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YIELD OF COTTON LINES IN DIFFERENT CLIMATIC-SOIL CONDITIONS OF UZBEKISTAN

***Abstract**: It has been carried out an assessment of cotton lines' yield related to G.hirsutum L. in the Tashkent, Fergana and Kashkadarya regions of the republic of Uzbekistan. It was analyzed 10 lines with different genetic origin, identified productivity of assessment of influence genotype and environment on the yield. Results of three-year experiments showed that the environment to a greater extent affects the variability of the trait than the genotype. For determining optimal variant of the genotype-geographical point, it is necessary to carry out a series of tests.*

***Key words**: cotton, Fergana, Kashkadarya.*
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Introduction

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Modern methods make it possible to achieve an increase in the effectiveness of breeding, especially usage of various ecological-geographical zones is becoming more and more widespread [1]. It has been determined that the yield of spring barley in the Central region of Russia depends by 50 % on the conditions of the season, 25 % falls on the place of study and about 15 % on the genotype [2]. Combination of the interaction of these three factors determines the assessment of the variety in a particular in the place of experiment.

As a technique for increasing accuracy of assessing a variety by yield, without lengthening the timing of its study, Nettevich E.D. (2001) recommends sowing it in one year at several points. Simultaneous study of a variety at the several points with varying sowing dates, predecessors, fertilizers and other factors is more informative compared to growing it by using various technologies at on point.

MATERIALS AND METHODS

The aim of the research was to determine the influence of the genotype, environment and their interaction on the yield of cotton lines that are different in their origin, as well as the selection of the most productive lines in a particular region, which showed the stability of trait over the years. The experiments were carried out in the Tashkent, Fergana and Kashkadarya regions of the republic in a randomized manner, in four replicates. To determine the influence of genotype and environmental factors on the variability of the trait, were used two-way analysis of variance with repetitions.

Table-1. The indicators of cotton lines' yielding c/ha (2018-2020 y.)

Regions	Lines index	2018 y.	2019 y.	2020 y.
Tashkent (Salar)	481	33.9	25.6	33.0
	595	20.2	22.0	25.7
	655	34.8	20.5	33.1
	681	31.4	27.7	33.6
	705	31.9	31.9	32.9
	752	16.4	21.0	32.7
	765	38.1	23.4	33.5
	782	23.2	22.0	27.8
	956	17.6	24.4	27.8
	998	32.9	30.5	31.8
	St. Namangan 77	24.5	29.1	35.0
	St. C-6524	22.6	27.9	35.7
Fergana (Kuva)	481	37.6	34.0	32.6
	595	40.1	39.6	43.5
	655	34.9	31.1	42.2
	681	40.2	42.0	47.3
	705	39.1	42.6	42.4
	752	31.3	38.1	38.1
	765	40.4	36.9	48.1
	782	36.8	44.1	40.1
	956	33.3	40.3	45.8
	998	37.8	45.7	44.7
	St. Namangan 77	26.0	31.2	32.2
	St. C-6524	24.8	28.7	31.9
Kashkadarya (Kasbi)	481	32.2	33.6	37.3
	595	24.0	38.9	32.0
	655	32.8	27.8	35.4
	681	29.1	38.4	43.8
	705	32.6	39.4	38.8
	752	26.5	36.0	34.3
	765	33.3	34.9	35.3
	782	24.4	45.1	31.6
	956	24.5	39.6	27.5
	998	34.7	35.8	25.9
	St. Namangan 77	32.4	33.4	36.6
	St. C-6524	28.8	32.1	36.0

As we see from the 1-table, the average yield indicators for three regions in 2018 for the studied lines significantly differed from each other. The most productive of them was the line 765 with yield 37.3 c/ha. In five studied lines (681, 655, 705, 481, 998) the yield ranged from 33.6 to 35.1 c/ha. For three lines 956, 595 and 782 this indicator was at the level of 25.1, 27.8, 28.1 c/ha, respectively. The lowest yield was noted for the line 752 with 24.7 c/ha. The yield of most lines varied greatly across regions. Moreover, in two groups of lines (in Tashkent and Kashkadarya regions, the average yield in the group was approximately the same 28.0 and 29.4 c/ha. The average yield for the group tested in the Fergana region turned out to be much higher than 37.1 c/ha.

Table-2. Dispersion analysis of cotton lines' yielding (2018 y.)

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F-critical*
Sample	2256.307	9	250.7008	10.23363	1.04E-10	1.985595
Column	1884.432	2	942.2159	38.46133	8.47E-13	3.097698
Interaction	960.2455	18	53.34697	2.177628	0.008679	1.719592
Within	2204.797	90	24.49775			
Total	7305.781	119				

Genotype	30.9%					
Habitat	25.8%					
Interaction	13.1%					
Random deviations	30.2%					

Two-way ANOVA of yield showed significant effects on yield of both the genotype factor and the environmental factor. Thus, the share of the variability of the trait was 30.9 % in our experiments, and the environment influences by 25.8 % (table-2). The interaction of these two factors was also significant – 13.1 %.

In 2019, in the Tashkent region determined the most productive line L-705 with 31.99 c/ha, in Fergana L-998 with 45.75 c/ha, in Kashkadarya L-782 with 45.12 c/ha (table-1). The L-655 line turned out to be the least productive an all three regions. The yield in the regions was 20.54, 31,11 and 27.81 c/ha, respectively. Should be noted that the best lines L-595 (39.67 and 38.99 c/ha) and L-681 (42.02 and 38.49) in terms of productivity in the Tashkent region, didn't turn out high yield in two other regions.

Table-3. Two-way ANOVA for the yield of cotton lines 2019 y.

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F-critical*
Sample	1405.576	9	156.1751	8.380372	5.56E-09	1.985595
Column	4848.787	2	2424.393	130.0932	2.8E-27	3.097698
Interaction	659.4107	18	36.63393	1.96578	0.019839	1.719592
Within	1677.224	90	18.63582			
Total	8590.997	119				
Genotype	0.16					
Habitat	0.56					
Interaction	0.08					
Random deviations	0.20					

Two-away analysis of variance for yield in 2019 showed significant differences between groups of lines by region. However, the share of the influence of the genotype on the yield was small, namely 16 % (table-3). On the contrary, the share of the influence of the environment on the yield was higher and amounted to 56 %. Interaction of genotype-environment factors in our experiment was 8 %, and the share of unaccounted for factors on yield was 20 %.

In 2020, the studied lines showed different yields. Thus, the average indicators for the three regions varied from 33.2 c/ha for line 782 to 41.6 c/ha for line 681 (table 1). There was also a significant difference in yield among the groups tested in different regions. The indicators was observed in the Fergana region of 42.5 c/ha on average for the group. In the Tashkent region, this indicator was 31.2 c/ha and in Kashkadarya 34.2 c/ha. The yield of the overwhelming majority of lines greatly depending on the region of cultivation.

Table-4. Two-way ANOVA for the yield of cotton lines 2019 y.

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F-critical*
Sample	848.4592	9	94.27325	3.802498	0.000423	1.985595
Column	2741.44	2	1370.72	55.2878	2.18E-16	3.097698
Interaction	1242.766	18	69.04257	2.784822	0.00075	1.719592
Within	2231.321	90	24.79245			
Total	7063.987	119				
Genotype	12.0%					
Habitat	38.8%					
Interaction	17.6%					
Random deviations	31.6%					

Two-way analysis of variance for yield in 2020 revealed significant differences in yield both between lines and between groups of lines by region (table 4). In this experiment, as in the previous year, the yield was largely influenced by the environment – 38.8 %, the genotype influenced 12 %, the share of their joint influence was 17 %. The unaccounted-for factors turned out to be quite significant – 31.6 %.

CONCLUSIONS

Thus, the significant influence of the environment on the yield indicates the complex structure of this trait. Lines 681 and 765 were identified, which showed consistently high yield rates. The results of this experiment allow us to conclude that when selecting for cotton yield, it is necessary to consider that the environment significantly affects it, and in order to find the optimal variant of the genotype-geographical point, it is necessary to conduct a number of analysis in different cultivation regions.

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