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INFLUENCE OF SUFUR AND MANGANESE MICRONUTRIENTS ON FORMATION OF LEAF AREA OF "ORZU" CULTIVAR OF SOYBEAN

Abstract: *In this article, It is given data about the use of micronutrients in the suspension method 2 times during the period of application of soybean varieties in the conditions of meadow-swamp soils in 2018-2020 affected leaf area of Orzu variety of soybean, in the variant where not used mineral fertilizers and micronutrients, the leaf area of the soybean in the control variant of the Orzu variety was 51.1 thousand m^2 / ha, and the leaf area of the Orzu variety under the influence of microelements was 59.1-64.6 thousand m^2 / ha. The highest rates of micronutrients were observed with medium use of sulfur and manganese. Due to macro and micro fertilizers, the leaf area of Orzu increased by 4.0-13.5 thousand m^2 / ha, or from 7.3 to 20.9%.*

Key words: *leaf area, manganese, mineral fertilizer, micronutrient, "Orzu", photosynthetic activity, sulfur, soybean, suspension.*

Language: *English*

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Introduction

Nowadays, when protein deficiency is prevalent all over the world, the protein richness of soybeans, the presence of all the amino acids useful for humans in the protein content, is of particular importance, further increasing the nutritional value of soybeans. It should be noted that the advantage of soybean is comparable to a number of foods in terms of richness in lysine, methionine, arginine, leucine and other essential amino acids.

In many countries where soybeans are grown, this crop is the only source of protein, which also provides livestock with nutritious food and increases its productivity. Soybeans contain 30-52% protein, 17-27% oil and 20% carbohydrate water. The prevalence of soybean crop on earth is related to the quality of grain and protein.

Based on the positive biological properties of soybeans in the country, it is necessary to study the norms of micronutrients on the background of mineral fertilizers, to determine the optimal ones in the creation and improvement of technology for growing soybeans as a primary and secondary crop.

Soybean is a plant demanding to nutrients. 124 kg of nitrogen, 22 kg of phosphorus, 102 kg of potassium, 34 kg of calcium, 23 kg of sulfur, 191 g of zinc, 18 kg of magnesium, 207 g of manganese, 865 g of iron and 75 g of copper are extracted from the soil at a grain yield of 24 c / ha per hectare. This shows that in addition to macronutrients, micronutrients are also necessary for the growth and development of soybean.

Literature review

X.N.Atabaeva, F.B.Namozov, A.A.Kurbanov and S.Sh.Khayrullayev (2020), in their experiments in 2018-2020, found that when micronutrients affected soybean crops, micronutrients affected stem height, leaf and root development, root nodule formation, grain quality and yield, and provided high yields [7].

According to R.Juraeva, J.Tashpulatov, A.Iminov, H.Bozorov, Khatamov S.R, Khayrullaev S.Sh and L.Zaynitdinova (2020), in their experiments in 2015-2017, mineral fertilizers and rhizobium were applied to soybeans. When exposed to strains of azotabacteria belonging to the group, it was observed that the yield increased by 12.6-12.8 c / ha compared to the control variant, [4; pp.72-79], [3; p.172].

According to Khayrullayev Sardor Shamsiddin ugli (2021), the application of micronutrients in the suspension method 2 times during the application period of soybean varieties in the conditions of meadow-swamp soils provides an increase in grain quality [6].

According to data of Atabayeva Khalima Nazarovna, Khayrullaev Sardor Shamsiddin o'g'li, and Usmonova Shohista Usmon qizi (2020), sulfur has a positive effect on the branching of soybean varieties on the background of mineral fertilizers, and in 2018 the number of branches in the variety "Orzu" increased by 0.8-1.3 compared to the control option due to the micro element sulfur. In the "Nafis" variety, this figure was 0.3-0.4, and good results were obtained from medium and high sulfur standards. In 2019, these indicators increased by 0.3-0.7 in the variants of sulfur compared to the control in the "Orzu" variety, increased by 0.1-0.3 in the "Nafis" variety, and good results were obtained from the medium and high standards of sulfur [2].

According to Iminov Abduvali Abdumannobovich, Khayrullayev Sardor Shamsiddin ugli, et al, Nitragine treatment of soybean and mung bean seeds before sowing had a positive effect on seed germination under both laboratory and field conditions, the germination rate of seeds in the laboratory under the conditions of cotton cultivation in the following ear under the background of non-treatment by nitragine before sowing the seeds of soybean and mung bean crops grown as a secondary crop after winter wheat was 0.3-1.3%, and field fertility was 0.2-0.8% higher. Also, it was found that the use of phosphorus and potassium fertilizers in soybean and mung bean crops grown as a secondary crop was 0.6-1.0% higher in the laboratory, and 0.6-0.7% higher in the field than in the control options without mineral fertilizers in studies [1].

According to Umarova Nigora Sadriddinovna, Bo'riboyev Bekzod Yetmish ugli, Khayrullayev Sardor Shamsiddin ugli, Usmonova Shokhista Usmon kizi, & Turdaliyeva Shokhista Tulkinjon kizi, the demand of the soybean plant for mineral fertilizers, it was observed that when NPK and liquid fertilizer were used together, all the biometric parameters and yields of the plant increased by varieties compared to other methods. The use of mineral fertilizers in different ways in typical sierozem soil conditions affects the grain yield of local and foreign varieties. In other words, the average yield of medium-ripe soybean varieties "Nafis" was 43.4 c / ha, "Vilana" was 42.4 c / ha, and the best way to increase the yield is to apply fertilizers as NPK in combination with liquid fertilizer [8].

According to data of Khayrullayev Sardor Shamsiddin o'g'li and Usmonova Shohista Usmon qizi, the location of the lower first pod in soybean varieties is 12.8-15.9 cm in Orzu variety, 3-3.1 cm in Radimax stimulator, 2.2-2.4 cm in Gummat stimulator, 2.1 cm in Tecamin stimulator and 3.1 cm in Algora stimulator was found to be high. The most effective results were observed in Radimax, Gummat and Algora bio-simulators, and the location of the lower first pod was detected 14.7-17.6 cm in the "Nafis" variety, which was 2.5-2.9 cm higher in the Radimax stimulator, 2.2-2.5 cm higher in the Gummat stimulator, 2.1 cm higher in the Tecamine stimulator, and 2.4 cm higher in the Algora stimulator than in the control variant. The most effective results were observed in Radimax, Gummat and Algora biosimulators [5].

According to data of Kh.N.Atabayeva, N.S.Umarova, S.Yakubov, and S.Sh Khayrullaev, micronutrients on the basis of micronutrients prolonged the shelf life of the 'Orzu' variety by 4- 5 days for sulphur and 2-4 days for manganese; macro and micronutrients affected the growth of soybeans, the stems were higher by 4.45% due to macronutrients and 2.78-6.30% due to micronutrients [9].

Materials and methods

The research was conducted in the experimental fields of the Rice Research Institute for 2018-2020. The Rice Research Institute is located in the south-eastern part of the Tashkent region, in the Chirchik oasis, 15 km from Tashkent, on the left bank of the Chirchik River. In terms of geographical location, the coordinates of the institute are bounded on the Greenwich scale by $69^{0}18$ east longitude and $41^{0}20$ north latitude. The topography of the area is flat, the soil in the experimental fields corresponds to the soil of the riverside areas, the soil layer of the area consists of meadow-swampy soil.

The reason for the emergence of this type of soil is mainly that the lands attached to the institute are located close to the banks of the Chirchik River, the surrounding farms are also engaged in rice cultivation, and there is an excess of moisture in the soil.

The soil layer in the experimental area is meadow-swampy, loamy sandy soil. It is known that sierozem soils are less stratified and are characterized by a lack of humus, which is also evident from the specific color that occurs in meadow-swamp soils.

The driving layer of the experimental farm of the Rice Research Institute is 0-30 and 0-40 cm, below the driving layer is a layer of gel 30-40 cm thick, at a depth of 60-70 cm there is a layer of sand and small stones.

The soil in the experimental farm was not saline (pH 7.1-7.3). According to its mechanical composition, heavy sand belongs to the soil type. The amount of physical mud in the driving layer was 40-60 percent.

The amount of humus in the driving layer was 1.63-1.95%, total nitrogen was 0.27-0.30%, phosphorus was 0.17-0.21%, and potassium was 0.71-0.76%.

There are no mineral salts due to the fact that the

experimental area is partly sloping, the bottom layer of the soil consists of sand and small stones, and the groundwater flows from the northeast to the southwest. Groundwater varies at a depth of 0.5-1.0 meters during periods when rice plots are flooded. When the rice is not filled with water, the groundwater begins to deepen, which lasts until February at a depth of 1.5-1.6 m.

The experiments were conducted in an area free of rice. Field experiments showed that in 4 turns the plots were 20 m long, 2.4 m wide, 4 rows, the total area of each plot was 48.0 m^2, including 2 rows in the middle and 2 rows of protection rows at the edges. The options are placed by the randomization method.

Conducting field calculations, calculations and observations were carried out on the basis of "Methodological manual of the State Commission for Variety Testing of Agricultural Crops (1989)", "Methods of field experiments (UzPITI, 2007)" and B.A.Dospekhov's "Methodology of field experiment." Leaf area is determined by the method of A.A. Nichiporovich, by leaf cuttings, the number of stems and weight were determined by the method of G.S. Posypanov. To determine the weight of the roots, a monolith measuring 60x50x30 cm was dug. The roots were washed and weighed both wet and dry. Biometric measurements were performed on the counted plants prior to harvest. The plant height, branching, number and weight of pods, number and weight of grains, weight of 1000 grains were determined. To determine the yield, the pods were collected, crushed, and pulled from the accounted area of the stalks. Yield was determined by converting the yield per hectare using the number of bushes per hectare. The results of the study were analyzed by variance according to the method of B.A.Dospekhov.

Description of "Orzu"cultivar of soybean planted in the experiment

"Orzu" is an early maturing variety, which takes 35-40 days from sowing to flowering, 110-120 days before ripening. The stem is branched. The stem grows upright, the stem is hollow. The height of the stem can be up to 50-70 cm. The leaves are trifoliate, large, light green. The leaves of the plant are average. The leaves are located symmetrically. The length of the leaf band is 10 cm. When they fully ripe, 75% of the leaves fall off. The flower is white, with 2-7 flowers in the inflorescence. Pods are gray, small, 2.4 cm long, and until.4.0 cm. The pods do not crack when ripe, forming an average of about 40 pods per bush. The average grain size is 120-130 g per 1000 grains. Grain yield is 32 c per hectare on irrigated lands. When sown as a secondary crop, 10-20 c of grain is obtained. The grain contains 25% oil and 36-38% protein. Authors: Rakhmanov A.R, Yunusov B.K, Tulaganov N, Burigina O.V.

Agrotechnics of the experiment

The technology of cultivation of meadow-swamp soils has been implemented in the Tashkent region. After the land was prepared, the experimental field was divided into plots based on a working program. Planting method is wide, 60 cm between rows, 5 cm between bushes. The "Orzu" variety was planted in May. 500,000 seeds (62.5 kg / ha) were sown at a depth of 4-5 cm per hectare. Prior to planting, a program of mineral fertilizers was established, using 50 kg of nitrogen, 100 kg of phosphorus and 70 kg of potassium. The experimental field was irrigated 4 times and cultivated 3 times during the application period. According to the program, at the beginning of the mowing period (or at the development of 5-6 trifoliate leaves and the end of the flowering period - the beginning of budding) soybean was fed with micronutrients in 3 different doses, extra-root (foliar application), suspension was used.

Results and discussion

It is known that taking high yields of field crops are closely related to their leaf formation and leaf area per hectare. Because, plants produce large amounts of organic matter through photosynthesis through the leaves, which in turn provides a rich harvest from the plants.

In the experiment, In the Control variant, in which no minerals and micronutrients were used in the Orzu variety, the leaf area per bush averaged 355.4 cm^2 / bush during the budding period. Before sowing, mineral fertilizers in the variant with Background given in the ratio $N_{50}P_{100}K_{70}$, the leaf area was 360.2 cm^2 / bush, and the higher result was obtained 4.8 cm^2 / bush than in the control variant. Due to the absence of micronutrient effects during fertilization, only under influence of variant where the sulfur used, the leaf area per bush was 365.5-384.2 cm^2 / bush in the sulfur used variant, while in the manganese used variant, this figure was 373.9-387,8 cm^2 / bush. In this phase, it was observed that in the sulfur and manganese variants, the leaf area was higher than in the control variant only due to the fertilizer background.

During the flowering period, in the control variant, the leaf area was 720.4 cm^2 / bush. Under the background of mineral fertilizers, the leaf area was 755.1 cm^2 / bush, which was 24.7 cm^2 / bush higher than the control variant. During this period, the effect of micronutrients on soybeans was observed, the leaf area was 772.3-825.6 cm^2 / bush due to sulfur, and 51.9-105.2 cm^2 or 6.72-12.74% higher compared to the control variant, and the leaf area was found to be 795.2-830.6 cm^2 / bush in exchange for manganese, and was found to be high 74.8-110.2 cm^2 / bush, or 9.4-13.3%, compared to the Control variant.

Table 1. Leaf area in bush plant and per hectare of Orzu variety, (average)

№	Options	Developmental stages, cm^2/bush			thousand m^2/ha
		budding	flowering	podding	
1	Control	355,4	720,4	1132,2	51,1
2	*Background-$N_{50}P_{100}K_{70}$	360,2	755,1	1210,2	55,1
3	Background+*S_1	365,5	772,3	1256,1	59,1
4	Background+S_2	384,2	825,6	1338,7	63,3
5	Background+S_3	372,4	796,7	1277,5	60,2
6	Background+*Mn_1	373,9	795,2	1316,0	59,9
7	Background+Mn_2	387,8	830,6	1392,3	64,6
8	Background+Mn_3	378,0	807,1	1330,9	61,2

*Background is mineral fertilizers ($N_{50}P_{100}K_{70}$) used as basis in the experiment

*S_1, S_2, S_3-amount of sulfur used in different norm in the experiment (10 l water+1,5; 3,0; 4,5 gr)

*Mn_1, Mn_2, Mn_3-amount of manganense used in different norm in the experiment (10 l water+2,5; 5,0; 7,5 gr)

During the podding period in the control variant, the leaf area was 1132.2 cm^2 / bush. Under the background of mineral fertilizers, the leaf area was 1210.2 cm^2 / bush, which was 78.0 cm^2 / bush or 6.4% higher than the control variant. During this period, the second application of micronutrients affected to soybeans and influencing the formation of leaf area, in exchange for sulfur, the leaf area was 1256.1-1338.7 cm^2 / bush, and 123.9-206.5 cm^2 or 9.9-15.4% higher compared to the control variant, while the leaf area was found to be 1316.0-1392.3 cm^2 / bush in exchange for manganese, and was found to be 183.8-260.1 cm^2 / bush, or 14.0-18.7% higher compared to the Control option.

In the experiment, in Orzu Variety, along with the leaf area of a single plant, the leaf area per hectare was also determined. In the control variant, the leaf area was 51.1 thousand m^2 / ha. Under the influence of mineral fertilizers, the leaf area was 55.1 thousand m^2 / ha, which was 4.0 thousand m^2 / ha or 7.3% higher than the control variant. When micronutrients were applied to the soybean crop in suspension, these micronutrients affected the leaf area formation, and the leaf area in exchange for sulfur was 59.1-63.3 thousand m^2 / ha, and 8.0-12.2 thousand m^2 / ha or 13.5-19.3% higher compared to the control variant, and in exchange for manganese the leaf area was found to be 59.9-64.6 thousand m^2 / ha, and 8.8-13.5 thousand m2 / ha, or 14.7-20.9% higher compared to the Control variant.

CONCLUSIONS

In the variant, where not used mineral fertilizers and micronutrients, the leaf area in the control variant of the Orzu variety of soybean was 51.1 thousand m^2 / ha. Under the influence of microelements, the leaf area of Orzu was 59.1-64.6 thousand m^2 / ha. The highest rates of exposure to micronutrients were observed with medium use of sulfur and manganese. Under influence macro and micro fertilizers, the leaf area of Orzu variety increased from 4.0 to 13.5 thousand m^2 / ha, or from 7.3 to 20.9%.

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