

Importance of Nutrifying with Potassium Mineral Fertilizers from the Leaf Level in Decreasing Rust Disease of Autumn Wheat

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Annotation

Rust disease of autumn wheat is considered to be very risky, it will bring into sharp decrease of productivity due to its massive spread in all fields. When a bigger amount of potassium is sprayed on leaves of autumn leaves along with mineral fertilizers, it will result in creating

nutrient atmosphere for the plants along with the increase of the feature of being tolerant to diseases.

Аннотация

Болезнь ржавчины озимой пшеницы считается очень опасной, она приведет к резкому снижению урожайности из-за ее массового распространения на всех полях. При опрыскивании большего количества калия на листья осенней листвы вместе с минеральными удобрениями это приведет к созданию питательной атмосферы для растений и повышению их устойчивости к болезням.

Key words: soil, seeds, mineral fertilizers, nitrogen, phosphorus, potassium, growth, development, rust, biometrical indices, fertility.

Ключевые слова: почва, семена, минеральные удобрения, азот, фосфор, калий, рост, развитие, ржавчина, биометрические показатели, плодородие.

In order to accomplish the leading directions in increasing the efficiency of the reforms accomplished in the Republic of Uzbekistan, creating convenient conditions for multilateral, extremal development of the country and society, modernization of our country and liberalization of all spheres, a strategy of development on 5 basic directions was adopted.

It is favourable to decrease the cotton fields, to improve the plantation fields and sowing autumn wheat in the fields freed from plants. In order to satisfy the needs of our people for grain, we are making a basis for further increase the fruitfulness of autumn wheat by applying new technologies in the fields where autumn wheat is sown. Over the past years, we are having good achievements on getting rich harvest from wheat, however, this harvest does not satisfy the demands as a part of the crop is disappearing due to pesticides and spread of diseases. At present time the farmers and achieves of clusters who know it very well, are achieving good results following the recommendations given by our scientists based on leading experiences [1].

Rust disease of autumn wheat is considered to be a dangerous disease in grain growing and it usually results in sharp decrease in productivity due to massive spread in all fields. The complication of this disease is that there is a big possibility of yellow rust development and disease spread in large areas owing to humidity increase and tree thickness more than the norms [2]. In the result of the investigations carried out by our scientists disease causatives are bringing into the decrease of pathogenic ability towards autumn wheat stems. Resulting from our experiment we can conclude that not supplying the plants with sufficient mineral fertilizers decreases the tolerance of plants and result in decreasing the fruitfulness autumn wheat during the vegetation period [3].

In decreasing rust disease of autumn wheat by the scientists of our Republic, the fact that tree thickness is very important was proven by the investigations carried by them. For instance, when the number of baby trees in one hectare of land is preserved up to 3.2- 3.5 millions, the level of being diseased with rust was observed to be equal to 10.6-14.2 % or when the tree thickness was equal to 3.6 mln/ha up to 4.2 mln/ha, the total level of being diseased was

observed to be equal to 5.7% up to 8,6 % [4]. This case preserved in the carried experiment i.e. the rust disease decreased with the increase of the amount of trees [5].

Resulting from the given references, during 2019-2020 we carried out a number of experiments on identifying the tolerance of plants to rust disease fungicides when the autumn wheat was nitrified with the solution of potassium mineral fertilizer in water by the leaf level.

The experiment was carried out as in the following scheme:

The experiment scheme

Control version 1: nitrogen -200 kg/ha; phosphorus 200 kg/ha; potassium -0

Version 2: nitrogen -200 kg/ha; phosphorus 200 kg/ha; potassium -50 kg/ha

Version 3: Nitrogen -200 kg/ha; phosphorus -200 kg/ha; potassium -75kg/ha

Version 4: Nitrogen -200 kg/ha; phosphorus -200 kg/ha; potassium -100 kg/ha

The experiment was carried in 4 versions and 4 repetitions, all versions were placed in one layer.

Tree thickness is considered to be an important factor in grain growing. Therefore, by sowing the seeds of autumn wheat under convenient weather conditions perhaps supplies gaining profuse crop from hectares in a short period of time.

In the experiment, the field, where the seeds of autumn wheat were 60 cm, was processed thoroughly and this period was considered to be a period when fungicides were 2-3 times more than the beds in the control version. Sowing autumn wheat seeds in narrow rows firstly resulted in fast ripening due to the improve of soil porosity, humidity and optimal preservation and secondly, processing the soil well caused to ripen the seeds fast and to increase the tolerance of cells to pathogen in the primary stage of development. Due to the experiment results, on October 19, ripening of the seeds of autumn wheat was 15.7 times more in well processed versions than the control version. On October 25, ripening process reached 12.1 % and on November 4, it reached 100,0 % whereas in the control version it composed 83.4 %. Seed budding differed to 2-3 days. To conclude, it is possible to get complete crop from hectares only when the amount of humidity is sufficient.

Tree thickness plays an important role in farming, thus when autumn wheat seed budding was well accumulated, resulting from calculations in the experimental field the plant thickness was 3 mln 373 thousand pieces up to 3 mln 794 thousand pieces. We can result from it that, energy of budding of autumn wheat seeds was close to each other.

Applying only one agro technical method in growth and development of autumn wheat is not sufficient for getting good results. Getting rich harvest from plants which answers the demands of growth and development is only possible by applying leading experiences. We conclude from this that changes of morphological signs in plants are considered to be the appearance of plant rejuvenation [7] .

Taking into consideration all these, on March 27, in experiment versions 15 kg/ha of potassium mineral fertilizer was dissolved in water by putting into a 25 l motor sprayer and we got solution. The formed solution was sprayed on wheat leaves by the help of this apparatus. In 6 days after processing, we started to identify some changes in morphological signs in plant stems in the 3rd version (Table -1).

The observations showed that, the plant leaves of the version processed with potassium solution changed from light green into dark green. Some wheat stems started to enter the stage of tillering. As it is known from phenologic observations (Table 2) on April 1, the height of wheat stems in all versions were very close to each other and the height of stem growth composed 34.7-37.3 cm. However in further references gained on April 15, the best result was seen in the 3rd version. The height of plant stem in this version was 57.8 cm while on the same date the height of autumn wheat stem in the control version was 46.5 cm, i.e. the difference between them was 11.3 cm.

Table-1

Influence of potassium mineral fertilizers in different norms on the growth and development of autumn wheat

№	Experiment versions	Calculated dates				Number of leaves		
		IIV	15IV	IV	15V	IIV	15IV	IV
1	Control	34.7	46.5	69.5	78.6	2.1	2.2	2.6
2	N-200, P ₂ O ₅ 200 K ₂ O 50 kg/ ha	34.9	49.4	81.3	94.3	2.1	2.9	3.3
3	N-200, P ₂ O ₅ 200 K ₂ O 75 kg/ha	41.6	57.8	94.6	110.2	2.4	3.6	4.0
4	N-200, P ₂ O ₅ 200 K ₂ O 100 kg/ha	37.3	51.7	84.1	84.1	2.2	3.0	3.5

Further references gained on May 15 showed that the height of plant stems in the control version was 78.6 cm and in the 3rd version it was equal to 110.2 cm, the difference between them was 31.1 cm, the growth of stems in the control version lagged behind. The appeared difference in the number of leaves being more than 1.4 pieces and it differed from the 3rd version. We can conclude from it that, when potassium mineral fertilizer was sprayed on autumn wheat stems more than 15kg/ha norms, we were able to create nutrient atmosphere for plants.

When on time nutrition was applied in cereal plants we observed not only phenological changes in morphological signs but also in physiological signs too [8]. That is why the more organic and mineral substances in plant cells are the longer the life period of plants and their tolerance to rust disease are.

But since soil and climatic conditions of continents were different, growth and development of rust fungicides were different too. The rust fungicide spreads in environment by the help of winds, running water, machines, tractors, birds, humans [9].

The most dangerous side of this fungicide is that stages of pathogenic development is divided into 4 types which are further subdivided into types. The seriousness of pathogen is seen in that it gets all parts of the plant on the ground badly diseased in all phases of autumn wheat stem. As a result, it makes the fruitfulness sharply decreased. Convenient conditions should be created for autumn wheat stems in such a case that the plant must not be evaluated for the processes of renewing but also for not creating conditions for disease causatives. Only in this case we can achieve the expected results.

Table -2**Biological efficiency of potassium mineral fertilizer of different norms**

Experiment versions	Calculated dates					Biologic efficiency, %
	1 IV	15 IV	1 V	15 V	25 V	
Control	4.7	7.3	13.8	21.4	24.2	-
N-200, P ₂ O ₅ 200 K ₂ O 50 kg/ha	1.9	2.4	6.9	13.8	14.0	45,3
N-200, P ₂ O ₅ 200 K ₂ O 75 kg/ha		0	2.1	6.3	7.1	73,7
N-200, P ₂ O ₅ 200 K ₂ O 100 kg/ha	0.3	0.7	6.0	11.7	13.2	46,7

As it is known from the given table -3, on April 1, getting diseased was primarily seen in the stems of the control version i.e. 1.9% of getting diseased was observed. In the 4th version, this case composed 0.3%. But in further gained references it was imbalanced and as it is known from calculations made on May 1, the highest degree of getting diseased was observed in the stems of the control versions. Total degree of getting diseased composed 13.8 % in this version and in the version where the plants were nitrified with 75 kg/ha potassium mineral fertilizer on the same date, it composed 2.1 %. In calculations carried on May 25 it changed much. The least degree of getting diseased was observed in the stems of the 3rd stage i.e. it composed 7.1 % while in the control versions the level of getting diseased composed 24.2 %. The difference between them composed 17.1%. in an etalon version this index was equal to 14% (Table -3). In conclusion, in 7 days after spraying 15 kg/ha more potassium mineral fertilizer on the leaves of the autumn wheat than in the norms resulted in the appearance of morphological changes.

A characteristic feature of the prepared solution is that when the solution enters cells, new ecological environment appears [10]. In the result of which, due to additional nutrition, a peculiar feature of tolerance emerges. Due to the fact that when inconvenient environment is created for the disease causative, the number of the causatives decreases and renovation emerges in plants.

Table - 3

Influence of potassium mineral fertilizer suspension in different norms on rust disease of autumn wheat

№	Experiment versions	Baby tree thickness mln/ha	Calculated number of plants	Processed day	Average level of getting diseased		
					Number of diseased plants till the date of processing	In 15 days after processing	In 25 days after processing
1	Control	3,794	100	5 IV	57	68	83
2	N-200, P ₂ O ₅ 200 K ₂ O 50 kg/ha	3,768	100	5 IV	44	28.5	31.7
3	N-200, P ₂ O ₅ 200 K ₂ O 75 kg/ha	3730	100	5 IV	47	11.3	19.4
4	N-200, P ₂ O ₅ 200 K ₂ O 100 kg/ha	3,752	100	5 IV	43	26.7	27.4

As it is seen from the given table (Table -4), suspension, prepared from mineral substances on April 5 for the 1st and 3rd repetitions of the experiment on determination of fungicide resistance of mineral substances against disease causatives, was sprayed on the leaf surfaces of autumn wheat in the norms of 10.0 l/ha. In 10 days after this process, we started our observations on identifying the fungicide resistance of the suspension prepared from potassium mineral fertilizer against pathogens.

As it is known from the references, in the period between April 5 and April 15, the suspension did not show fungicide resistance against disease causatives, however, it increased the level of plant tolerance to diseases.

As a result, the plant had a peculiarity to defend itself. In 10 days after the suspension was sprayed the number of diseased plants decreased up to 35.7 pieces. In other versions this index decreased from 15.5 pieces to 16.3 pieces [11].

Concluding from it, we can say that by respraying the suspension prepared from potassium mineral fertilizer on leaves during the period of May 5-10 the tolerance of plants to rust diseases increased in the result of prolonging the life period of autumn wheat stems.

Table – 4.

Influence of potassium mineral fertilizers in different norms on biometrical indices of autumn wheat

№	Experiment versions	Height of basic stem, cm	Indices			
			Length of a plant head, cm	Number of grain heads	Weight of one plant head	Weight of 1000 grain pieces, gr
1	Control	78.6	10.9	40	0.96	39.0
2	N-200, P ₂ O ₅ 200 K ₂ O 50 kg/ga	94.3	11.4	46	1.14	40.0
3	N200, P ₂ O ₅ 200 K ₂ O 75 kg/ga	110.2	13.8	54	1.46	41.1
4	N200, P ₂ O ₅ 200 K ₂ O 100 kg/ga	97.7	12.6	48	1.19	40.0

The number of grains and the weight of one grain in one wheat head are very important. As it is seen from the given table, the influence of disease causative in the contents of the soil on the plants will result in the appearance of tolerance characteristics in a plant due to the strength of mineral ability of mineral substances [12]. The length of the heads in them was equal to 2.9 cm and in the 2nd and 4th versions this index was equal to 0.5-1.7 cm. This index in stems will bring into the emerge of numerous grains in heads on time. This kind of example can be seen in the version nitrified with potassium mineral fertilizer in 75 kg/ha norms. The best indices were seen in the 3rd version.

The number of grains in the heads of the autumn wheat of this version was 14 more than the control version and in the 2nd and 4th versions this index composed 0.6 up to 0.8 pieces more. The weight of one head in the 3rd version was 1.4 up to 2.3 gr more than the control version.

To sum up, the agro technical measures carried on increasing the quality of autumn wheat heads were very high. In developing grain growing the result is evaluated with the amount of

gained result, since by applying basic measures upon scientific basis one can achieve getting rich and qualitative harvest.

Taking all these into consideration we can see as in our example that when the stems of autumn wheat are nitrified with 75 kg/ha potassium mineral fertilizer we are able to get more crop rather than in other versions.

Table - 5

Impact of potassium mineral fertilizer of different norms on fruitfulness of autumn wheat, c/ha

Experiment versions	Repetitions				Average crop gained from repetitions c/ha	Additional crop due to the control version c/ha
	I	II	III	IV		
Control	41.3	40.9	38.7	38.1	39.7	-
N-200, P ₂ O ₅ -200 K ₂ O-50 kg/ga	42.6	44.6	43.9	44.3	43.8	4.1
N-200, P ₂ O ₅ -200 K ₂ O -75 kg/ga	46.8	47.7	47.8	48.2	47.8	8.1
N-200, P ₂ O ₅ -200 K ₂ O-100 kg/ga	4.9	43.2	47.1	45.5	45.1	5.4

The experiments show that, the life period of plants may be prolonged to 8-10 days due to the fact that potassium mineral fertilizers increase the tolerance of plants towards fungicides and fungicides decrease pathogenic features. Along with it we can have an opportunity to get rich harvest. The most harvest from the wheat was gained in the 3rd version - 43.8c/ha, the least harvest was gained in the control version. The difference between them was equal to 8.1 c/ha and this index composed 4c/ha index relatively to the etalon version.

In conclusion, we consider that in getting rich harvest from autumn wheat all measures should not be carried unilaterally but by nurtifying the plant stems additionally too.

Owing to giving additional 15-20 kg/ha more nutrition than in the norms to autumn wheat stems, we can observe the increase of their tolerance peculiarity and it will result in passing to the budding phase 2-3 days earlier than the stems of the control version.

Additional nutrition given to the stems of autumn wheat causes renovation in them and it will not only influence the increase of plant tolerance to rust disease but also brings into the increase of fruitfulness up to 8.1c/ha.

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