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Parameters Homeostaticity And Two-Factor Dispersion Analysis Of Indicators Of Agronomic Valuable Characteristics Of Cotton Lines Depending On Growing Conditions

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Abstract. Determination of the adaptive properties of the breeding material obtained under different growing conditions allows measuring the breeding value of the material mostly in full. In the context of a noticeable change in the hydrothermal parameters of the climate in many areas of the world, including our region, a sufficient level of adaptability of the cotton varieties used is becoming increasingly important. In a sharply continental climate, an important indicator of cotton varieties is their resistance to stress. Currently, the issues of identifying and creating adaptive cotton varieties have become particularly important, which arecharacterized by the stability of the main agronomic valuable traits. Objects of researches were lines of cotton L-33, L-34, L-35, L-35, L-37 kind G.hirsutumL.. The Sulton cultivar sown in these regions in large areas was used as a standard variety for comparison. In 2018 studying of lines was conducted in two regions: in the Tashkent region in the experimental farmKibray-selection" (deep level subsoil water 8-10m, Infected ground mushroom Verticillium dahliaeKlebahn) and in Syr-Darya area in branch Cotton breeding, seed production and agrotechnologies research institute (differs salinity ground and to relatives level subsoil water 1,5-2,0m). Field experiments in each ecological point have been organized under the uniform scheme. Techniques of an estimation of adaptability were applied to the decision of tasks in view the two-factorial dispersive analysis.

During the process of studying the created cotton breading material under various growing conditions, significant effects of the environment genotype and genotype-environmental interactions on the manifestation of agronomic valuable traits were revealed. It was found that manifestati on of agronomic valuable traits and that the lines created from various hybrid combinations are prevailing genotype effects and respond in the same way to environmental changes. It follows, that properties of adaptability, stability, and responsiveness to the environment largely depend on the bioclimatic potential, the frequency of favorable and stressful periods in the regions where the research was carried out, the source material and the tasks set to breeders. Ecologically stable lines were revealed, which are significantly exceeding the standard variety in terms of average indicators of agronomic valuable traits. Among the studied lines, line L-36 was distinguished by highindicators of adaptive ability which will be transferred to the State Commission for Variety Testing of Agricultural Crops.

Key words: variety, cotton, hybrid, hybridization, homeostaticity, a raw cotton weight of one boll, fiber output, fiber length.

Introduction. The development of cotton varieties with the high indicators of agronomic valuable traits and the level of their stability is associated with a number of difficulties arising in connection with the need to consider their responsiveness to growing conditions and resistance to stress factors. The regions of cotton growing in Uzbekistan differ sharply both in weather conditions and in the presence of stress factors, such as water shortage combined with high temperatures, strong soil salinity, and different depths of groundwater. In this regard, the breeder needs to reduce the magnitude of the genotype - environment interaction and increase the effects of the genotype, which ensures the stable formation of agronomic valuable traits under different growing conditions. Varieties adapted to specific environmental conditions are usually highly specialized and have local significance (Tollenaar and Lee, 2002; Duvick et al., 2004). Variations of agronomic valuable traits, which means that the yield and quality of the harvest of genotypes is largely determined by the interaction between genotype and environment. Genotype - environment interactions open up the possibility of selecting genotypes adapted to a specific location and the prevailing environmental conditions of that location (Lin and Binns, 1991; Ceccarelli, 1996).

In most cases, varieties are created with a stable yield and wide adaptation to a variety of environmental conditions (Lin, Binns, 1988; Evans, 1993), which is mainly associated with a wide amplitude of variation of climatic factors over the years. An ideal genotype should work well both for many years in one place (certain environmental conditions), and in a wide range of environments formed by external conditions in different locations (Romagosa, Fox, 1993).It was shown in (De Vita et al., 2010) that the selection strategy adopted over the past decades led to a decrease in the effects of genotype - environmental interaction and the selection of genotypes with better stability in a wide range of environments. Some modern genotypes outperform older varieties in different growing conditions. S. Rajaram (2003) provides convincing data on the possibility of creating high-yielding varieties adapted to stress factors, confirmed by other CIMMYT studies (Braun et al., 1996; Crossa et al., 2014).

The studies carried out by P.N. Malchikov et al. (2018) deserve special attention, which in the process of ecological-geographical study of modern breeding material of durum wheat from Russia and Kazakhstan revealed significant effects of genotype and genotype-environmental interactions. According to the parameters of stability and responsiveness, the varieties of all breeding establishments do not have stable changes relative to Bezenchukskaya 139, which the authors explain by the incompleteness of the breeding process for these properties and confirm the expediency of the operation of the KASIB program.Similar data can be cited for cotton. Hence, the recently created cotton varieties Gulistan, S-5706, S-5707, SP-7703 have highagronomicvaluable indicators and are distinguished by complex resistance to water deficit, soil salinity and to most stress factors. (Alikhodzhaeva S.S., 2017; Amanturdiev A.B., 2017). They show good results, both in the southern regions of the republic, and in the northern zones of cotton growing.The purpose of the research was to differentiate the selection material according to the parameters of adaptability, stability and breeding value according to the indicators of agronomicvaluable traitsbased on the data obtained during the study of cotton lines created in NIISSAVH under different growing conditions. The study was supported by the Ministry of Innovative Development of the Republic of Uzbekistan, project KX-A-KX-2018-201.

Materials and methods. The objects of research were cotton lines L-33, L-34, L-35, L-35, L-37 of the species G. hirsutum L. As a standard variety, we used the Sulton variety, sown in these regions on large areas. In 2018, the study of the lines was carried out in two regions: in the Tashkent region in the experimental farm "Kibray-

selection" with deep groundwater (8-10m) and in the Syrdarya region in the NIISSAVH branch, it is distinguished by soil salinity and close groundwater occurrence (1,5-2,0 m).

The agrotechnic facilities adopted for these regions were applied. Allocation of plots, observations and surveys at each ecological point were organized according to a single scheme. Sowing was carried out in the agrotechnical terms applicable for the given region. The lines were evaluated by the method of A.V. Kilchevsky and L.V. Khotyleva (1997), based on testing genotypes in various environments and using two-way analysis of variance. Homeostaticity parameter, calculated according to the formula of V.V. Hangildin (1978). Statistical processing of the obtained digital material was carried out according to Dospekhov (1979).

Results and discussion. Table 1 shows the characteristics of agronomicvaluable traits in a standard variety and lines of cotton in the conditions of the Tashkent and Syrdarya regions. From the data presented, it can be seen that the differences between the average values of most of the studied of agronomic valuable traits of the lines and the standard variety are significant. Also, it should be noted that in most lines, the average indicators ofagronomic valuable traits are superior to those of the standard variety in both growing conditions.Under the conditions of the Syrdarya region, the lines L-36 and L-37 showed a significant increase in the mass a raw cotton weight of one boll, and in all the lines studied, an increase in the indicators of fiber output was noted.

The standard variety Sulton showed a significant decrease in the weight a raw cotton of one boll, which is associated with a decrease in the weight of 1000 seeds of an important factor determining the weight a raw cotton of one boll. In the conditions of the Tashkent region, the average indicator a raw cotton weight of one boll was 6,5 g, which was at the level or lower than the indicators of the lines by 0,6 g. Also, under the conditions of the Syrdarya region, a decrease in the weight of raw cotton of one bollwas noted in the standard variety in comparison with the lines by 1,5-1,7 g. Similar results were obtained for fiber output and fiber length. Thus, the average fiber output in the lines exceeded the Sulton variety by 3,7-5,3% in the conditions of the Tashkent region and 3,4-5,4% higher in the Syrdarya region.

Table 1 Characteristics of agronomic valuable traits in cotton lines in the conditions of Tashkent and Syrdarya regions.

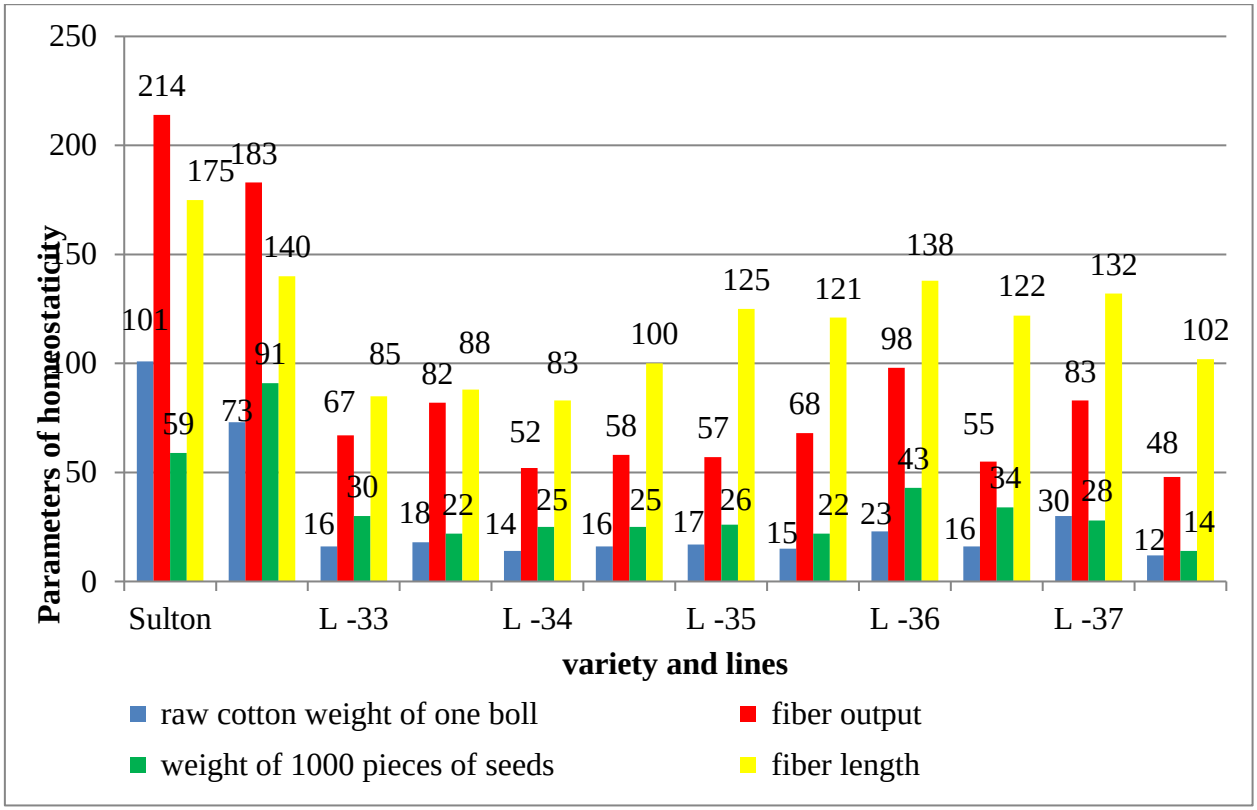
The standard variety and lines	Growingconditions	Agronomic valuable traits			
		a raw cotton weight of one boll, g	fiber output, %	the weight of 1000 seeds, g	fiberlength, мм
		X±SEM	X±SEM	X±SEM	X±SEM
Sulton	Tashkent regions	6,5±0,21	33,9±0,30	130±6,07	32,6±0,43
	Syrdarya regions	5,5±0,14	35,0±0,42	126±2,75	32,6±0,58
L -33	Tashkent regions	6,8±0,05	37,7±0,16	128±1,0	36,3±0,15
	Syrdarya regions	7,0±0,09	38,4±0,27	128±1,34	35,6±0,23
L -34	Tashkent regions	7,1±0,08	37,6±0,22	127±1,21	35,4±0,18
	Syrdarya regions	7,0±0,05	38,8±0,17	122±0,71	35,3±0,12
L -35	Tashkent regions	7,1±0,08	37,6±0,23	125±1,22	37,0±0,15
	Syrdarya regions	7,3±0,06	40,0±0,17	124±0,81	35,8±0,12
L -36	Tashkent regions	6,5±0,07	39,2±0,24	121±0,92	36,6±0,14
	Syrdarya regions	7,1±0,08	40,1±0,28	124±0,13	36,1±0,21
L -37	Tashkent regions	6,8±0,11	38,1±0,33	121±1,63	36,3±0,20
	Syrdarya regions	7,2±0,09	40,4±0,36	126±2,01	36,4±0,25
LSD_{05}		0,3	1,1	6,6	0,9

In terms of average fiber length, the excess depending on the growing conditions comprised of 2,8-4,4 mm and 2,7-3,8 mm, respectively. From the given data, it can be seen that the created lines meet the requirements of modern production and surpass the standard Sulton variety. In breeding practice, it is very important that the varieties created have high average indicators of agronomic valuable traits, but also their stability. The S.A. Eberhart and W.A. Rassell method isused most frequently to determine environmental stability, which allows you to determine not only the plasticity of a genotype, but also its stability.

In our studies, we determined the parameters of homeostaticity of agronomic valuable traits in the variety and cotton grown lines in the conditions of the Tashkent and Syrdarya regions. The results obtained are shown in the form of a histogram in Figure 1. From the data presented, it can be seen that the Sulton cultivar has the highest indicators of homeostatic parameters of the studied traits in comparison with the lines, and the highest indicators in both regions were observed in the traits of fiber output and fiber length. This is explained by the factthat Sulton variety has been sown for a long time in these regions and in the process of seed production, high results have been obtained based on stability of agronomic valuable traits.

The homeostatic parameters of the mass of a raw cotton weight of one bollin the Tashkent region were in the range of 14-30 and were higher in comparison with the conditions of the Syrdarya region by 2-12. The homeostatic parameters of the fiber output in the Tashkent region were 52-98, in the Syrdarya region, 48-82, the weight of 1000 seeds is 25-43 and 14-34, respectively, and the fiber length is 83-138, respectively, in the Tashkent region and 88-122 in the Syrdarya region. From the data presented in the figure, it can be seen that the lowest homeostatic parameters were obtained for L-34 in the conditions of the Tashkent region for all the studied characteristics, and for L-37, a similar picture, with the exception of the fiber length characteristic, was observed under the conditions of the Syrdarya region. The highest homeostatic parameters were observed in L-36 under the conditions of the Tashkent region for all characteristics, and under the conditions of the Syrdarya region, based only to the characteristics, the weight of 1000 seeds and fiber length, according to the characteristics of the weight of raw cotton of one boll and the fiber output, the homeostatic parameters were at an average level.

So, line L-36 showed a fairly high adaptive ability for all the studied characteristics. Analysis of the data obtained showed that for some lines it is necessary to carry out thorough seed-growing work with rejection of genotypes that go beyond the middle classes of variation of traits under specific growing conditions.

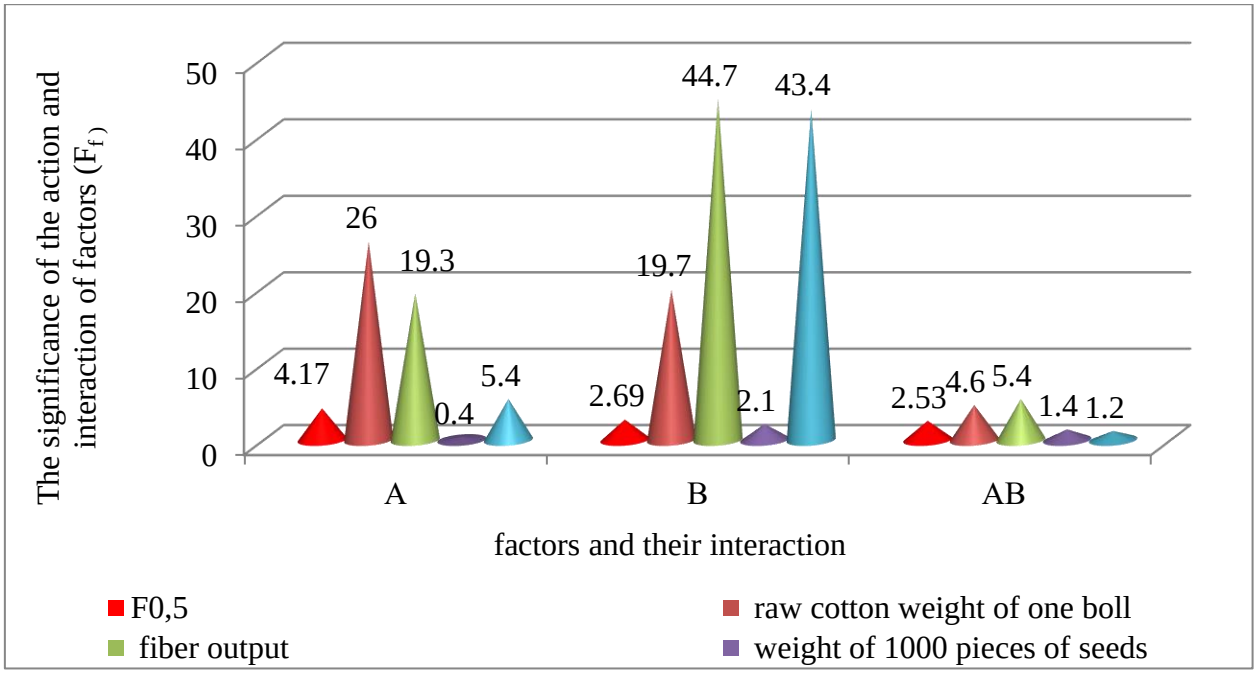


Note: 1-Tashkent region; 2 - Syrdarya region

Figure 1. Parameters of homeostaticity of agronomic valuable traits in the variety and cotton grown lines in the conditions of the Tashkent and Syrdarya regions.

Figure 2 shows a two-way analysis of variance of indicators of agronomic valuable traits in the variety and cotton grown lines in the conditions of the Tashkent and Syrdarya regions. The results of two-way analysis of variance showed various effects of the environment, genotypes and their interactions (Fig. 2). In both growing conditions and in all the studied material, the significance of the effect of factors and their interaction on the manifestation of the trait, the weight of 1000 seeds was insignificant.

A significant influence of environmental conditions took place on the manifestation of signs of the a raw cotton weight of one boll, fiber output and fiber length, which apparently is associated with the manifestation of limiting factors that acted on plants under the conditions of Tashkent and Syrdarya regions (depth of groundwater, soil salinity, soil infection with the fungus Verticillium dahliaeKlebahn).



Note: factor A - growing conditions; factor B - lines; AB is the interaction of two factors.

Figure 2. Two-way analysis of variance of indicators of agronomic valuable traitsin the variety and cotton grown lines in the conditions of the Tashkent and Syrdarya regions.

A similar picture was observed for the action of the genotype factor, although it should be noted that, in comparison with the action of the environment factor, the significance of the action of the genotype factor on the manifestation of the characteristics of the fiber output and length of the fiber was much higher. The significant importance of the interaction of environmental factors - genotype was noted only according to the characteristics of the mass of a raw cotton weight of one bolland the fiber output. The significance of the interaction of environmental factors - genotype for the manifestation of traits, the weight of 1000 seeds and the length of the fiber were insignificant.

Conclusion: Thus, in the process of studying the created cotton breeding material under various growing conditions, significant effects of the environment, genotype and genotype-environmental interactions on the manifestation of agronomic valuable traits were revealed. It was found that genotypic effects prevail on the manifestation of agronomic valuable traits. It was found that lines created from various hybrid combinations could have common features and respond in the same way to environmental changes. It follows that the properties of adaptability, stability, and responsiveness to the environment largely depend on the bioclimatic potential, the frequency of favorable and stressful periods in the regions where the research was carried out the source material and the tasks set for the breeders. Ecologically stable lines were revealed, significantly exceeding the standard variety in terms of average indicators of agronomic valuable traits. Among the studied lines, line L-36 was distinguished by high indicators of adaptive ability, which will be transferred to the State Commission for Variety Testing.

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