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THE INFLUENCE OF MINERAL FERTILIZER APPLICATION ON THE WINTER HARDINESS OF THE YAKSART VARIETY OF WINTER WHEAT

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Abstract:

With optimal sowing dates (15.X) for winter wheat and the application of increased rates and ratios of mineral fertilizers ($N_{210}P_{110}K_{70}$) compared to the recommended rates and ratios ($N_{180}P_{90}K_{60}$), winter hardiness can be enhanced, which is one of the ways to increase grain yield.

Keywords: Winter Wheat, Yaksart Variety, Winter Hardiness, Agrochemical Foundations, Dry Matter Content, Sugar, Grain Yield.

INTRODUCTION. Obtaining a high-quality and abundant winter wheat grain harvest depends on the norms, ratios, and types of mineral fertilizers used during the autumn-winter growing season [4, 5, 6].

When winter wheat accumulates more protein in its stem and tillering node before wintering, its resistance to winter frosts decreases. However, when it accumulates more sugar in these organs before wintering, its resistance to winter increases [6, 7, 8].

When winter wheat seedlings accumulate more sugar before wintering, the respiratory process intensifies under the negative influence of winter frosts. As a result of more sugar being used in the respiratory process, more thermal energy is released, increasing the plant's resistance to winter frosts.

This phenomenon also depends on the types of mineral fertilizers applied to winter wheat before wintering [2,3,9,10,11].

Therefore, our research investigated the influence of mineral fertilizers applied to winter wheat before wintering on its winter hardiness.

METHODICAL PART. Field experiments were conducted from 2015 to 2017 at the "Qulmanov Umir" farm in the Koson district of the Kashkadarya region. The experiments were set up in one tier with four replications, with experimental plots measuring 180 square meters and accounting plots measuring 100 square meters.

According to the experimental variants presented in the table, the annual rates of phosphorus and potassium fertilizers were applied simultaneously with sowing, while nitrogen fertilizers were applied during the spring tillering (35%), stem elongation (35%), and heading (30%) phases of winter wheat. All other agrotechnological processes were carried out uniformly.

The research was conducted according to B.A. Dospekhov's "Field Experiment Methodology" [1]. The sugar content in the tillering node of seedlings was determined using H.N. Pochinok's titration method [7].

The depth of the tillering nodes relative to the soil surface (cm); dry mass accumulation (g) and sugar content (%) in 100 seedlings before wintering; and the number of overwintered plants per square meter (units) were determined in odd-numbered experimental variants. The number of overwintered plants per square meter (units) was determined in odd experimental variants.

Grain yield was determined from plants in a 1 square meters area and converted to hectares. The data obtained as a result of the research are presented in the table.

RESEARCH RESULTS. According to the data presented in the table, when the Yaksart variety of winter wheat was sown early (15.X), the tillering node was located more superficially relative to the soil surface, in proportion to the applied rates and ratios of mineral fertilizers. When sown later, the tillering node was observed to be located somewhat deeper. However, due to the significant impact of phosphorus (P_2O_5=90-110 kg/ha) and potassium (K_2O=60-70 kg/ha) fertilizers applied during winter wheat sowing on the autumn growth period of seedlings, their role in the deeper positioning of tillering nodes was notable. This indicator showed that in the control variant without NPK application, the tillering nodes were located 1-2 cm deeper compared to when reduced rates and ratios of phosphorus (P_2O_5=70 kg/ha) and potassium (K_2O =50 kg/ha) fertilizers were applied.

However, the accumulation of dry matter in 100 seedlings of winter wheat before wintering was up to 19 g higher when sown early (15.X) with increased rates and ratios of phosphorus and potassium fertilizers compared to the recommended rates, and when sown with a month delay (15.XI).

When determining the sugar content in the tillering node of winter wheat seedlings before wintering, it was found that early sowing (15.X) resulted in higher sugar content in all cases compared to sowing with a one-month delay (15.XI), showing an increase of 3.9% to 5.9%. However, when phosphorus and potassium fertilizers were applied at increased rates ($P_{110}K_{70}$) compared to the recommended rates ($P_{90}K_{60}$), the sugar content in the tillering node increased by 1.6% when sown in mid-October (15.X), by 0.6% when sown on November 1, and by 0.5% when sown on November 15. A 0.6% increase was observed when sown on the 1st XI and a 0.5% increase when sown on the 15th XI.

Table 1

The effect of mineral fertilizer rates and ratios on winter hardiness of the Yaksart variety of winter wheat (average for 2015-2017)

№	Experimental variants	Depth of the tillering node placement relative to the soil surface, cm	Dry mass of 100 seedlings before wintering, g	Sugar content in the tillering node before wintering, %	Number of overwintered plants per 1 sq.metres, units	Grain yield, c/ha
sown on the 15.X						
1	Without NPK application (st_1)	2	72	19,2	310	40,1
2	$N_{150}P_{70}K_{50}$	2	80	21,3	321	60,6
3	$N_{180}P_{90}K_{60}$ (st_2)	3	85	22,7	330	65,5
4	$N_{210}P_{110}K_{70}$	3	92	24,3	335	70,4
sown on the 1.XI						
5	Without NPK application (st_1)	2	65	16,6	304	38,8
6	$N_{150}P_{70}K_{50}$	2	71	18,3	312	58,3
7	$N_{180}P_{90}K_{60}$ (st_2)	3	75	19,5	321	62,6
8	$N_{210}P_{110}K_{70}$	3	81	20,1	324	65,0
sown on the 15.XI						
9	Without NPK application (st_1)	3	60	15,3	292	37,1
10	$N_{150}P_{70}K_{50}$	3	63	16,7	310	54,7
11	$N_{180}P_{90}K_{60}$ (st_2)	4	68	17,9	315	57,0
12	$N_{210}P_{110}K_{70}$	4	73	18,4	320	59,2

It has been observed that the amount of sugar in the tillering node of winter wheat seedlings before wintering is proportional to the number of seedlings that survive winter. Specifically, when winter wheat was sown in mid-October (15.X) and applied with increased levels of phosphorus and potassium fertilizers ($P_{110}K_{70}$) compared to the recommended application ($P_{90}K_{60}$), the number of overwintered seedlings per 1 m2 was 335. This indicator was 324 when sown on 1.XI and 320 when sown on 15.XI.

The main factor in increasing winter hardiness of winter wheat should be sowing at the optimal time (15.X) and applying increased levels of phosphorus and potassium fertilizers ($P_{110}K_{70}$) compared to the recommended norms ($P_{90}K_{60}$). This is because when winter wheat was sown at the optimal time (15.X) and the levels and ratios of

phosphorus and potassium fertilizers were increased compared to the recommended amount ($P_{90}K_{60}$) to ($P_{110}K_{70}$), the grain yield reached 70.4 centners per hectare.

CONCLUSION. In the southern regions of Uzbekistan, sowing the Yaksart variety of winter wheat at the optimal time (October 15) and applying mineral fertilizers at an increased rate ($N_{210}P_{110}K_{70}$) compared to the recommended rate and ratio ($N_{180}P_{90}K_{60}$) serves as the primary factor in increasing grain yield by enhancing winter hardiness.

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