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ECOLOGICAL AND BIOLOGICAL INDICATORS OF PLANT CHARACTERISTICS

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Annotation

This article provides information on the study of the influence of sowing deadlines on the variation of quantitative indicators of signs of winter wheat. The "Dustlik" variety of autumn soft wheat was chosen as the object of research. This variety of winder wheat was studied in the conditions of scarce salty gray soil in September, October and early November. Seeding periods strongly affected the number of wheatears. Compared to seeding in September< seeding in November showed 36.67% decrease in the number of wheatears. High harvests of winter wheat (at 447.1 gr per 1m2) were recorded in seeding in October. The timing of seeding affected the variation in quantitative indicators. Being strongly variated and strongly determinated productivity is accepted as an eco-biological indicator in the selection of genotypes adapted for the environment. Wheatear length, its density, plant height, 1000 grains weight are among the least variegated and relatively stable signs, which are recommended as biological indicators in determining productive genotypes.

Keywords: seeding times, variation, correlation, determination, outside environment, quantitative indicators, indicator, eco-biological, biological.

Introduction

The growth and development of plants is influenced by abiotic, biotic factors. The degree of influence of these factors finds its expression in the quantitative indicators of plant features. While the features associated with the influence of an external factors are strongly variational, those that depend on the biological characteristics of the plant are relatively stable. It is noted that the elements of productivity and yield are strongly variated under the influence of the external environment [1].

During the recent years, as a result of the widespread use of digital technologies in biological research, the peculiarities of quantitative features and their variation were identified. The results of the study showed that variational changes have occurred in the quantitative indicators of plant features under the influence of the external environmen, while in animals such changes occurred in biochemical indicators. For instance, strong effect of the nutrient field has been established on the variation of quantitative indicators of the rice plant in relation to mineral fertilizer is strong. An increase in the seeding norm caused a variation in quantitative indicators due to the occurrence of unfavorable conditions for the growth and development of plants (insufficient feed) [2].

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Similar results were also noted in grain crops. Strong influence of the seeding season and the natural climatic conditions of the sown area on the quantitative indicators of winter wheat was noted in relation to the biological characteristics of the varieties. Some increase in the degree of correlation relationships between quantitative indicators in unfavourable conditions was established [3].

Such studies were carried out with winter wheat varieties in the conditions of the saline soil of the Syrdarya oblast. As a result, some increase in the level of correlation relationships between quantitative indicators of features was noted in the case, when winter wheat was planted late and densely. High variation and strong determination of productivity and wheatear weight were recorded [4].

The level of inter-dependance between the features of an organism is divided into ecological (external environment) and genotypic groups. In this case, it is noted that genotypic correlation was stronger than ecological correlation. It has been established that the features depend not only on the external environment, but also on the genotype [5].

From the above information, one can see that the external environment (seeding times, norms, amount of feed, natural climatic conditions of the area) and the biological characteristics of plants have influenced the variation of quantitative indicators. This is a natural course of things. During the vegetation period the plant grows, develops and forms under the influence of the external environment. Thus, quantitative indicators continue to serve as the main subject of research. Obtaining more information about quantitative indicators is of scientific and practical importance.

This study differs from others in that the winter wheat variety was seeded early (early September). This is the first time such a study to be conducted.

Study Methods and Location

The research was carried out at the field experimental site of Gulistan State University in Syrdarya region. The ”Dustlik" variety of the winter soft wheat (Triticum aestivum L) was chisen as the subject of the study. The SSPS-17 software was used for phenological observations and computational work [6]. If the variation coeffisient **(CV,%)** was found as a strongly variable if the value was below 10%, medium - from 10% to 20% and significant - over 20%. N.S.Rostova method was used for differentiating the quantitative indicators into ecological, eco-biological, biological and genotypic indicators [3]

Results Obtained and Discussion

The primary data on the influence of seeding times on the quantitative indicators of winter wheat are presented in Table 1. The data in the table show when wheat was seeded in early September (1.09), the germination was 59.96% on average, in October (1.10) - 55.49%, and in November (1.11) - 50.98%. This data shows high level of germination at early seeding. The fact that the germation level has changed subject to the timing of seeding can also be seen on both its minimum and maximum indicators. In the early seeded (1.09) option, the minimum coefficient of germination was - 42%, the maximum - 81.6%, in the case of seeding in October - 15.8-79.4% respectively, and in November - 40%; 63.0%.

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Table 1 The influence of seeding times on quantitative indicators of the features of the Dustlik variety of winter wheat

Germination,%	Number of wheatears,pcs	Plant height, cm	Putting out side shoots, pieces	Weight of one wheatear, gr	Productivity, 1m2, gr	Grain harvested, %	Wheatear length, cm	Grain weight in a wheatear, gr	Wheatear density	1000 grains weight, gr	Harvesting index
Seeding time: September 1											
59.96 ±2.71	543.1 ±45.33	69.58 ±2.33	1.52 ±0.08	1.49 ±0.07	393.3 ±39.55	68.86 ±1.96	6.4 ±0.15	0.94 ±0.07	19.64 ±0.28	34.45 ±0.28	0.27 ±0.02
	Minimum										
42.0	262	53.6	1.06	1.0	250.4	52.28	5.2	0.49	18	31.5	0.16
	Maximum										
81.6	781	56.5	2.31	2.1	871.5	78.9	7.5	1.5	21.9	42.0	0.43
Seeding time: October 1											
55.49 ±3.78	467.9 ±25.72	74.33 ±2.02	1.39 ±0.12	1.53 ±0.03	447.1 ±29.78	79.65 ±2.59	6.54 ±0.08	1.22 ±0.04	20.11 ±0.28	39.33 ±0.72	0.33 ±0.02
	Minimum										
15.8	292.	56.7	0.61	1.2	261.6	60.0	5.9	0.9	17.9	34	0.20
	Maximum										
79.4	643	84.2	2.45	1.7	643.5	83.7	7.0	1.5	22.0	43	0.50
	Seeding time: November 1										
50.98 ±1.93	343.9 ±13.42	59.79 ±3.01	1.35 ±0.1	1.09 ±0.11	335.5 ±28.28	77.38 ±5.83	6.09 ±0.13	1.01 ±0.04	20.16 ±0.36	35.58 ±0.46	0.26 ±0.02
	Minimum										
40.0	242	37.3	0.90	0.20	157.9	54.7	5.2	0.71	18.1	32.0	0.16
	Maximum										
63.6	439	78	2.36	1.58	519.2	78.6	6.9	1.33	22.7	38.6	0.35

From these data one can see that at early seeding, the limit of the level of winter wheat germination expanded compared to other seeding times. The number of wheatears (per 1m2) was 543.1 in September, in October - 467.9, and in November-343.9 pieces. The data show a decrease in the number of wheatears at seeding later. Here, the number of wheatears decreased due to a decrease in the number of putting out side shoots. When planted early, the number of side shoots was 1.52, while in November - it was 1.35. Productivity was equal to 393.3 gr (per 1m2) in early (1.09) seeded winter wheat, while in October - 447.1 gr, in November - 335.5 gr. From this data one can see that there was yield was high from the crop, seeded in October. The primary data show that the time of seeding had impact on all quantitative indicators. It was noted that the quantitative indicators of wheat sown in November

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decreased compared to wheat sown in September and October. This is also confirmed by the data from Figure 1.

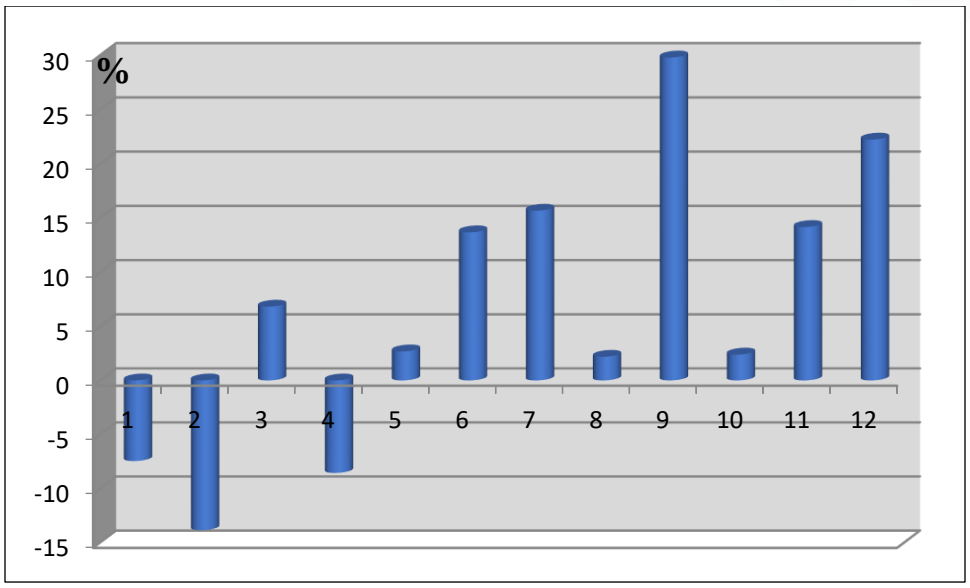

Figure 1. Difference between October and September ,%

Note: numbers mean features. Here: 1- germination**,%; 2-**number of wheatears per 1m2; 3-plant height, cm; 4-shoot oouts; 5-weight of one wheatear, gr; 6-productivity, 1m2, gr; 7-grain output,%; 8-wheatear length, cm; 9-grain weight on the wheatear, gr; 10-wheatear density; 11-1000 grains weight, G; 12-harvest index.

The quantitative indicators of wheat sown in September recorded a difference compared to wheat sown in October. Compared to October data, germination dropped by 7.45%, number of wheatears - by 13.84%, putting out shoots by 8.55%, it was identified that the plant height increased by 6.82%, the wheatear weight - by 2.68%, the productivity - by13.67%, the grain output - by 15.66%, the wheatear length by 2.18%, the grain weight in the wheatear by 29.78%, the wheatear density by 2.39%, the 1000 grains weight- by 14.16%, and the harvest/yield index increased by 22.2%. This indicates that almost all quantitative indicators occurred mainly in the harvest elements. Grain weight in wheatear increased by 30% in October seeding compared to September

The difference in the quantitative indicators of wheat sown in November is shown in Figure 2. The data in the picture shows that in comparison with the area, sown in September, the germination decreased by 14.97%, the number of wheatears - 36.67%, plant height -14.07%, shoot outs - by 11.18%, weight of one wheatear - by 26.84% and productivity - by 14.69%.

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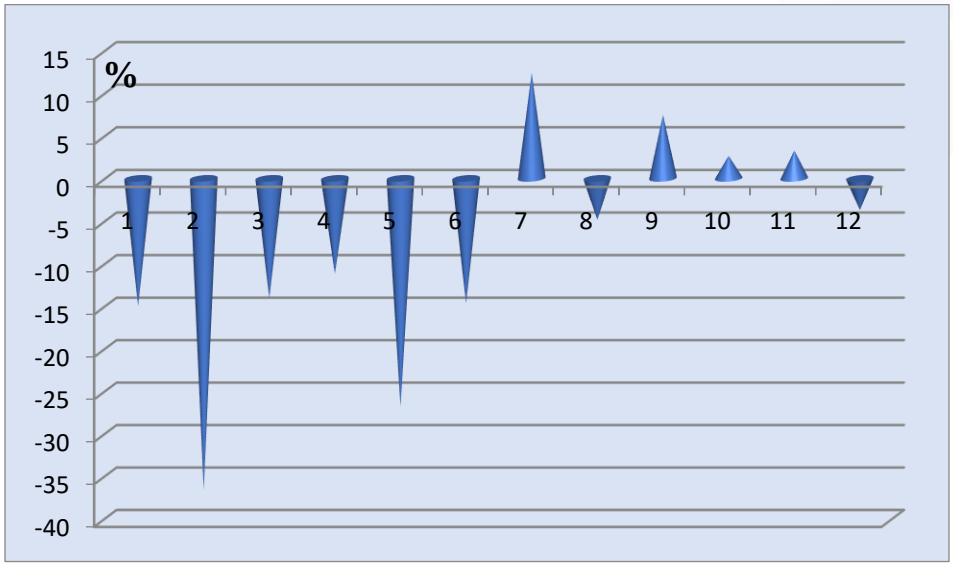

Figure 2. Difference between the wheat sown in November and September ,%

Note: Numbers mean featuress - see Figure 1

It was found that the grain germination increased by 12.37%, the grain weight in the wheatear increased by 7.44%, the wheatear density - by 2.64%, the 1000 grains weight - by 3.28%. These data show that most quantitative indicators of winter wheat decreased compared to wheat sown in September. Especially the number of wheatears - decreased by 36.67%. In its turn this affected productivity. The productivity of winter wheat, sown in September was 393.3 gr, while the same of wheat sown in November was 335.5 gr. The difference between the seeding times was 57.8 gr.

Above we gave information on the minimum and maximum indicators of quantitative indicators in the analysis of Primary Data (Table 1). This data shows the degree of change of the quantitative indicators. During the recent years, in analysing the variation of quantitative indicators the researchers are paying attention to their determinability (determination is the square of the correlation coefficient, which determines the delimitation of the feature) [3]. This gives the opportunity to fully analyze the causes of the variation of features to some extent. 12 studied features of winter wheat are presented in Figures 3.4 and 5 on the basis of the variational and determinational dependence of quantitative indicators on the time of seeding. The data in the picture shows that the quantitative indicators of early seeded (1.09) winter wheat such as productivity (6), grain weight in wheatear (9), number of wheatears (2), yield/harvest Index (12) and single wheat weight (5) were strongly variable (the coefficient of variation was higher than 25%) and strongly determinated.

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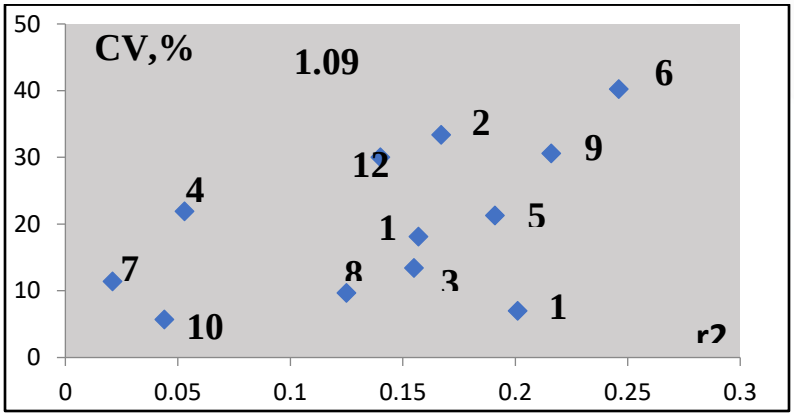

Figure 3.Impact of the seeding time (1.09) on the levels of variation (CV, %) and determinability (r^2) of quantitative indicators of winter wheat.

Note: the numbers represent the characters here and in the following pictures. Here**: 1**-germinaton**,%; 2-**number of wheatears per 1m2; 3-plant height, cm; 4-shooting out; 5-weight of one wheatear, gr; 6-productivity, gr/1m2; 7-grain output,%; 8-wheatera length, cm; 9-grain weight on the wheatear, gr; 10-wheatear density; 11- 1000 grains weight, gr; 12-yield/harvest index.

In this case, the variation of these indicators occurred in dependence with others. weight of 1000 grains, (11), plant height (3), wheatear length (8) were found to be variated at moderate levels, and strongly determinated. These features were more dependent on the biological characteristics of the plant. In this case, these features can be called biological indicators. Wheatear density (7) and grain output (10) are poorly variated and determinized, and these features are noted to have independent variational characteristics.

The change in the timing of seeding affected the degree of variation of quantitative indicators. In this seeding date (1.10) it was determined that productivity (2), number of wheatears (2) and yield/harvest index (12) and germination (1) are strongly variated.

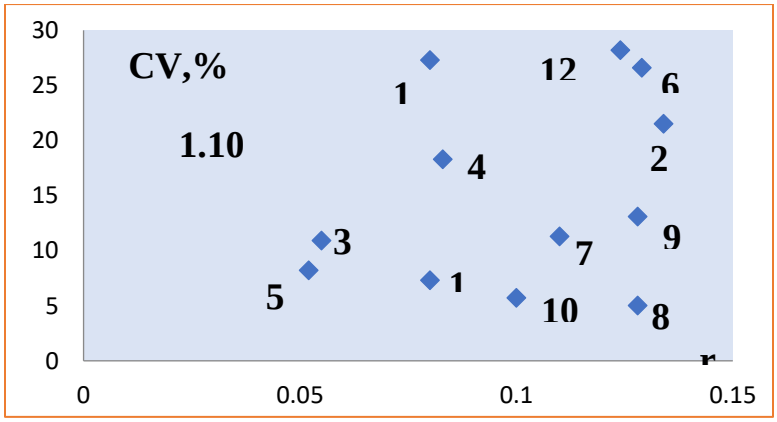

Figure 4. Impact of the seeding time (1.10) on the levels of variation (CV, %) and determinability (r^2) of quantitative indicators of winter wheat. Note: Numbers mean featuress - see Figure 3

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The features such as wheatear length (8), grain weight in wheatear (9), grain output (7), wheatear density (10), 1000 grains weight (11) were medium level variation. As we noted above, these indicators have become more dependent on the biological indicators of the variety.

The results obtained from wheat, sown in November showed strong variation and determination characteristics of productivity (6) as was recorded in the case of sowing on other dates. This suggests that this indicator depends not only on the genotype, but also on the external factor. For the wheat, sown in November, while the wheatear length (8) showed strong determination and low variation, the indicators of 1000 grains weight (11) and the wheatear density was found to be less variated and poorly determinated.

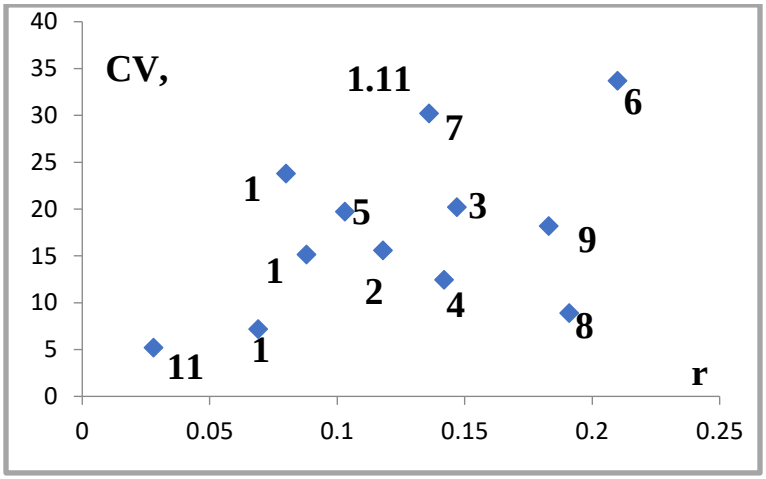

Figure 5. Impact of the seeding time (1.11) on the levels of variation (CV, %) and determinability (r^2) of quantitative indicators of winter wheat. Note: Numbers mean featuress - see Figure 3

The impact of sowing dates on the quantitative indicators of the winter wheat variety was confirmed in general. The seeding time had impact on the level of all quantitative indicators . The winter wheat sown in September generated an average harvest of 393.3 gr, sown in October - 447.1 gr, and in November - 333.2 gr. In comparison with the wheat seeded in November, the wheat seeded in September produced harvest by 14.69%, while the wheat sown in October gave 13.61% more harvest.

The time of seeding affected the variation of quantitative parameters of winter wheat. It was identified that the productivity is strongly determinated and variated in all cases of the sowing dates. The variation of this indicator occurred subject to other parameters others. It was noted that the height of the plant, the length of the wheatear, the density of the wheatears, the weight of 1000 grains is less variated, which depends on the biological characteristics of the variety. The variation of the indicators such as germination, number of wheatears, wheatear weight, grain weight in wheatears, and yield/harvest Index varied over different seeding times.

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Conclusion

1. It was noted that productivity is a strong variational and determinative eco-biological indicator that determines whether the varieties are adapted to the conditions of the external environment.
2. The indicators such as wheatear length, wheatear density, 1000 grains weight, plant height were stable and recommended as a biological indicator when choosing low-variable, productive plants.

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