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THE VARIABILITY OF CERTAIN VALUABLE AGRONOMIC TRAITS IN COTTON HYBRIDS UNDER DIFFERENT SOIL AND CLIMATIC CONDITIONS OF OUR REPUBLIC

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ABSTRACT

One of the important directions in breeding work for any crop, including cotton, is the identification of plant responses to the environment and stress conditions, as well as determining the degree of sensitivity of plants to biotic and abiotic factors. During the processes of growth and development, plants continuously interact with their surrounding environment, resulting in the emergence of adaptability or adaptation mechanisms. The adaptation process never fully ends and continues throughout the entire life cycle of the plant.

Keywords: Cotton, genotype, adaptation, variability, introgressive forms, hybrid, fiber yield, fiber length.

G‘O‘ZANING DURAGAYLARIDA AYRIM QIMMATLI-XO‘JALIK BELGILARINI RESPUBLIKAMIZNING TURLI TUPROQ – IQLIM HUDUDLARIDAGI O‘ZGARUVCHANLIGI

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Annotatsiya

Har qanday ekin turi jumladan, g‘o‘za bo‘yicha ham seleksiya ishlarining ahamiyatli yo‘nalishlaridan biri – o‘simliklarning atrof muhitga, uning stress sharoitlariga reaksiyasini aniqlash, biotik va abiotik omillarga o‘simliklarning sezuvchanlik darajasini belgilash hisoblanadi. O‘sish va rivojlanish jarayonlarida o‘simliklar atrof muhit bilan doimiy o‘zaro ta’sirda bo‘lib, natijada organizmlarning moslashuvchanligi yoki adaptatsiya jarayoni yuzaga keladi. Adaptatsiya jarayoni hech qachon yokunlanmaydi va o‘simlikning barcha o‘mri davomida sodir bo‘ladi.

Kalit so‘zlar: G‘o‘za, genotip, adaptatsiya, o‘zgaruvchanlik, introgressiv shakllar, duragay, Tola chiqimi, tola uzunligi.

INTRODUCTION

Currently, about 90% of the cotton fiber produced worldwide comes from the cultivated species *Gossypium hirsutum* L. In the 86 countries where cotton is grown, around 20–22 million tons of fiber are harvested and exported annually. One of the major challenges in cotton breeding is the development and widespread use of high-yielding, early-maturing varieties with high fiber output and quality. Due to the growing global population and the increasing limitations on irrigated land, it is crucial to obtain high-quality yields from areas adapted to diverse soil and climate conditions without expanding the cultivated area.

Global climate change, the emergence of new pathogen races, and the significant damage caused by insect pests indicate the need for developing new cotton varieties resistant to adverse factors. This issue can be addressed by incorporating new donors with unique traits into breeding programs. In our country, extensive efforts are being undertaken to create competitive cotton varieties that produce fiber output meeting the demands of the global cotton market. At present, the development of cotton varieties adapted to different soil and climate zones, with a fiber yield of no less than 40%, is highly relevant, and further research in this direction is necessary.

RESEARCH RESULTS

The length of the growing period is one of the key indicators for achieving high yields. It is known that the duration of this period mainly depends on geographic latitude and climate. As can be seen in Figure 1, the variability in the duration of the growing season for the F_2 hybrid [(F_8 L-247 × S-484) × F_{15} L-248] in 2018 was 9 days in Tashkent region, and 7–8 days in Fergana and Kashkadarya regions, respectively. The figure also shows that the average values of this trait in Fergana and Kashkadarya were almost the same — 116.5 and 117 days — which is 12 days shorter than the growing season of this hybrid in the Tashkent region. Similar results, with slight variations in the mentioned combinations, were observed in experiments conducted in 2019 and 2020.

The variability in the duration of the growing season in the F_2 hybrid combination [(F_8 (Bukhara 6 × L-h) × L-247) × (F8 L-247 × S-6593)] ranged from 122 to 129 days in Tashkent region, from 108 to 116 days in Fergana, and from 106 to 114 days in Kashkadarya (see Figure 4.4). In other words, the range of variability in this combination was 2 days shorter compared to the previous hybrid combination, but in the other two regions, it remained within 7–8 days. It should be noted that the duration of the growing period in this hybrid was also shorter in Kashkadarya and Fergana regions compared to Tashkent, except for the third year of testing, when the average value in Fergana was observed to be slightly higher.

In the F_2 hybrid [(F_{15} L-248) × (F_8 L-243 × S-2552)], the variability in the duration of the growing period in Tashkent was greater than in the previous two hybrid combinations, reaching 11 days, while in the other two regions, this indicator ranged between 6 and 7 days (see Figures 4.7–4.9). It is important to emphasize that we were able to reduce the average values and variability of early maturity through consistent selection. When comparing and analyzing the distribution of average values for the duration of the growing period, the second generation F_2 hybrid [(F15 L-248) × S-2016] showed relatively wide variability: 11 days in Tashkent, and 7–9 days in Fergana and Kashkadarya, respectively (see Figures 4.10–4.12).

The average growing period also decreased due to the presence of right-sided transgression. The tendency for late maturity in this combination can be attributed to the influence of the paternal form S-2016, which had a significantly longer vegetation period than the maternal line L-248 from the local breeding pool.

An analysis of the variability in the weight of raw cotton per boll showed that, with rare exceptions, the widest range of variability was observed in hybrids grown in the Fergana region. The maximum range was recorded in the F_4 hybrid [(F_{15} L-248) × S-2016], where the boll weight varied from 3.1 g to 6.8 g. A similar result with slightly narrower variability was observed in the same combination a year earlier. Likewise, a wide amplitude of variability was consistently observed across all three testing years in Fergana for the hybrid combination [(F_8 L-247 × S-484) × F15 L-248]. The increase in the norm of response for the boll weight trait in Fergana can be explained by the region's climatic conditions, as well as the significant genetic distance between the parental lines used in the crosses.

As for the hybrids grown in Tashkent and Kashkadarya regions, the variability in boll weight was relatively narrow, ranging from 0.4 g to 2.0 g. An exception was observed in the F_2 hybrid combination [(F_{15} L-248) × (F8 L-243 × S-2552)] in Tashkent region, where the variability range was between 5.0 g and 7.9 g.

Among all the hybrid combinations, the one that stood out with the highest amplitude and peak values of fiber length variability was [(F_8 (Bukhara 6 × L-h) × L-247) × (F_8 L-247 × S-6593)] (see Figures 52–54). It was observed that the range of variability differed across regions during various testing years. In 2018, the highest amplitude of fiber length was recorded in Fergana and Kashkadarya regions. In contrast, in 2019, the widest range was observed in Tashkent and Fergana regions, which was largely due to the emergence of lower-performing forms. By the fourth generation, the norm of genotype response significantly decreased due to selection of genotypes with close average values.

Regarding fiber length variability in the hybrid combination [(F_{15} L-248) × (F8 L-243 × S-2552)], the range of variation differed annually regardless of the cultivation region. For instance, in 2018, the greatest variability was observed in Kashkadarya region (range: 0.06 inches), in 2019 it was in Tashkent (0.08 inches), and in 2020 the maximum variability (0.1 inches) was again recorded in Kashkadarya. A similar trend was observed in the combination [(F_{15} L-248) × S-2016], indicating that the cultivation region had no consistent or dominant influence on the trait's variability.

CONCLUSION

In conclusion, it is important to emphasize that based on years of experimentation, the duration of the growing season is more strongly influenced by environmental factors, specifically the geographic location of cotton cultivation. Two-way analysis of variance revealed that in this experiment, genotype had an insignificant effect on the variability in the duration of the vegetative period in F_2–F_4 hybrids. However, the interaction between environment and genotype showed a statistically significant influence on the trait, with the environment contributing 68.3% and genotype-environment interaction contributing 19.0% to the variation. Thus, both genotype and environment were found to significantly affect the variability in the vegetative period of cotton hybrids.

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