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DETERMINING THE DEMAND FOR MINERAL FERTILIZERS BASED ON THE STATISTICAL ANALYSIS OF WINTER WHEAT VARIETIES' AGRONOMIC INDICATORS

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ABSTRACT

It is possible to value by cluster analyzing that varieties of winter wheat can be assessed for mineral fertilizers such as dry item collecting of grain harvest and band structure. According to the various agronomic indicators, the variability of wheat sorts for mineral fertilizers was different.

Usually, a specific agronomic indicator (for example, yield) is used as a basis for the mutual comparison of varieties, in which the threshold indicators or the distance between them are set based on the measured biometric data. As a result, the analysis of most genotypes and a number of agronomic parameters belonging to each of them is somewhat complicated [5].

Therefore, we used clustering in the SPSS 12.0 statistical program and Ward's minimum variance analysis to determine the mineral fertilizer requirements of varieties on the basis of most agronomic indicators. Full details of these methods are provided in the SAS manual [4]. Cluster analysis (minimum dispersion analysis by Ward) is widely used to determine the resistance of rice, wheat and potato varieties to soil salinity and to group them [2, 3, 5].

In our studies, we verified that mineral fertilizers, mainly nitrogen fertilizers, are of great importance for the growth and high yield of sugar beet. For sugar beets in the form of sodium nitrate ($NaNO_3$), $N_{200}R_{150}K_{200}$ kg/ha normal is effective [4; 12-б., 5; 122-126-б.].

After the winter wheat repeated sowing of beet crops will have a positive effect on the size of the soil and serve to increase its productivity. Although this crop, which has been studied in practice, yields relatively good results, it is important to select the optimal sowing standards for all repeated crops [6; 140-144-б.].

According to the opinions of A. Khabibullayev and Kh. Fayziyev, calcium and micro- and macroelements in chicken egg shells are highly effective fertilizers for the cultivation of amaranth medicinal plants for wide distribution on earth as various fertilizers and bioactive compounds. It is reported that it was used in

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research, medicine, and as a rare raw material in agro fields, in the cultivation of Amaranth and other plants. [8; 321-325-b].

According to A. Khabibullayev, when amaranth plants are grown on light gray soils, it is appropriate to set mineral fertilizer norms of $N_{150}R_{100}K_{150}$ kg/ha. Also, the application of nitrogen fertilizers in the form of liquid manure at the rate of 30 kg/ha during the growing season of the plant ensures that the soil has the necessary amount of organic nutrients. [9; 7-12-b].

H. Fayziyev and A. Khabibullayev said that calcium and micro- and macroelements in chicken egg shells are used as various fertilizers and bioactive compounds to be widely distributed on earth in finding highly effective fertilizers for growing amaranth medicinal plants, in medicine and it is said to have been used in the cultivation of the Amaranth plant as a unique raw material in agro fields. [10; 321-325-b].

Since the agronomic parameters (grain yield, dry matter, ear structure) are in different dimensions, first, that is, before performing the cluster analysis, these data were brought to a single relative measurement unit. For this purpose, the following coefficients were obtained by dividing the average of each indicator by varieties by its control (Table 1).

In this case, plants that did not feel a shortage of mineral nutrients, that is, the variant used $N_{200}P_{140}K_{100}$ kg/ha and the Chillaki variety, which absorbed the most NPK, were taken as a control.

Table 1

Indices of requirement of grain yield for mineral fertilizers when winter wheat is fed at different rates

Varieties	2001 year			2002 year		
	$N_0P_0K_0$	$N_{150}P_{105}K_{75}$	$N_{250}P_{175}K_{125}$	$N_0P_0K_0$	$N_{150}P_{105}K_{75}$	$N_{250}P_{175}K_{125}$
Chillaki	0,640	0,920	1,030	0,660	0,880	1,020
Kupava	0,650	0,930	1,020	0,640	0,860	1,000
Demeter	0,430	0,750	1,030	0,640	0,860	1.010
Sanzar-8	0,600	0,890	1,020	0,650	0,880	1,010

As a result of the statistical analysis, a 2- and 3-cluster table was shown, in which wheat varieties were grouped (Table 2).

Table 2

Varieties clustering by Ward's method (for variant $N_0P_0K_0$)

Varieties	3 clusters	2 clusters
Chillaki	1	1

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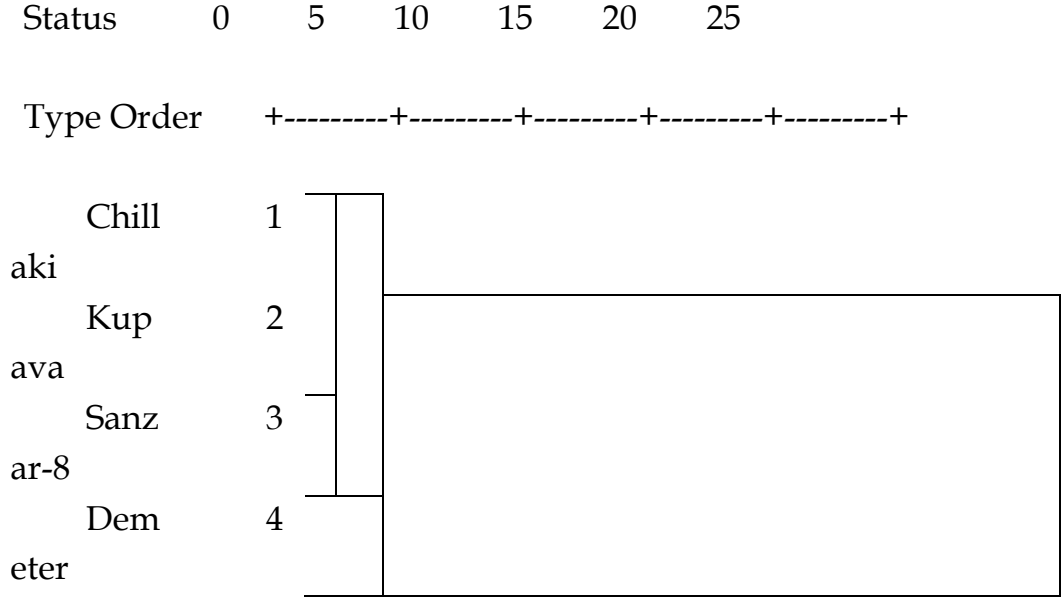
Kupava	1	1
Demeter	2	1
Sanzar-8	3	2

The selection of a suitable cluster was made on the basis of the created dendrogram (Fig. 1), that is, it is desirable that the varieties have a close orientation within the same group, and different between clusters.

Figure 1. Dendrogram using Ward Method for variant $N_0P_0K_0$

The distance between clusters merged according to the updated scale (Rescaled Distance Cluster Combine)



In the assessment of the studied genotypes, we based the ranking on the selected cluster based on the dendrogram, and the winter wheat varieties were ranked according to their requirement for mineral fertilizers (tables 3-4).

Table 3

Classification of mineral fertilizer requirements of winter wheat varieties by grain yield (minimum dispersion analysis by Ward)

Var	The rate of mineral fertilizers			∑	Grouping according to demand for mineral fertilizers
	$N_0P_0K_0$	$N_{150}P_{105}K_{75}$	$N_{250}P_{175}K_{125}$		
Chillaki	1* (1) **	1 (1)	1 (1)	6	1
Kupava	1 (2)	1 (2)	2 (2)	10	2

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Demeter	2 (2)	2 (3)	3 (3)	15	3
Sanzar-8	3 (3)	3 (1)	2 (3)	15	3
*2001 year; **2002 year					

As a result, in all cases, wheat varieties were divided into three clusters according to all agronomic indicators, the value (level) of each fertilizer rate was added together and their sum was determined. In this case, the genotype with the lowest score was evaluated as demanding towards mineral fertilizer.

Table 4

Grading winter wheat varieties according to the structure of the spike structure in their requirement for mineral fertilizers (minimum dispersion analysis by Ward)

Var	The rate of mineral fertilizers			∑	Grouping according to demand for mineral fertilizers
	$N_0P_0K_0$	$N_{150}P_{105}K_{75}$	$N_{250}P_{175}K_{125}$		
Chillaki	1* (1) **	1 (1)	1 (1)	6	1
Kupava	2 (2)	2 (2)	2 (2)	12	2
Demeter	2 (2)	2 (2)	3 (1)	12	2
Sanzar-8	3 (3)	3 (3)	1 (3)	16	3
*2001 year; **2002 year					

According to the results of statistical analysis, the demand for mineral fertilizers in terms of winter wheat grain yield is high in Chillaki, Kupava and Demetra varieties are in the intermediate place, which can be expressed as follows: Chillaki>Kupava>Demetra=Sanzar-8.

Table 5

Grading winter wheat cultivars of mineral fertilizer requirements based on dry matter accumulation during the growing season (minimum dispersion analysis by Ward)

Var	The rate of mineral fertilizers			∑	Grouping according to demand for mineral fertilizers
	$N_0P_0K_0$	$N_{150}P_{105}K_{75}$	$N_{250}P_{175}K_{125}$		
Chillaki	1 * (1) **	1 (1)	1 (1)	6	1
Kupava	2 (2)	2 (1)	2 (1)	10	2

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Demeter	2 (2)	2 (2)	2 (2)	12	2
Sanzar-8	3 (3)	3 (3)	3 (3)	18	3
*2001 year; **2002 year					

In terms of dry matter accumulation of plants during the growing season, the Chillaki variety was ranked first, Kupava intermediate, and Demetra and Sanzar-8 varieties ranked last. Relative assessment of fertilizer requirements of cultivars based on spike structure (spike length, number of spikes per spike, number of grains per spike, grain weight per spike, 1000 grain weight) is similar to plant dry matter accumulation. When varieties are evaluated by clustering according to different agronomic indicators, it was also observed in the research that their reaction to the external environmental factor is different [1].

Therefore, it is possible to assess the demand of winter wheat varieties for mineral fertilizers based on most agronomic indicators (grain yield, dry matter accumulation of plants, ear structure) by cluster analysis. The requirement of wheat varieties for mineral fertilizers can be different based on different agronomic parameters. When clustered according to agronomic parameters such as grain yield, plant dry matter accumulation and yield components, Chillaki variety was found to be very demanding on mineral fertilizers, while Kupava was found to be demanding. It was found that Sanzar-8 variety is less demanding of mineral fertilizers in all indicators, and Demetra is less demanding of fertilizers in terms of grain yield, it is demanding of mineral fertilizers when clustered based on dry matter accumulation and spike structure.

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