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EVALUATION OF SPRING WHEAT VARIETIES OF CHINESE SELECTION FOR PRODUCTIVITY IN THE DRY-STEPPE ZONE OF NORTHERN KAZAKHSTAN

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The climate in Northern Kazakhstan is characterized by a severe lack of moisture during the growing season, and over the past 13 years the dynamics of increasing drought years is not at all in the direction of farmers working the land and cultivating cultivated plants. The frequency of droughts has increased by a factor of 1.5 compared to previous years of the 20th century [1].

The main areas of agricultural crops here in the north of Kazakhstan, continues to occupy spring wheat. At the same time the average yields of approved varieties of this crop in the production, in the best case stands still, and in some years rapidly decreases, being in the range from 9 to 13 c/ha. The genetic diversity of spring wheat varieties is also decreasing [2].

To increase productivity, resistance to stress factors and generally enrich the genetic diversity of spring wheat in Kazakhstan, there is a need to involve new genetic material in the breeding process. Foreign genotypes, which are the result of modern breeding achievements of their country, are a good source material here [3].

In this regard, China is not only considered one of the largest producers of spring wheat, but also, because of its large population, a large consumer of the crop. Among all major cereal crops, wheat is the 3rd most used crop in China, behind only rice and corn. The products made from spring wheat are considered to be the main consumed crop in northern China. Its use in the southern regions of the country is also increasing rapidly [3]. Talking about spring wheat breeding, it has been 70 years in China to improve grain yield, grain quality, stress tolerance and adaptability [4]. Breeders have paid special attention to spikelet eariness and coarseness of spring wheat varieties. In addition to increasing the elements of productivity, Chinese breeding scientists aim to develop varieties with a high degree of resistance to stress conditions, particularly drought [5]. On this basis, varieties of Chinese breeding are considered promising source material for creation of new varieties in Northern Kazakhstan.

Materials and research methodology. The publication presents 5-year data on evaluation of 6 varieties of Chinese breeding for productivity in the conditions of dry-steppe zone of Northern Kazakhstan. Planting of samples, as well as

phenological observations and accounting were carried out according to VIR methodology. The samples were sown by hand, the area of plots was 1 m2, in 2-fold replications. All replicates were arranged in a randomized manner. Seeding rate was 3 million germinated seeds per hectare. Astana and Akmola 2 were used as standards for different ripeness groups. Mathematical data processing was carried out according to the recommendations of Dospekhov B.A. [6].

Soil and climatic conditions of the research. The field trials were conducted from 2018 to 2022, on the basis of the field stationary of KATU named after Saken Seyfullin KGH "Niva", Akmola region. This area is located in the dry steppe zone of Northern Kazakhstan. The soils in the field stationary area are mainly dark chestnut soils and the content of humus compounds varies within 2.5-2.7%. The area is characterized by sharply continental climate. A distinctive feature of the sharply continental climate is the severe climate in winter. The number of frost-free days' ranges from 100 to 125 days. The distinctive feature of the climate is an uneven distribution of precipitation during the growing season, with recurrent droughts. Atmospheric droughts are accompanied by strong winds. The earliest droughts and dust storms occur at the end of April and also at the beginning of May. This causes a lack of moisture and increases the frequency of drought recurrence [7]. For the period of research activities aimed at evaluating spring wheat varieties, climatic data from the closest weather station, Akmol, were studied and analyzed. Air temperature and precipitation data were studied for 5 years. The wettest year was 2020, where 201 mm of precipitation fell during the growing season, exceeding the annual average of +36 mm. A moisture deficit was noted in 2019, with 83.4 mm of precipitation for the entire growing season, 81.6 mm below the annual average. Throughout 2018 to 2022, the occurrence of spring drought was noted. Thus, in 2018, the amount of rainfall for the entire month of May was only 6.7 mm. It is worth noting that the annual average for this month is 31 mm of precipitation. Also lacking in moisture was 2019, in which in addition to the spring drought, there was a severe prolonged summer drought. There was 5.7 mm of rainfall in July and 15.1 mm in August, which was significantly inferior to the annual average with 52 mm of rainfall in July and around 41 mm in August. The hydrothermal coefficient during the 2019 growing season was 0.47, indicating low moisture levels. In terms of atmospheric temperature, the highest indicator was recorded in 2020 and 2021, with an average air temperature of 20 C for the entire growing season. The lowest atmospheric temperature was recorded in 2018 at 15.7 ^{o}C. Meanwhile, the average for the growing season was 15.9 ^{o}C.

Survey results. Based on phenological observations, all varieties of Chinese selection were divided into two ripeness groups: early-ripening and mid-ripening. The following varieties were classified as early-ripening: Xn-03, Xn-04, Xn-08. These varieties of spring soft wheat were compared with Astana standard. The varieties Xn-09, Xn-10, Xn-13 showed themselves as mid-ripening by the growing season, and the comparison of all indicators was carried out with the standard variety Akmola 2.

According to the results of the study, it was noted that the samples have high productive bushiness. For example, average productive bushiness of Xn-08 in

average for 5 years of study is 1.94, which is higher than productive bushiness of Astana variety 1.9 by +0.4. The highest productive bushiness in the Xn-08 sample was in 2022 with 2.3. Among the early maturing group, the lowest rate of productive bushiness in 5 years was noted in the sample Xn-04 and is 1.42, lower than the standard of 0.48. Among the middle maturity group, the highest productive bushiness index was noted in variety Xn-09, productive bushiness of which is 1.82, exceeding the standard of Akmola 2 by 0.28. The highest productive bushiness of this variety was recorded in 2022 at 2.0. Among the medium maturity group, the lowest rate of productive bushiness was noted in the variety Xn-13 and was 1.52 for the 5-year research period.

Also varieties of Chinese selection were marked by coarseness. The average index of 1000 seeds in the standard variety Astana in the early maturing group was 33.6 g. In turn, the early maturing variety Xn-08, a mass of 1,000 grains averaged 41.2 g, the deviation from the standard of +7.8 g. The smallest index of 1000 grains among early maturing varieties of Chinese selection was noted in Xn-03 - 41.18 g, but even in this variety 1000 grains exceeded the standard Astana 7.6 g. The coarseness in the middle-season group differed variety Xn-09 - 42,18 g, the deviation from the standard Akmola 2 made +4,78 g.

The indicators of productivity varieties of Chinese selection, in particular productive bushiness, coarseness, allowed these foreign genotypes to form a fairly high level of productivity in the dry steppe zone of Northern Kazakhstan. The average yield of early maturing variety Xn-08 averaged 373.2 g/m^2 over 5 years of research, exceeding the indicator of the variety Astana by 35.6 g, with the highest manifestation in 2019 - 441.6 g/m2. Among the medium-ripening group, the variety Xn-09 was noted, with an average yield of 323.6 g/m^2, 10.6 g/m2 higher than the variety Akmola 2, which had a yield of 313.0 g/m2. The other varieties of the Chinese selection did not exceed the yield of the standards. The lowest yield in the early maturing group differed pattern Xn-03, the average yield for the year was 250.4 g/m2, the deviation from the standard Astana - 87.2 g/m^2. In the middle-ripening group less productive was the variety Xn-10, the average yield over 5 years of field studies was 244.3 g/m^2, with a deviation from the standard -68.7 g/m^2. Despite of low productivity, these genotypes are good starting material in selection for coarseness.

Conclusion. Field trials to evaluate spring soft wheat varieties of Chinese selection were conducted from 2018 to 2022. These years were characterized by drought conditions, with the most severe drought occurring in 2019. As a result, based on 5-year data, samples Xn-08 and Xn-09 were highlighted as the most productive under drought conditions. Yields in Xn-08 and Xn-09 varieties averaged 373.2 g/m2 and 323.6 g/m2, respectively, for each year. The high yields of Chinese varieties were formed mainly due to high productive bushiness and coarseness. This breeding material can be recommended as a valuable starting material for the improvement of spring wheat in terms of productivity in the dry-steppe zone of Northern Kazakhstan.

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