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Pacing medicine platform for pumpkin and its relations (excerpt from the review to be published in KazNU Newsletters, Ecology, 2018)

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Pumpkin and other plant species (*Cucurbita pepo, Amaranthus dubius, Vigna unguiculata*) have been implied against obesity in Kenya. Recent studies were concentrated on the antiobesity activity of leaf organic extracts from in progesterone-induced mice with overweight (Nderitu et al., 2017). This activity was identified by bioscreening in progesterone-induced obese mice at 200mg/kg and 400mg/kg. Body mass index was calculated once a week for 30 days. Blood samples were subjected to the lipid profiling. Antiobesity plant extracts were compared to the controls. Leaf extracts of C. pepo and other plants revealed significant effects on body mass reduction. At concentration of 200 mg/kg weight gain has been observed at the level of 2.7%, whereas at 400 mg/kg weight loss has been determined to be around 0.3%. No significant difference of the three plant extracts was noticed by the lipid composition. Plant extracts contained a range of phytochemicals including saponins, flavonoids, alkaloids, and steroids. Thus pumpkin among other plants under investigation were recommended for effective management of obesity.

Carotenoids possess diverse biological effects functioning as antioxidants preserving eye tissues from damaging free radicals. Main source of carotenoids is plant food, and the carotenoid abundance in plasma is essential for maintenaining tissue viability in the long run. Pumpkin, zucchini squash, and yellow squash together with some other plant and egg sources may be regarded as major sources of carotenoids. In the middle of 1990s it was suggested that by consuming these vegetables, which are rich in carotenoids, people may decrease the risk of age-related macular degeneration. The goal of those studies (Sommerburg et al., 1998) was to ascertain those fruits and vegetables which would contain abundant lutein and/or zeaxanthin to serve as putative dietary supplements for these carotenoids. Homogenates of 30 fruits and vegetables, two fruit juices, and egg yolk, completed by homogenized pumpkin, zucchini squash, and yellow squash mesocarps (fleshes), were used to obtain the carotenoids by hexane extraction. Carotenoid factions and their isomers were indicated by high performance liquid chromatography with a single column eluted in an isocratic mode. Though the egg yolk and maize (corn) revealed the highest percentage of lutein and zeaxanthin (over 85% of the total carotenoids), substantial amounts of lutein and zeaxanthin (30–50%) were shown for squashes, zucchini (vegetable marrow), kiwi fruit, grapes, spinach, and orange juice. Maize was referred to possess the largest amount of lutein (60% of total), whereas orange pepper - the highest zeaxanthin (37% of total). These outputs show that there are squashes and other plant fruits with a high carotenoid content. So squashes and other fruits and vegetables are advised to enrich dietary intake of lutein and zeaxanthin. Authors emphasized that taking into consideration a fivefold higher concentration of lutein and zeaxanthine in the macula compared with the peripheral retina, such strategy of food consumption or dietary supplementation may prevent macular degeneration.

On the other hand, a number of investigators have reported growing susceptibility to nematodes in both humans and livestock. Grzybek et al. (2016) conducted a special study to assess the in vitro and in vivo anthelmintic effect of *Curcubita pepo* L. For this aim hot water extract (HWE), cold water extract (CWE) and ethanol extract (ETE) have been examined on two model species of nematodes, *Caenorhabditis elegans* and *Heligmosoides bakeri*. Raman, IR and LC-MS spectroscopy analyses were carried out on plant material under investigation to collect qualitative and quantitative data on the composition of the obtained HWE, CWE and ETE extracts. The in vitro activity has demonstrated the impacts of C. pepo extracts on C. elegans and various developmental stages of H. bakeri. The following in vivo experiments on mice infected with H. bakeri confirmed inhibitory properties of the ETE as the most active pumpkin extract selected by the in vitro study. All of the extracts were detected to contain cucurbitine, aminoacids, fatty acids, and berberine and palmatine. The latter two substances were revealed for the first time. All C. pepo seed extracts showed a nematidicidal property in vitro, specifically affecting viability of the larvae, L1 and L2, of H. bakeri. The ETE was the strongest and demonstrated a positive effect on H. bakeri oviposition (eggs hatching) and marked inhibitory effect on the worm motility comparing to a PBS-buffered control. No significant effects of pumpkin seed extracts on C. elegans integrity or maneuverability were indicated. The ETE in the in vivo experiments manifested anthelmintic properties while both H. bakeri fecal egg counting and adult worm burdens calculating. The most substantial egg number reduction was observed at the concentration of 8 g/kg dose (IC50 against H. bakeri = 2.43; 95% Cl = 2.01–2.94). Dropping of faecal egg counts (FEC) was accompanied by a significantly lowered worm burdens of the treated mice compared to the control cohort. Thus the alcohol and the water pumpkin seed extracts may be used to administrate gastrointestinal (G.I.) nematode infections. This cheap alternative to the currently available chemotherapeutic should be regarded as a powerful curative candidate in the short run. The researchers predict new extensive methods for extract stabilization, preservation, and formulation.

Do *Cucurbitaceae* spp. may be involved in controlling the process of aging? Recent study reported by Martínez-Valdivieso et al. (Martínez-Valdivieso et al., 2017) stresses that zucchini (*Cucurbita pepo* subsp. *pepo*) is a seasonal vegetable with high nutritional and medical values. A number of useful properties of this fruit were attributed to bioactive compounds. Zucchini fruits (cvs. "Yellow" and "Light Green") and four distinctive components (lutein, beta-carotene, zeaxanthin and dehydroascorbic acid) were chosen for observations. Initially, the lutein, beta-carotene, zeaxanthin and dehydroascorbic acid concentrations were detected in fruits of these cultivars. To assess the safety and suitability of fruits, different assays were performed: (i) genotoxicity and anti-genotoxicity tests to indicate the safety and DNA-protective features to hydrogen peroxide; (ii) cytotoxicity; (iii) DNA cleavage (fragmentation) and Annexin V/PI (Propidium Iodide) assays to ascertain the pro-apoptotic effect. These experiments showed that: (i) all the substances were non-genotoxic; (ii) moreover, these substances revealed anti-genotoxicity except high lutein concentrations; (iii) "Yellow" zucchini epicarp and mesocarp were detected to possess the maximum cytotoxic index (IC50 > 0.1 mg/ml and 0.2 mg/ml, respectively); and (iv) "Light Green" zucchini skin enzymes induced inter-nucleosomal DNA fragmentation, and beta-carotene served as the putative molecule evoking pro-apoptotic activity. So zucchini fruit could positively effect human health and nutrition, since its components were found to be safe, able to impair substantially the H2O2-induced damage and demonstrate anti-proliferative and pro-apoptotic activities among tumor cells (namely HL60 human promyelocytic leukemia cells). Valuable information generated by this study should be taken into consideration while selecting potential resources for Cucurbitae breeding programmes, and designing anti-aging programmes for humans, livestock and other animals of interest.

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