

Influence of the rate and ratios of mineral fertilizers on growth, development and yield of winter wheat

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Abstract

The southern regions of Uzbekistan are blocked only from the eastern side with the Gissar mountains. In connection with the openness, the other parties freely penetrate the cold cyclones from the north side, and from the south-west side of the region the hot Kara-Kum cyclones freely penetrate with strong hot winds at any periods of the year and adversely affects the growth, development and yield of winter wheat.

As a result of our research, the application of optimal rates and ratios of mineral fertilizers successfully overcame the negative effect of weather conditions, as a result of which the productive tillering was increased, the duration of the development phase was reduced, the quantity, mass and yield of grain were increased, which contributed to increase in the grain yield of winter wheat.

Key words: winter wheat; mineral fertilizers; tillering; developmental stages; grain mass; grain yield

Southern regions of Uzbekistan where Kashkadarya and Surkhandarya regions are located is blocked only from the east side with the Gissar mountains.

In connection with the openness, the rest of the parties freely penetrate the cold cyclones from the north side, and from the south-west side of the region the hot Kara-Kum cyclones freely penetrate with strong hot winds in any periods of the year in which the winter wheat bloom often coincides with the phase that adversely affects the growth, development and yields (Balashova et al., 1960; Kimberg, 1975; Irnazarova, 2002). This results in the sensations and sparsity in the spikes of winter wheat, which greatly affects the yield and quality of grain (Moiseichik, 1967). However, by applying optimal rate and ratio of mineral fertilizers, the adverse effect of unfavorable weather conditions can be (Pannikov and Mineev, 1977; Mineev and Pavlov, 1981; Aripova, 2000).

In this connection, the influence of rate and ratio

of mineral fertilizers on the growth, development and productivity of winter wheat in non-low-soil conditions was studied to obtain high quality grain yields.

Materials and Methods

Field experiments were carried out in 2012-2014 on the farm "Turakulov Ravshan" of the Nishan district with winter wheat, variety Krasnodar-99, with four short replicates. The plot size is 180 m², the registration plot is 100 m². Field experiments and other studies were carried out according to Dospekhov's methods (Dospekhov, 1985).

Annual rates of phosphorus and potassium fertilizers were applied with sowing of winter wheat according to the variant of the experiment. Nitrogen fertilizers were applied in the phase of spring tillering (35%), at the beginning of the tube (35%) and in the phase of earing (30%).

In addition to the repetitions of the experiment

variants, there was 1 m² control area, used to determine productive tillering, the duration of the growing season, the number and mass of grain per spike, and grain yield.

Results and Discussion

As shown by the results of the study, under the influence of the optimal rate and ratio of mineral fertilizers, the adverse effect of weather conditions on the spiny and unreasonable winter wheat, variety Krasnodar-99, in southern Uzbekistan was successfully overcome, as a result of which the planned yield of winter wheat was obtained (Table 1).

In the first place there is a positive effect of the increased rate and ratio of mineral fertilizers on the duration of development stage and the number of productive tillers in winter wheat. For example, if the duration of development stage was 212 days without application of the NPK, with the use of mineral fertilizers this index naturally decreases to 6 days, respectively, with the applied rate and ratio of mineral fertilizers. However, the fluctuation in the duration of the development stage was based on the rate, ratios and types of mineral fertilizers.

When studying the effect of mineral fertilizers on productive tillering, an increase in the number of productive tillers by 0.19-0.39 was observed.

Table 1. Influence of the rate and ratio of mineral fertilizers on growth, development and productivity of winter wheat (Average data for 2012-2014)

№	Indicators	Duration of the development stage, days	Number of productive tillers	Number of grains per spike	Grain weight per spike, g	Yield of grain, %	Harvest of grain, centner/ha
	Variants						
1	Without NPK (st1)	1,41	212	40	1,2	35,5	34,9
2	N ₁₅₀ P ₇₀ K ₅₀	1,73	211	48	1,5	40,0	60,8
3	N ₁₈₀ P ₉₀ K ₆₀ (st2)	1,78	209	52	1,6	41,2	65,5
4	N ₂₁₀ P ₁₁₀ K ₇₀	1,80	210	55	1,7	43,0	70,4
5	N ₀₀₀ P ₉₀ K ₆₀	1,64	208	42	1,4	38,1	43,3
6	N ₁₈₀ P ₀₀ K ₆₀	1,62	206	43	1,5	36,5	45,4
7	N ₁₈₀ P ₉₀ K ₀₀	1,60	208	44	1,5	37,5	46,4

The highest number of productive tillers was observed with the application of N₂₁₀P₁₁₀K₇₀ - 1.80 pieces, i.e. with 0,39 pieces more in comparison with the control variant of the experiment where NPK was not applied.

The number and the mass of grain per spike were also correspondingly higher, where a different rate and ratio of mineral fertilizers were applied. The average number of grains per spike in the control variant of the experiment was 40 pieces, and with the use of the reduced rate and ratio fertilizers (N₁₅₀P₇₅K₅₀) it increased with 8 pieces, and when applying the recommended rate and ratio (N₁₈₀P₉₀K₆₀) it increased with 12 pieces. At application of N₂₁₀P₁₁₀K₇₀ the increase

in the number of grains per spike reached with 15 pieces. However, when one of the elements is missing, the number of grains per spike sharply decreased and it was only with 2-4 pieces larger in comparison with the control variant with no applied NPK.

The mass of grain per spike was also determined in accordance with the regularity, depending on the rate and ratio of the mineral fertilizers applied to winter wheat. A noticeable positive effect of the rate and ratio of mineral fertilizers was reflected in the yield of winter wheat. Therefore, the highest yield of grain of winter wheat was with the use of N₂₁₀P₁₁₀K₇₀ where the grain yield averaged 70.4 c/ha.

Thus, the application of the optimal rate and ratio of mineral fertilizers is one of the ways to overcome the negative effect of weather conditions on the growth, development and yield of winter wheat in the conditions of southern Uzbekistan.

Conclusion

Using the optimal rates and ratios of mineral fertilizers in adverse weather conditions in the southern Uzbekistan contributes to the improvement of productive tillering, shorten the developmental stage, increase the quantities, mass and grain yield, which contributed to increase yield of winter wheat.

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