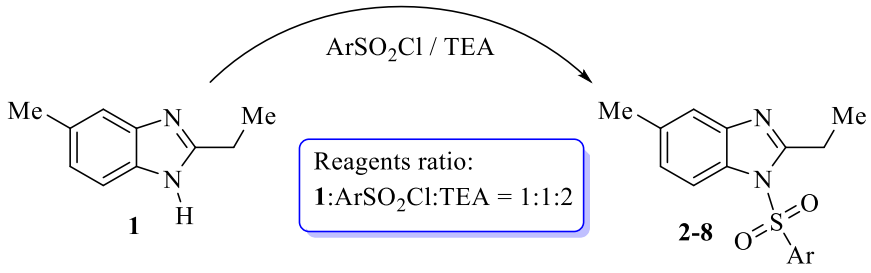
K. Abdireymov, B.J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77

In the last decades, the broad research in the application of benzimidazole derivatives made it important for mankind. Many scientists have worked on benzimidazole derivatives and they found that this compound has a diverse role in the field of medicinal chemistry. Some benzimidazole derivatives are currently in the market as a drug candidate against various diseases. Moreover, the benzimidazole derivatives exhibit pharmacological activities such as anti-tuberculosis, anti-malarial, antihistamine, antimicrobial, antiviral, antidiabetic, anticancer, anti-fungal, anti-inflammatory, analgesic, anti-HIV, etc. [1-3].

Therefore, currying out targeted research on the synthesis and study of the biological activity of arylsulfonyl-benzimidazoles is very interest.

In present work is described results of reactions of 2-ethyl-5-methylbenzimidazole (**1**) with substituted arylsulfonyl chlorides. The aim of this work was synthesis of potentially biological active arylsulfonyl derivatives of benzimidazoles (**2-8**):



Ar= **2**, C_6H_5 (90%); **3**, 4-Me-C_6H_4 (62%); **4**, 4-MeO-C_6H_4 (81%); **5**, 4-Cl-C_6H_4 (77%); **6**, 3,4-$(Me)_2$-C_6H_3 (72%); **7**, 4-$C(Me)_3$-C_6H_4 (62%); **8**, 2,4,6-$(Me)_3$-C_6H_2 (72%).

Arylsulfonylation of 2-ethyl-5-methylbenzimidazole (**1**) with substituted arylsulfonyl chlorides curried out in the presence of triethylamine at room temperature for 4 hours. As results we have synthesized corresponding N^1-arylsulfonyl-2-ethyl-5-methyl-benzimidazoles (**2-8**) in good yields. Structure of the synthesized compounds (**2-8**) was confirmed by results of ^1H, ^{13}C NMR spectroscopy.

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SYNTHESIS OF NEW AMIDES OF 3-*O*-ACETIL-18β-H-GLYCYRRETIC ACID

A.Zh. Dzhuraev[1], R.S. Esanov[2,4], A.A. Ganiev[3], Kh.M. Bobakulov[3], N.D. Abdullaev[3], A.D. Matchanov [2,4]

1) Gulistan State University 120100, Gulistan, microdistrict 4,
e-mail: alex26111972@gmail.com
2) Institute of Bioorganic Chemistry named after academician A.S. Sadykov AS RUz 100125, Tashkent, Mirzo Ulugbek ave., 83.
3) S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
4) National University of Uzbekistan

The main active ingredient of the licorice root extract is the triterpene saponin glycyrrhizic acid (GA) and its aglycone glycyrrhetic acid (GlA), on the basis of which anti-inflammatory, antiviral, antimicrobial drugs were synthesized and created, which are widely used in medical practice [1,2]. There are data in the literature on the synthesis of new amides of 3-acetoxyglycyrrhetinic acid with some sulfur- and nitrogen-containing heterocyclic amines [3].

Based on the foregoing, the search for new biologically active compounds based on licorice root ingredients, the synthesis of new derivatives, the establishment of their structure and the study of their biological activity is an urgent task. GlA was obtained by the previously known method [4], by acid hydrolysis of GA, which was isolated from a thick extract of licorice root according to the procedure [5].

For this, 3-AGlA was obtained by the action of acetic anhydride with GlA, and the interaction of the latter with thionyl chloride gave 3-AGlA acid chloride [6]. When the acid chloride 3-AGlA reacts with the corresponding aromatic (1-phenylmethanamine, 2-amino-1-hydroxybenzene, 2-amino-1-carboxybenzene) and heterocyclic (2-aminoantipyrine) amines, compounds are obtained. The resulting compounds were purified by recrystallization from a mixture of chloroform and methanol.

The chemical structures of the synthesized compounds were proved by investigation of UV and IR spectroscopy, as well as by 1D and 2D NMR spectroscopy data.

Thus new 3-AGlA amides were synthesized for the first time and their physico-chemical properties were studied.

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SYNTHESIS AND CHARACTERIZATION OF SODIUM-CARBOXYMETHYLCELLULOSE SOLUTION CONTAINING ZINC OXIDE NANOPARTICLES FOR THE CREATION OF BIOMATERIALS

M.M. Mirkholisov, K. E. Yunusov, A.A. Sarymsakov

Institute of Polymer Chemistry and Physics, Uzbekistan Academy of Sciences, 100128, Tashkent, str A. Qodiriy, 7 "b", e-mail: polymer@academy.uz

Creation the of special biomaterials based on cellulose-containing zinc and its oxides with antibacterial properties at cleaning the atmospheric air from toxic viruses and bacteria is one of the serious problems of pharmaceutical and chemical scientists [1]. Zinc oxide nanoparticles (ZnONP) is considered to be non-toxic to humans and has a high antibacterial effect, and is also important in restoring the immune system [2].

The purpose of this work is to synthesize ZnONPs in the sodium – carboxymethylcellulose (Na-CMC) solutions and study physicochemical characteristics by UV-spectroscopic method in order to determine the size and shape of nanoparticles.

An aqueous solution with a concentration of 1% was prepared from purified Na-CMC with a degree of substitution (DS)-0.85 and a degree of polymerization (DP)-1050. For the synthesis of ZnONPs were used 0.1 M aqueous solution of zinc nitrate ($Zn(NO_3)_2$).

After adding the amount of $Zn(NO_3)_2$ to the solution of Na-CMC the Zn^{2+} ions react with carboxymethyl (CH_2COO^-) groups of Na-CMC forming Zn^{2+}CMC hydrogel with ionic coordination bonds. By adding sodium hydroxide, the ions of zinc were restored to a metallic state by the formation of ZnONPs. In order to determine the size and shape of ZnONPs which are synthesized in the Na-CMC matrix, were carried out UV-spectroscopic studies.

The maximum absorption spectra of the synthesized ZnO/CMC solution spectra were observed at the λ_{max}-370 nm wavelength, which characterized the formation of spherical ZnONPs with sizes 10-80 nm in the solution.

In the ZnO/CMC film obtained film solution was observed by atomic force microscopic investigation ZnONPs with sizes 5-68 nm.

Acknowledgment. *This work was supported by project Uzbekistan-Belarus MRB-2021-548 (Creation of fiber-containing materials modified with organic and polymer-inorganic coatings for various functional purposes) for the years 2022-2023 by the Ministry of Innovative Development of the Republic of Uzbekistan*

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FTIR-SPECTROSCOPIC ANALYSIS OF SODIUM-CARBOXYMETHYLCELLULOSE CONTAINING SILVER CATIONS BASED ON ANTIBACTERIAL FILM

J.Z. Jalilov o‘g‘li, X.E. Yunusov, A.A Sarimsakov.

Institute of Polymer Chemistry and Physics, Uzbekistan Academy of Sciences, 100128, Tashkent, str A. Qodiriy., 7 "b", e-mail: polymer@academy.uz, javlonj2204@mail.ru

The aim of this work is the synthesis of polymermetalcomplexes from sodium carboxymethylcellulose (Na-CMC) and silver cations and FTIR-spectroscopic analysis of films obtained on their basis.

In this study, purified samples of Na-CMC with a degree of substitution (DS) 0.88 and degree of polymerization (DP) 800) used as polymer matrix. A 2% aqueous solution of purified Na-CMC was chosen as the stabilizing polymer matrix. In the presence amounts of 0.1-0.001 M aqueous solutions of $AgNO_3$ in 2% aqueous solution of purified Na-CMC. FTIR-spectroscopic studies were carried out on obtained polymermetallocomplex films obtained from Ag^+CMC^-, Na-CMC hydrogels.

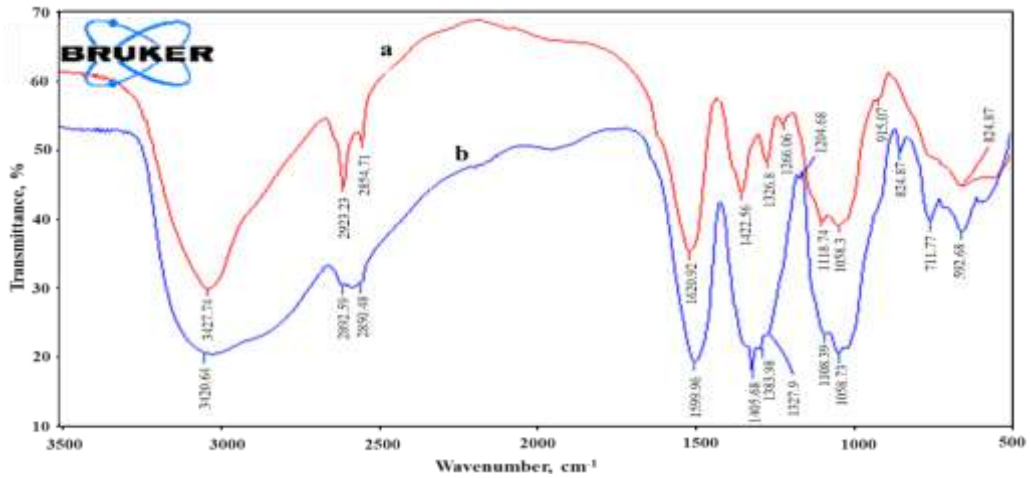


Fig. 1. Purified Na-CMC (a) and Ag^+CMC^-, (b) films FTIR-spectrum results

As can be seen in Figure 1-a, the maximum of the absorption band of the carboxymethyl anion in purified Na-CMC macromolecules is observed in the region of 1620.92 cm^{-1}. When sodium cations (Na^+) were replaced by silver cations (Ag^+) in the CMC macromolecule, the intensity of the absorption band increased to 1599.96 cm^{-1} (Fig. 1-b). FTIR-spectroscopic studies have shown the possibility of synthesizing the Ag^+CMC^- polymermetalcomplex as a result of the interaction of Na-CMC with $AgNO_3$ salts.

This work was supported by project Uzbekistan-Belarus MRB-2021-548 (Creation of fibre containing materials modified with organic and polymer-inorganic coatings for various functional purposes) for the years 2022-2023 by the Ministry of Innovative Development of the Republic of Uzbekistan.

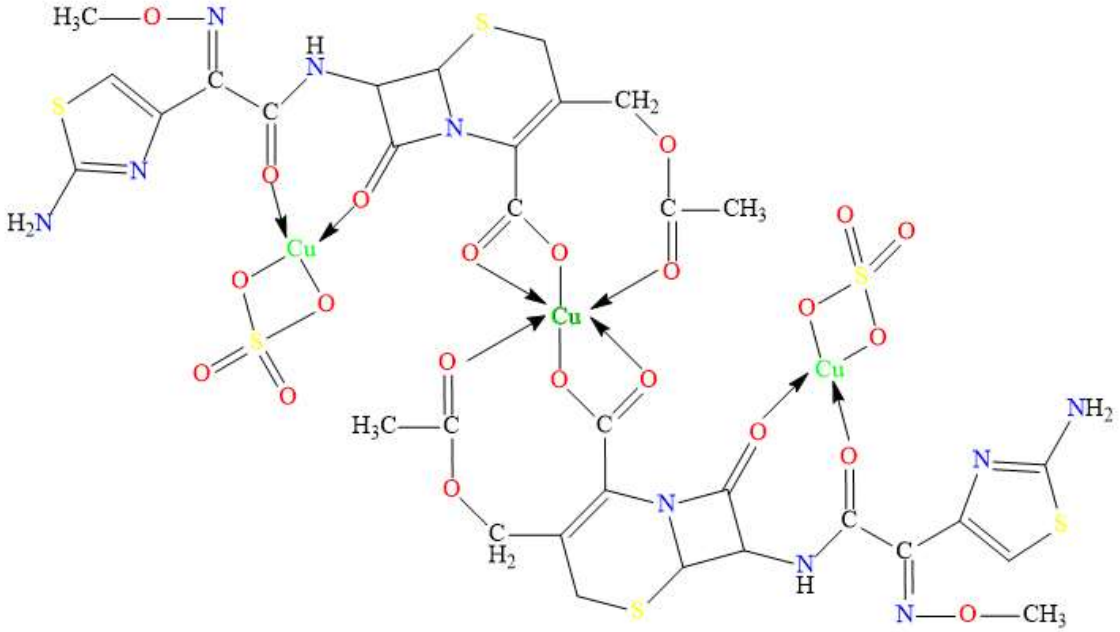
SYNTHESIS OF COORDINATION COMPOUND BASED ON COPPER (II) SULFATE AND CEFOTAXIME

Sh. Khasanov, Z. Abdullaeva, A. Masharipov

Khorezm Ma'mun Academy, e-mail: shadlik@mail.ru

Today, the use of modern innovative technologies plays an important role in increasing the productivity of the world's main agricultural crops, in particular, in creating effective tools that accelerate the growth of crops and increase their productivity. In the production of such tools, the use of materials with antimicrobial properties as well as simple, cheap and well-known structures as raw materials is of great importance.

The following method was used to synthesize a complex compound based on $CuSO_4$ and cefotaxime. Aqueous and acetonitrile solutions of $CuSO_4$ (1.44 g, 0.003 mol) and cefotaxime (0.455 g, 0.001 mol) were mixed with a magnetic stirrer at a speed of 800 revolutions per minute at a temperature of 400 ^{0}C for 1.5 hours. As a result, a pale blue-green solution was obtained. This solution was left at room temperature for 5 days until crystals formed.



Coordination compound obtained on the basis of copper (II) sulfate and cefotaximein order to compare with the theoretically calculated amounts of the elements in the composition, elemental analysis was carried out using the scanning electron microscope - energy dispersion analysis (SEM-EDT) method of the composition of the complex compounds obtained as a result of the reaction, and it was found that their amounts are compatible with each other. According to the results of SEM-EDT, a large number of peaks characteristic for the metal ion were noted, together with the formation of a complex of procaine hydrochloride with the metal ion and the change of the microstructure of the ligand. The degree of crystallinity of the new complex was also determined.

SYNTHESIS OF POLYCOMPLEXES OF MICROELEMENTS WITH POLYPEPTIDES

O.M. Namozov, G.A. Usmanova, X.A. Mirzaxidov, M.M. Karimov, T.M. Babaev

National University of Uzbekistan, Tashkent. 100174. University campus,
e-mail: rector@nuu.uz

The complex formation of synthetic polymers with metal ions is a modern way of delivering macro- and microelements to a living organism, which are necessary for the development, maintenance, and restoration of cells and tissues. In the present study, this technique is extended to polypeptides obtained by alkaline hydrolysis of the silkworm. Systematic studies of the polypeptides themselves (fibroin and sericin) by molecular physics methods have not yet been carried out. The study is aimed at studying the mechanism and features of the complex formation of these polypeptides with micro-elements (zinc, calcium, magnesium ions) by modern physical methods for studying macromolecular compounds in order to correct the balance of microelements in a living organism, modeling the processes occurring in it. Comparison of the hydrodynamic and dynamo-optical characteristics of metal-polymer complexes with polypeptides of various compositions and molecular weights made it possible to estimate the degree of binding and conformation of macromolecules in aqueous solutions.

After alkaline hydrolysis of the silkworm, the fiber was washed with distilled water several times until a neutral medium (pH 6.0-6.5), after which the fiber was placed in solutions (50 ml) of 0.1 N. calcium chloride, magnesium sulfate, zinc sulfate ($CaCl_2$; $MgSO_4 \cdot 7H_2O$; $ZnSO_4 \cdot 7H_2O$). 4 were prepared from each solution of 12 solutions, and 0.2 g of fibroin were placed in each solution. The sorption of metal ions was measured by the conductometric method over time every 15, 30, 60 and 90 min.

The method of IR spectroscopy was used to study silk samples before hydrolysis, the resulting polypeptide after silkworm hydrolysis, polymer metal complexes obtained with calcium, magnesium and zinc. The study conditions were the same. The studies were carried out in the laboratory of physical research of the Institute of Bioorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan named after. A.S. Sadykov.

The original approach implemented in this work is the use of natural polypeptides obtained by hydrolysis of the silkworm as a polymeric carrier of metal ions. The use of these polypeptides for the study of complexation predetermines both the novelty of the study and the possibility of practical use in medicine of metal-polymer complexes based on them.

SYNTHESIS AND THERMAL ANALYSIS OF THE COMPLEX COMPOUND OF NICKEL (II) SULPHATE WITH NAPHTHALDINE DISULFOACID

J.R. Suyunov[1], X.X. Turayev[1], J.M. Ashurov[2], A.T. Djalilov[3], Y.E. Nazarov[1]

1) Termez State University,
2) Institute of Bioorganic Chemistry, Academy of Sciences of Uzbekistan.,
3) Director of the Tashkent Scientific Research Institute of Chemical Technology,
Tel: +99897-850-05-91, e-mail: jabbor.suyunov@bk.ru

At present, metal complexes containing a naphthalene ring or synthesized on the basis of naphthalene derivatives are of great importance in manufacturing enterprises, in the development of agricultural crops and in the field of medicine of the world and our country. For example, various concentrations of metal complexes containing a naphthalene ring used in the division and expansion of plant cells from in the formation of adventitious roots in plants, in increasing the yield of plant fruits, in preventing early fruit abscission, in changing the ratio of seed and pollen flowers in plants and in many other areas.

0.01 mol (2.81 g) of hydrated nickel(II) sulfate salt ($NiSO_4*7H_2O$) and 0.01 mol (3.32 g) of naphthalene-1,5-disulfonic acid sodium salt ($C_{10}H_6Na_2O_6S_2$) were taken on an analytical balance. The resulting substances were dissolved in distilled water and formed a solution. First, 5 ml of a solution of naphthalene-1,5-disulfonic acid was measured from the resulting solutions and poured into a flat-bottomed flask. Then, 5 ml of nickel (II) sulfate salt solution was added to the solution in the flask. 1 ml of an ethylenediamine (NH_2-CH_2-CH_2-NH_2) solution was added dropwise to the resulting mixture while stirring with a magnetic stirrer and heated at 50-55°C for 25-30 minutes. The obtained transparent pale pink solution was poured into glass vials, left at room temperature for evaporation, and the process was observed. As a result, after 10-15 days, the formation of solid crystals of dark blue color, granular form at the bottom of the containers was observed. When analyzing the crystals obtained by X-ray diffraction analysis (XRD), it was found that they are new crystals of the composition $(C_2H_{16}N_2NiO_4)^{2+}\cdot(C_{10}H_6O_6S_2)^{2-}\cdot 2H_2O$. The reaction equation was proposed as follows.

$$C_{10}H_6S_2O_6Na_2 + NiSO_4 + C_2H_4(NH_2)_2 + 6H_2O \longrightarrow (C_2H_{16}N_2NiO_4)^{2+}\cdot(C_{10}H_6O_6S_2)^{2-}\cdot 2H_2O + Na_2SO_4$$

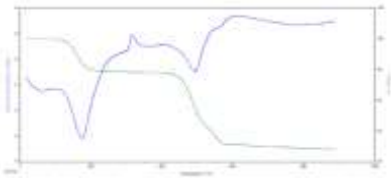


Fig. 1. Thermal analysis of a complex compound containing $(C_2H_{16}N_2NiO_4)^{2+}\cdot(C_{10}H_6O_6S_2)^{2-}\cdot 2(H_2O)$

As can be seen from the data in Fig. 1 above, according to the results of thermal analysis of the complex containing $(C_2H_{16}N_2NiO_4)^{2+}\cdot(C_{10}H_6O_6S_2)^{2-}\cdot 2(H_2O)$ TG was observed in 2 stages, and DTA decomposition was observed in several stages. The first thermal decomposition continued up to 185°C after the start of the process, where it ended with some weight loss due to evaporation of water and volatile molecules of the complex. The second thermal decom-position began at 185.5°C and continued up to 578.04°C due to the gradual breaking of bonds in the complex and thermal decomposition of the product. In addition, as can be seen from the data in the image above, differential thermal analysis (DTA) shows that several exothermic decomposition processes have occurred and that the product has completely decomposed.

SYNTHESIS AND IR-SPECTRUM ANALYSIS OF THE COMPLEX COMPOUND OF NAPHTHALDINE DISULPHO ACID WITH COPPER (II) ACETATE

J.R. Suyunov[1], X.X. Turayev[1], J.M. Ashurov[2], A.G. Eshimbetov[3], Y.E. Nazarov[1]

1) Termez State University; 2) Institute of Bioorganic Chemistry, Academy of Sciences of Uzbekistan ; 3) Bioorganic Chemistry, Academy of Sciences of Uzbekistan

As we know, metallocomplexes and their derivatives containing the naphthalene ring are currently widely used in agriculture as herbicides and plant growth stimulants. This is an important factor in the fight against perennial weeds with a well-developed root system. Low-concentration solutions of systemic herbicides are sprayed on the surface of plant leaves, and also introduced into the soil.

0.01 mol (3.32 g) of $C_{10}H_6Na_2O_6S_2$ (from naphthalene-1,5-di-sulfoacid) and 0.01 mol (1.82 g) of $Cu(CH_3COO)_2$ copper (II) acetate salt were taken on an analytical balance. A solution was prepared by dissolving the obtained substances using distilled water. Among the resulting solutions, 5 ml of sodium salt solution of naphthalene-1,5-di-sulfoacid was taken and poured into a flat-bottomed flask. Then, 5 ml of copper (II) acetate salt solution was poured over the solution in the flask along the wall of the container, while stirring well with a magnetic stirrer, 1 ml of NH_2-CH_2-CH_2-NH_2 (ethylenediamine) solution was added drop by drop and heated at 50-60°C for 20 -heated for 25 minutes. The resulting solution was poured into glass bottles, left at room temperature to evaporate, and the process was monitored. As a result, after 14 days, light blue crystals were formed at the bottom of the container. The reaction equation was suggested by X-ray structural analysis (RSA) as follows.

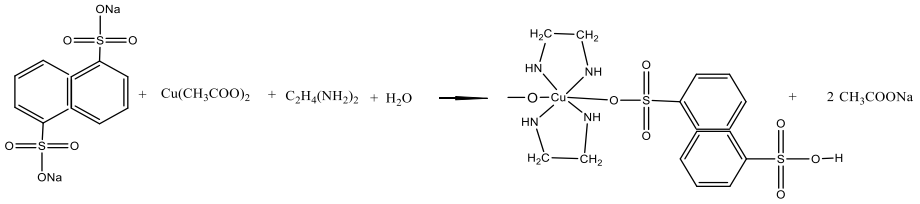


Table 1. Analysis of IR spectra of sodium salt of naphthalene-1,5-disulfoacid ($C_{10}N_6Na_2O_6S_2$) and synthesized copper (II) (1,2-diaminoethane) naphthalene-1,5-disulfonato hydroxo cuprate ($C_{14}H_{22}Cu_1N_4O_6S_2$)n complexes.

Vibration description	N-H	ν(Ar) =C-H	CH_2	=CH	-C=N-	ν(Ar (C_6H_6)	SO_2	Naphthalene	Me-O
$C_{10}H_6Na_2O_6S_2$	-	3348,42	2924,09	1838,16	-	1500,62	1234,44	786,96	661,58
$(C_{14}H_{22}Cu_1N_4O_6S_2)_n$	3427,51	3381,21	1463,97	-	1585,49	1502,55	1242,06	792,74	661,58

As a result of the conducted research, a new metallocomplex containing $[C_{14}H_{22}Cu_1N_4O_6S_2]_n$ was synthesized as a result of the reaction of naphthalene sulfonic acid with copper (II) acetate and ethylenediamine. The composition, molecular and crystal structures of the synthesized metallocomplex were proved using X-ray structural analysis (RSA), vibrational frequencies of the ligand and the complex compound molecule were analyzed using IR-spectroscopy.

QUANTUM-CHEMICAL ANALYSIS AND SYNTHESIS OF THE COORDINATION COMPOUND OF SODIUM M-CRESOXYACETATE WITH COPPER (II) FORMAT

M. Yakhshmuratov[2], Sh. Khasanov[1], Z. Abdullaeva[2], R. Jumanazarova[2], M. Sabirova

1) Ma'mun Academy, Khiva, e-mail: shadlik@mail.ru
2) Urganch State University, Urganch

Currently, the study of the mechanism of action of drugs on the human body is one of the urgent problems of medical chemistry and pharmacology. The use of modern innovative technologies plays an important role in creating effective tools. It is known from the literature that cresoxyacetate and its derivatives have been found to have immunomodulators, reduction of microbes in the body, hepatoprotection and many other biological activities [1].

When determining the spatial structure and coordination number of the central atom in the coordination compound $[Cu(HCO_2)_2 \cdot 4NaC_9H_9O_3]$, an input file was created using the nonempirical method of the HyperChem 8.07 software in the MINIMAL STO-3G approximation, and optimization was performed in the nonempirical 3-21G B3LYP approximation in the Gaussian 9.0 program [2]. Four variants of the possible coordination structure of cobalt formate and lead(II) acetate with coordination numbers 4 and 6 in a 1:1 ratio and coordination numbers 6 and 8 in a 1:2 ratio were considered. The stability of the complex compounds was analyzed based on the minimum heat of formation. Thus, it was found that the cobalt coordination number equal to 6 in the complex compound, obtained in a 1:2 ratio of salts, is stable.

The synthesis of the complex compound was carried out according to the following method: 0.01 mol cobalt (II) formate was dissolved in 15 ml of water. In another beaker, 0.04 mol sodium methacreoxyacetate was dissolved in 20 ml of a 1:1 mixture of water: acetonitrile by heating in a hot water bath (at a temperature of 50-55°C). Then Cu (II) formate dropwise over the solution, noof a hot solution of metha-creoxyacetate was added and the mixture was evaporated for 4 h until the volume was reduced by a factor of 1.5. The resulting solution was left for 2 days. The resulting powdery substance was dissolved in a mixture of 2 ml of distilled water and 2 ml of alcohol and left for 72 hours to recrystallize..The yield of the mass of the obtained substance compared to the mass of the initial substance was 76.8%.

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CHEMICAL SYNTHESIS OF BORON NITRIDE NANOPARTICLES WITH A HEXAGONAL CRYSTAL STRUCTURE

Sh.Sh. Shakharov[1], Sh.E. Abdurakhmonov[1,2], O.E. Abdurakhmonov[1]

1) Tashkent University of Chemical Technology, 100011, Uzbekistan, Tashkent, Ave. Navoi, 32
2) Almalyk branch of the National Research Technological University "MISiS", 110105, Uzbekistan, Tashkent region, Almalyk, st. Amir Temur, 56

In this work, we investigated a chemical method for the synthesis of boron nitride (BN) nanoparticles using boric acid and urea as starting materials. The production process was divided into three stages: the first stage is the preparation of B, N containing products, the second stage is the preparation of boron nitride nanoparticles, the third stage is the washing of the obtained boron nitride nanoparticles. The size and shape of the nanoparticles formed at each stage of synthesis, the elemental and phase composition of the obtained BN nanoparticles were also studied.

The shape and size of the synthesized boron nitride nanoparticles were studied using a transmission electron microscope (Figure 1a). The size distribution of BN nanoparticles is shown in Figure 1b.

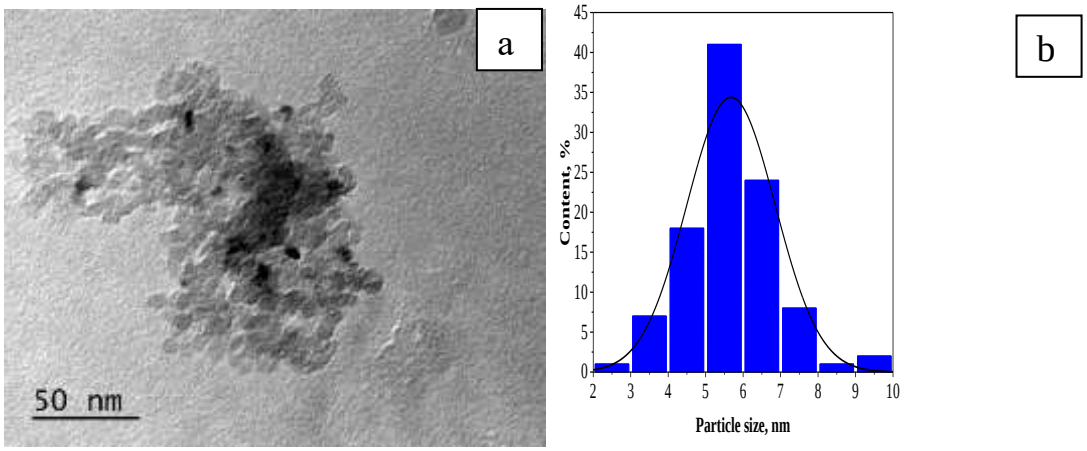


Fig. 1. -. (a) TEM image of BN nanoparticles; b – size distribution of nanoparticles

The average size of the resulting nanoparticles is 7.6 nm. The authors developed a highly efficient method for washing boron nitride of chemical precursors containing B and N, which makes it possible to obtain pure BN nanoparticles.

The proposed method has proven to be a simple, highly efficient, safe and inexpensive way to obtain boron nitride nanoparticles, which can later be used in industry to obtain BN nanoparticles.

IRON PROCESSING SLAG FOR OBTAINING IRON OXIDE RED PIGMENT

U.A. Khasanov[1], Sh.E. Abdurakhmonov[1,2], O.E. Abdurakhmonov[1]

1) Tashkent University of Chemical Technology, 100011, Uzbekistan, Tashkent, Ave. Navoi, 32
2) Almalyk branch of the National Research Technological University "MISiS", 110105, Uzbekistan, Tashkent region, Almalyk, st. Amir Temur, house 56.

The plants process raw materials containing secondary lead from lead batteries (about 70%), residual parts of units and devices of the electrical, metallurgical and chemical industries (about 15%) and other waste (about 15%). This secondary raw material is processed using the calcination method with soda in electric furnaces. The average composition of the charge, %: lead-containing raw materials (battery scrap and waste) - 77, recycled dust - 10, soda - 7.5 and coke - 5.5. As a result, antimony lead is obtained (3-3.5% Sb, 0.5-0.8% Cu, 0.05-0.8% Sn), sprudin (80% Pb, 10% S), dust (54% Pb, 3% Cl) and soda slag.

At the Jizzakh battery plant, waste is generated during the processing of secondary lead containing scrap; soda slag (Figure 2a). According to X-ray fluorescence analysis (XRF), soda slag contains the main macrocomponents in terms of elemental composition in wt. %: 21.3 Na, 0.52 Al, 3.61 Si, 17.5 S, 0.64 Ca, 34.3 Fe, 1.12 Sn, 1.74 Pb. The XRF spectrum of slags is shown in Figure 1.

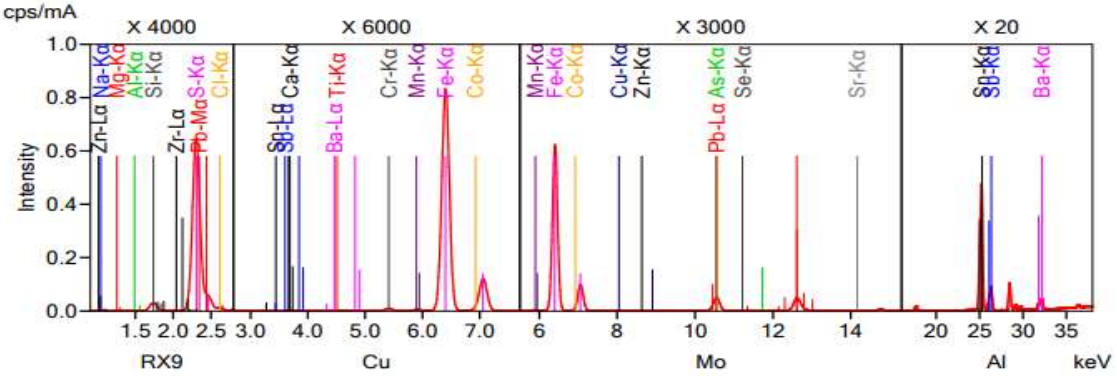


Figure 1. XRF spectrum of soda slag.

In this work, two types of iron oxide red pigment were obtained from soda slag by leaching, which are shown in Figure 2 (b, c).

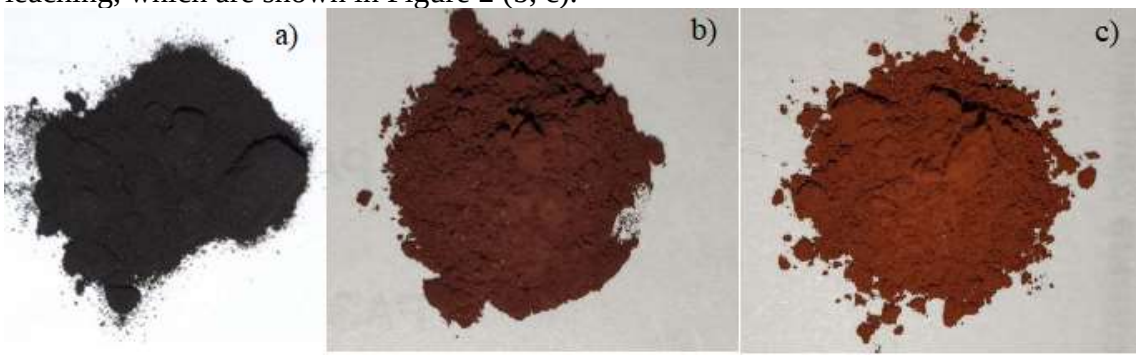


Figure 2. Initial soda slag (a), obtained iron oxide pigments.

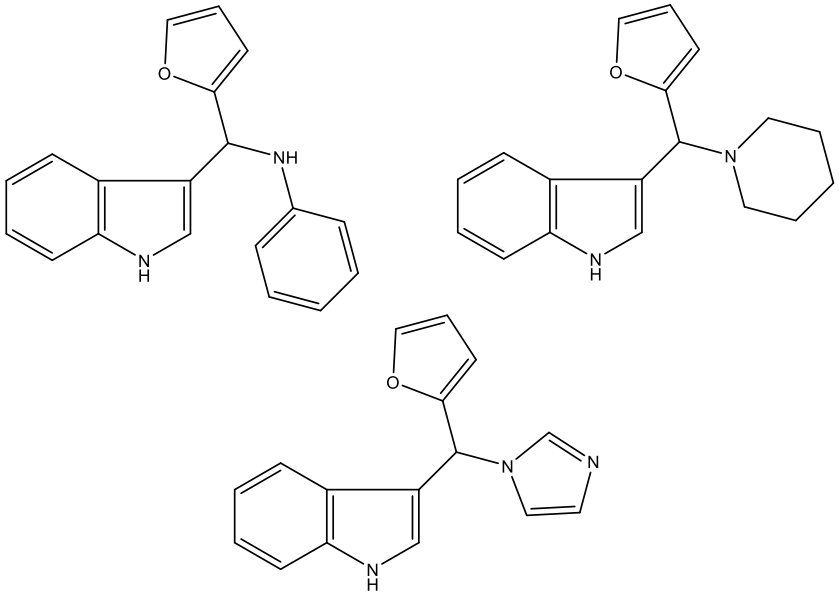
THE SYNTHESIS OF SOME MANNICH REACTION PRODUCTS OF INDOLE WITH FURFURAL UNDER SOLVENT-FREE CONDITIONS

D.G. Urmonov, I.J. Jalolov, A.A. Ibragimov

Department of Chemistry, Fergana State University
19, Murabbiylar street, Fergana, Uzbekistan

Indole and furan moieties are the significant structural units for various biologically important compounds. These compounds are widely employed as antibacterial, antiviral, anti-inflammatory, anti-fungal, anti-tumor, anti-hyperglycemic, analgesic, anti-convulsant, etc. Meanwhile, Mannich reaction is a key step in synthesis of a wide variety of natural products, pharmaceuticals and important for the construction of nitrogen containing compounds. The Mannich reaction of indoles give gramines which have been recently found as novel agents against certain types of plant virus. Here is shown the simple synthesis of compounds bearing both indole and furan moieties employing Mannich reaction under the solvent-free condition.

The general method: Furfural (0.05 mol) and appropriate cyclic or aromatic amines (0.05 mol) were placed in a dried round-bottomed flask containing a magnetic stirrer bar and equipped with a reflux condenser. The mixture was stirred at 50−80 °C for about 3-5 hours. Then indole (0.5 mol) was added in small parts for 15-20 minutes, and the mixture was heated. The reaction procedure was monitored by thin-layer chromatography (TLC). After completion, the reaction mixture was cooled to room temperature. The solution was poured into ice-water, and the precipitate was filtered off. Compounds below were purified by chromatography on a column of silica gel with Hexane-EtOAc (v/v = 2:1). The yields were 30-50%.



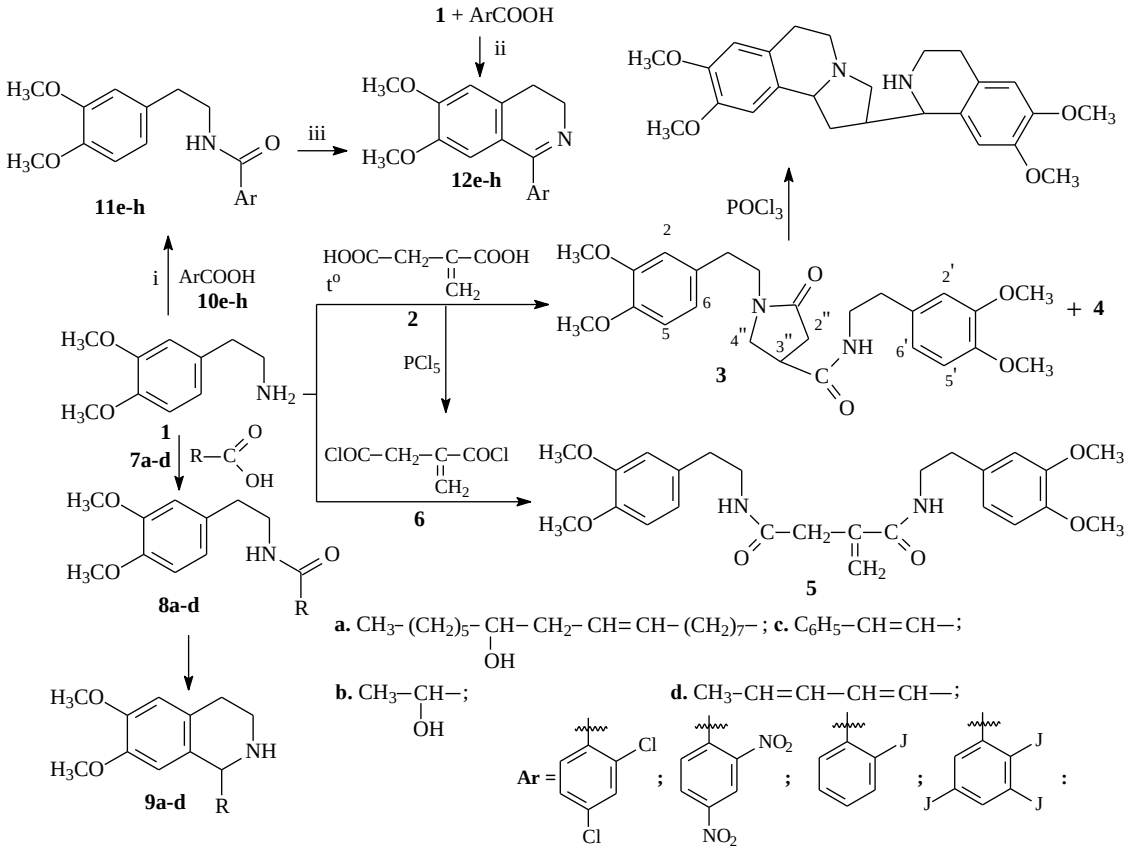
SYNTHESIS OF PHARMACOLOGICALLY ACTIVE ISOQUINOLINE DERIVATIVES

Z.E. Urunbayeva, S. Usarova, A.Sh Saidov.

Sh. Samarkand State University named after Rashidov

In recent years, the synthesis of isoquinoline derivatives has aroused great interest in synthetic chemists and directed their scientific research to the development of the synthesis of such structural substances, and establishing their structure using modern physicochemical methods and determining their chemical and biological properties is one of the urgent issues.

As a continuation of our previous work, we conducted the second-stage amylation reaction thermally by heating carbonic acid and homoveratrylamine in an oil bath at 178°C for 2-4 hours, and as a result of amidation, amide and diamide derivatives were synthesized. The cyclization stage was carried out by adding $POCl_3$ to the acid amide according to the method of the Bishler-Napiralsky reaction, heating for 4-6 hours with a reverse cooler, and 3,4-dihydroisoquinoline derivatives were synthesized.



i. t^oC, **ii.** $POCl_3$, xylene, t^oC; **iii.** $POCl_3$, t^oC

STUDY REACTION INTERACTION OF ACETOACET ETHER, HOMOVERATRYLAMINES AND *p*-HYDROXYBEZALDEHYDE

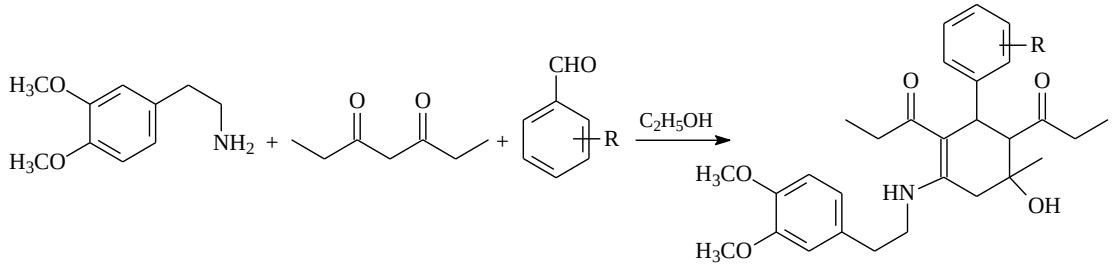
A.A. Xudoyberdiyeva, S.B. Xolmatova, A. Sh Saidov

Sh. Samarkand State University named after Rashidov

For decades, the chemistry of heterocyclic compounds has been one of the most important sciences in organic synthesis and pharmaceutical chemistry. In addition, science and technology are moving to environmentally friendly and sustainable processes. In this context, multi-component reactions have become one of the main areas of synthetic organic chemistry. Compared to traditional methods, multicomponent reactions show higher efficiency and diversity because of their selectivity and economy of reaction steps, as well as the formation of carbon-carbon and carbon-heteroatom bonds in one pot, as evidenced by the simplicity of the process. will give. Usually, the purification of the products obtained as a result of multicomponent reactions is also simple, since all organic reagents participate in the reaction process and are used for the formation of the target products.

As a continuation of the work, we dissolved homoveratrylamine, p-hydroxybenzaldehyde and acetylaceto in ethyl alcohol in a magnetic stirrer.

The progress of the reaction was monitored by thin-layer chromatography, and the hexahydropyrimidinone derivative was synthesized as a result of the reaction.



The structure of the product was established on the basis of IR and NMR spectroscopies.

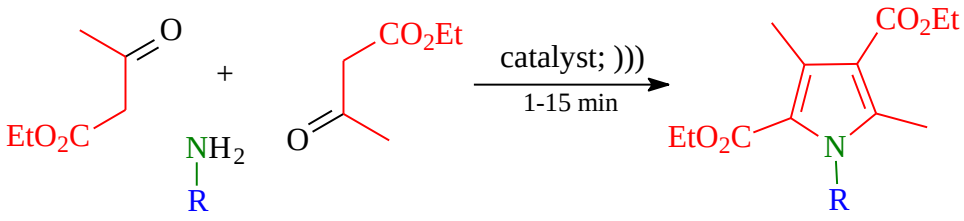
SYNTHESIS PYRROLES BASED ON β-DICARBONYL COMPOUNDS

Z.O. Kilichev, A.B. Yusupov, D.B. Tukhtaev

Samarkand State University, Samarkand, Uzbekistan
e-mail: ayusupov.chem@gmail.com

The pyrrole ring is found in plant chlorophylls - porphyrins, hemoglobin heme and cytochromes, as part of a number of important biologically active natural and synthetic compounds. Formation of a pyrrole ring is also very common in the synthesis of candidate biologically active compounds. Therefore, the effective synthesis of pyrroles and pyrrole ring compounds requires extensive research. The synthesis of pyrroles from β-dicarbonyl compounds under the conditions of the Paal-Knorr reaction is conventionally explained as consisting of two stages. Early stage enaminones themselves are one of the important intermediate compounds in organic synthesis. Enaminones are traditionally obtained by boiling β-dicarbonyl compounds and amines in aromatic solvents. The process requires the azeotropic removal of water from the reaction mixture, which is formed as a result of internal molecular dehydration. In addition, in recent years, a number of methods using various catalysts based on Lewis acids have been developed. However, condensation reactions in all cases involve complex processes involving high temperatures, toxic catalysts, and volatile organic solvents.

In recent years, the presence of ultrasound has been widely used as a mild, efficient and highly selective method in organic synthesis. The method is also fully compatible with energy saving requirements. In our experiments, enaminones were initially obtained from the reaction of primary aromatic and heteroaromatic amines with β-dicarbonyls under the influence of ultrasound. As a result of continued reactions with enaminones in the presence of a catalyst, suitable pyrrole derivatives were synthesized. In this case, the reaction temperature was much lower than traditional methods , and was lowered to 0-5^{o}C. Due to the addition of ultrasound to the process, the duration of the reaction was reduced to 1-15 minutes.



The reactions of 1,3-dicarbonyl compounds with new amines was carried out under ultrasonic conditions and the capability of aromatic and heteroaromatic amines in enamination reactions was compared. The selected method was found to be “green” and efficient for the synthesis of enaminones and pyrroles.

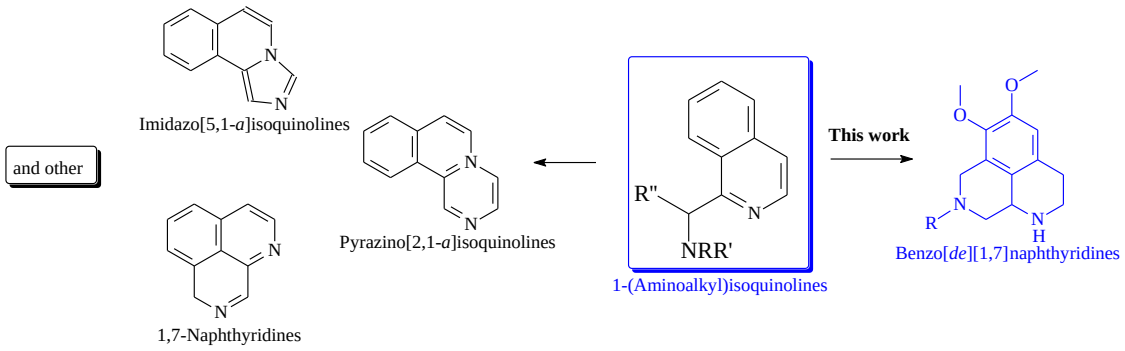
1-(AMINOALKYL)ISOQUINOLINES AS CONVENIENT INTERMEDIATES FOR IMPORTANT HETEROCYCLIC PRODUCTS

S.M. Mirzokulov, A.B. Yusupov, D.B. Tukhtaev

Samarkand state university, Samarkand
e_mail: davlatuzb@mail.ru

1-(Aminoalkyl)isoquinolines are known as important intermediates in the preparation of tricyclic and polycyclic heterocycles, in addition to being the end products of research. In particular, the manipulation of 1-(aminoalkyl)isoquinolines allows the formation of the imidazo[5,1-a]isoquinoline skeleton in convenient ways [1]. 1-(aminoalkyl) isoquinolines can be converted into starting products for the synthesis of pyrazino [2,1-a] isoquinolines using the possibility of changing reagents and conditions [2]. Also, the specific strategy chosen may make this compound a good intermediate for the synthesis of benzo[*de*][1,7]naphthyridines.

Accordingly, 1-phthalimidomethyltetrahydroisoquinolines derived via N-phthaloyl-α-amino acids [3] may be a convenient strategy for the synthesis of new saturated 1,7-naphthyridines. Positive results of natural saturated 1,7-naphthyridine compounds against several types of cancer cells [4] give hope that such new structures are promising.



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MEANS FOR PROTECTING LEGUMINOUS CROPS AND GRAIN PRODUCTS FROM PESTS

S.M. Turaeva, P.A. Nurmakhmadova, F.A. Zulpanov, B.J. Elmurodov, S.B. Allokulova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: saidaicps@gmail.com

One of the dangerous pests of leguminous plants is the cowpea seed beetle (*Callosobruchus maculates* F.) and the pests of grain products and seeds is Khapra beetle (*Trogoderma granarium*), which damage the plant generative organs, and its harmfulness constantly increasing.

C. maculatus develops on pea seeds, various legumes, chickpeas, cowpea, chickasano pea, and other legumes, with the exception of soybeans and beans. India produces around 12.65 million tons of pulses per year and nearly 8.5% of this is lost during post harvested handling and storage

Khapra beetle infestation can spoil other valuable trade goods and threaten significant economic losses if introduced to a new area. Handling or consuming contaminated grain and seed products can lead to health issues such as skin irritation and gastrointestinal distress. It is considered one of the 100 worst invasive species in the world. Infestations are difficult to control because of the insect's ability to survive without food for long periods, its preference for dry conditions and low-moisture food, and its resistance to many insecticides.

Wide spread and economic damage to pests of leguminous crops and grain products is a pressing issue in agriculture. *C. maculates* and *T. granarium* cause great harm to leguminous crops in Uzbekistan.

The aim of our work was a comparative assessment of the insecticidal activity of derivatives of quinozolin-4-on hydroxlorides relative to imago *C. maculates* and *T. granarium*

Compounds based on quinozolin-4-on hydroxlorides, which have insecticidal activity have been synthesized at the Institute of Chemistry of Plant Substances of the Academy of Sciences of the Republic of Uzbekistan.

The derivatives of quinozolin-4-on hydroxlorides were evaluated for insecticidal activity on *Callosobruchus maculates* and *Trogoderma granarium*, an important insect pest of leguminous crops. At the end of the experiment, recorded mortality was 96.6%-89.5% at the 1.0 mg/ml and 0.1 mg/ml concentration of 3-propilquinozolin-4-on hydroxlorides used for imago *C. maculates* insect. Efficiency of 3-propilquinozolin-4-on hydroxlorides at the 1.0 mg/ml, 0.1 mg/ml and 0.01mg/ml after 24 h. exposure was 76.0%, 69.5% and 48.0% against *T. granarium*.

Based on the results of screening studies, it was found that the biological effectiveness of 3-propylquinozolin-4-one hydrochlorides, 3-isoamylquinozolin-4-one hydrochloride at concentrations of 1.0 mg/ml and 0.1 mg/ml was higher in relation to the *C. maculates* than to the *T. granarium*.

It is recommended to continue further field studies of the synthesized substances quinozolin-4-on hydroxlorides for insecticidal activity and to study it in detail.

ALLELOPATHY OF SOME ESSENTIAL OIL PLANTS FROM UZBEKISTAN

S.M. Turaeva, E.R. Kurbanova, Kh.A. Raxmatov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: saidaicps@gmail.com

Allelopathy is a biological phenomenon by which an organism produces one or more biochemical that influence the germination, growth, survival, and reproduction of other organisms. The term allelopathy derives from the Greek words "allelon" and "pathos" which mean mutually and effect. They refer to the chemical interaction of plants through organic secretions. Biogenic secretions are extremely important in the chemical interaction of various organisms (from microbes to higher plants), called allelopathy, and at various levels of their existence.

Plant allelopathy may result in either accelerated or retarded plant growth. The process offers the potential for biological weed control through the production and release of allelochemicals from leaves, flowers, seeds, stems and roots of living or decaying plant materials.

Higher plants produce active compounds that promote seedling growth by allelopathic inhibition of competitive vegetation. Weeds are permanent components of agrophytocenoses and even though the number of weeds is controlled by a man with the help of plant protection products and various agricultural practices, in agriculture they are a by-product of evolution and occur in varying numbers in cultivated crops. The study of the allelopathic effect of weeds on cultivated plants is of great practical importance.

The research aims to study several plant species with allelopathic properties.

The most interesting is the active secretions (allelochemicals) of higher plants, in particular, root exudates, which, entering the environment, can affect representatives of both their own and other species growing in the neighborhood. For example, the roots of many tree species (oak, maple, ash, etc.) release toxins that inhibit the development of both their undergrowth and annual grasses. The spread of the black walnut (Juglans nigra) root system, which releases into the soil a substance called juglone, which is a respiration inhibitor for plants and eucalyptus (Eucalyptus), can be traced by the absence of grass cover.

The allelopathic effect of some essential oil plants against some common weeds that grow in fields and horticultural crops is demonstrated by *Mentha spicata* L., *Carum carvi* L., *Pimpinella anisum* L., *Coriandrum sativum* L., *Foeniculum vulgare* Mill., *Lavandula stoechas* L., *Origanum onites* L., *Rosmarinus officinalis* L. and *Thymbra spicata* L. against some common weeds that grow in field and horticultural crops.

The discovery of natural allelopathic compounds will reduce the use of synthetic herbicides or even replace them with naturally occurring agents for weed control in agrosystems.

TOXIC EFFECT OF *Achillea millefolium* ESSENTIAL OILS ON *Tuta absoluta MEYRICK* LARVAE

P.A. Nurmakhmadova, Sh.O. Melieva, K.A. Eshbakova, R.P. Zakirova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: nurmaxmadova1994@mail.ru

The tomato leaf miner *Tuta absoluta* Meyrick is a dangerous pest of nightshade crops. The insect, whose natural range was in the countries of South America, has become widespread in Africa and Europe. At the present time, the mining moth was registered in neighbouring countries, including Uzbekistan [1].

These species have become a major pest of tomatoes, causing huge crop losses. The fight against *Tuta absoluta* is hampered by the insect's rapidly developing resistance to chemicals.

Our research aims is to evaluate the toxic effect of *Achillea millefolium* essential oils on the larvae of *Tuta absoluta* M. under laboratory conditions.

Essential oils were obtained from the inflorescences of the *A. millefolium* plant by hydro distillation. Leaves of *Lycopersicon esculentum Mill.* cultivar *Leslie F1* containing tomato moth larvae in the mesophyll were placed in Petri dishes and sprayed with various concentrations of essential oil. In the control variant, the leaves were sprayed with water, Benzoate Super 10% was used as a reference. The condition of the pests was taken into account 24 hours after treatment. The biological effectiveness of the extracts was determined by the Abbott formula [2].

Experiments have shown that the essential oil of *A. millefolium* has a toxic effect on tomato moth larvae. The use of essential oil in doses of 1 and 0.5% caused 100% death larvae both the first and second stages of development. Under the influence of 0.1% concentration, the mortality in larvae of the first stage was 89%, the second - 77%. With a decrease in concentration to 0.01%, the biological efficiency was lower - for the studied ages and amounted to 75% and 71%, respectively. Essential oils at 0.001% concentration caused 63% death of the larvae of the first stage and 55% of the second stage.

Thus, it can be noted that the essential oil of *A. millefolium* is toxic to tomato moth larvae. The biological effectiveness of 1% and 0.5% concentrations was at the level of the insecticide Benzoate Super and amounted to 100%.

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GROWTH-STIMULATING EFFECT OF THE AMOUNT OF NEUTRAL SUBSTANCES COTTON LEAVES LINE T-104

N.O. Panaeva[1], P.A. Nurmakhmadova[1], N.M. Mamatkulova[1], N.K. Khidyrova[1], S.S. Sidikov[2]

1) *S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan*
2) Mirzo Ulugbek National University, e-mail: panaeva83@gmail.com

Cotton belongs to the genus Gossypium of the Malvaceae family. All its organs are valuable raw materials for industry, and about 1200 products can be obtained on their basis. Earlier, we studied some secondary metabolites of leaves of dwarf and tall cotton lines and found tocopherols, phytosterols, and polyisoprenoids, on the basis of which the uchkun biostimulator was created [1]. Continuing research in this direction, we conducted research on the study of cotton leaves of the breeding line T-104, created by employees of the Institute of Breeding, Seed Production and Agricultural Technology of Cotton Growing [2]. The breeding line T-104 belongs to the species *G. hirsutum* L. early maturing, highly productive, resistant to pests and diseases. Extraction of dried cotton leaves T-104 yielded a total of neutral substances (TNS) with a yield of 6.7%. The primary screening of which gave a positive growth-stimulating effect [3].

The aim of the study is to study the effect of TNS on the development and productivity of cotton variety Kelajak on improved soil structure.

Small plot tests were carried out in typical sierozem soils on the territory of the Botanical Garden of the National University of the Republic of Uzbekistan (in 200 m^2 of land). As a result of the agrochemical treatments, the content of nitrogen, phosphorus and potassium in the soil was 0.080%, 0.20% and 1.51%, respectively. Treatment with TNS was carried out by the method of pre-sowing seed treatment and spraying of plants in the vegetation phases at a concentration of 0.005%.

The results obtained showed that the treatment of soil with microfertilizers and cotton seeds with an aqueous emulsion of TNS contributed to the emergence of friendly seedlings on the 6th day, and true leaves on the 14th day, respectively, i.e. 3 days earlier than control. Spraying with an aqueous emulsion of TNS was carried out twice in the phase of the beginning of budding and after 10 days. A positive effect was observed in all phases of cotton development - earlier flowering, accumulation of fruit elements and ripening, which contributed to an increase in yield by 50% compared to the control.

Thus, the influence of the amount of neutral substances of cotton leaves of the T-104 line on the yield of cotton under conditions of improved soil structure was studied. As a result of the experiments, the increase in the yield of raw cotton was 10.5 centner per hectare.

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OBTAINING OF CALLUS TISSUE *Ajuga turkestanica* AND STUDY ITS ANTIFUNGAL ACTIVITY

R.P. Zakirova[1], M.A. Tulebaeva, Kh.T. Zairova, A.M. Nigmatullaev[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Tashkent Pharmaceutical Institute, e-mail: ranozakirova@mail.ru

The flora of the Republic of Uzbekistan is characterized by the richest gene pool of useful wild plant species. Medicinal plants of our country are an important part of biological resources. Particularly vulnerable species are endemic and rare plant species.

Cells cultivated in vitro can serve as an additional source of raw materials for obtaining products of secondary metabolism. Studies of the secondary metabolism of higher plants and cells in vitro are of great importance not only for the creation of modern innovative biotechnologies, but also as models for fundamental research [1].

The endemic species *Ajuga turkestanica (Rgl.) Briq.* families Lamiaceaeis is of great interest as a source of biologically active substances. Some drugs have been developed from this plant and used in medicine.

The aim of this work was to obtain callus tissue *Ajuga turkestanica* and study its antifungal activity against *Fusarium oxisporum Schrf.* and *Aspergillus niger*.

To obtain callus tissue, leaf explants of a vegetative plant *A. turkestanica*, brought from the places of growth in the period of full maturity (end of July 2022) were used. To introduce into culture, standard techniques adopted in biotechnology were used. To study antifungal activity, we used *A. turkestanica* callus tissue cultivated for 5 months on Murashige and Skoog medium with the addition of auxin 2.4D - 0.5 mg/l and cytokinin BAP - 0.2 mg/l. Spores of the fungi *Fusarium oxisporum* and *Aspergillus niger* were introduced onto the surface of the nutrient medium of the same composition, after which callus explants were planted.

On the fifth day of counting, sterile zones were observed around the callus, on the lawn of the microscopic fungus *F. oxisporum* the zone of no growth was 0.7 cm, on *A. niger* - 0.5 cm.

The results obtained indicate the synthesis by callus tissues *Ajuga turkestanica* substances with fungal properties.

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ONTOGENESIS OF *Ajuga turkestanica*

A. Egamberdiev[1], B. Nigmatullaev[1], A. Nigmatullaev[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: akmal-egamberdiyev-76@mail.ru, *phone: +998998588835*

Observations on the ontogeny of *A. turkestanica* (Regel) Brig. were carried out in an experimental field in Boysun district. We divided the growth and development of the plant into latent, virginal and generative periods. The virginal period, in turn, was divided into three stages: grass, juvenile, immature. **Latent period.** The seeds of *A. turkestanica* ripen in early July. The fruit is 4, nutlet form, dry, unopened, bean, covered with 20-30 toothed fluffs. In the seed, the endosperm is developed, the ridge is located correctly. Seed germinability is preserved for up to 5 years. To determine this issue, we conducted experiments in laboratory conditions during the years 2018-2022 to determine the germination of seeds stored for different periods of time and at different temperatures. Seeds stored in laboratory conditions at 20-22°C for 1 year had a maximum germinability of 71.3%, and after 5 years, this indicator decreased three times to 21.2%. The average value of the germinability of freshly harvested seeds in laboratory and field conditions during 2018-2022 was 67.7±41.7 and 33.4±3.2. The favorable temperature for seed germination was 20-22°C, and the germination rate was 58.8±3.3%. Thus, the level of germination was high at a temperature of 20-22°C. **Virginal period.** Grass stage - 65% of the seeds sown in fall on October 2, 2017 in an experimental field in Boysun district germinated on February 25, 2018. Seed leaves are narrowly lanceolate, 0.5 cm long and 1.2 mm wide in a 10-day-old seedling. The grass stage in the plant was 8-12 days. **Juvenile stage.** In the middle of March 12.03.2018, a true leaf was formed, the height of the plant was 1.2 cm. After a few days, the growth of the plant accelerated, the height of the plant was 2.9 cm, and the width was 2.6 mm. In the second ten days of March, the height of the plant reached 5 cm, the number of leaves reached 6, and their size was 0.4-0.5 cm. At this time, the root depth reached 9 cm. It was observed that the height of the plant is 9-10 cm, the number of leaves reaches 6-7, and their length is 0.7 cm and width is 0.4 cm. At this time, the sparsest joint spacing of the branch was 0.4 cm, and the leaf helve was 0.2-0.3 cm long. By the end of March (30.03.), the height of the plant reached 11-12 cm, the number of leaves reached 8, and their size was 0.9 cm, width 0.5 cm. Thus, Ajuga turkestanica (Regel) Brig in the juvenile state of the plant, up to 8 leaves were formed on the stem, and this stage of sprout development lasted 15-20 days. **Immature stage.** In the first ten days of April (5.04), the height of the plant reaches 13 cm. The number of leaves reached 9, and their length was 0.6-0.7 cm. At this time, the root depth reached 22 cm. By the middle of April (15.04.), the growth of branches became active with the increase in air temperature. It was observed that the height of the plant is 19-20 cm, the number of leaves reaches 9-11, the length is 0.9 cm, the width is 0.4 cm. By the end of April (30.04.) the height of the plant was 21-25 cm. The number of leaves reached 14, and their length was 1.1 cm, width 0.5 cm. This stage of development of *A. turkestanica* Brig seedlings lasts 25-27 days. According to the observations, the third-year plant in the experimental field in Boysun district entered the generative period on April 25, 2022. By this time, it was found that its height was 39-42 cm, the number of stems was 3-4, the number of leaves was 23-31, and the depth of the root was 75-82 cm.

EVALUATION OF THE EFFECT ON ARECOLINE TREMOR OF THE VINCANINE ALKALOID AND ITS PIRAZOLINE DERIVATIVE, UNDER EXPERIMENTAL CONDITIONS

Yu.R. Mirzaev, E.M. Ruzimov, T.T. Khamroev, Sh.M. Adizov, B.B. Abduazimov, B.N. Khandamov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: tolmas4th@mail.ru

The indole alkaloid vincanine (norfluorocurarine) isolated from Vinca erecta, a plant endemic to Central Asia, is known as a strychnine-like agent and its new derivatives can be attributed to thymostenic agents, especially in small doses. It is known that currently, although significant progress has been made in the diagnosis of various diseases in medical practice, the issue of finding and implementing drugs with high activity has not lost its relevance. Therefore, large-scale scientific and practical research on the basis of plants is carried out on a global scale in search of substances with high pharmacological activity and less harmful to the body. In this regard, the Institute the Chemistry of plant substances Academy of Sciences of the Republic of Uzbekistan is conducting research on vincanin and its derivative, as well as determining its biological activity.

The purpose of the study. Study of the vincanine and its derivative study of the effect on tremor caused by the introduction of arecoline.

All the studies were conducted on mongrel laboratory white mice with a body weight of 20-22 g, which were kept and kept in standard quarantine conditions for 14 days. Effect on the M-cholinergic receptors of the studied substance were studied according to the recommendations given in the guides and literature. The vincanine and its derivative were administered orally to experimental animals in the form of an aqueous solution in doses of 0,1, 1,0 and 10 mg/kg, and distilled water in an appropriate volume to animals of the control group. Arecoline was administered at a dose of 10 mg/kg under the skin of experimental animals an hour after administration of the test substance.

The results obtained and their discussion. The results obtained on the basis of the conducted studies showed that the studied substances vincanine showed an M-cholinomimetic effect in all doses and pirazoline showed M-cholinolytic effect in all doses, depending on the duration of tremor and salivation.

Thus, in the studies of the vincanine hydrochloride showed an M-cholinomimetic and its derivative showed an M-Cholinolytic effect. A number of research works needed to study the neuropsychopharmacological properties of vincanine derivatives.

PRODUCTIVITY OF *Ajuga turkestanica* SEEDS

A. Egamberdiev[1], B. Nigmatullaev[1], A. Nigmatullaev[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: akmal-egamberdiyev-76@mail.ru, *phone: +998998588835*

Determination of seed productivity of *Ajuga turkestanica* (Regel) Brig was carried out in Kashkadarya and Surkhandarya regions during 2019-2022. vegetative and generative branches of *Ajuga turkestanica* (Regel) Brig. were formed up to 65 in each bush. Each plant produced up to 60 flowers.

Due to very warm weather in 2019, flowering of plants started much earlier (15.04). In 2020, the flowering period was observed later (18.05) due to good weather and prolonged rainfall. 2021, when the phenology of *Ajuga turkestanica* (Regel) Brig. was observed in an experimental field in Boysun District, the plant began to flower on April 29. The period of fruiting lasted longer than flowering, depending on weather conditions. We studied fruit set based on the beginning of the flowering process, total flowering, completion and location of the flowers on the stem (bottom, middle and top). The highest number of opened flowers and set fruits was observed during the beginning of flowering and the period of total flowering. At the beginning of the flowering period, an average of 7.2 flowers were formed on one stem per plant. During the total flowering period, it was 7.9 flowers, and at the end of flowering, this indicator was 6.3 flowers. In the experimental field of Boysun district, it was observed that the plant had a high seed production rate for three years. But, due to the change of weather, some of the buds did not have time to form and produce fruit. At the end of flowering, the buds and flowers formed are relatively small, and only 50-55% of the fruit's seeds are fully ripe.

In conclusion, the seed productivity of plants in nature also varies depending on weather conditions. The formation of seed rate was 85.6% on average for 3 years. The main reasons for this are that some flowers are not pollinated and some of them fall due to the influence of the external environment (15%). The table shows the results of three years of experiments, 1 bush of *Ajuga turkestanica* (Regel) Brig. averaged 72.7±5.9 buds, 62.6±2.95 flowers, 51.2±2.36 fruits, and produced 248 seeds. The weight of 1000 pieces of *Ajuga turkestanica* (Regel) Brig. seeds was 20.20 grams. So, one bush of Turkestan ajuga seed yield is equal to 5.06 grams. *Ajuga turkestanica* (Regel) Brig. in the experimental field of Boysun district had high productivity at the beginning of flowering and total flowering periods, and the rate of seed setting was 67.6%.

Seed yield of *Ajuga turkestanica* (Regel) Brig (in natural conditions)

Geographical place (soil type, height from sea level, h)	Observed years	Number of generative organs in the one bush, 100 pcs			Seed forming rate, g, %	1000 pieces seed weight, gr	seed productivity of one bush, pcs
		buds	flowers	fruits			
Boysun district, red and brown soil, h-800	2019	73.1 ±4.95	62.0±3.55	48.0±2.05	67,6	20.02	248
	2020	71.4±5.40	65.8±3.29	51.2±3.01			
	2021	73.8±5.24	60.1 ±2.01	54.4±2.04			
Average	3 years	72.7±5.19	62.6±2.95	51.2±2.36			

GENERATIVE PERIOD OF *Ajuga turkestanica*

A. Egamberdiev[1], B. Nigmatullaev[1], A. Nigmatullaev[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: akmal-egamberdiyev-76@mail.ru, *phone: +998998588835*

There is no information in the literature about generative period, flowering, fruit forming of the medicinal plant *Ajuga turkestanica* (Regel) Brig.

The results of our observations showed that the plant entered the generative period in the third year of its vegetation. This coincided with the beginning of May, and flower buds appeared from under the leaves from the third joint to the 9-10 joint of the main stem. At the end of May, single buds in the axils of 8-9 pairs of leaves begin to open. During this period, the height of a 3-year-old plant reaches an average of 24-26 cm, and the growth of the plant slows down. The opening of flowers of *Ajuga turkestanica* lasted mainly from the end of April to the end of May. The flower opens as follows: the buds that should open the next day differ in size and weight compared to others. The calyx leaves are higher than the corolla leaves, and the next day the buds begin to open as they mature. Corolla leaves are jointed with a broad base, multi-veined, reddish in color, 2-3 cm long. During the opening of the flower, the pollinators are tightly attached to the pistil, 5 hours after the opening of the flower, the pollinators move away from the pistil towards the petals, leaving the remains of the pollinator sealed in the form of pollen grains around the stigma. The stigmas of the seed are head-shaped, it is turned with feathering towards the top. 1 day after the opening of the flower, the stigma parts begin to separate from the middle part, and by the 3rd day, the stigma parts are completely separated and remain separate, by the 4th day, the stigma parts are bent, the inner smooth surface is turned to the outer side, and the remains of pollen remaining around the stigma parts are twisted together with the stigma and remain under the stigma parts. At this time, the corolla darkens and begins to shrivel. By the 5th day, the stigma changes from red to pinkish-red, on the 6th day, the rind dries up on the stigma and the fruit is formed. So, it takes 6 days for the bud to fully open and the petals to spill out. Some parts of the mature pollen grains, that is, the places where the pollen nests stick together, are covered with a thick cuticle. As a result of the tests, it was found out that there are a large number of pollen grains in 9 mm long buds, the length of the pollen grain is 4 mm, and the length of the pollinator thread is 1 mm. During the period before the bud matures and the flower opens, the anther grows imperceptibly, its length reaches 4.4 mm, and it is considered to be anther at this time. In the generative period, the tap root of the plant reaches up to 80 cm, and it branches up to the 4th order. The base of the root is strongly woody.

Ajuga turkestanica (Regel) Brig. belongs to the category of diurnal thermophilic plants. Flowers start to open in open weather, temperature 20°C, from 8-9 am in the morning. Flowers were observed to open from 8:00 am to 5:00 pm in the Boysun District experimental field. Its flowering rhythm has changed a lot due to air temperature (35°C) and other environmental factors. So, it was observed that the total flowering period of this plant lasted 44-46 days from the middle of April (15.04) to the end of May (30.05). In order to determine the daily flowering period of this plant, 10 plants were selected and observed from 6 am to 12 pm. In this, the number of open flowers on each bush was counted and then plucked. In addition, air temperature (30-35°C) and humidity (55%) and sunlight (80,000 lux) were taken into account.

DISTRIBUTION, RAW MATERIAL RESERVE AND PHYTOCENOLOGY OF *Ajuga turkestanica*

A. Egamberdiev[1], B. Nigmatullaev[1], A. Nigmatullaev[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: akmal-egamberdiyev-76@mail.ru, *phone: +998998588835*

At the Institute of the Chemistry of Plant Substances S.Yunusov, new preparations from *Ajuga turkestanica* (Regel) Brig - ayustan, ecdisten, exumide - were created and used in medicine. These drugs are blood-enhancing, purifying, maintain a normal blood sugar level and increase the production of insulin, increase the amount of blood in the liver and help the liver to work actively, normalize the immune system in the body, create carbohydrate reserves in the body, calm the nervous system, break down proteins in the body, neurosis, myocardial infarction, accelerates the growth of muscles in the body.

Therefore, during 2018-2022, the natural reserve of *Ajuga turkestanica* (Regel) Brig. and its place in the vegetation cover were determined. *Ajuga turkestanica* (Regel) Brig. is distributed in the southern regions of Uzbekistan, Kashkadarya and Surkhandarya, and it is widespread in the gravel, gypsum, turf, typical gray soil and bedrock deposits of the mountain slopes, especially in the southeastern slopes.

As a result of our scientific research, the distribution limit of *Ajuga turkestanica* (Regel) Brig. in Central Asia starts from the north in the upper part of the Kattauradarya, Aksuvdarya, Kizildarya basins of the Kamashi district of the Kashkadarya region (around the Maydanak observatory road), to the vicinity of the village of Obimozor in the northwest of the Dushanbe region of the Republic of Tajikistan, in the southwest, it was found that it spread from the Kohitang mountain of the Republic of Turkmenistan, around Vakhshavor village of Denov district from the east, Boysun district from the south, and some villages of Sherabad district from the west.

A GIS map of plant distribution was created. On the map, the new areas where the plant is currently growing are Turk, Beliboyli, Aqqishloq, Yonaqishloq, Kachaksoy, Murgak, Kattakishloq, Chashmiron, Kizildarya, Tashkurgan, Darband, Charvaq, Sisanga, Gaza, Boysun, Dugoba, Sayrob, Pasurkhi, Cholbayr, Vakhshavar, Chashmiron, The villages of Jiydalisoy, Laylik, Boykurgan, Shorguzar, Bozortepa, Pachkamar, Langar Ota, Kizilkisloq, Okdagana, Kataltoy, Chit, Dashtigaz, Inqabad, Koshbulok, Fangart and Sherabad were marked on the map with special symbols that are widely distributed around the Kohitang mountain of the district.

The main indicators obtained in the research, *Ajuga turkestanica* (Regel) Brig., the current biological reserve of this plant is 93.5±35.3 t, the usable reserve is 46.2±13.8 t, and the 1-year reserve is 28.4±5.42 tons.

In addition to these, geobotanical research was also carried out in the mountainous areas of the southern regions of Uzbekistan. As a result, it was determined and described that *Ajuga turkestanica* (Regel) Brig. forms 11 new associations in 7 formations. Based on the obtained data, a schematic map was made showing the occurrence of *Ajuga turkestanica* (Regel) Brig. in the vegetation cover of southern Uzbekistan.

COMPARATIVE PHARMACOLOGICAL ACTIVITY OF THE VINCANINE ALKALOID AND ITS PIRAZOLINE DERIVATIVE IN A SINGLE ADMINISTRATION

Yu.R. Mirzaev, E.M. Ruzimov, T.T. Khamroev, Sh.M. Adizov, B.B. Abduazimov, B.N. Khandamov.

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: tolmas4th@mail.ru

From the strychnine-like alkaloid vincanin isolated from the Vinca erecta plant, a new derivative pirazoline in ICPS was obtained. For the first time, comparative pharmacological studies have confirmed that vincanin belongs to convulsive agents or analeptics of the central nervous system, while pirazoline, according to the results of the studies carried out, can be attributed to psychostimulants.

The purpose of the study. To study the effect of the vincanine alkaloid and its pirazoline derivative with a single administration, on the motor and search activity of experimental animals in an experimental condition.

All the studies were conducted on mongrel laboratory white mice with a body weight of 20-22 g, which were kept and kept in standard quarantine conditions for 14 days. The vincanine alkaloid and its pirazoline derivative were with asingle administered orally to experimental animals in the form of an aqueous solution in doses of 0,1; 1,0 and 10 mg/kg, and distilled water in appropriate volumes to animals of the control group. The psychopharmacological indications of the substance under study were studied by the methods of I. Lapin on motor activity and C. Hall on motor and research activity according to the recommendations given in the guides and literature.

The results obtained and their discussion. 1. The vincanine hydrochloride, increased of motor activity caused by the action of phenamine at a dose of 7 mg/kg under the skin of white mice by Lapin by 1,3; 1,4 and 1,6 times, and pirzoline hydrochloride increased it by 2,21; 2,17 and 1,74 times respectively, compared with the control group. Usually, using this research method, the central α – adrenoreceptor stimulating effect of substances is studied against the background of the introduction of a special analyzer of phenamine. And the results of the preliminary screening study allow us to conclude that the studied substances showed an effect stimulating these receptors.

2. It was also noticed that the vincanine hydrochloride reduces the motor and research activity of white mice in all doses in the Hall method “open field” by 1,1-1,24 times and pirazoline hydrochloride increased them by 1,43 times compared to the control group, respectively and proportionally. This makes it necessary to conduct studies of the sedative (hypnotic) activity of vincanine hydrochloride and the psychostimulating activity of pirazoline hydrochloride.

Thus, in the screening studies carried out, it was found that the substance consisting of the vincanine alkaloid and its pirazoline derivative with a single administration, have a stimulating effect on the central α – adrenoreceptors. At the same time, with the ”open field" method, vincanine hydrochloride significantly decreased motor and research activity, and pirazoline hydrochloride increased more, respectively, compared with the control group.

EVALUATION OF THE EFFECT OF THE EXTRACT OBTAINED BY SAWING AND DRYING THE SEEDS OF TECHNICAL GRAPE VARIETIES ON THE PERFORMANCE OF EXPERIMENTAL ANIMALS

I.T. Abdinazarov, Z.I. Sanoev, S.D. Rakhimboev, S.Z. Rashidov, T.T. Khamroev, A.I. Sanoev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: zafarsano19@mail.ru

To date, the antihypoxic activity of grape seed extracts is being studied based on studies of various grape varieties that exhibit a wide range of biological activity, including antioxidant, immunostimulating, anti-inflammatory, bactericidal, astringent and reparative. Also today, a number of scientific studies are being conducted on the basis of this plant to isolate new promising substances with high biological activity and conduct their pharmaco-toxicological studies. In this regard, ICPS studied the effect of the extract obtained by sawing and drying the seeds of technical grape varieties on the performance of experimental animals in comparison with drugs used in medical practice.

All studies on the study of working capacity conducted on mongrel laboratory white mice with a body weight of 20-22 g and the effect of the studied substances on the performance of experimental animals was studied by the method of forced swimming with load. The average lethal dose for acute toxicity of the studied substance as a result of the LD_{50} experiments with oral administration exceeds 18000 mg/kg and the substance belongs to class VI for acute toxicity and is considered absolutely non-toxic. Extract obtained by sawing and drying the seeds of technical grape varieties, was administered at doses of 10, 30 and 60 mg/kg, while the drug mildonat, as selected as a reference drug, had the greatest activity at a dose of 100 mg/kg and distilled water was orally administered to the control group in an amount equal to the volume of the test substance. In the conducted studies, grape seed extract in the studied doses increased the time of forced swimming of experimental animals close to those of Mildronat.

Thus, in the conducted studies it was found that the extract obtained by sawing and drying the seeds of technical grape varieties is absolutely non-toxic and harmless. At the same time, in studies, grape seed extract in the studied doses significantly increased the time of forced swimming of experimental animals and increased in slightly quantities at a higher dose compared with mildronate compared with control.

SYNTHESIS SELENIUM NANOPARTICLES IN SOLUTION SODIUM - CARBOXYMETHYLCELLULOSE BASED ON NANOCOMPOSITES FOR THE CANCER TREATMENT

Foziljon Turakulov, Khaydar Yunusov, Abdushkur Sarymsakov

Institute of Chemistry of Polymer Physics, Uzbekistan Academy of Sciences. 100128, Tashkent, str. A. Khodiry, 7 "b". e-mail: polymer@academy.uz

Selenium nanoparticles are well known for their antitumor properties and have been successfully used in medicine for the treatment of cancer diseases. Selenium nanoparticles are also one of the essential elements for humans and It has been confirmed that selenium can improve the activity of the seleno-enzyme, glutathione peroxidase and prevent free radicals from damaging cells and tissues in vivo.

The purpose of this work is to study the possibilities of synthesis of stabilized selenium nanoparticles (SeNPs) in the solution of sodium-carboxymethcellulose (Na-CMC) based on composites and to study their physicochemical properties.

In this study, aqueous solutions of sodium selenite (Na_2SeO_3) with a concentration of 0.01 M were used to synthesize SeNPs from selenite ions (SeO_3^{2-}). Purified Na-CMC samples with a degree of polymerization (DP) 1015 and degree of substitution (DS) 0,85 were selected as the stabilizing polymer matrix. In the presence of ascorbic acid ($C_6H_8O_6$) in a 2% aqueous solution of the selected purified Na-CMC, SeO_3^{2-} of Na_2SeO_3 salt are reduced to zero-valent (0) selenium element and SeNPs are formed in the solution (reaction 1).

$$\mathbf{Na_2SeO_3 + 2C_6H_8O_6 = 2C_6H_6O_6 + Se + H_2O + 2NaOH} \quad \text{(reaction 1)}$$

UV spectroscopic, FTIR-spectroscopy, and DLS studies were carried out to determine the amount, structure, size, and shape of SeNPs synthesized in the Na-CMC matrix.

According to the results, UV absorption intensities were not observed in Na-CMC, SeO_3^{2-}-CMC solutions, and the free passage of UV rays from the transparent solution confirms that red SeNPs were not formed in the solutions. After the reduction of SeO_3^{2-} ions with $C_6H_8O_6$, in the solution of Na-CMC the content of SeNPs were 0,0237 mg/ml in solution and solution colored red and the absorption of *A=3.5%* of the UV rays with a wavelength of λ_{max} =300-350 nm in the solution characterizes the formation of SeNPs in the solution. The hydrodynamic diameter of SeNPs and their diffusion in solution were investigated by dynamic light scattering (DLS) and spherical SeNPs with diameters of 70-97 nm and a scattering rate of 60% were formed in the solution.

In conclusion, the amount, size, and size control of SeNPs formed in the Na-CMC solution could be characterized by UV-spectroscopy, FTIR-spectroscopy, and DLS.

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RESEARCH OF PSYCHOPHARMACOLOGICAL ACTIVITY OF 1-(4-METHOXYPHENYL)-6,7-DIMETHOXY-1,2,3,4-TETRAHYDROISOQUINOLINE

Z.I. Sanoev, Yu.R. Mirzaev, Sh.N. Zhuraqulov, V.I. Vinogradova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: zafarsano19@mail.ru

Scientists around the world are conducting experimental experiments on compounds derived from isoquinoline alkaloids in neurodegenerative diseases. Therefore, the synthesis of new compounds based on isoquinoline alkaloids is carried out in the laboratory of alkaloid chemistry of ICPS. In this regard, the alkaloid 1-(4-methoxyphenyl)-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinoline was synthesized and psychopharmacological studies were conducted.

Materials and methods used for the study. Pharmacological studies were carried out on white mice weighing 18-24 g, stored in quarantine for 14 days in a vivarium. The effect of 1-(4-methoxyphenyl)-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinoline on an attack caused by strychnine, corazole, catalepsy resulting from haloperidol, as well as anxiolytic activity by the Kilfoil method was studied.

The obtained results and conclusions. Anticonvulsant activity of the alkaloid 1-(4-methoxyphenyl)-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinoline was studied by injecting 1.1 mg/kg of strychnine under the skin. The studied substance did not affect the latency period of seizures when administered orally at doses of 1 and 10 mg / kg, and the frequency of deaths decreased by 50%. Due to the excitation of the area of action of the cerebral hemispheres, pentylenetetrazole, which causes seizures, was administered subcutaneously at a dose of 70 mg/kg, and the substance under study was studied with oral administration at doses of 1 and 10 mg/kg. In this test, it can be seen that he increased the latency period by 1.5-2 times compared to the control group and reduced the frequency of deaths. Using a typical neuroleptic dose of haloperidol 0.3 mg/kg, the duration of catalepsy was observed for 6 hours. The test substance was administered orally at doses of 1 and 10 mg /kg, while a large dose with a catalepsy duration of up to 4 hours in a small dose caused complete antagonism. Anxiolytic activity was observed by the Kilfoil method for 2 minutes and at doses of 1 and 10 mg/kg showed 1.5 times higher activity compared to the control group. Thus, 1-(4-methoxyphenyl)-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinoline alkaloid showed a 2-fold reduction in the number of deaths due to the prevention of seizures caused by strychnine and corazole. It also has an effect against catalepsy arising from haloperidol, enhances dopamine-positive activity and moderate anxiolytic activity.

PECULIARITIES OF THE PSYCHOTROPIC ACTIVITY OF DONSUMIN

Yu.R. Mirzaev[1], E.M. Ruzimov, S.F. Aripova[1], I.Zh. Zhalolov[2], R.A. Botirov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: rahmanych@rambler.ru
2) Ferghana State University, Ferghana

It has been established that donsumin, the sum of four indole alkaloids of the tryptamine series from the aboveground parts of Arundo Donax, is a blocker of $5HTA_2$ D receptors. The alkaloid at a dose of 1 and 10 mg/kg increased motor activity by 12 and 280% (MA) and increased verticalization from phenamine. At a dose of 30-50 mg/kg, activation alternated with periods of sedation, 100 mg/ kg caused a sedative effect. From a dose of 500 mg / kg, mice calmed down and muscle weakness was noted, after 10 minutes. the weakness increased, the mouse was only able to crawl. When hanging by the tail, there was a slight tremor and twitching. After 2 hours, 1 mouse fall down of 6 fell. LD_{50} was 1030 mg/kg orally. At a dose of 10 mg/kg accelerated the production of conditioned reflex of passive avoidance (CFPA) and accelerated the search activity for C. Hall. With 45-day daily administration on all days, MA increased from 70 to 280% compared to the control ones. After 2 days the cancellation of Donsumin, the MA in the experimental and control groups was the same. A dose of 10 inhibited haloperidol catalepsy, and 100 mg/kg had no effect. At a dose of 10 mg/kg, mutual antagonism of dopamine and haloperidol 0.3 mg/kg was noted, at a dose of 100 mg/kg, search activity and antagonism to haloperidol catalepsy were completely eliminated.

The strengthening of MA and stereotypes of verticalization from phenamine, the acceleration of CFPA and search activity, antagonism to haloperidol catalepsy – indicate that Donsumin belongs to psychostimulants. When comparing Donsumin and phenamine, it was found that the minimum MA activating doses corresponded to 1 orally and 0.3 mg/kg s/c with acute toxicity – 1030 orally and 28 mg/kg s/c, which indicates the multiple superiority of the pharmacological latitude of the first over the second. Phenamine dose-dependent stimulates the central nervous system and the death of animals occurs from toxic phenomena from the cardiovascular system. In Donsumin, the activation of the central nervous system begins with a dose of 1 mg/kg, the optimal is 10 mg/kg and the maximum "therapeutic" is 30 mg/kg. A dose of 100 mg/kg and above, Donsumin exhibits sedative and neuroleptic effects.

Thus, if phenamine is a representative of typical psychostimulants, then Donsumin can be attributed to atypical, showing the main psychostimulating properties in the range of 1-30 mg/kg. Death occurs against the background of adenamia and respiratory arrest.

DETERMINATION OF DEOXYNIVALENOL AND ZEARALENONE IN FOOD PRODUCTS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

A.A.Tojikulov, Kh.Kh.Kushiev, T.A.Djuraev, M.S.Khudoynazarov

Experimental Biology Laboratory of Gulistan State University, Gulistan, Uzbekistan

Identification and monitoring of mucotoxins with mutagenic, teratogenic and carcinogenic properties in the food and pharmaceutical industry are topical issues. Therefore, the study of concomitant contamination of grain crops with mycotoxins, the collection and analysis of data on the degree and frequency of their detection are an important basis for assessing the risk to public health and developing measures to reduce it. This work provides information on mycotoxin contamination of wheat, corn, barley, oats and rye grains in Uzbekistan. These include mycotoxins deoxynivalenol (DON), toxin T-2 (T-2), zearalenone (ZON), fumonicins B1 and B2 (fw1, fw2), aflatoxin B1 (AFL B1), otatoxin a (OTA), which are often found in plant grains. In this study, samples of plant grains (corn, rice, barley and wheat) were analyzed using high-performance liquid chromatography (HPLC) spectrometric method for the presence of DON and ZON damage. DON and ZON are two of the five most important natural mycotoxins secreted by *Fusarium* fungi. According to the results of the analysis, a quantitative limit of toxins was established based on the established order. At the same time, the limit of the amount is from 40 to 100 μg/ml for grain and from 5 to 50 μg/ml for the zone.

Chromatographic analysis has performed in Agilent 1260 Infinity II Rapid Resolution Liquid system. In this case, the pump G7111A 1260 Quat Pump VL, vialsampler G7129A 1260 is an autosampler, the UV-VIS array detector G7115A 1260 DAD and G7121A 1260 FLD were used in Chem Station program. For better dissolution of solutions, an ultrasonic bath "Guangdong gt ultrasonic" was used. HPLC pump flow rate 0,8 ml/min, thermostat temperature 30°C, DON mobile phase; Acetonitrile/water in a ratio of 50:50, ZON mobile phase in a ratio of 70:30 at 0,8 ml/min, injection volume 5 mcl, DON 210 nm, and ZON 240 nm in DAD detector, Infinity Lab Poroshel 20 EC-C18 (150 mm x 4,6 mm, 4 microns (Agilent Technologies USA) analytical report on the program" Chemstation".

It has been observed that the correlation coefficient is greater than 0.99 based on hummingbird reference samples. The standard linearity and correlation coefficients adopted for the drawn ZON and DON using calibration solutions are defined as 0,99999 for ZON and 0.99981 for DON (Table 1). In standard samples of the linearity curve of the method for ZON at different four levels of 5,10,20 and 25 μg/ml, with a quantitative limit for ZON at three levels of 20, 40 and 100 μg/ml, a calibration curve was obtained.

Based on the results obtained, we has noted that ZON was found only in barley grains with a quantitative index of 3.56 μg/ml. While the quantitative DON index of rice, corn, and wheat participating in the studies were found in plant grain samples, it was noted that they contained 6.8 μg/ml in rice, 174.34 μg/ml in corn and 67.2 μg/ml in wheat. This will be cost-effective in safety and quality assurance programs.

PROSPECTS OF USING *Cistanche salsa* IN MEDICINE

A.B. Bazarbaeva, G.B. Satimov, B. Nigmatullaev, A. Egamberdiev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: akmal-egamberdiyev-76@mail.ru, phone: +9989774293076

Cistanche salsa (C.A.Mey) Beck. – salt marsh cistanche, a perennial plant from the Orobanchaceae family. It looms in April and bears fruit in May-July.

It is found mainly on sandy-clay and clay-saline soils and salt marshes in the desert zone, in the Bukhara, Navoi regions of Uzbekistan and Karakalpakstan. It parasitizes the roots of perennial plants from the genera *Anabasis, Calligonum, Haloxylon* and *Salsola*.

The main type of raw material is the underground mass of the plant – roots, the so-called stolons, the harvesting of which begins after the fruiting of the plant, before retiring, when the content of biologically active substances is maximum. At this time, the plant is easily recognizable due to the presence of an aboveground part, which completely disappears after some cattle run and strong winds. Harvested stolons are cleaned from soil and other mineral impurities. The end of drying is determined by the fragility of the stolons. The raw materials are packed in bags of 15-20 kg or in bales of 30 kg, stored in dry, ventilated rooms on racks protecting them from insect pests.

We have studied the chemical composition of a sample of *C.salsa* collected in the Bukhara region. The raw materials were crushed and extracted four times for 8 hours at room temperature with 70% aqueous alcohol, the resulting mass was mixed with KSK grade silica gel, fractionated on a chromatographic column and eluted sequentially with extraction gasoline, chloroform, ethyl acetate, isopropyl alcohol and a mixture of isopropanol : water (1:1). A compound was isolated from the fraction of isopropyl alcohol by chromatography on a column with silica gel and sephadex LH-20. Based on the study of spectral data of 1H and 13 C NMR, this compound was identified as betaine (trimethylglycine) 178-180^{0}C. According to the literature, betaine has hepatoprotective properties and may be a source of a therapeutic drug.

In the Central Asia the decoction is used for syphilis, water extracts show bactericidal activity, and it is recommended to use in the male and female genital areas, disorders of the musculoskeletal system, urinary system and circulatory disorders. *Cistanche* is widely used in traditional medicine in China, as well as in Japan and Taiwan to create tonic drinks and remedies for the treatment of diseases of the urinary system, including chronic kidney failure. However, mainly, the plant *Cistanche* is positioned as a remedy for the treatment of impotence and infertility. Many years of experience in using *Cistanche* confirms the extraordinary properties of this plant. This is truly the "desert ginseng". At the same time, cistanche acts very gently, has no side effects and is suitable for long-term use. Indeed, numerous preclinical studies conducted in China and Japan have confirmed the antioxidant, anti-inflammatory, neuroprotective and immunostimulating properties of *Cistanche* extract.

In the field research by O. Xojimatov (2018), it was found that the salt marsh *Cistanche* parasitizes the host plant, and sometimes forming significant populations. In the average yield of raw materials of stolons of cistanche saline was 1.88 kg/ha, in air-dry weight. Thus, *Cistanche salsa* is a potential source of medicinal products and has good prospects for use in medicine.

GROWTH-PROMOTING ACTIVITY OF *ALLIUM CEPA* EXTRACT

U.B. Mamarozikov[1], M.R. Berdimuratova[2], P.A. Nurmakhmadova[1], N.K. Khidyrova[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Tashkent Institute of Chemical Technology
e-mail*:* u_mamarozikov@inbox.ru

At the present time scientific development in the world, together with the improvement of agricultural biotechnology, the number of preparations based on plant extracts is increasing. Such agents are taking the place of such specific synthetic preparations as they demonstrate their activity against harmful insects (insecticide), growth properties, against harmful fungi and many others. Such natural means are of great importance in protecting agricultural crops from pests and increasing their productivity. Since the extracts are natural, they do not have a negative effect on human health, and the accumulation of harmful substances in the body is prevented [1].

Based on the above and literature data, the bark of *Allium cepa* was extracted and thoroughly dried. Dry bark was extracted in 96% ethyl alcohol. The resulting alcohol extract was evaporated in a rotary evaporator and 0.71 grams of dry extract was obtained. The 1% water solution of the obtained extract was tested in the organic synthesis and plant protection laboratory of the institute. Cucumber seeds of the variety "Orzu" and wheat seeds of the variety "Asr" were used in the experiments in order to determine their growth-promoting and herbicide activity. The test process was carried out according to the established methods [2]. The concentration of the extract is from 1% to 0.00001%. The biostimulator "Uchqun" was used as a etalon. Preliminary screening results showed that M-01 fractions at a concentration of 0.0001% reduced wheat root and stem length by 12.0% and 8.6%, respectively, compared to the control, and in cucumber, these indicators were 37.7% and 38.8% showed growth-promoting activity respectively.

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ELECTROSPINNING OF NANOFIBERS FROM *Bombyx mori* CHITOSAN SOLUTIONS

R.Yu. Milusheva, K.K. Pirniyazov, S.Sh. Rashidova

Institute of Polymer Chemistry and Physics of ASRU, Tashkent, Kadyri St., 7, b

The development of functional materials from renewable sources (silk production waste) is an urgent task. The production of nanofibers based on chitosan is a new direction in the field of nanotechnology, since their production differs significantly in key parameters. Different feedstocks (chitosans from heterogeneous sources) lead to spinning solutions with different characteristics, which naturally leads to differences in the resulting nonwoven nanofiber materials.

The electrospinning of nanofibers was carried out on an ES-robot Electrospinning /spray system with chitosan solutions of various concentrations. The electric field voltage was 25–28 W, the distance between the anode and cathode was 10 cm. The solution supply rate was controlled in the range from 2 to 20 μl/min. To obtain nanofibers, purified chitosan was obtained of preliminary dissolution of chitosan in 2% acetic acid, precipitation and coagulation of the solution at a certain pH, washing with alcohol, centrifugation, and freeze-drying of the sample.

A sample of purified chitosan with Mv 184 kDa and SDA=84% was obtained. Bombyx mori solutions of various concentrations of chitosan in 80% acetic acid were prepared for electrospinning. IR spectroscopic and X-ray studies of the obtained nanofibers were carried out (Fig. 1,2).

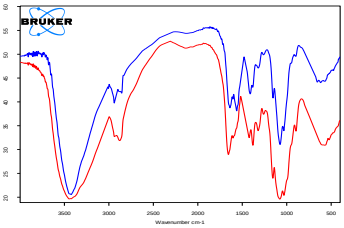

Fig. 1. - IR spectra of chitosan Vm and nanofibers based on it (Blue - nanofibers, red - original)

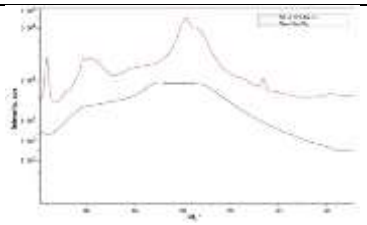

Fig. 2. - Diffraction pattern of chitosan Vm and nanofibers based on it (Blue - nanofibers, red - original)

The IR-spectrum of nanofibers of chitosan Bm differs from the initial spectrum of chitosan Bm, which may be due to the conditions for the formation of nanofibers, since during electrospinning of chitosan solutions, orientation of macromolecules occurs. Changes in the crystallinity and polymorphism of chitosan lead to slight differences in the absorption intensity in the absorption bands at 1604 cm-1 and 1592 cm-1. In nanofibers, a narrower absorption band at about 3500 cm–1 is observed, which confirms the partial participation of hydroxyl groups in the C2 and C6 positions of chitosan in intra- and intermolecular hydrogen bonds.The diffraction patterns of Bombyx mori chitosan show crystalline reflections with maxima at 2θ=5.79o, 10.52o, 20.3o and 28.9o. At the value of the angle 2θ=20.3°, the most intense maximum is observed, which refers to the crystallographic reflection (020). In this case, an amorphous halo is observed in the diffraction patterns of nanofibers, as well as broad crystalline reflections of the corresponding imperfect crystals. Thus, the IR and X-ray diffraction patterns of the obtained samples unambiguously indicate the formation of nanofibers under these conditions with the observed differences in the IR spectra and diffraction patterns.

ON THE ANTIOXIDANT PROPERTIES OF CAPER BUDS EXTRACT

D.A. Narbutaeva, A.M. Karakulova, Yu.R. Mirzaev, R.A. Botirov, A.Z. Sadikov, Sh.Sh. Sagdullayev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: narbutaeva83@list.ru, *phone: (97)7292383*

The prickly caper plant has been known as a medicinal remedy since the times of ancient Greece and Rome. In the last decade, there has been an increased interest in the medicinal properties of preparations of this plant due to the presence of polyphenols, polysaccharides, alkaloids, lipids, etc. According to the literature, polyphenols and polysaccharides have an antioxidant effect. Antioxidants can be used in the treatment of neurodegenerative diseases, including Alzheimer's disease. Several extracts were isolated from capers collected in the Tashkent region, including from the buds of capers, whose studies revealed an increase in motor and research activity according to two tests. The composition of the extract of caper buds revealed about 30% of polysaccharides with known antioxidant or anti-radical properties. The prospects of substances with antioxidant activity in the treatment of Alzheimer's disease are indicated in literature.

The purpose of the study is the identification of antioxidant properties of caper buds extract in order to assess its prospects as a potential therapeutic agent for neurodegenerative diseases.

The extract of caper buds was subjected to pharmacological research in comparison with vitamin E. The antioxidant activity of the studied substances was determined by their effect on the intensity of lipid peroxidation processes, which was assessed by the accumulation of malondialdehyde (MDA) in vitro experiments.

The content of malonic dialdehyde in *in vitro* experiments was determined by a color reaction with thiobarbituric acid. The antioxidant properties of the compounds were evaluated on the accumulation of malondialdehyde under conditions of iron-induced as corbata-dependent POL, which was induced by 10 microns of $FeSO_4$ in the presence of 200 microns of ascorbate in a medium containing 145 mM KCl, 25 mM tris HCl, pH 7.4. All the studied samples were previously dissolved in 70% ethyl alcohol and examined at a dose of $1 *10^{-5}$ mg/ml. As a comparison drug, an oil solution of pharmacy vitamin E (10%) in a concentration of $1 * 10^{-5}$ mg/ml and or the extract of caper buds in the same concentration were used. Statistical processing was performed using the Student's t-test in the program Statistica version 6. Statsoft, Inc. (2001).

The obtained data showed that when the incubation medium was introduced at a concentration of 10^{-5} g/ml of the studied drugs, it contributed to a more pronounced inhibition of the processes of a peroxidation of liver lipids *in vitro* and at the same time there was a more pronounced decrease in the formation of MDA, caper buds extract by 51.0% ($p<0.05$), and vitamin E - 81.0% ($p<0.001$).

Thus, the study showed the extract of caper buds has a significantly pronounced antioxidant effect for 37% less than those of vitamin E. Based on these data, it can be assumed that the extract of caper buds can be used as a promising tool in the complex treatment of neurodegenerative.

BIOLOGICAL ACTIVITIES OF FLAVONOID SUM ISOLATED FROM *Crocus sativus*

D.A. Narbutaeva, Sh.R. Makhmudova, B.S. Okhundedaev, S.Z. Nishanbaev

S. Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, e-mail: sabir78@rambler.ru

Crocus sativus L. belongs to the *Iridaceae* family, which is commonly cultivated in Europe and America. The commercial product and use of saffron comes from the dried stigmas, which impart a yellow color, bitter taste and intense aroma. Saffron is the most expensive spice in the world, combining useful properties. Possessing a rich chemical composition, *C. sativus* L. has significant specificity and is used in medicine, cosmetology, cooking, as well as in the textile and perfume industries [1, 2].

At present, based on the special value and wide application of *C. sativus* L., for the first time, work has been launched on its cultivation in the Republic of Uzbekistan. When the stigma-based saffron spice is obtained from the flowers of *C. sativus* L., a huge number of petals are left as waste.

The purpose of this work is to determine the biological activity of flavonoid sum isolated from the petals of *C. sativus* L., which remain as a waste.

Pharmacological studies have shown that the sum of flavonoids isolated from the petals of *C. sativus* L. exhibits both antihypoxic activity (determined under conditions of acute normobaric hypoxic and hemic hypoxia) and antioxidant properties *in vitro* (determined by the accumulation of malondialdehyde). Their antihypoxic and antioxidant activity was comparable to that of rutin, luteolin, and vitamin E.

As can be seen from the results obtained, the sum of flavonoids from the petals of *C. sativus* L., in comparison with rutin and luteolin, showed a pronounced antihypoxic activity, increasing the lifespan of animals in this case by 32.0-44.0%. Under conditions of hemic hypoxia, the increase in the lifespan of animals with the introduction of the studied drugs was 28.0–42.0%, and their inhibitory effect on the processes of lipid peroxidation *in vitro* was from 60.0 to 75.0%, almost in the same range as the antioxidant effect. The most active was the sum of flavonoids from the petals of *C. sativus* L., which was comparable with the activity of the reference drug, vitamin E (85.0%).

The data obtained allow us to assert that the sum of flavonoids isolated from the petals of *C. sativus* L. have a sufficiently antihypoxic and antioxidant effect. This sum of flavonoids is of practical interest for further in-depth studies of its pharmacological properties.

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MEFOSIN 25% aq.sol. IS AN EFFECTIVE HERBICIDE COMPOSITION

E.O. Rakhmatov, Sh.U.Yuldoshev, A.Sh. Abdurazokov, Kh.U. Mamadaminov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances AS RU, st. Mirzo-Ulugbek, 77, 100170 Tashkent, e-mail: elyor-raxmatov@mail.ru

In recent years, annual and dicotyledonous weeds have been increasing in the fields of our country. They develop quickly compared to the crop, prevent the crop from absorbing sunlight, absorb 30-40% of the nutrients and irrigation water given to the crop, and reduce the yield and quality of agricultural plants by 20-50% [1].

As a result of intensive use of herbicides, the biological effectiveness of the herbicide is significantly reduced due to the emergence of weed biotypes resistant to this drug. To destroy such weeds, the dosage of herbicide should be increased. As a result, the price of herbicides will increase, which in turn will increase the price of agricultural products.

The results of the preliminary study on testing the Mefosin composition developed by scientists of our institute [2] showed that the composition demonstrated a highly effective herbicidal activity against one-year spike and dicotyledonous weeds. (Table 1).

Table 1. Comparative efficacy of Mefosin 25% aq.sol composition on weeds

Types of weeds	% Weed drying due to herbicide application.		
	Mebinol 1.5 kg/ha	Glyphosate 1.5 kg/ha	Mefosin composition 1.5 kg/ha.
Bromus sterilis	10	15	100
Avena fatua	9	10	100
Apéra spíca-vénti	10	15	100
Póa ánnua	10	10	100
Rumex obtusifolius	10	15	100
Capsella bursa-pastoris	15	10	100
Thlaspi arvense L	10	15	100
Brassica napus	10	10	100
Euphorbia helioscopia	10	15	100
Galium aparine L	10	15	100
Lamium amplexicaule L	10	10	100
Veronica arvensis	10	15	100
Matricaria discoidea	14	12	100
Málva pusílla	10	18	100
Cirsium arvense	0	0	70
Convōlvulus arvēnsis	0	0	85
Cýnodon dáctylon	0	0	40

It should be noted that the herbicidal activity of the composition is much higher than the activity of Mebinol (2-methyl-5-chlorobenzimidazole) and Glyphosate herbicides when used at the same rate, i.e. 1.5 kg/ha. Mefosin 25% aq.sol. - herbicidal composition showed 40-85% herbicidal activity against perennial weeds.

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INTRODUCTION OF *Silene viridiflora* IN UZBEKISTAN

T.Sh. Khushatov, A.M. Nigmatullaev, B. O`. Ergashev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: hushatovtohir@gmail.com, *phone: +998974644964*

Perennial herbaceous plant - *Silene viridiflora* (greenish tarry) fam. Caryophyllaceae occurs naturally in the forest meadows of Crimea, the Western Mediterranean countries, and the Balkan Peninsula.

The total preparations of siverinol, exhumed, from *Silene viridiflora*, is of practical interest for the development of medicines and dietary supplements based on them, which increase efficiency, and accelerate rehabilitation processes after illnesses, injuries, and physical overstrain, in addition, it is an additional source of the drug ecdisten.

From this point of view, it is highly advisable to create a stable raw material base for ecdysteroid preparations by introducing wild-growing, as well as foreign, medicinal plants.

Ecdysteroids are non-toxic, non-addictive, and have no negative side effects. Medicines based on phytoecdysteroids in sports and military medicine are used to improve the activity of the human body to physical and nervous stress. Taking into account the above, we are developing pyrotechnics for the cultivation of green resins in the experimental plots of the "Botany" garden of the Academy of Sciences of the Republic of Uzbekistan and the Institute of Chemistry of Plant Substances of the Academy of Sciences of the Republic of Uzbekistan.

Plant seeds were planted in the spring of March 2022. The germination rate of seeds was 89%. Germination of seeds began one month after planting. In the first year of life, plants formed only a set of leaves, and in the second year of life, they went to the generative stage.

They started growing in March 2022, germinated in mid-April, bloomed on May 10, and sowed their seeds in early June.

Introduction rate of *Silene viridiflora* L.

Indicators	**Score**
Frost resistance	25
Conservation of individuals	10
Stem formation	5
Annual stem growth	5
Entering the generative phase	25
Possibility of cultivation	10
Total points	80

Thus, the speed of introduction of *Silene viridiflora* L. showed that it is possible to grow the plant as a source of medicines in the conditions of the Tashkent oasis. Taking this into account, we set a goal to study the agrotechnology of its cultivation in the future.

A MACHINE LEARNING STUDY OF THE ANABOLIC ACTIVITY OF ECDYSTEROIDS

S.S. Narzullaev, U.Yu. Yusupova, D.A. Usmanov, N.Sh. Ramazonov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

In the last decade, medicinal plants have become an important part of the world pharmaceutical market. The peculiarity of many drugs is that it is difficult to determine the level of pharmacological action of their individual components, because often the therapeutic effect of phytopreparations depends on the combined effect of various biologically active compounds contained in plant raw materials [1].

Ecdysteroids are hormones controlling cell proliferation, growth and the developmental cycles of insects and other invertebrates. Recent studies suggest that the anabolic effect of ecdysterone, a naturally occurring steroid hormone claimed to enhance physical performance, is mediated by estrogen receptor (ER) binding [2].

The dataset for the present study has been collected from a series of 23 ecdysteroid compounds. AA data (anabolic activity) are taken from our previous study. All original *in vitro* activity values (5mg/kg) have been converted into molar log(AA) response variables.

A QSAR study has been performed for the set of 23 ecdysteroids to correlate and predict anabolic activity. QSAR modeling was performed applying such methods as GA for variable selection among generated and calculated descriptors and MLRA to get a final model. Molecular mechanics and quantum-chemical calculations have been applied for structure optimization and quantum-chemical properties calculations.

Three mathematical models for prediction of AA values are proposed. The best overall performance is achieved by two-descriptor QSAR model, where r^2 values for the training and test sets are 0.89 and 0.90, respectively. The significant molecular descriptors related to the compounds with AA are: information indices - SIC0, WHIM descriptor G3p weighted by polarizability. These variables lead to a molecular level explanation of the potency of AA, based on structural descriptors. Obtained model (two-variables Model 1) can be used to estimate the anabolic activity of new compounds that belong to functionalized ecdysteroids type.

The following equation represents the two-variable model:

Log [AA] = 0.8082 (±0.1754) SIC0 - 0.5817(±0.1925) G3p + 6.4905 (±0.1417) (1)

n=23; r^2= 0.8899; s= 0.110; F= 64.664; RMSE tr= 0.101; q^2= 0.84 (training set);

n=4; r^2ext= 0.8990; s = 0.128 (test set)

According to the obtained data, this model can be used to predict the anabolic activity of ecdysteroids.

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RESULTS OF PHARMACOLOGICAL STUDIES OF *FERULA TADSHIKORUM* RESIN OF FLORA OF UZBEKISTAN

Egamova F.R., Mirzaev Yu.R., Ruzimov E.M., Aripova S.F., Khalilova E.Kh.

Institute of Chemistry of Plant Substances named after acad. S.Yu.Yunusov Academy of Sciences of the Republic of Uzbekistan, Tashkent 100170, Uzbekistan, e-mail: ferustamovna_14@mail.ru

Ferula tadshikorum resin obtained by cutting the lower part of the trunk in early spring is used as a seasoning for food in the Orient. Currently, tons of resin are exported to the Middle East and South Asia.

In folk medicine of the East, the use of *F. tadshikorum* is known as an antiparasitic, anticonvulsant, antispasmodic, expectorant, for tuberculosis, malignant tumors and to improve digestion. The dried juice of the plant consists of resin, gum and essential oil. Ferulic acid, asarezinotanol, assarezinol and their ferule derivatives: farnesiferol C, umbelliferon et al. isolated from the resin.

We have studied 3 different fractions obtained from the resin of this plant collected in the Kashkadarya region of Uzbekistan: alcohol, gasoline and chloroform. The pharmacological properties of the 3 fractions were investigated using various experiments on laboratory animals.

As a result of the study, it was found that the alcohol fraction at a dose of 10 mg/kg obtained from this plant has a more pronounced pharmacological effect than the other two fractions.

In a model of indomethacin gastric ulcer (30 mg/kg) orally, 16.0±3.4 drain ulcers were detected in control mice. Against the background of alcohol fraction treatment, the number of ulcers was - 8.0±2.8 ($p<0.05$), i.e. reduced the number of ulcers twice.

The effect of alcohol fraction on intestinal motility of intact mice was studied. In the control group, for 4 hours, the number of boluses was 25.0±2.3, against the background of the alcohol fraction, the number of boluses decreased by 19.0±2.0, i.e. 24%.

Thus, the conducted studies revealed that the alcohol fraction of *Ferula tadshikorum* significantly showed an anti-ulcer effect. The study of the effect on intestinal motility has shown its certain oppression.

THE PRODUCERS FOR MICROBIAL INOCULANT IMPROVING PLANT GROWTH IN SALINE CONDITIONS

M.Z. Isoqulov[1], V.V. Shurigin[2]

1) National University of Uzbekistan, Tashkent, 100174, Uzbekistan
2) Institute of Microbiology of the ASc RUz, Tashkent, 100128, Uzbekistan

In recent years, soil salinization has become one of the most acute global problems of agriculture around the world. Salinization contributes to the rapid degradation of agricultural land. The current situation requires scientists to develop effective measures to prevent this problem. One of the effective approaches to solve the problem is the development of an effective biotechnology for obtaining biological preparations to improve the quality of plants and increase their yield.

The aim of our research was to isolate salt-tolerant bacteria from the rhizosphere of cotton and wheat and to select the most effective bacteria that stimulate the growth of tomato and cucumber under soil salinity conditions.

In total we isolated 5 isolates of *Azotobacter* spp., 8 isolates of *Bacillus* spp. and 8 isolates of *Pseudmonas* spp. from the rhizosphere of wheat and cotton grown in saline soils. As a result of screening of bacterial isolates for activity in stimulating the growth of cucumber and tomato under saline conditions, the most active isolates *Azotobacter* sp.-2, *Azotobacter* sp.-5, *Pseudomonas* sp.-1, *Pseudomonas* sp.-7, *Bacillus* sp. -3 and *Bacillus* sp.-6 were selected.

To test the effect of various selected strains of *Azotobacter* sp.-2, *Azotobacter* sp.-5, *Pseudomonas* sp.-1, *Pseudomonas* sp.-7, *Bacillus* sp.-3 and *Bacillus* sp.-6 on the growth and yield of cucumber and tomato, the following experiment was carried out. The plants were growing in large containers with saline and non-saline soil. At the same time, seeds were inoculated and the soil was fertilized with a bacterial suspension of various combinations of bacterial strains. The mixture of *Azotobacter* sp.-5, *Pseudomonas* sp.-1 and *Bacillus* sp.-3 strains proved to be the most effective. So, when growing cucumber of the Navruz variety using this mixture of bacterial strains, the stem length increased by 35% in non-saline soil and by 32% in saline soil, the root length in non-saline soil increased by 70%, and in saline soil by 47%, fruit weight increased by 6.5 g in saline soil and 7.3 g in non-saline soil, the number of fruits increased from 3 in control to 7 when inoculated in saline soil and from 5 to 10 in non-saline soil.

In the case of tomato, the mixture of *Azotobacter* sp.-5, *Pseudomonas* sp.-1 and *Bacillus* sp.-3 strains also proved to be the most effective. So, as a result of the use of an inoculum based on these strains, the length of the stem of the Istiklol variety increased by 24% in non-saline and 20% in saline soil, the length of the main root increased by 52% in non-saline and 44% in saline soil, fruit weight increased by 7 g in saline and 10.9 g in non-saline soil, the number of fruits per plant increased from 3 in control to 6 after the application of bacterial suspension in saline soil and from 5 to 9 in non-saline soil.

In the future research, we plan to conduct field trials of a microbial inoculant based on a mixture of *Azotobacter* sp.-5, *Pseudomonas* sp.-1, and *Bacillus* sp.-3 strains. In the case of positive results, this microbial association can be used to obtain a microbial preparation increasing plant yields under saline conditions.

INFLUENCE OF THE COMBINATION OF CYTISINE WITH SUCCINIC ACID ON THE ACUTE ALCOHOLIC INTOXICATION

Sh.B. Latypova[1], A.A. Azamatov[2], F.M. Tursunkhodzhaeva[2], Kh. Davronova

1) Urgench branch of Tashkent Medical Academy, MH RUz
2) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

Succinic acid-containing remedies belong to drugs of a metabolic type of action, the pharmacotherapeutic effects of which are aimed at restoring biochemical metabolic reactions disturbed by pathological processes. This type of drugs is widely used in cardiology, neurology and hepatology. The antihypoxic effect of SA is based not only on the ability to activate the succinate dehydrogenase pathway of ATP re-synthesis in the ischemic zone, to reduce the level of NAD-dependent substrates of the Krebs cycle and fatty acids, but is also associated with the stimulation of the cytochrome oxidase activity, which is a key enzyme of the respiratory chain of mitochondrial cells. Succinate-containing drugs, for example, Reamberin, in case of poisoning with neurotoxic poisons, reduce the time spent in a coma and patients' death.

Alcoholic coma is often accompanied by respiratory failure. We have previously established that cytisine and its derivative N-(3,4-methylenedioxybenzyl)cytisine hydrochloride have a pronounced antitoxic effect in acute alcohol intoxication, and N-(3,4-methylenedioxybenzyl) cytisine hydrochloride is 2.8 times less toxic than cytisine (1).

The purpose of this work is to study the effect of a combination of cytisine and succinic acid in a ratio of 1:1 on acute alcohol poisoning. Substances were injected subcutaneously for 10-15 minutes before intraperitoneal injection of 24% ethanol at a dose of 4.8 g/kg. The effect of the substances was judged by the duration of the sleep of animals. The results are presented in the table, which shows that the studied composition has a pronounced antitoxic effect, exceeding the highest effects of cytisine and SA by 12 and 86%, respectively.

Table. Effect of cytisine and its combination with UC on acute alcohol intoxication in mice (N=10)

No	Animal group	Dose, mg/kg	Sleep duration		Effectiveness,%
			min.	%	
1	Control (ethanol)	4,8	107.6±4.2	100%	-
2	Succinic acid (SA)	5.0	72.4±2.8	67.2	32.8
		10.0	64.5±3.1	59.9	40.1
3	Cytisine (C)	0.1	36.1±2.4	33.5	66.5
		0.5	37.3±2.7	34.6	65.4
		1.0	40.2±2.5	37.3	62.7
		5.0	59.3±3.6	55.1	44.9
4	C:SA (1:1)	0.1	27.4±4.2	25.4	74.6
		0.5	29.6±3.4	27.5	72.5
		1.0	44.8±2.9	41.6	58.4
		2.0	51.0±3.6	47.3	52.7
		5.0	62.5±4.0	58.0	42.0

COMPARISON OF THE OLIGONUCLEOTIDE PROBES OF DIFFERENT STRUCTURES FOR THE DIAGNOSIS OF THE *Virus hepatitis* B BY PCR ANALYSIS

O.B. Alimukhamedova, O.N. Ashirov, A.A. Makhnev, A.B. Baimirzaev, Kh.Z. Nasriddinov, Ikramov S.A., G.A. Piakina

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent

For the diagnosis of infectious diseases such as the hepatitis B virus, a highly sensitive quantitative PCR method is widely used using fluorescent probes complementary to a specific DNA region of the hepatitis B virus. Fluorescent probes are short oligonucleotides of 20–25 nucleotides in length with fluorescent molecules and “quencher” molecules attached at the ends. When the probes interact with the DNA region of the hepatitis B virus during PCR analysis, a fluorescent signal is formed due to the destruction of the probe under the influence of the polymerase enzyme and the divergence of the fluorophore and “quencher” molecules. An increase in the fluorescent signal indicates the presence of an infection. The sensitivity of PCR analysis directly depends on how high the fluorescent signal rises.

To compare the growth of the fluorescent signal, we designed two fluorescent probes with different structures specific to the core gene of the hepatitis B virus DNA. The first fluorescent probe A is a single-stranded DNA molecule 21 nucleotides long, to the 5' end of which the FAM fluorophore is attached and to the 3' end of the quencher molecule BHQ-1. Thus, the FAM fluorophore is 21 nucleotides away from the BHQ-1 "quencher" molecule. The second fluorescent probe, B, has a double-stranded structure in which the FAM fluorophore molecule is in close proximity to the BHQ-1 quencher molecule.

The growth of the fluorescent signal was analyzed on a QuantStudio 5 instrument by the relative fluorescence units’ value. To analyze the fluorescent signal, probe A was treated with DNase for 15 minutes at 37°C, after which the fluorescence was measured. Fluorescent probe B was analyzed using the melt curve method: 60°C - 1 minute/temperature increase from 60°C every second by 0.5°C (signal reading) to 95°C. Fluorescent probes were used at a concentration of 100 nM.

As a result of the analysis, the growth of the fluorescent signal of probe A began at 75,000 fl and plateaued at 375,000 fl, for fluorescent probe B, the initial fluorescence signal was 50,000 fl and the final fluorescence signal output was 1,000,000 fl.

Thus, it was found that the increase in fluorescence is 4 times higher when using probe B with a double-stranded structure. It was found that the growth of the fluorescent signal is inversely proportional to the distance between the molecules of the fluorophore and the quencher. The use of more efficient methods for designing fluorescent probes can increase the sensitivity of molecular diagnostics of hepatitis B virus.

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ON THE HYPOLIPIDEMIC EFFECT OF TOTAL EXTRACTIVE PREPARATIONS CONTAINING FLAVONOIDS, TRITERPENE GLYCOSIDES AND PHYTOECDYSTEROIDS ISOLATED FROM *Thermopsis alterniflora, Zygophyllum oxianum* and *Silene viridiflora*

N.Kh. Yuldasheva[2], D.A. Narbutaeva[1], V.N. Syrov[1]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
e-mail: narbutaeva83@list.ru
2) Tashkent Medecinal Academy, Farobiy 2, Uzbekistan,
e-mail: nigoray@inbox.ru

Currently, the idea of using various biologically active substances isolated from plants for the prevention and treatment of hyperlipidemia and atherosclerosis is becoming more widespread.

The aim of the present work was to study in an appropriate way the sum of flavonoids from *Thermopsis alterniflora*, the sum of triterpene glycosides from *Zygophyllum oxianum* and the sum of phytoecdysteroids from *Silene viridiflora*.

The experiments were carried out on male rats weighing 200-250 g, with hyperlipidemia caused by triton WR-1339 (225 mg/kg, once, intraperitoneally). The test substances were administered orally at doses of 5-50 mg/kg. The content of total cholesterol and triglycerides in the blood serum of animals was determined by the enzymocalorimetric method using Cypress diagnostics (Belgium) reagent kits on a Secomam Basic biochemical analyzer (France). In the course of the studies, it was found that the amount of flavonoids isolated from *Thermopsis alterniflora* (apigenin, luteolin, formononetin, etc.), from *Silene viridiflora*, the amount of phytoecdysteroids (ecdysterone, sileneosides A, D, polypodin B, etc.) and from *Zygophyllum oxianum*, the amount of triterpene glycosides (zygofiloside E, etc.) have a significant hypolipidemic effect. The amount of triterpene glycosides from *Z. oxianum* lowered the level of cholesterol in the blood serum more pronouncedly (by 35.0%), the amount of flavonoids from *Th. alterniflora* clearly showed a hypotriglyceridemic effect of 40.8%, and the amount of phytoecdysteroids from *S. viridiflora* had an approximately equivalent effect in this regard (25.8-30.2%). The reference drug clofibrate under these conditions lowered the level of cholesterol in the blood serum by 27.2%, and triglycerides by 38.6%. The data obtained in experiments on rats on a significant lipid-lowering activity of the studied substances were subsequently confirmed in rabbits with experimental atherosclerosis caused by prolonged oral administration of cholesterol.

Thus, the considered total preparations of flavonoids, triterpene glycosides, and phytoecdysteroids are of interest as potential drugs for the treatment of hyperlipidemia and atherosclerosis.

SOME DATA ON THE INFLUENCE OF THE BUD AND FLOWER EXTRACT OF *Capparis spinosa* ON THE DA RECEPTORS

Yu.R. Mirzaev, E.M. Ergashev, R.A. Botirov, G.E. Saidova, A.Z. Sadikov, Sh.Sh. Sagdullayev

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan, Tashkent, Uzbekistan
e-mail: botiroovr@mail.ru

Plants of the genus *Capparis spinosa* grows in arid areas of the Northern Hemisphere. Several extracts, including those from buds and flowers, consisting of polyphenols, polysaccharides and protein compounds, have been isolated from caper prickly collected in the Tashkent region in the ICPS. These caper extracts have a wide spectrum of pharmacological activity, including lipid peroxidation of the underlying neurodegenerative diseases, which include Parkinson's disease (PD). Our pharmacological studies of extracts of buds and flowers of caper (PEB) showed that at a LD_{50} of more than 4000 mg/kg, at a dose of 10 mg/kg, it causes an increase in motor activity (DA) and verticalization behavior in mice, which indicate the activation of DA2 receptors in the CNS. As you know, stimulation of DA2 receptors underlies the treatment of Parkinson's disease (PD), characterized by stiffness of movements, slowness and tremor, to eliminate which DA2 stimulants are used, and primarily the imported drug Levodopa, long-term use of which, according to E. Nakanishi (2019), is accompanied by side effects:

1 - confusion;
2 - drowsiness;
3 - excitation,
4 - memory impairment.

This requires the replacement of Levodopa with other DA2 stimulants, the effect of which is less pronounced. In view of this, the expansion of the arsenal of antiparkinsonian drugs with different mechanisms of action is relevant.

When evaluating the possibility of using EBA as such a tool, it was shown that with a toxicity of less than 4000 mg/kg r.o. EBC at a dose of 10 increases DA and verticalization from phenamine up to 2 times, and at a dose of 30 mg/kg up to 3 times. With a daily dose of 30 mg/kg orally for 5 days, there was a decrease in the intensity of the activating effect on verticalization, i.e. tendency to tachyphylaxis. At a dose of 50 mg/kg, DA is inhibited, and at a dose of 100 mg/kg, DA and verticalization are almost completely inhibited.

Levodopa at a dose of 3 mg/kg tones D2 receptors to the maximum extent. A dose of 10 starts to inhibit the stimulation of DA receptors, and at a dose of 30 mg/kg it paralyzes it.

In EBP, in addition to stimulation of DA2 receptors, one should also expect an antioxidant effect that prevents the development of PD. In addition, in the experiment, EBK eliminated the side effects of Levodopa. EBP is of interest as a potential anti-Parkinson agent in case of loss of the therapeutic effect of Levodopa, as well as a remedy for its side effects.

STUDY OF THE ACUTE TOXICITY OF NEW DIAZOIMINO DERIVATIVES OF GOSSYPOL

N.Kh. Yakubova, N.A. Tagayalieva, L.U. Makhmudov, Q.R. Baratov K.Zh. Rezhepov, M.B. Gafurov

A.S. Sadykov Institute of Bioorganic Chemistry Academy of Sciences of the Republic of Uzbekistan, 100125 Tashkent, Uzbekistan, Mirzo Ulugbek str, 83.
e-mail: nozi_1705@mail.ru

It is known that the use of gossypol in practical medicine is limited due to it's high toxicity and other side effects on the body. It is known from the literature that Schiff bases of gossypol, obtained by amino compounds of various nature, exhibit a number of biological activities, including anticancer, antiviral, immunomodulatory, immunosuppressive and similar activities. With this in mind, we studied the acute toxicity of a number of newly synthesized gossypol diazoimino derivatives with nitrogen-containing heterocyclic and aliphatic amino compounds.

Diazoimino derivatives of gossypol XAN-III, XAN-IV, XAN-V, NY-I, NY-X were studied for acute toxicity when administered intragastrically to mice. The results are shown in the table. With the introduction of substances XAN-III, XAN-IV, XAN-V, NY -I, NY-X to mice once intragastrically at a dose of 2000 mg/kg, after 5-10 minutes, the animals observed washing, narrowing of the eyes, bunching and urination. Mice returned to normal within 1-3 hours. The death of animals was not observed (0/5). Further, throughout the entire period of research (14 days), observations of surviving animals were carried out. Observation of experimental animals according to the studied indicators did not reveal any deviations in the condition of the hair and skin, the position of the tail, the consistency of fecal masses, diuresis, and changes in body weight from the animals of the control group.

Thus, the study of the acute toxicity of substances after intragastric administration in accordance with the modified OECD classification showed that the samples XAN-III, XAN-IV, XAN-V, NY-I, NY-X correspond to the V-class of substance toxicity (Practically non-toxic), LD50 > 2001 mg/kg.

Table. Acute toxicity rates for intragastric administration of samples XAN-III, XAN-IV, XAN-V, NY-I, NY-X to mice

№	Samples	Animal species / route of administration	Doses, mg/kg	Number of dead / number of animals in the group	LD_{50}, mg/kg Toxicity class
1.	XAN-III	mouse/i/s	2000	0/5	>2001 (V class)
2.	XAN-IV	mouse/i/s	2000	0/5	>2001 (V class)
3.	XAN-V	mouse/i/s	2000	0/5	>2001 (V class)
4.	NY-I	mouse/i/s	2000	0/5	>2001 (V class)
5.	NY-X	mouse/i/s	2000	0/5	>2001 (V class)
	Control	mouse/i/s	5,0 ml	0/5	

5 samples of gossypol diazoimino derivatives with nitrogen-containing heterocyclic and aliphatic compounds XAN III, XAN IV, XAN V, NY I, NY X when administered intragastrically correspond to the V class of substance toxicity (practically non-toxic), LD_{50} > 2001 mg/kg.

MECHANISMS OF 20-HYDROECDYSIONE EFFECT ON ELITE ATHLETES

J.I. Islamova[1], V.N. Syrov[1], A.X. Toychiev[2], S.O. Osipova[2], F.A. Kerimov[3]

1) S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
2) Republican Specialized Scientific and Practical Medical Center for Epidemiology, Microbiology, Infectious and Parasitic Diseases, Tashkent, Uzbekistan
3) Uzbek State University of Phisical Culture and Sport, Tashkent, Uzbekistan

Ecdysten was developed on the basis of hydroecdyson, it possesses a wide range of biological activities: anabolic, antioxidant, anti-inflammatory, immunomodulatory, actoprotective, etc. [Syrov V. et al. 2014]. Identification of the mechanisms of ecdysten effect on elite athletes, including elevation of performance as well as possible cancellation of overtraining syndrome (OS) is of particular interest.

OS is an important problem in the training of elite athletes. There are different opinions on the nature of OS. Some believe that essentially OS is the result of undiagnosed abnormalities in the athlete's health. Others attribute OS to physical exertion. There are various points of view on the OS development, including the cytokine theory [Kreher J.B., Schwartz J.B., 2012].

The aim of the study to detect ecdysten influence on cytokines profile in elite athletes with OS.

We examined 12 elite athletes (wrestlers) 18-22 aged with OS. Before examination intestinal parasites were excluded in all of them, because it was found that they can imitate the OS symptoms. Athletes received 100 mg of ecdysten per day (in three doses) for 4 weeks. Proinflammatory cytokines were determined by enzyme immunoassay at the beginning of the examination and 4 weeks after the start of treatment. The test systems were manufactured by Vector-Best, Russian Federation. The control group included 20 healthy individuals engaged in amateur sports (morning jogging or tennis once a week).

At the beginning of the examination, we found a significant increase in the level of inflammatory cytokines: tumor necrosis factor (TNF)-α (21.4 pg/mL), interleukin (IL)-6 (45.7 pg/mL), IL-1β (32 pg/mL) in elite athletes compared to the control group (TNF-α-5.1 pg/mL, IL-6-20.3 pg/mL and IL-1β-9.1 pg/mL) ($P< 0.05$). After the course of ecdysten the levels of TNF-α (14.7 pg/mL), IL-6 (32.4 pg/mL) and IL-1β (22.9 pg/mL) were decreased in 9 of 12 athletes. It was accompanied by an improvement in the performance and a drop of anxiety. In 3 athletes ecdysten did not cause the expected results: cytokines level did not decrease. Symptoms typical for OS did not change also. Causative factor remained unclear.

It is possible that ecdysten inefficiency is connected not only with muscles inflammation but other causes that dominate as triggers of inflammation and corresponding shifts in cytokines profile. The various positive properties of ecdysten and the absence of side effects deserve further research.

DETERMINATION OF THE TOXICITY OF *Rubia tinctorum* ROOT EXTRACT

A.S. Ishmuratova, A.Kh. Islamov

Institute of Bioorganic Chemistry named after academician A.S. Sodikov of the Academy of Sciences of the Republic of Uzbekistan; 100125 Tashkent city Mirzo Ulugbek street, 83

As it is known, it is aimed at studying the biology and chemical composition of Rubia tinctorum L plant species, which have been used by people for many years. In this case, it is of urgent importance to separate natural medicines from local raw materials, to prepare cheap and high-quality drugs that can replace imports, and to create the initial raw material bases. Such preparations can be isolated from the medicinal plant growing in our country and used in medical practice and in the national economy. [1-2].

No acute toxicity effects were observed in the above-mentioned animals at the studied doses of 500, 1000, 1500, 2000 and 3000 mg/kg of *Rubia tinctorum L* extrac. No animal deaths were observed at the above doses observed throughout the experiment. Animals in the experimental groups did not show a decrease in body weight when compared to the control group. Based on the obtained results, we can conclude that the average lethal dose (LD50) of Rubia tinctorum L extrac once injected into the stomach of mice is >3000mg/kg. The obtained results are presented in the table below.

It can be concluded that the results of the study of the acute toxicity of *Rubia tinctorum L* extrac showed that the median lethal dose (LD50) after a single gastric injection in mice was higher than 3000 mg/kg, and the samples were found to belong tothe class of non-toxic compounds.

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BIOLOGICAL ACTIVITY OF THE OIL EXTRACT OF *Curcuma longa* HARVESTED IN SURKHANDARYA REGION

M.R. Tursunova[1], B.R. Umarov[1], A.B. Soliev[2], U.K. Inogamov[1]

1) Tashkent Scientific Research Institute of Vaccines and Serums, Uzbekistan, 100084, Tashkent, Yunusabad district, Chingiz Aitmatov str., phone:(+99871)234-77-67, e-mail:malika.tursunova.1983@mail.ru
2) Turin Polytechnic University in Tashkent, 100095, 17 Little Ring Road, Tashkent, Uzbekistan, phone; (+99871) 246-80-52

One of the promising and dynamically developing areas of modern medicine and pharmacy is the appeal to food plants as a source of biologically active compounds (BAC). *Curcuma Longa* is a valuable source of BAC with diverse biological activity. The nutritional and medicinal value of turmeric is associated with a high content of curcuminoids – heptadiene compounds of phenolic nature (at the level of 2-4%, but may also exceed 5%); the essential oil component of BAC also deserves attention. Turmeric rhizomes serve as raw materials for obtaining a number of medicines, such as "Holiver", "Hepatofalk plant", "Holagogum", cough syrup "Suprima-broncho". The purpose of this work is to study the biological activity of an oil extract from the rhizome of *Curcuma Longa*.

To achieve the goal, the root part of the plant grown in Surkhandarya region was extracted. The extraction was carried out with hexane. A comparative analysis to determine the antioxidant activity of the oil extracts of local and Indian origin of *Curcuma Longa* was carried out on white rats. It is known that paracetamol hepatitis increases the activity of free radicals and as a result increases the level of the secondary product of lipid peroxidation – malondialdehyde (MDA). The level of MDA was determined in a model of paracetamol hepatitis. For the experiment, 24 white male rats with a body weight of 180-200 g were taken and divided into 4 groups. The control group - intact - received purified water, the experimental group received a single intragastric paracetamol at a dose of 1000 mg/ kg, and the 3rd and 4th group of rats received intragastric paracetamol with turmeric oil extract of *Curcuma Longa* from Surkhandarya and India for 3 days. The obtained results showed that the compared extracts suppress free radical processes in the body. The results of the experiment are shown in the table.

Table

№	Groups	MDA, nmol/ml
1	Control - Intact	2.42±0.23*
2	Experimental	3.74±0.26
3	Experimental - Oil extract of *Curcuma Longa* from Surkhandarya region	2.92±0.28
4	Experienced - Turmeric Long India Oil Extract	2.32±0.08*

(Note:*- the difference in the reliability index at P<0.05 in comparison with the intact group.)

Conclusion: Experimental study of turmeric oil extract of *Curcuma Longa* from Surkhandarya, has an antioxidant effect.

HERBICIDAL ACTIVITY OF SULFONYLUREAS IN THE SERIES OF BICYCLIC ALKYLQUINAZOLONES

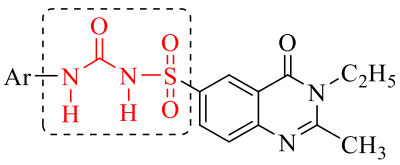
H.U. Mamadaminov, R.P. Zokirova, S. M. Allabergenova, U. M. Yakubov, Sh.U. Yoldoshev, B. J. Elmuradov

S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences Republic of Uzbekistan, 100170, Tashkent, M. Ulugbek st., 77
e-mail: ubaydullo13@mail.ru

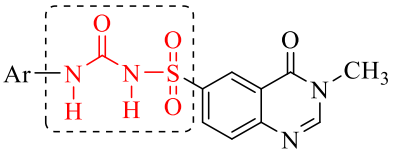
Nowadays, the use of chemical protection agents in agriculture is increasing. The global market share of agrochemicals is worth 60 billion dollars a year and continues to increase. Herbicides take the largest share, 40-60% in different parts of the world, depending on crop dominance. Sulphonylureas are the class of herbicides with the highest biological activity. *Chlorsulfuron*, the first representative of this class of compounds, was produced by the DuPont company in 1982. The use of sulfonylureas in low doses (10-100 g/ha), high selectivity, and safety for humans and animals increase the demand for compounds of this class.

Therefore, it is very urgent to carry out targeted synthesis and chemical modification of new, potentially biologically active compounds containing sulfonylurea residues, to determine their physical, chemical and biological properties, to create new preparations based on selected “candidate” substances [1, 2].

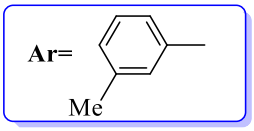
We studied the herbicidal activity of new bicyclic quinazoline derivatives containing sulfonylurea residues on wheat seeds *“Grom”*. The experiment adopts the Rakitin method [2]. *"Granstar"* herbicide was used as standard. The newly synthesized sulfonylurea derivatives **US-16** and **US-17** were studied at different concentrations (1-0.01%). Preliminary results indicated that compound **US-16** exhibited active herbicidal properties at a concentration of 0.1%:



US-16



US-17



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ACUTE TOXICITY TESTING OF NATIVE AND MODIFIED FORMS OF IMMUNOPARAZITAN-N

B.I. Mamatkulov

Tashkent Research Institute of Vaccines and Serum Uzbekistan, 100084, Tashkent, st. Chingiz Aitmatov, 37

Immunoparasitan N is a chemically modified complex of polysaccharides and lipoproteins isolated from fungi. In appearance, it is a light gray suspension intended for intramuscular injection. The drug activates the system of antiparasitic immunity, including the cytotoxic activity of macrophages, eosinophils, neutrophils, as well as activating the production of antibodies.

To enhance the immunobiological properties of the drug, its structure was modified with iron and cobalt ions. It was found that this modification increased the biological activity of the drug (increased phagocytic activity in mice). However, the acute toxicity of the drug increased significantly compared to the original form. These changes were expressed in a decrease in body weight by 12,2 + 0.23% and 8,6 + 0.17%, respectively, as well as in a decrease in motor activity and an orienting reflex in the first 7 days after the administration of the modified compound.

Thus, the modification of Immunoparasitan-N preparation with metal ions can enhance the indicators of their acute toxicity.

EFFECT OF *Cuscuta europeae* GLYCOPROTEINS ON CANCER CELLS

Z.S. Khashimova, K.A. Kakhorova, M.K. Salakhutdinova, M.S. Abdullahodzaeva, Yu.I. Oshchepkova

Institute of Bioorganic Chemistry, Academy of Sciences, Tashkent, Uzbekistan

Despite the existence of a number of theories of ontogenesis, including those aimed at creating new anticancer drugs, there are many outstanding oncological problems. This indicates not only the complexity, but also the need to develop new approaches, both to cancer chemotherapy and to understanding the overall problem. One such approach is early cancer diagnosis and treatment. So far, among oncological diseases, cervical cancer remains one of the most pressing problems in oncogynecology.

Professor M.S. Abdullahodzhaeva and co-workers found distinctive dispersed luminous particles (DLP) in polarized light on the surface of epithelial cells of the cervix of cancer patients. Such dispersed luminous particles (DLP) appeared only in cases of diagnosed cervical cancer. Normally, as well as in inflammatory or dystrophic process in the cervix, these particles were not detected. In this regard, the purpose of this work was to investigate DLP in cultured cancer cells and study the effect of various anticancer drugs on them. A transplanted HeLa cell culture was used to study the nature of DLP.

HeLa cells in an amount of 1 million/ml were placed to 24-well plates and cultured in 5 ml of DMEM growth medium containing an antimycotic antibiotic, L-glutamine, 10% fetal calf serum in a CO2 incubator for 24 hours. Then the cells were removed from the surface plastic with versin, washed with culture medium, and the cell suspension was placed to a defatted glass slide, on which a non-fixed smear was made with another glass slide. The smear dried in air for 3 to 5 minutes. After that, the glass slide was placed smear down on the stage of the «Axiovert 40 MAT» reflective optical microscope, where the DLP were visualized. When viewed under a microscope in polarized light, 40% of the cells showed DLP, i.e. not all cells in transplanted HeLa cancer culture contain such structures. Subsequently, we studied clinical antitumor drugs with a known mechanism of action, namely, methotrexate and cisplatin on HeLa cell culture. To do this, HeLa cells were seeded into 96-well plates in an amount of 20000–30000 cells/mL in 100 μL of DMEM medium with 10% fetal calf serum and cultured at 37°C in a CO2 incubator. A day later, the preparations were administered at doses of 100, 10, and 1 μg/ml per 100 μl of the medium, and the cells were cultured for 24 hours. Cells without drug exposure served as control. Cytotoxic activity was assessed by incorporation of MTT into cells. A high cytotoxic activity of drugs (70-90%) on HeLa cells was established. Microscopic examination revealed DLP in control cells, but no intracellular DLP were found in the experimental samples.

Since DLP is observed on the surface of epithelial cancer cells, we studied the effect of carbohydrate-containing proteins on HeLa cells. Proteins were obtained from the seeds of Cuscuta europeae by extraction with 80% saline ammonium sulfate. The content of carbohydrates was determined and the hemagglutinating activity of the protein was established. Proteins exhibit high cytotoxic activity on HeLa cells. Microscopic examination did not reveal DLP in the experimental samples, in contrast to the control ones.

SYNERGISTIC EFFECT OF THE STEROID BIOSTIMULANT AND FUNGICIDE ON THE PHYTOPATHOGENIC FUNGUS *Fusarium oxysporum sp. vasinfectum*

D.T. Babaeva, N.R. Khashimova, A.A. Akhunov, R.R. Shixnazarov

Institute of Bioorganic Chemistry named after academician A.S. Sadykov, Academy of Sciences of Uzbekistan, 83 Mirzo Ulugbek street, 100125, Tashkent, Uzbekistan. e-mail: dildora.babaeva.11@mail.ru

Both biotic and abiotic stress inhibits the growth potential of all crops, and the mechanisms and strategies for mitigating these effects are still poorly understood. Cotton plants are grown in many fields of our republic, but the areas of plant infection with phytopathogenic fungi are expanding, which directly hinders the growth and development of cotton. *Fusarium* fungi mainly cause root rot and wilting diseases in the cotton plant, causing a sharp decrease in the volume of cotton production and fiber quality. Plant biostimulants based on natural materials have received considerable attention by both the scientific community and commercial enterprises especially in the last two and a half decades. Many natural-based biostimulants contain biologically active compounds that participate in the form of signaling molecules and can directly affect plant metabolic processes. It is unclear what effects soil or foliar application of the unspecified product will have on plants. Optimizing the use of biostimulants requires accurate information about the rate and time. Therefore, using biostimulants with unknown dosages and the efficiency of functional compounds in plants requires determining what processes lead to them.

C-6580 cotton variety seeds were treated with DAG-1 biostimulator based on glycyrrhizic acid of steroidal nature, P-4 fungicide, and their composition with four-fold reduced P-4 fungicide. The activities of peroxidase (PO), phenylalanine ammonia-lyase (PAL) enzymes, and cellulose content were studied in pretreated 7-day-old cotton seedlings and roots under the influence of the cultural liquid of the phytopathogenic fungus *F. oxysporum f. sp. vasinfectum*. According to the results of the study, control (water) and *F. oxysporum f. sp. medium*, it was found that the enzyme activities were the most active in samples grown under the influence of DAG-1, DAG-1+P-4 composition. In samples treated with a complex with a reduced fungicide content, separately *F. oxysporum f. sp. vasinfectum* and fungicide P-4 and its complex with a bioregulator did not show PO activity in the root compared to the control, but under the influence of DAG-1, the activity of PO and FAL in the shoot and root showed high results. The cell wall is considered to be the first barrier that pathogens must overcome to colonize plant tissuesThe increase in the contents of cellulose in response to biotic stress indicates the activation of protective processes. It was found that in *F. oxysporum f.sp. vasinfectum* fungus medium, the amount of cellulose in the roots of seedlings treated with the usual dose of P-4 fungicide was higher than the control. A sharp increase in the amount of cellulose indicates the activation of lignin synthesis and the formation of a mechanical barrier against phytopathogens due to the synergism of biostimulant DAG-1 and P-4 fungicide.

The obtained results confirmed that the drug DAG-1 is universal due to its stimulating properties, participation in complex biochemical processes in plants, as well as synergistic compatibility with P-4 fungicide.

STUDY OF THE INFLUENCE OF BIOLOGICALLY ACTIVE SUPPLEMENT «BIFOBALANS AKTIV" IN THE EXPERIMENTAL RATS: HEMATOLOGICAL RESEARCH

S.M. Nurmuratova, B.J. Azimova

Tashkent pharmaceutical institute, Tashkent, Uzbekistan

Recently, dietary supplements have become an increasingly urgent problem, including in terms of activity in the health sector. In Uzbekistan, there are few studies on the ecology of bifidobacteria in the intestines of the local population, their isolation from the composition of the intestinal microflora, obtaining pure cultures, studying the characteristics of biology, taking into account environmental environmental factors and the characteristics of the type of nutrition of the local population. These studies are extremely important for our region due to the wide spread of intestinal dysbacteriosis in children and adults. Factors causing deficiency of bifidobacteria are high solar insolation, saturation of food products with pesticides, mineral fertilizers, high content of heavy metal salts in water, unsystematic use of antibacterial drugs, etc. In this regard, the development of new drugs and fermented milk products based on local, highly effective strains of bifidobacteria is highly relevant.

The purpose of this study was to study the hematological parameters under the influence of the biologically active food additive “Bifobalans aktiv” produced by Private limited company “General Med pharm”, Uzbekistan.

Biologically active food additive “Bifobalans aktiv” is a dry powder from white to light beige color, with a weak fermented milk smell. In the experiment used white rats weighing 138-160 grams. The experimental rats received biologically active food additive “Bifobalans aktiv” at doses of 200, 500 and 1000 mg/kg/day by intragastrically injection for 30 days.

At the end of the treatment, animals were sacrificed and the blood was collected for hematological and biochemical investigations in four groups of control and biologically active food additive “Bifobalans aktiv” at doses of 200, 500 and 1000 mg/kg of this experiment. There was no significant difference hemoglobin, red blood cells, leukocytes, eosinophils, lymphocytes, monocytes, platelets and segmented cells, color index and an erythrocyte sedimentation rate (ESR) in peripheral blood in all experimental groups.

The study of the dynamics of hemoglobin, red blood cells, leukocytes, eosinophils, lymphocytes, monocytes, platelets and segmented cells, color index and ESR in peripheral blood did not reveal statistically significant differences in the animals of the experimental group compared with the control data.

Based on the results of our own research, it was established that the biologically active food supplement “Bifobalans aktiv” for adults produced by General Med Pharm LLC (Uzbekistan) does not adversely affect the health status of experimental animals, nor does it have cumulative properties.

OBTAINING DRY EXTRACTS BY SPRAY DRYING FOR THE DEVELOPMENT OF ANTIHYPERTENSIVE DRUGS

D.T. Safarova

Tashkent Pharmaceutical Institute Tashkent, Uzbekistan

For the treatment and prevention of hypertension, there are also drugs based on medicinal plant materials, prepared in various combinations and increasing their pharmacological efficacy. In this regard, it is important to expand the range of drugs with high therapeutic efficacy, harmless and affordable, produced on the basis of plant materials at domestic pharmaceutical enterprises.

The aim of the study is to develop antihypertensive drugs (extracts for further preparation of the balm) based on medicinal plant materials. Peppermint leaves (folium *Menthae piperitae* L.), rhizomes with roots of valerian (rhizoma et radicis *Valerianae officinalis* L.), rose hips (fructus *Rosae cinnamomae* L.), aerial parts of lemon balm (herba *Melissae officinalis* L.), motherwort herb (herba *Leonuri cardiacae* L.S.L.), corn stigmas (*Styli cum Stigmatis Zeae maydis* L.), and blood-red hawthorn fruit (fructus *Crataegus sanguineae* Pall).

Table

Saw drying temperature at the inlet of medicinal herbs extracts

№	Name of extract	Spray drying inlet temperature
1	Motherwort herb extract - Extractum herbae Leonuri	1800 C
2	Peppermint Leaf Extract - Extractum Menthae	1850 C
3	Corn Stigma Extract - Extractum Styli cum Stigmatis Zeae	165 0C
4	Blood red hawthorn fruit extract - Extractum fructus Crataegus	1890 C
5	rose hips extract - Extractum fructus Rosae	1720 C
6	Melissa leaf extract - Extractum folium Melissae	1900 C
7	Rhizome extract with roots of valerian officinalis- Extractum rhizomatis et radicis Valerianae	1850 C

As a result of the research, dry extracts were obtained from the dark extracts obtained from the above plant raw materials using MCGS-5 L spray drying equipment. The obtained dry extracts were evaluated from a technological point of view.

STUDY OF ANTIARRHYTHMIC ACTIVITY OF MODIFIED FORMS OF AMIODARON

V.V. Uzbekov[1], I.Z. Jumayev[2], Sh.Yu. Rustamov[2], Yu.I. Oshchepkova[1*], P.B. Usmanov[2], Sh.I. Salikhov[1]

1) A.S. Sadykov Institute of Bioorganic Chemistry Academy of Sciences of the Republic of Uzbekistan, *e-mail: joshepkova05@rambler.ru
2) Institute of Biophysics and Biochemistry National University of Uzbekistan

Heart rhythm disturbances are one of the most complex and urgent problems of modern cardiology. Arrhythmias are detected both in various cardiovascular diseases and in healthy individuals. The spectrum of clinical manifestations of cardiac arrhythmias varies from asymptomatic to severe course, from prognostically insignificant arrhythmias to determining the nature of the long-term outcome. Amiodarone is the most effective of the existing antiarrhythmic drugs. It is even called "arrhythmolytic drug". Along with all the advantages, the main disadvantage of amiodarone is the likelihood of developing many extracardiac side effects, which are observed in 10-52% of patients with long-term use of the drug.

The aim of this work is to study the antiarrhythmic and inotropic activity of complexes of amiodarone hydrochloride (AmdHC) with glycyrrhizic acid (GA) and its monoammonium salt (MASGA) in models of $CaCl_2$-induced arrhythmia in comparison with AmdHC.

The study in experiments on the papillary muscle of the rat heart was carried out on the complexes of GA-AmdHC (2:1), GA-AmdHC (4:1), GA-AmdHC (8:1), MASGA-AmdHC (2:1), MASGA-AmdHC (4:1) and MASGA-AmdHC (8:1). It was determined that in the presence of complexes GA-AmdHC (2:1) (5-100 μM), GA-AmdHC (4:1) (5-60 μM), GA-AmdHC (8:1) (5-40 μM), MASGA-AmdHC (2:1) (5-120 μM), MASGA-AmdHC (4:1) (5-100 μM) and MASGA-AmdHC (8:1) (5-30 μM) the papillary muscle contraction force decreases to 12.3±5.5%, 16.4±3.9%, 6.2±3.4%, 4.3±3.5%, 3.8±3.5 % and 2.7±2.4%, respectively, from the control level. Based on the conducted studies, it can be assumed that GA-AmdHC (8:1) and MASGA-AmdHC (8:1) have a stronger negative inotropic effect than amiodarone and other complexes. When studying the effects of complex compounds on the $CaCl_2$-induced arrhythmia model, it was found that their addition during the second phase of $CaCl_2$ action leads to the restoration of papillary muscle contractions in response to stimulation. In control experiments with amiodarone, it was found that, in its presence, the restoration of muscle contractions occurs 10 min after its introduction into the incubation medium. In the presence of GA-AmdHC (8:1), the restoration of muscle contractions occurred within 7 minutes after its introduction into the incubation medium. A more pronounced effect on the background of $CaCl_2$-induced arrhythmia has MASGA-AmdHC (8:1), in the presence of which the restoration of muscle contractions was observed within 3 minutes after its introduction into the incubation medium. The data obtained indicate that the modification of the structure of AmdHC by the introduction of MASGA provides the complex MASGA-AmdHC (8:1) with a higher negative inotropic and antiarrhythmic activity. Such an increase in the inotropic and antiarrhythmic activity of the MASGA-AmdHC (8:1) complex may be due to the presence of additional MASGA groups in its structure, which can increase its lipophilicity and, accordingly, membrane activity.

SEARCH FOR STIMULAS AFFECTING THE LEVEL OF INORGANIC POLYPHOSPHATES IN THYMOCYTES

Ergasheva Diyora

Center of advanced technologies under the Ministry of Innovative Development of the Republic of Uzbekistan, e-mail: info@cat-science.uz

Phosphorus is a vital element of all living organisms, being part of the most important organic compounds, including nucleic acids, ATP and other nucleoside phosphates, phospholipids, phosphorylated proteins, and carbohydrates. An insufficient amount of this element in the environment is an unfavorable factor limiting growth and development, and its absence leads to the death of organisms. Inorganic polyphosphates (Poly-P) is the oldest molecule found in all living organisms from bacteria to mammals, they are multifunctional molecules depending on the subcellular location in different types of organism.

In this regard, an important strategy for survival in changing environmental conditions for organisms is the accumulation of reserves of phosphorus compounds. These compounds are varied. These can be organic phosphorus compounds, such as phytin (Ca-Mg-salt of inositol phosphate) of higher plants, phosphomannan of some yeast species (*Hansenula capsulata*), teichoic acids of the bacterial cell wall.

To date, it is known that Poly-P in mammalian cells play a predominantly regulatory role. Although the specific enzymes involved in the synthesis of Poly-P are still unknown. However, from the literature and the results of our studies, it is known that the synthesis of Poly-P is associated with the energy metabolism of the cell, as well as the integrity of the membrane. To date, the issue of studying the pathways of Poly-P metabolism in mammalian cells remains relevant.

The aim of this work was to assess the phosphate-accumulating potential of rat thymocytes, as well as to study the features of the metabolism of inorganic polyP in these cells, which accumulate Pi most efficiently.

To achieve this goal, thymocytes of outbred rats weighing 100-120 grams were isolated using differential centrifugation. The isolated thymocyte suspension was incubated with a 20 μM DAPI probe at room temperature for 40 minutes. During incubation, thymocytes were pipetted every 5-7 minutes.

Fluorescence was performed using an Agilent Technologies fluorometer (Cary Eclipse Fluorescence Spectrophotometer). All recordings were made in 3 ml glass cuvettes with Ringer's solution without glucose (medium composition: 5 mM KCl, 135 mM NaCl, 11 mM HEPES, 2 mM CaCl, 1 mM MgCl, pH 7.3).

To study the features of Poly-P metabolism in thymocytes, a modified measurement of Poly-P fluorescence using DAPI was used. Changes in the level of Poly-P on the main molecule of energy metabolism, glucose, were taken as a control. Application of 10 mM glucose to incubated thymocytes in a glucose-free medium caused an increase in DAPI-polyP fluorescence in thymocytes. In the incubation medium without the addition of glucose, a decrease in DAPI-polyP fluorescence was observed, which indicates that the metabolism of Poly-P is inextricably linked with the energy metabolism of the cell.

The results obtained can be used to further study the effect of activators and inhibitors of polyP metabolism in thymus cells.

THE STRUCTURE OF SAPOLIDE FROM THE AERIAL PART OF THE SAPONARIA OFFICINALIS

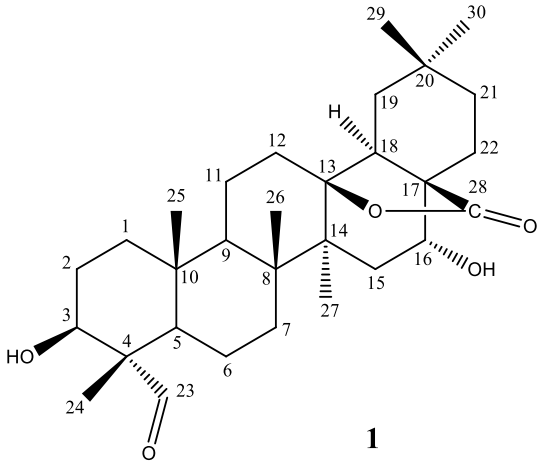
L.N. Ashurova, A.R. Khurramov, Kh.M. Bobakulov, I.T. Mamatvaliev, N.Sh. Ramazonov

Institute of the Chemistry of Plant Substances, Academy of Sciences of Uzbekistan, 77, Mirzo Ulugbek str., 100170, Tashkent, Uzbekistan. E-mail: ashurova_lola1985@mail.ru

Plants of the genus *Saponaria* L. (family Caryophyllaceae) include about 40 species distributed in temperate Eurasia, mainly in the Mediterranean region; of these, six species grow in Uzbekistan, including *Saponaria officinalis*. Previously, carbohydrates, triterpene glycosides - saponazides, saponariosides, A-M and four hederagenin aglycones, hydroxyhederagenin, gypsogenin and quillaic acid, etc. were isolated from the roots of *S. officinalis*. Alkaloids, ascorbic acid, flavonoids: vitexin, saponarin, saponaretin were found in the leaves. In official medicine, preparations of *S. officinalis* are used as an expectorant, choleretic, diuretic, anti-inflammatory, diaphoretic and laxative. In continuation of research on the aerial part of *S. officinalis* growing in Uzbekistan, a new natural saponin named sapolide has been isolated (**1**).

The air-dried aerial part of the plant (1 kg) was crushed and extracted with methanol at room temperature and after vacuum evaporation a crude extract (445 g) was obtained, which was suspended in H_2O (5 L) and then successively fractionated with chloroform, ethyl acetate, and *n*-butanol. *n*-Butanol extract (120 g) was chromatographed on a silica gel column (0.03-0.200 mm) in a gradient solvent system $CHCl_3$–CH_3OH (1:0-0:1) and as a result 4 fractions A-D (1-4) were obtained. Rechromatography of fraction 1 (56 g) on silica gel (0.040-0.063 mm) in the solvent system $CHCl_3$-CH_3OH (50:1-0:1) to obtain 10 fractions (A 1.1-1.10). Fractions A 1.1-5-6 (48 mg) were further purified by preparative TLC (40:1 $CHCl_3$-CH_3OH) to give compound **1** (20 mg). The yield was 0.002% relative to the air dry plant.

The structure of the new saponin **1** was established based on the analysis of ^{1}H and ^{13}C NMR spectra, as well as HSQC, HMBC, COSY and NOESY experiments as 3β,16α-dihydroxy-23-oxo-oleanan-28,13β-olide.



1

Chemical structure of the compound **1**.

BIOACTIVE ADDITION VER-MOL – 2 FOR PROFHYLAXIS AND TREATMENT DIABETES MELLITUS

O.Kh. Saitmuratova, O.U. Murotov

Tashkent Pediatric Medical Institute, Tashkent City, 100140 Bogi Shamol str., 223

Recently for treatment diabetes mellitus besides medicines the bioactive addition (BAA) of vegetable origin were used. The series of BAA consist of alpha diabetin, spirumin-Sochi 4 and dolgit, being made on the base of Jerusalem artichoke, presenting antioxidant drug have antioxidants.

Nowadays the treatment diabetes mellitus became difficult. So it is very important to search, study new nontoxic bioavailable natural sources, and, on their base to create BAA for prophylaxis and complex treatment diabetes mellitus. To such sources may be referred milk and sour diary products being taken on their base. They have unique remedial properties. There is camel's milk among them. It has bioactive iron, zinc which have much more therapeutic property than diary products from other sources. The camel's milk and "shubat" are having been used in medication for long time to treat Alzheimer's disease, chronic gastritis, tuberculosis, colitis, diseases of respiratory ways, improves blood supply and strengthens immunity. The camel's milk is not only nutrient and tasteful product, but it is the source of vitamins. In spite of this, its chemical content and biological properties have not been researched yet. The next researches were carried out : determination of general and free amino acid content, detection of micro-elementary and carbohydrate content and study biological activity of Ver-Mol-2 from the camel's milk. At determination biological activity of Ver-Mol-2 in the past the antiviral, interferon inducing activity and anti-anemic properties were researched. In described biological activity of Ver-Mol-2 the alimentary and adrenaline hyperglycemia were researched. Ver-Mol-2 manifested bright expressed hyperglycemic effect on the models, and, by the efficacy, it doesn't yield to the modern drugs. The value of biological activity additions (Ver-Mol-2) includes: firstly, milk doesn't curdle; it easy sucked out; it has insulin like albumen; it connects glucose in blood.

As a whole, the taken work on study chemical content of Ver-Mol-2 and its biological activity opens some new approaches to understanding of curable activity of this natural substance and supplement with series using medicines. On the base of taken results Ver-Mol-2 may be recommend as natural biological active addition for prophylaxis diabetes mellitus.

PHYTOCHEMICAL STUDIES OF BIOLOGICALLY ACTIVE SUBSTANCES OF THE AERIAL PART OF *Daphne altaica*

A. Musagalikyzy, Zh.Zh. Akzhigitova, J. Jenis

*The Research Center for Medicinal Plants of Al-Farabi Kazakh National University*e-mail: janarjenis@kaznu.kz, arailym.musagalikyzy@icloud.com*

Daphne is a genus of 70 to 95 species of deciduous and evergreen shrubs in the Thymelaeaceae family. *Daphne altaica* is a rare endemic species to the north of Jungar Basin of Xinjiang, Chine, Altai, Manrak and Tarbagatai Mountains of Kazakhstan, and Altai region of Russia, as well as northwest Mongolia. *D. altaica* is an insufficiently explored rare endemic species from East Kazakhstan. *D. altaica* is a medicinal herb used in traditional Kazakh medicine for the treatment of numerous diseases, including cancer of the digestive tract, tracheitis, common cold, sore throat, rheumatism and snakebite. The plant is known for its anticancer properties. The Kazakh added the peel of stem barks of *D. altaica* to lamb broth and drank it against cancer

In this work, the quantative and quantative analysis of phytochemical constituens of medicinal plant *Daphne altaica* from Kazakhstan has been made for the first time. Total bioactive components of *D. altaica* such as organic acids (0.24%), flavonoids (0.223%), coumarins (0.9848%) and together with moisture content (4.9%), total ash (4.27%), and extractives content (11.36%), were determined. Eleven macro-micro elements from the ash of the plant were identified, main contents of them were K (250.25mg/ml), Mg (78.565mg/ml), Ca (71.88mg/ml) by using the method of multi-element atomic emission spectral analysis. In addition, 20 amino acids and 8 fatty acids were studied from the plant. Glutamine (2360), asparatic acid (2360) and alanine (625) predominated among amino acids. Oleic (55.7) and linoleic (27.3) acids were contained in large amounts compared to other fatty acids.

Key words: *Daphne altaica*, bioactive constituents, macro-, microelements, amino acids , fatty acids.

DESTRUCTION OF POLYPRENOLS OF *VITIS VINEFERA* DURING EXTRACTION UNDER MWI CONDITIONS

U.T. Zokirova, A. Mamadrakhimov, N.K. Khidyrova

S.Yu. Yunusov Institute of the Chemistry of Plant Substances Academy of sciences of the Republic of Uzbekistan st. Mirzo-Ulugbek, 77, 100170 Tashkent
E-mail: missumida@yandex.com

The development of the natural sciences contributed to the emergence of new areas of chemistry, such as laser chemistry, photochemistry, plasma chemistry, as well as a new section of modern chemistry - microwave chemistry.

Unlike conventional liquid extraction, the microwave extraction method can significantly reduce the extraction time due to the rapid heating of the solvent. It is known that microwave exposure makes it possible to minimize the temperature gradient and accelerate heat transfer, significantly reduce the consumption of solvents, energy costs, and at the same time the extractive yield of the target product is significantly increased. But in the process of microwave radiation, some compounds are partially destroyed or their structure changes. Therefore, this method does not always give positive results if the process is not controlled [1].

In this work the degree of destruction of polyprenols (PPs) of the leaves of *Vitis vinefera* was studied. Previously, we studied the acylation of polyprenols and the extraction of leaves of *Vitis vinefera* under microwave irradiation (MWI) and showed a decrease in the content of PPs [2,3].

In order to find out the reason for the decrease in the content of polyprenols, the degree of destruction of polyprenols was studied using Agilent technology LC / MC - 6420. The results of the analysis showed that when extracted under MWI conditions for 10 minutes, polyprenols do not undergo degradation, when extracted for 15 minutes, the degree of destruction will be 17.9%, within 20 minutes – 20.8% (destruction), and at 30 minutes - 59.7% polyprenols undergo degradation.

Thus, for the first time, the degree of destruction of polyprenols in the leaves of *Vitis vinefera* under MWI conditions was studied and the optimal conditions (10 min., yield of PPs 70-72%) for extraction were determined.

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OBTAINING ACARICIDES BASED ON OBTAINING INDENE FROM A SECONDARY PRODUCT PRODUCED IN NATURAL GAS PROCESSING AND THEIR BIOLOGICAL ACTIVITY

F. Z. Burkhev[1], Q. J. Rustamov[2]

Gulistan State University, Laboratory "Experimental biology"[1]
Republican Center for the fight against termites[2]
Email: farkhod_2020@mail.ru

Heavy pyrolysis oil, which is considered a secondary product in natural gas processing, is a complex multi-component mixture, a number of works are underway to process it. Thermal processing (fractional processing) (T_{boil}=181°C) under 165-185°C temperature conditions enabled producing indene containing liquids. During the studies, it was found that the mixture obtained contains complexes composed of methyl and ethyl-containing derivatives of indene and aromatic compounds that contained various radicals. The initial fraction of pyrolysis oil containing indene was influenced by Na metal to form a sodium compound of indene. The resulting compound was transformed into a sodium salt of indene–1 carbonic acid in a toluene medium.

Various etherification reactions were conducted to obtain ethers based on the indene ring. Taking into account the use of ethers obtained on the basis of indene as acaricides, the effect of the obtained preparation “Inden–1” on red spider mite that cause serious damage to agricultural crops was studied at the Republican Center for the fight against termites at the Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan. The analysis of the obtained values of the biological effectiveness of the experimental and etalon preparations by the ratio of the preparation and solvent gave the following result: to combat red spider mites, 2ml of the A1 preparation was added to 100 ml of water and treated a certain number of insects. The calculations showed that on day 3 after the exposure to the preparation, the effectiveness was 48.2%, 54.1% - after 7 days and 72.3% - after 14 days. At the same time, the insects were treated by adding 2 ml of the drug B1 to 20 ml of water. The calculations showed that the results were 46.2% on day 3 of the experiment, 80.6% on day 7, and on day 14 - 95.2%. The insects were treated with the B1 preparation at 2 ml of it to 100 ml water ratio; from the calculations point ov view, the values of biological efficiency in 3 days was 45.7%, on day 7 of the experiment - 54.7% and in 14 days = 72.9%. For the purposes of identifying the limits of affecting, the efficiency at adding 2 ml of B1 preparation to 500 ml water in 3 days was 22.2%, in 7 days - 32.3% and on day 14 - 51.8%.Then treatment was conducted by adding 5 ml of C1 preparation to 500 ml water. In 3 days the 21.6%, on day 7 - 32.4%, and in 14 days - 51.0% efficiency was registered.

We used 1.8% Abamectin solution as a reference substance. We prepared a standard sample by adding 8 ml of the solution to 500 ml water. Treatment with the standard sample showed that on day 3 od the experiment the efficiency value was 44.85, on day 7 - 81.4% and on day 14 of observations - 95.2%. It was demonstrated that the highest efficiency value was achieved at the experiment when 2 ml of the preparation was resolved in 20 ml water to use against red spider mites. It was identified that using this preparation for agricultural crop fileds would meet the admitted criteria.

CHEMICAL CONSTITUENTS OF THE AERIAL PART OF THE *FERULA FOETIDA*

Aiya Sovetbek[1], Ayaulym Minkayeva[1], Aliya Nurlybekova[1,2], Janar Jenis[1,2]

[1]The Research Center for Medicinal Plants, Al-Farabi Kazakh National University, al-Farabi Ave. 71, Almaty 050040, Kazakhstan; janarjenis@kaznu.kz
[2]Research Institute for Natural Products & Technology, Almaty 050046, Kazakhstan;

Keywords: *Ferula foetida*, biological active constituents, macroelements, microelements

Ferula foetida is a type of Ferula that is used in traditional medicine widely. In Kazakhstan, they grow in four regions: Almaty, Zhambyl, Turkestan and the south of Kyzylorda. Their height can be reached in 2.5 – 3 m. The flowers and fruits usually appear in March-April and they need 4 – 5 years to give a seed before it dies.

In research work, we determined biological active constituents of *Ferula foetida* such us organic acids (0.155%), flavonoids (0.023%), coumarins (1.96%). In addition, we found moisture content (6%), total ash (0.1%) and extractive content (10.35%). Eleven macro and microelements from the ash of plant were identified by atomic absorption spectrometry method. The results showed that aerial part contains macroelements like K (2839.93 μg/ml), Ca (391.17 μg/ml), Na (332.7 μg/ml), Mg (183.14 μg/ml) and also microelements such us Fe (5.79 μg/ml), Zn (1.64 μg/ml), Mn (0.84 μg/ml), Cu (0.62 μg/ml).

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PHYTOCHEMICAL STUDIES OF BIOLOGICALLY ACTIVE SUBSTANCES OF THE AERIAL PART OF *Daphne altaica*

A. Musagalikyzy[1], Zh.Zh. Akzhigitova[1], Ye. Shybyray[1], J. Jenis[1]

*[1]The Research Center for Medicinal Plants of Al-Farabi Kazakh National University*e-mail: janarjenis@kaznu.kz, arailym.musagalikyzy@icloud.com*

Daphne is a genus of 70 to 95 species of deciduous and evergreen shrubs in the Thymelaeaceae family. *Daphne altaica* is a rare endemic species to the north of Jungar Basin of Xinjiang, Chine, Altai, Manrak and Tarbagatai Mountains of Kazakhstan, and Altai region of Russia, as well as northwest Mongolia. *D. altaica* is an insufficiently explored rare endemic species from East Kazakhstan. *D. altaica* is a medicinal herb used in traditional Kazakh medicine for the treatment of numerous diseases, including cancer of the digestive tract, tracheitis, common cold, sore throat, rheumatism and snakebite. The plant is known for its anticancer properties. The Kazakh added the peel of stem barks of *D. altaica* to lamb broth and drank it against cancer

In this work, the quantative and quantative analysis of phytochemical constituens of medicinal plant *Daphne altaica* from Kazakhstan has been made for the first time. Total bioactive components of *D. altaica* such as organic acids (0.24%), flavonoids (0.223%), coumarins (0.9848%) and together with moisture content (4.9%), total ash (4.27%), and extractives content (11.36%), were determined. Eleven macro-micro elements from the ash of the plant were identified, main contents of them were K (250.25mg/ml), Mg (78.565mg/ml), Ca (71.88mg/ml) by using the method of multi-element atomic emission spectral analysis. In addition, 20 amino acids and 8 fatty acids were studied from the plant. Glutamine (2360), asparatic acid (2360) and alanine (625) predominated among amino acids. Oleic (55.7) and linoleic (27.3) acids were contained in large amounts compared to other fatty acids.

PHYTOCHEMICAL STUDY AND BIOLOGICAL ACTIVITIES OF *ARTEMISIA ALBIDA* WILLD

Arailym Zhomartova[1], Aliya Nurlybekova[1, 2], Kunbike Baktybala[1, 2], Janar Jenis[1, 2*]

[1] The Research Center for Medicinal Plants, Al-Farabi Kazakh National University, al-Farabi Ave. 71, Almaty 050040, Kazakhstan;
[2] Research Institute for Natural Products & Technology, Almaty 050046, Kazakhstan;
janarjenis@kaznu.kz

A perennial plant growing in the mountains, rich in lignans, triterpenes, sesquiterpenes, alkaloids and steroids, *Artemisia albida* Willd plant has a high research potential and requires comprehensive study. In previous studies, qualitative and quantitative analysis was carried out for the first time, and a quantitative analysis of the total amount of biologically active components was carried out and moisture, total ash, organic acids, flavonoids, coumarins of the whole *Artemisia albida* Willd plant. [1,2,3,4]. The plant extract has substances that contribute to improving brain activity, contractile function of the heart and skeletal muscles, nerve conduction and the action of many hormones that play an important role in nutrition, protein structure, metabolism, signal transmission, hemostasis, enhance immunity, protect against the development of pancreatic and prostate cancer [3, 3].

As the standard of living increases, people are becoming more aware of the importance of medicinal plants. The MeOH extract of *Artemisia albida* Willd showed a high potential to inhibit α-glucosidase (55.8%), PTP1B (85.5%) and BNA (95.5%), the presence of these bioactive components may indicate that the plant has substances, antiviral nutraceuticals to fight diabetes, obesity and bacterial infections [4].

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STUDYING THE CHEMICAL COMPOSITION AND BIOLOGICAL ACTIVE CONSTITUENTS OF THE FERULA FOETIDA'S UNDERGROUND PART

Ayaulym Minkayeva[1], Aiya Sovetbek[1], Aidana Kudaibergen[1,2], Ulpan Amzeyeva[1,2], Jenis Janar[1,2*]

[1]The Research Center for Medicinal Plants, Al-Farabi Kazakh National University, al-Farabi Ave. 71, Almaty 050040, Kazakhstan; janarjenis@kaznu.kz
[2]Research Institute for Natural Products & Technology, Almaty 050046, Kazakhstan;

Kazakhstani nature stands out with its distinctive and peculiar flora that have beneficial therapeutic properties and *Ferula foetida* is one of the plants with useful qualities. Anti-flatulent, antibacterial, antiviral, antifungal, anti-ulcerogenic, antidiabetic, and anti-hepatotoxic qualities are only a few of the pharmacological effects that are present in it [1]. An extract of *Ferula foetida* at a concentration of 100 mg/mL showed the maximum activity and was substantially more active than typical medications, according to Indian researchers studying anti-helmintic action [2].

The study presents the findings of a quantitative investigation of *Ferula foetida's* root, which included an examination of the compositional substituents and phytoconstituents of the major organic groups. The extractive material content of *Ferula foetida* is 22,69%, flavonoids are 0,237%, polysaccharides are 2,8%, alkaloids are 1,34%, and tannins are 8,5%. The atomic absorption spectrometry method was used to identify eleven macro and micro components from plant root ash. It demonstrated that root ash has higher concentrations of macroelements like K (141,45 g/ml), Ca (560,640 g/ml), and Na (158,08 g/ml) and microelements like Fe (11,826 g/ml), Mn (2,4748 g/ml), and Cu (0,9230 g/ml). The State Pharmacopoeia of the Kazakhstan Republic's approach was used to conduct the quantitative analysis. This study will proceed to further investigate the chemical composition and active phytoconstituents of the underground part of *Ferula foetida* plant.

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CHEMICAL COMPOSITION OF THE PLANT *PRANGOS PABULARIA* GROWING IN THE SOUTH OF KYRGYZSTAN

Mamyt kyzy Kyzsaykal, Talantbek kyzy Tamara, Zyinat Boronova, Bakyt Keneshov

OSHSUOsh, Kyrgyzstan
e.mail:keneshovbakyt@mail.com

Annotation: In the southern region of Kyrgyzstan, the plant Prangos pabularia is widely distributed, and has a valuable forage, medicinal, honey-bearing, soil-protective and water-regulating value. But the chemical composition is very poorly understood. Based on this, the roots of the Prangos pabularia plant after the growing season from the Kara-Shoro National Park of the Uzgen district were used as the object of research. As a result, two individual compounds were isolated and identified with previously isolated substances from plants of other species of the umbrella families.

- Root extraction was carried out with ethanol.
- To isolate individual compounds, the following methods were used: fractionation by polarity, column chromatography (KX) using silica gel of the KSK brand as an adsorbent.
- Fractions were collected in 20-100 ml, the uniformity and purity of the fraction was checked by thin-layer chromatography (TLC) on plates "SilifolUV-254" produced in Sweden in the hexane-ethyl acetate system.
- The melting point was determined visually, the rotation angles were obtained on the polarimeter PolamatA.

Conclusions:

1. The coumarin composition of the roots of Prangos pobularia growing in the South of Kyrgyzstan has been studied.
2. As a result of studies of the chemical composition of prangos roots, 2 individual compounds were identified: substance I and substance II.
3. The physicochemical constants and chemical properties of the isolated substances were determined, as a result, they were identified with previously known compounds: substance I - karatavicin, substance II–fecalone.

THE STATE OF LIPID METABOLISM IN OLD RATS IN HIGH ALTITUDE CONDITIONS AGAINST THE BACKGROUND OF THE USE OF COENZYME Q10

Gulbarchyn Asrankulova, Zhyldyz Makhmudova

Kyrgyz State Medical Academy named after. I.K. Akhunbaeva, Bishkek, Kyrgyzstan. Department of Biochemistry with the course of general and bioorganic chemistry named after A.J. Dzhumalieva.
email: gul996778@bk.ru

Annotation. It is known that in conditions of high mountains, the body is affected by extreme factors of high mountains, which accelerate the aging process and reduce life expectancy. In this regard, it becomes necessary to search for ways and methods of drug therapy in order to increase the duration and quality of life, since the action of many pharmacological drugs in a mountainous climate is manifested specifically. Coenzyme Q10 was used as the studied antioxidant.

The experiments were carried out on 24 laboratory rats aged 15-18 months weighing 300-350g in low mountains (in the Intersectoral Educational and Scientific Center for Biomedical Research of the Kyrgyz State Medical Academy named after I.K. Akhunbaev, Bishkek, 720 m above the level sea), and on the 30th day of the stay of animals in high mountains (Too-Ashuu pass, 3200 m above sea level).

In conditions of low mountains and on the 30th day of the stay of animals in conditions of high mountains, the animals were divided into the following groups:

1 - intact group of old rats located in the low mountains.

Group 2- is old rats that have undergone 30 days of adaptation in high altitude conditions.

Group 3 - a group of old rats that received coenzyme Q10 orally at a dose of 30 mg/kg of body weight 1 time per day for 30 days during a meal.

Conclusion. After a 30-day adaptation of old rats in high altitude conditions, compared with old low mountain rats without drug treatment, there was a decrease in cholesterol levels from 4.24±0.24 to 2.24±0.27 mmol/l ($p<0.00$) . triglycerides from 1.18±0.12 to 0.85±0.07 mmol/l ($p<0.04$), HDL fractions from 1.42±0.16 to 0.97±0.07 mmol/l ($p <0.03$), LDL fraction from 2.92±0.29 to 1.53±0.16 mmol/l ($p<0.00$).

After treatment with coenzyme Q10 in 30-day-old adapted old rats, cholesterol decreased from 2.24±0.27 to 1.63±0.14 mmol/l, triglycerides slightly and not significantly decreased from 0.85±0.07 to 0, 77 ± 0.05 mmol / l, fractions HDL remained almost unchanged from 0.97 ± 0.07 to 0.94 ± 0.05 mmol / l, fractions LDL decreased from 1.53 ± 0.16 to 1, 01±0.13 mmol/l ($p<0.03$).

CHEMICAL COMPOSITION OF HEXANE EXTRACT OF CALLUS CULTURE AND REGENERANTS OF THE MEDICINAL PLANT *NIEDZWEDZKIA SEMIRETSCHENSKIA*

Sarsenbek B.T.[1], Bobakulov Kh.M.[2], Sanoev A.I.[2], Mursaliyeva V.K.[3], Turasheva S.K.[1], Sagdullayev Sh.Sh.[2]

[1]Al-Farabi Kazakh National University, Almaty, Republic of Kazakhstan, e-mail: s.balausa.s@mail.ru, Tel. +77077015628
[2]Institute of the Chemistry of Plant Substances named after academician S. Yu. Yunusov of the Academy of Sciences of Uzbekistan, Tashkent, Republic of Uzbekistan
[3]Institute of plant biology and biotechnology, Almaty, Republic of Kazakhstan

Medicinal plant *N. semiretshenskia* B. Fedtsch *(Incarvillea niedzwedzkia)* is a representative of the *Bignoniaceae* family and belongs to a relict endemic species listed in the Red Book of Kazakhstan and the Red Book of the International Union for Conservation of Nature and Natural Resources.

Chemical studies have shown that species of the genus *Incarvillea* are rich sources of secondary metabolites with anti-inflammatory and antinociceptive activity. In this regard, volatile compounds of the species *N. semiretschenskia* have not been studied in natural conditions and in culture.

The purpose of this work is to study the chemical composition of hexane extract of this species cultivated *in vitro*.

Hexane extract from callus and regenerant plants of *N. semiretschenskia* was obtained at a temperature of 20°C for 4-5 hours. The resulting extract was filtered over anhydrous Na_2SO_4 and stored at 4°C in a tightly closed vial before analysis. The obtained *N. semiretschenskia* oils are a pale yellow mobile liquid with a specific odor (the yield from the callus is 0.82%, from regenerate plants 0.74%).

The obtained extracts were analyzed on an Agilent 7890A GC gas chromatograph with an Agilent 5975C inert MSD quadrupole mass spectrometer as a detector. The components of the mixture were separated on a quartz capillary column HP-InnoWax (30 m × 250 μm × 0.25 μm). The volume of the introduced sample is 1 μl (hexane), the flow rate of the mobile phase was 1.0 ml/min. The components were identified based on a comparison of the characteristics of the mass spectra with data from the electronic libraries W8N05ST.L and NIST08.

As a result of the analysis of hexane extract from regenerating plants, 16 compounds were identified, of which the major compounds are nonacosane (24.5%), dodecane (22.8%), clionasterol (10.4%), triacontane (9.3%), heptadecane (7.6%), undecane (6.3%), palmitic acid (2.9%), linoleic acid (2.9%), ethyl 9,12,15-octadecatrienoate (2.4%), heptacosane (1.4%), amounting to 90.5%. 18 compounds were identified from callus, such as: 9,12-octadecadienoic acid (17.8%), hexadecanoic acid (10.9%), β-sitosterol (26.4%), cis, cis, cis-7,10,13-hexadecatrienal (9.4%), 5,12-naphthacenedione (6.8%), squalene (6.8%), hexatriacontane (3.5%), octadecane (3.4%), eicosane (3.1%), hexadecane (1.6%), hexacosane (1.5%), amounting to 91.2%.

Further phytochemical studies of extracts from callus biomass in dynamics and comparative chemical analysis of test tube regenerants and plants grown in a greenhouse are planned.

INFLUENCE OF L-ARGININE ON LIPID METABOLISM IN EXPERIMENTAL ATHEROSCLEROSIS AND MORPHOLOGICAL CHARACTERISTICS OF THE MYOCARDIA IN ANIMALS

Nuriza Akynbekova, Zhyldyz Makhmudova

Kyrgyz State Medical Academy named after. I.K. Akhunbaeva, Bishkek, Kyrgyzstan. Department of Biochemistry with the course of general and bioorganic chemistry named after A.J. Dzhumalieva, e-mail:nuriza.akynbekova@bk.ru

Relevance. On a global scale, morbidity and mortality from cardiovascular diseases occupies a leading position among the most common non-communicable diseases, which is also typical for Kyrgyzstan. The main cause of death among the population from coronary heart disease is atherosclerosis. The accumulation of cholesterol in the walls of blood vessels in the form of plaques is a violation of lipid metabolism.

Purpose of the study. The study of lipid metabolism and myocardial morphology in rabbits before and after atherosclerosis modeling against the background of the use of L-arginine as a donor of nitric oxide.

Materials and methods. 18 rabbits were divided into 3 groups: group 1 - intact animals; group 2 - animals with simulated atherosclerosis (oral administration of cholesterol at a dose of 500 mg/kg of body weight 1 time per day for 60 days); group 3 - animals with simulated atherosclerosis on the background of the use of L-arginine (oral administration at a dose of 170 mg/kg of body weight 1 time per day for a month). To study the morphology of the myocardium of rabbits, micropreparations 5-6 microns thick were made, the sections were stained with hematoxylin - eosin. A comparative assessment of the histological picture was carried out before and after atherosclerosis modeling, as well as after L-arginine therapy.

Research results. After modeling atherosclerosis in the blood of rabbits, there was a significant increase in the level of CL from 3.97 ± 0.07 to 12.2 ± 2.3 mmol/l ($p < 0.01$), TG from 1.38 ± 0.1 to 6 .95 ± 1.1 mmol/l ($p < 0.005$), LDL fractions from 2.4 ± 0.1 to 6.76 ± 0.8 mmol/l ($p < 0.003$), an insignificant increase in the level of HDL fractions with 0.98 ± 0.03 to 1.41 ± 0.2 mmol/l, at $p \leq 0.1$.

After treatment of animals with atherosclerosis with L-arginine in the blood serum, there was a decrease in the level of CL from 12.2 ± 2.3 to 5.28 ± 0.4 mmol/l ($p < 0.03$), TG from 6.9 5 ± 1 .1 to 0.83 ± 0.06 mmol/l ($p < 0.003$), LDL from 6.76 ± 0.8 to 3.29 ± 0.2 mmol/l ($p < 0.008$), a decrease in the level was also noted HDL from 1.41 ± 0.2 to 0.9 ± 0.06 mmol/l ($p < 0.08$).

Conclusions. As the results of our study showed, experimental atherosclerosis was accompanied by a significant increase in the level of total cholesterol, triglycerides, high and low density lipoproteins in the blood of animals.

As a result of morphology, thickening of the intima, deposition of cholesterol, fat cells and increased proliferation of connective tissue with the subsequent development of atherosclerotic plaques in the intima were revealed. After treatment with L-arginine in rabbits, there is a decrease in cholesterol deposition, there is a tendency to reduce the progression of atherosclerosis.

Contents

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