International Journal of
Biological Engineering and Agriculture

ISSN: 2833-5376
Volume 2 | No 6 | jun -2023

Effect of Nutrition on Winter Hardiness of Winter Wheat

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Annotation: With optimal timing of sowing (15.X) of winter wheat with application of increased norm and ratio (N210P110K70), mineral fertilizers are one of the ways to increase winter hardiness in comparison with the recommended norms (N180P90K60), which contributes to the increase of grain yield.

Keywords: winter wheat, winter hardiness, agrochemical basis, dry matter, sugar, grain yield.

Introduction. Cultivation of abundant and high-quality grains from winter wheat is related to feeding norms, proportions and types of mineral fertilizers used during the autumn-winter growth period [4,5,6].

If winter wheat accumulates a lot of protein in its body and the root joint before overwintering, its resistance to winter frosts decreases, and if it accumulates more sugar in these organs before wintering, its resistance to winter increases [6,7,8].

When winter wheat accumulates more sugar in its grass until winter, the respiration process increases due to the negative effects of winter frosts. As a result of the increased use of accumulated sugar in the respiratory process, heat energy is released more and resistance to winter cold increases.

This situation also depends on the types of mineral fertilizers used before overwintering of winter wheat [2,3,9,10,11].

Therefore, the effect of mineral fertilizers applied before wintering of winter wheat was studied in our research.

Methodical part. Field experiments were conducted in 2015-2017 at the farm "Kulmanov Umir" in the Koson district of Kashkadarya region on one level, in four plots, the size of the experimental areas is 180 m^2, and the calculation areas are 100 m^2.

According to the experimental options presented in the table, the annual standards of phosphorus and potassium fertilizers were applied along with planting, and nitrogen fertilizers were applied during the spring tillering (35%), tuber (35%) and earing (30%) phases of winter wheat. All other agrotechnological processes were carried out in the same way.

Researches were conducted according to the methodology of B.A. Dospekhov "Metodika polevogo opyta" [1]. The amount of sugar in the stem joint of grasses was determined by the titration method of H.N. Pochinok [7].

The depth of placement of grass joints in relation to the surface of the earth (cm); dry mass (g) and sugar accumulation (%) in 100 lawns before wintering; the number of overwintered plants (units) per 1 m^2 was determined in odd variants of the experiment.

The grain yield was determined in plants of 1 m^2 area and converted into 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 spring wheat is planted early (15.X) in proportion to the norms and proportions of mineral fertilizers used, it was observed that the root joint is located more superficially than the surface of the earth, and when it is planted later, it is located a little deeper. However, the effect of phosphorus (P_2O_5=90-110 kg/ha) and potash (K_2O=60-70 kg/ha) fertilizers applied along with planting of winter wheat on the autumn growth period of lawns is significant, so the role of the deeper location of the tiller joints will be significant. This indicator showed that the control option without NPK has a greater role in the placement of 1-2 cm deeper than when phosphorus (P_2O_5=70 kg/ha) and potash (K_2O=50 kg/ha) fertilizers are used with reduced rates and proportions.

Table Effect of rates and proportions of mineral fertilizers on the winter resistance of winter wheat (average in 2015-2017)

№	Experience options	The depth of placement of the joint in relation to the surface of the earth, cm	Dry mass of 100 lawns before wintering, g	The amount of sugar in the stem joint before wintering, %	The number of wintering plants per 1 m2, units	Grain yield, tons/ha
When 15.X is planted						
1	When NPK is not applied (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
When 1.XI is planted						
5	When NPK is not applied (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
When 15.XI is planted						
9	When NPK is not applied (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

However, it was shown that dry matter accumulation in 100 lawns of autumn wheat lawns before wintering was up to 19 g when planted early (15.X) and applied with higher rates and proportions of phosphorous and potassium fertilizers compared to the recommended one month later (15.XI).

When determining the sugar content of winter wheat lawns before wintering, it showed that winter wheat was higher in all cases when it was planted early (15.X) than when it was planted one month later (15.XI), and it was 3.9% to 5.9% higher. However, when winter wheat was applied in excess of the recommended rates of phosphorus and potassium fertilizers ($P_{90}K_{60}$) when planted ($P_{110}K_{70}$) in mid-October (15.X) 1.6%; when 1.XI was planted 0.6% and when 15.XI was planted 0.5% increase in the amount of sugar in the bud joint was observed.

It was observed that the amount of sugar in the tiller joints before wintering of winter wheat grasses is proportional to the number of overwintered grasses. That is, when winter wheat was planted in the

middle of October (15.X) and increased ($P_{90}K_{60}$) compared to the recommended phosphorus and potassium fertilizers ($P_{110}K_{70}$), the number of overwintered grasses was 335 pieces per 1 m2 area, this indicator was 324 when planted in 1.XI grain, it was 320 grains when planted in 15.XI.

The main factor for increasing the winter resistance of winter wheat should be planting in the optimal period (15.X) and using phosphorus and potassium fertilizers ($P_{90}K_{60}$) in comparison with the recommended ones ($P_{110}K_{70}$). Because, when winter wheat was planted in an optimal period (15.X) and the norms and proportions of phosphorus and potassium fertilizers were increased ($P_{90}K_{60}$) compared to the recommended ones ($P_{110}K_{70}$), the grain yield was 70.4 tons/ha.

In the conditions of the southern regions of Uzbekistan, sowing winter wheat in an optimal period (15.X) and using ($N_{180}P_{90}K_{60}$) compared to the recommended norm and ratio ($N_{210}P_{110}K_{70}$) will be the main factor in increasing grain yield by increasing winter resistance.

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