BOOK OF ABSTRACTS

3rd Conference of Cereal Biotechnology and Breeding

November 2–4, 2015 • Berlin, Germany

Poster Presentations – Abstracts

Biotic and Abiotic Stresses

IDENTIFICATION OF WHEAT GERMPLASM RESISTANT TO CADMIUM FOR GROWING ON CONTAMINATED SOILS

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Keywords: wheat, heavy metals, metal resistant germplasm, physiological parameters, promising forms

Use and development of varieties that are resistant to pollutants, especially to heavy metals, is a constituent part of environmentally-friendly technologies which allow receiving clean agricultural products on contaminated soil. Plants, grown in contaminated soils, exhibit significant interspecies differences in responses to pollution. The available literature data showed the significant positive correlation between the concentration of heavy metals in the grain and genotypes, indicating the possibility of breeding varieties with a low potential for accumulation of heavy metals [1]. We investigated different genotypes of winter wheat in the East Kazakhstan agrocenoses to evaluate the accumulation of such a priority for the region pollutant as cadmium. Field studies were carried out for the determination of physiological parameters. Heavy metals in soil and in plant samples were determined by atomic absorption spectrophotometry. Determination of the content of this metal in the soil of rhizosphere of studied genotypes showed that the amount of cadmium exceeded the MPC for soil. Investigation of the distribution of cadmium in the organs of winter wheat showed that it accumulates mainly in roots and leaves, it is also present in the stems and seeds. Cadmium is a toxic element, and therefore, the presence of this metal in food is a problem for food security. The reduction of cadmium in the grain is one of the priorities of breeding programs [2]. Estimation of cadmium accumulation in seeds of investigated genotypes showed that the amount may exceed the MPC for seeds and the number of investigated heavy metal depends on the genotypic features of the variety. Cadmium content in seeds of winter wheat varieties Ming-2 and Komsomolskaya 56 do not exceed the MPC for the grain. These varieties can be recommended for further use in breeding for resistance to cadmium. Winter wheat variety Ming-2 is a promising variety – it accumulates little amount of cadmium, has a good development, overwintering, yield, and it can be recommended for growing in contaminated soils. Screening of spring wheat varieties in the laboratory conditions allowed to reveal metal resistant forms. These varieties can be used for research in the field to identify the most promising forms that combine resistance to adverse environmental conditions and productivity.

References

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GENETIC VARIABILITY ON GRAIN ZINC CONCENTRATION OF ADVANCED MUTANT LINES OF SPRING WHEAT OBTAINED THROUGH GAMMA IRRADIATION AND THEIR EVALUATION FOR YIELD-ASSOCIATED TRAITS

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Keywords: zinc enriched mutant M_5 lines of spring wheat

Bread wheat (*Triticum aestivum* L.) is a staple crop with global economic importance and is a major cereal in both human and animal nutrition. It is a major crop that supplies the bulk of nutrients in the diet, therefore genetic enhancement with more of this micronutrient is one of the most cost-effective ways of solving the global micronutrient malnutrition problem Zinc (Zn) deficiency associated with low dietary intake is a well-documented public health problem, resulting in serious health and socioeconomic problems. It is known that genotypic variation for grain Zn concentration among wheat cultivars relatively low. Induced mutation is a powerful tool for crop improvement. Seeds of the spring bread wheat variety Almaken (*Triticum aestivum* L.) were irradiated with 100 and 200 Gray doses from a ^{60}Co, source at the Kazakh Nuclear Centre. Promising advanced M_5 mutant lines were obtained and evaluated for yield components traits such as grain number and weight per main spike, grain weight per plant and TGW and grain quality associated trait, zinc concentration.

Mutant lines showed wide variation in grain weight per plant (GWP) and thousand grain weight (TGW). Ten of the mutant lines (33.3%) showed significantly higher values for this trait than non-mutagenic cv. Almaken. Nineteen of the lines (63.3%) were characterized by significantly higher values for TGW than non-mutagenized variety. Three of the mutant lines and six of the mutant lines showed significantly higher values for three (grain number per main spike, GWP and TGW) and two of the lines (GWP and TGW) traits, respectively, than non-mutagenic cv. Almaken.

Considerable variation for grain zinc concentrations with a means of 3.4 to 45.0 mg/kg (mean = 23.35 ± 10.8 mg/kg; $n = 30$) was found in the M_5 mutant lines. A significantly enhanced grain zinc concentrations relative to cv. Almaken were identified in fifteen M_5 lines (50.0%). In these lines grain zinc concentrations exceeds 1.6 to 3.8 times as compared with cv. Almaken parental line. Eight of the single mutant lines showed positive correlation between grain zinc concentrations and yield component TGW ($r = 0.45–0.99$). Hence, these mutant lines could be used as a donor parents in a breeding program and some of them can be recommended as candidates for new wheat varieties in Kazakhstan.