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REVIEW

on the doctoral dissertation of Zhirnova Irina Aleksandrovna on the topic:
"Creation of promising glutinous forms of proso millet using molecular-genetic markers",
submitted for obtaining of the degree of Doctor of Philosophy (PhD) in the educational program
"8D08101-Genetics and breeding of agricultural crops».

Proso millet (Panicum miliaceum L.) is a valuable cereal and forage crop, capable of growing and producing profitable yields even under conditions of insufficient hydration. Proso millet is an allotetraploid with functional diploidy and its genomic composition has not yet been studied. It is a crop with a short growing season, cultivated in arid regions of Asia, Africa, Europe, CIS countries, Australia and North America.

Proso millet cereal is on a par with rice and buckwheat cereal in the terms of nutrition. Proso millet porridge is characterized by high flavor and nutritional qualities. It contains about 81% starch, 12% protein, 3,5% fat, 1,45% ash, 1,04% fiber and 0,15% sugar. In addition, proso millet flour is made of proso millet, it can be used pure or mixed with rye flour for improving its nutritional quality. Due to the high starch content in the grain, proso millet is also used in the alcohol industry. In Kazakhstan, Russia and India, the breeding of this crop is primarily aimed at high yield, grain size, yellow coloring of seeds (high content of carotenoids), and is mainly conducted on morphological and biological traits. In the countries of Southeast Asia, the selection criteria are both high yield and qualitative characteristics of grain related to processing technology, preparation of semi-finished products, dietary nutrition: low content of amylose and tannin in grain, digestibility, bioavailability of nutrients.

Modern plant breeding is impossible without combining traditional and marker-oriented screening methods of both initial collection material and new hybrid populations, lines, varieties in the terms of high yield, resistance to biotic and abiotic stress factors, and quality performance of plants products. According to the use in agricultural production, proso millet can be divided into cereal and forage directions, as well as the creation of special purpose varieties. Special purposes varieties relate to the chemical composition of starch which can entirely consist of amylopectin or entirely of amylose. The objective of this dissertation work is to create glutinose

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forms of proso millet on the basis of traditional breeding combined with the molecular genetic methods.

The dissertation of Zhirnova I.A. is a completed high-quality scientific independent work, performed at high scientific and methodological levels. The doctoral candidate personally evaluated the initial plant material on morpho-physiological and economically valuable traits of initial collection samples of proso millet, selected the parental forms, selected the most suitable method of hybridization for proso millet, identified the glutinous samples using biochemical and molecular-genetic analysis of varieties and obtained the hybrid plants. The doctoral candidate directly participated in the collection and the analysis of initial data, the scientific research, the approbation of research results, the preparation of the main articles on the subject.

Because of the COVID-19 pandemic Irina Zhirnova realized her internship at the Kazakh Research Institute of Agriculture and Plant Growing, in the laboratory of biotechnology, physiology, biochemistry of plants and product quality assessment. As a result of the internship, she learned the method of protein certification applied to proso millet crop, the recording of electrophoretic spectrum in the form of "protein formula" for its further use in identification and registration of varieties, biotypes and lines.

In collaboration with her foreign consultant Professor Bai-Li Feng the doctoral candidate published an article in the Chilean Journal of Agricultural Research included in the Web of Science and Scopus databases (62% percentile). Also, the results obtained during the research were reported at the international scientific conferences and in the national scientific journals recommended by the Quality Assurance in the Sphere of Education of the Ministry of Education of the Republic of Kazakhstan.

Based on the foregoing, I consider that the dissertation of Zhirnova I.A. on the topic "Creation of promising glutinous forms of proso millet using molecular genetic markers", fulfills all the requirements and can be recommended for defense for obtaining the degree of Doctor of Philosophy (PhD) in the educational program "8D08101-Genetics and breeding of agricultural crops".

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