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Effect of Cultıvatıon Methods on Number of Plants of Wınter Wheat Varıetıes After Wınterıng in Dryland Condıtıon of Southern Mugan

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Abstract

The article shows results of the study about the effect of cultivation methods on the number of winter wheat plants after wintering in dryland condition. So, in a 3 factor (2x3x3) field experiment, chickpea, winter bread and durum wheat varieties were selected as predecessors and no-fertilizers, $N_{60}P_{60}$ +10 t manure and $N_{90}P_{60}K_{45}$ norms were used in each three cultivation variants which included: 1. Ordinary (ploughing at a depth of 20-22 cm + disking + harrowing; 2. Double disking at a depth of 10-12 cm with heavy disk harrow; 3. One disking at a depth of 10-12 cm with heavy disk harrow. Number of wintering plants and field germination (%) were found by counting in marked in 4 different points of the field for each variant.

Plants were counted again after wintering, at tillering stage of plants, in the areas of the field marked in each variant and the number of plants surviving in winter was defined according to field germination. The winter hardness of the varieties, after different predecessors, soil cultivation and root nutrition according to the number of wintering plants. The number of wintering plants was higher at predecessor of chickpea; also, the results were higher by double disking of the soil with heavy disk harrow at a depth of 10-12 cm. The highest result was obtained at the background of $N_{60}P_{60}$ +10 t manure.

It was found that by double disking of the soil with heavy disk harrow at a 10-12 cm depth, the winter hardness of plants was higher at both predecessors, cultivation in the background of $N_{60}P_{60}$ +10 t manure.

Keywords: dryland, soil cultivation, predecessors, nutrition condition, winter hardness

Introduction

The development of the agricultural sector, which is one of the main sectors of the non-oil sector, is one of the most important issues to ensure food security in the country. At present, the living standards and the stuff required for the well-being of population depends on the development of agriculture.

Therefore, the main task facing agrarian science in terms of grain production is to fully meet the needs of population for grain and grain products by producing higher yields from a single sown area.

Sustainable and dynamic development of production in agriculture, maintenance and improvement of soil fertility, increasing crop productivity and quality are impossible without the application of proper cultivation methods (Aslanov & Aslanov, 2014; Cherkasov, & Pykhtin, 2006).

The reason why the income from winter grains is lower than that of many agricultural crops is that the obtained yield is lower than the cost incurred for cultivation of the plants (Rzayev & Ismayilov, 2010). One of the main indicators of productivity is the winter hardiness of plants.

This indicator depends on the biological characteristics of the variety, the cultivation methods used and the environmental conditions. Thus, the choice of proper cultivation methods in specific agro-ecological conditions, on the one hand, leads to a certain increase in winter hardiness of plants, on the other hand, the minimization of cultivation by the application of energy-saving technologies which protect the soil from degradation to some extent and provides conditions to increase economic efficiency.

Materials and methods

Productivity of agricultural crops is one of the main indicators in the farming system (Aliyev, 2015). As cultivation methods have a direct impact on the viability of plants, which is one of the main indicators of productivity, it is possible to increase productivity through their proper selection.

In order to study the above-mentioned issues, a field experiment was conducted by planting winter wheat varieties after predecessors, with application of soil cultivation and nutritional conditions at the Jalilabad Regional Experimental Station (RES) of the Research Institute of Crop Husbandry, in the dry conditions of South Mugan.

Different subtypes of main gray-brown (brown) soils predominate in the region (Mammadov, 2007). According to the average multiplicity, the average annual

temperature is 14.10C, and the total active temperature during the growing season is 4300-4400 degree. The number of frost-free days is 250-280 days, and the amount of precipitation varies from north to south between 300 and 450 mm. Rainfall is unevenly distributed throughout the year and it rains mainly in spring and autumn months.

The three-factor (2x3x3) field experiment is based on the following scheme:

Factor A - predecessor: winter wheat, peas;

Factor B - method of cultivation: traditional cultivation (plowing at a depth of 20-22 cm + discing + leveling), 2 times discing with a heavy vertical trowel at a depth of 10-12 cm, 1 plowing with a heavy disc trowel at a depth of 10-12 cm;

Factor C - nutritional conditions: without fertilizer, $N_{60}P_{60}$ + 10 tons of manure, $N_{90}P_{60}K_{45}$.

The experimental area consists of three cultivation options for each predecessor, and each cultivation variant was divided into 3 spots with 50.4 m^2 area (3.6m x 14m) and 0.6 m distance between them. The experiment was performed in 4 repetitions with 4 m between cultivars, 3 m between varieties and 2 m between repeated plantings. The durum wheat variety “Barakatli 95” and the soft wheat “Gobustan” were studied using 3 fertilizer norms in each cultivation variant.

The number of plants surviving in winter was determined in the first decade of March by counting in two rows with a length of 83.3 cm (4 x 83.3 cm x 30 cm), ie in 4 places marked for each variant in the area of 1 m^2 (Musayev et al., 2008).

Results and discussion

One of the indicators of productivity is the amount of plants which survive in winter. The fact that plants spend the winter in optimal conditions is due to the correct choice of basic cultivation methods. Thus, the winter hardiness of plants depends not only on the characteristics of the variety, but also on the cultivation factors. Hence, a wide range of reaserches have been conducted in this regard throughout the country.

Aliyev A.M. notes that the correct selection of the predecessor and optimal nutritional conditions have a positive effect on the overwintering of plants. This is reflected in the growth of production (Aliyev, 2013). Also Ahmadov Sh.H., in his research, found that with the use of optimal nutrition, the number of plants that survived the winter increases and this leads to an increase in the rate of productivity (Ahmadov, 2014).

In our three-factor (2x3x3) field experiment which was to study the effect of soil cultivation and nutritional conditions on winter hardiness of plants, after different predecessors, the amount of plants that survived through winter was calculated according to the methodology and the variance analysis of the two-year results (average for 2019-2020) is given in Tables 1 and 2.

Thus, according to the two-year average results in Barakatli-95 wheat variety, the number of plants survived in winter was 204 in 1 m2 area by applying traditional cultivation, 275 by 2 times discing of soil with a heavy trowel at a depth of 10-12 cm and 242 by one time discing of soil with a heavy trowel at a depth of 10-12 cm.

After its pea predecessor, this indicator was estimated to be 223, 299 and 268, respectively. At nutritional conditions, high indicators were observed for each predecessor, in the variant of $N_{60}P_{60}$ + 10 t of manure, so, this has been respectively 228-249 by using traditional cultivation, 300-332 by 2 times discing of soil with a heavy trowel at a depth of 10-12 cm and 265-299 by one time discing of soil with a heavy trowel at a depth of 10-12 cm.

These indicators were relatively high in "Gobustan" wheat variety. Thus, after its predecessors of wheat and peas, in traditional cultivation, this varied between 271-301, it was 367-391 by 2 times discing of soil with a heavy disc trowel at a depth of 10-12 cm, and 324-360 by one time discing of soil with a heavy trowel at a depth of 10-12 cm. A relatively high rate was observed by the use of $N_{60}P_{60}$ + 10 t of manure after both predecessors. In this condition, the highest rate was 434, after the pea predecessor, by 2 times discing of soil with a heavy disc trowel at a depth of 10-12 cm.

Table 1. Results of three-factor variance analysis of the effect of predecessor, soil cultivation and nutritional conditions on the amount of winter-surviving plants belonging to winter wheat varieties

(Average for 2019-2020)

Factors	Df	SS	MS	F
Barakatli 95				
A	1	22250.69	22250.69	150.455**
B	2	139253.76	69626.88	470.805**
C	2	17542.39	8771.19	59.309**

AB	2	355.85	177.92	1.203 ns
AC	2	334.06	167.03	1.129 ns
BC	4	69.03	17.26	0.117 ns
ABC	4	122.53	30.63	0.207 ns
	3	123.36	41.12	
Residual dispersion	72	10648.00	147.89	
Gobustan				
A	1	36322.01	36322.01	157.15**
B	2	222628.60	111314.30	481.61**
C	2	29900.51	14950.257	64.68**
AB	2	619.01	309.51	1.339 ns
AC	2	263.43	131.72	0.570 ns
BC	4	198.40	49.60	0.215 ns
ABC	4	124.74	31.18	0.135 ns
Repetition	3	134.30	44.77	
Residual dispersion	72	16641.50	231.13	

ns: non-significant

**: Significant at the probability level of 0.01

A- Predecessor; B-soil cultivation; C- Nutritional condition

Table 2. According to Duncan's criterion, variance analysis on the effect of predecessor, soil cultivation and nutritional conditions to the number of winter-surviving plants belonging to winter wheat varieties

Variants	Average price	
	Barakatli 95	Gobustan
Traditional (plowing+discing+ leveling at a depth of 20-22 cm	226.62 C	303.62 C
by one time discing of soil with a heavy trowel at a depth of 8-10cm,	269.77 B	360.19 B
by 2 times discing of soil with a heavy trowel at a depth of 8-10cm,	302.56 A	399.42 A
Without fertilizer	252.25 C	335.90 C
$N_{90}P_{60}$ K_{45}	267.50 B	356.29 B
$N_{60}P_{60}$ + 10 t manure	279.21 A	371.04 A
a. The size of the average price used = 48.00 b. Alpha = 0.05		

The significance of the effect of predecessors, soil cultivation and nutritional conditions on the amount of plants surviving the winter was estimated by analyzing the variance using the SPSS 26 program, and the results are given in Table 1. As a result of the variance analysis, due to both varieties it was revealed that the effect of each factor is significant at the probability level of 0.01. According to the Duncan model of variance analysis, the winter hardiness of plants has been high at the variant of 2 times discing the soil with a heavy trowel at a depth of 10-12 cm after the pea predecessor and using $N_{60}P_{60}$ + 10 t of manure.

Thus, peas belong to the group of cereals and legumes and accumulate more nitrogen in the soil. So, it has great importance with meeting the nitrogen needs of plants. The most common of the organic fertilizers is manure. When adding manure into the soil instead of a certain part of the mineral fertilizers, it maintains moisture in the soil by improving the physical properties of the soil, and macro and microelements required by plants enter the soil together with manure. As a result, the root system of plants

develops better and the plant is fully supplied with nutrients, leading to an increase in the winter hardiness of the plant. Also, in the South Mugan region, due to high summer temperatures and very low amount of rainfall, the soil remains too dry after the harvest of predecessors (winter wheat and peas) and deep plowing results in the formation of lumps of soil that aren't broken down into parts during pre-sowing cultivation and hinders the quality of sowing. When the soil is plowed twice with a heavy disk harrow at a depth of 10-12 cm, large lumps hindering the sowing aren't formed, and mass sprouts in the same size are obtained.

Conclusion

Thus, the results of our two-year study show that the winter wheat varieties under study are different in terms of winter hardiness considering their predecessors, soil cultivation and nutritional conditions. Thus, this indicator was higher in "Gobustan" wheat variety than in "Barakatli 95" wheat variety. However, relatively good performance for each variety was observed in post-pea tillage. The best results in soil cultivation were obtained in the variant of 2 times discing the soil with a heavy disk harrow at a depth of 10-12 cm. The highest winter hardiness for each variety was observed in the condition of twice disking of soil with a heavy disc trowel at a depth of 10-12 cm and by using $N_{60}P_{60}$ + 10 t of manure.

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