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# SELECTION OF HIGH-POTENTIAL SPRING WHEAT GENOTYPES ACCORDING TO VEGETATIVE DURATION AND YIELD CHARACTERISTICS IN THE ARAL SEA REGION CONDITIONS

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**ABSTRACT.** In this study, the issue of identifying promising forms of spring wheat genotypes under the conditions of the Aral Sea region is studied based on the vegetation period and yield indicators. The growth and development of various genotypes, phenological stages, and fruit elements are analyzed. Based on the research results, scientific and practical recommendations will be developed for selecting high-yielding and stable varieties suitable for local climatic conditions.

**Keywords.** Spring wheat, genotypes, growing season, yield, conditions of the Aral Sea region, promising varieties, phenological stages, growth and development, breeding, agro-ecological conditions

**Introduction.** Wheat (Triticum aestivum L.) is among the most significant cereal crops globally, with an average yearly production of about 704 million tons and covering nearly 17% of the world’s cultivated land. In recent years, rapid fluctuations in air temperature have adversely influenced the morphological, physiological, biochemical, and molecular characteristics of wheat, resulting in reduced productivity. Consequently, the development of high-yielding varieties with tolerance to abiotic stresses, along with the assessment of their genetic resources under diverse environmental conditions, has become increasingly important.

In the southern part of the Aral Sea region, 63.7% of the lands designated for agriculture are arable, and due to water scarcity, efficient irrigation and water-saving practices are a pressing issue [1]. Wheat (Triticum aestivum L.) occupies a leading position in terms of cultivated area worldwide, providing nearly 20% of food industry products, which highlights its great importance [2]. Spring wheat is sown in regions where winter temperatures are severely low. In such conditions, wheat sown in autumn can be destroyed by severe cold. [3]. In contrast, spring wheat is sown after the harsh winter frosts have passed. Spring wheat generally yields less than winter wheat on rainfed and irrigated lands. However, if cultivated following advanced agrotechnical practices, spring wheat can produce a significantly higher yield [4].

According to A. Amanov (2001), the main focus of international centers operating under national programs is to study the heat tolerance of cereal crops [4] . This is due to the sharp rise in temperatures during the summer months, which negatively affects cereal crop yields.

Materials and Methods. The experiment was carried out in the field of the Aral Sea International Innovation Center (geographical coordinates: 42.520600, 59.582400). Spring wheat genotypes were chosen for the research, and sowing was performed on March 16–17, 2025. Throughout the growing season, the agro-climatic conditions of the region were carefully observed. No rainfall was recorded in April, while the average air temperature in May reached 27 °C. In June, abnormally high temperatures caused a slight reduction in the ripening period of the spring wheat samples.

**Experimental samples:** The research included local spring wheat varieties, advanced-generation hybrids, and breeding lines obtained from the International Maize and Wheat Improvement Center (CIMMYT). Under the soil conditions of Karakalpakstan, a total of 240 elite spring wheat accessions were evaluated. Based on grain yield performance, seven superior genotypes were identified and selected: 22KIB-24-IWWYT-8, 22-KIB-24-IWWYT-29, KIB-20-Sel 27 FAW-IR-P-39, BCN/WBLL1/ROLF07/3, C80.1/3*BATAVIA/, 18-REDING//PUB94, and MILAN/KAUZ.

**Results:** The vegetative period of the spring wheat samples was determined starting from the tillering stage (seedling emergence). The evaluated genotypes exhibited a growth duration ranging from 84 to 87 days. Early-maturing accessions (84–85 days) produced comparatively higher grain yields and are regarded as more suitable for drought-prone conditions. In contrast, medium-maturing genotypes (86–87 days) showed relatively lower yield performance than the early-maturing ones (Table 1).

**Table 1. Vegetation period of spring wheat samples**

| № | Sample Name | Sowing | Emergence | Tillering | Heading | Ripening |
|---|---|---|---|---|---|---|
| 1 | 22KIB-24-IWWYT-8 | 18.03 | 26.03 | 29.04 | 14.05 | 21.06 |
| 2 | 22-KIB-24-IWWYT-29 | 18.03 | 26.03 | 29.04 | 11.05 | 21.06 |
| 3 | KIB-20-Sel 27 FAW-IR-P-39 | 18.03 | 26.03 | 30.04 | 11.05 | 20.06 |
| 4 | BCN/WBLL1//ROLF07/3 | 18.03 | 26.03 | 30.04 | 12.05 | 21.06 |
| 5 | C80.1/3*BATAVIA/ | 18.03 | 27.03 | 31.04 | 12.05 | 22.06 |
| 6 | 18-REDING//PUB94 | 17.03 | 26.03 | 27.04 | 10.05 | 18.06 |
| 7 | MILAN/KAUZ | 17.03 | 25.03 | 28.04 | 11.05 | 18.06 |

**Main agronomic traits:**The grain quality, particularly the thousand-kernel weight, was determined to be within the range of 39–44 grams, indicating stable and well-developed grain formation across the studied samples. Notable variations were observed in yield performance, suggesting that the genotypes responded differently to the environmental conditions of the experimental field.

The results showed that the highest yield was recorded in the REDING (38 t/ha) and MILAN (37.5 t/ha) samples, both demonstrating strong adaptability and high productivity potential. In contrast, the lowest yield was observed in the BCN/WBLL1//ROLF07/3/BORL14 (24 t/ha) and C80.1/3*BATAVIA (25.5 t/ha) samples, which may indicate their lower tolerance to the growing conditions or weaker genetic yield capacity (Table 2).

**Table 2. Main agronomic traits of spring wheat samples**

| № | Variety/Line | 1000-Grain Weight (g) | Grain Yield (kg, 20 m²) | **Yield (c/ha)** |
|---|---|---|---|---|
| 1 | 22-KIB-24-IWWYT-29 | 40 | 6,3 | 31,5 |
| 2 | 22-KIB-24-IWWYT-8 | 41 | 6,4 | 32 |
| 3 | KIB-20-Sel 27 FAW-IR-P-39 | 43 | 6,7 | 33,5 |
| 4 | BCN/WBLL1//ROLF07/3/BORL14 | 39 | 4,8 | 24 |
| 5 | C80.1/3*BATAVIA | 40 | 5,1 | 25,5 |
| 6 | REDING//PUB94.15.1.12/WBLL1 | 44 | 7,6 | 38 |
| 7 | MILAN/KAUZ//DHARWAR DRY | 41 | 7,5 | 37,5 |

## Conclusion

The results of the study showed that the vegetation period from tillering to ripening ranged from 84 to 87 days. The development rate and ripening duration of the samples had a direct effect on yield. Early-maturing samples (84–85 days) demonstrated relatively higher yield and showed advantages under water-limited conditions. Medium-maturing samples (86 days) had lower grain yield compared to early-maturing samples.

The 1000-grain weight, an important indicator of grain quality, ranged from 39 to 44 g, which is a crucial trait for selection. According to yield analysis, the REDING (38 c/ha) and MILAN (37.5 c/ha) samples showed the highest results. These genotypes are recommended as promising sources for the conditions of the Aral Sea region (Table 2).

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