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The effect of micronutrients on the yield of soybean varieties

Atabaeva Xalima Nazarovna [1], Umarova Nigora Sadridinovna [2]
Achilov Furqatbek Saparbaevich [3]
[1] *Ph.D., Professor, Tashkent State Agrarian University*
[2] *Ph.D., Associate Professor, Tashkent State Agrarian University Universities*
[3] *Ph.D., Senior Lecturer, Tashkent State agrarian university*

Abstract

In this paper, soybean varieties have a longer shelf life, stem, leaf growth, leaf surface area, number of stems and weight than the control option, and the yield and grain quality of soybean varieties are significantly higher when applied in the form of suspensions of manganese and iron in the background of mineral fertilizers. reported an increase.

Keywords: *shade, mineral fertilizer, micronutrient, manganese, iron norm, growth, development, end, grain, weight, leaf surface, yield*

INTRODUCTION

Today, 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, is of particular importance, which further increases the nutritional value of soybeans. It should be noted that the advantage of soy is equal to a number of foods in terms of richness in lysine, methionine, arginine, leucine and other essential amino acids. In many soybean-growing countries, this crop is the only source of protein, providing livestock with nutritious food and increasing its productivity. Soybean contains 28-52% protein, 18-27% ecologically pure vegetable oil, many mineral salts and nutrients, which can be compared with the most important food products such as meat, milk and eggs in terms of high quality amino acids. .

Due to the positive biological properties of soybeans in the country, in the creation and improvement of technology for growing soybeans, special attention is paid to the norms of sowing, norms of mineral fertilizers. Soybean cultivation requires scientific research on the efficient use of water and land resources to obtain additional crops, with a strong emphasis on micronutrients, stimulants, growth regulators. Soybeans contain 30-52% protein, 17-27% fat and 20% carbonated water. The high prevalence of soybean in the world is related to the quality of grain and protein. The amount and proportion of protein, fat and other important organic and mineral substances in the grain allow it to be used in various industries. Soybean oil is used to make butter, margarine, cheese, milk, flour, confectionery and canned food. Soybean oil accounts for 40% of the world's vegetable oil production. [1]

In Uzbekistan, according to several government decisions, the area under soybeans is being expanded, productivity is increasing, our national varieties are being created and foreign varieties are being introduced. Scientific work on shade varieties is carried out in different soil and climatic conditions of Uzbekistan. Tashkent State Agrarian University trains specialists in soybean cultivation.

Literature review

Micronutrients optimize plant nutrition, increase resistance to stress, stimulate growth [3]. Such cases are also observed in the shade plant [11]. According to the biological potential of modern soybean varieties, it is possible to grow 3.5-4.4 t / ha of seeds, but in practice this is very difficult to achieve [5].

Micronutrients are relatively poorly absorbed by the soybean plant as nitrogen, phosphorus, potassium, calcium, magnesium and manganese. Nevertheless, their importance is not small, the lack of trace elements in the soil slows down the growth rate of the plant, the yield is reduced. Micronutrient Deficiency Increases Disease Resistance of Soybeans When fully supplied with micronutrients, the number of flowers and fruits in plants increases, ensures full maturity Helps transport nitrogen and

photosynthesis products in the plant

Air nitrogen assimilation takes place in the presence of trace elements in soybean plants, especially molybdenum and cobalt. In the process of nitrogen fixation, molybdenum improves plant nitrogen nutrition, increases the effectiveness of phosphorus and potassium fertilizers. As the yield increases, so does the protein content of the grain.

If manganese, barium and molybdenum are not enough, seeds will not form in the pods. At the beginning of the growing season, molybdenum and barium have a positive effect on the plant [3]. Effective methods of feeding soybean yield should be used [11]. Iron is a component of chlorophyll and is important in respiration and photosynthesis. In iron deficiency, chlorophyll production stops abruptly. The interstices of young leaves turn yellow. As the deficit increases, the leaf veins also turn yellow and the leaf turns completely white. Brown spots appear on the edges of the leaves.

Iron deficiency is common in soils with a soil environment pH greater than 7. Shade varieties have different approaches to iron deficiency. In resistant varieties, the assimilation of iron begins with the root system, and in the developing world, iron is assimilated from various root wastes. As the pH of the soil increases, the absorption of manganese becomes more difficult.

No trace elements are formed. Macro fertilizers should be used in soybean cultivation. The fertilization system plays an important role in increasing the yield of soybeans. The plant requires mineral nutrition: for the cultivation of 1 t of seeds requires 70–90 kg of nitrogen, 15–20 - phosphorus, 30–40 - potassium, 8–10 - magnesium, 18–21 kg of calcium. The amount of nutrients falling on the plant during the application period is not the same. From weeding to flowering, the shade absorbs 5.9-6.8% of nitrogen, 4.6-4.7% of phosphorus and 7.6-9.4% of potassium relative to the total absorbed volume. The most nutritious period is flowering, legumes and grain filling. During these periods, nitrogen was 57.9–59.7%, phosphorus 59.4–64.7%, and potassium 66.0–70.0%; nitrogen from the period of grain filling to the ripening period - 33.7-36.3%, phosphorus-30.6-36.0 and potassium 18.9-26.4%. The upper part of nitrogen is assimilated during flowering and budding, the main part of phosphorus is absorbed from weeding and branching, the main part of potassium is assimilated during budding and grain filling. Mineral fertilizers play an important role in soybean cultivation technology [9]. When soybeans were grown without fertilizers, the yield was 16.9 ts / ha per hectare, with a protein content of 35.7%. When N60P60K60 was applied per hectare, the grain yield was found to be 21.9 ts / ha with a protein content of 39.3%. It was noted that the yield of soy increased by 1.2 - 4.9 ts / ha due to mineral fertilizers [8, 9]. Depending on the phosphorus supply of the soil, the following norms of phosphorus fertilizers were recommended. It was found that when the phosphorus content in the soil is very low (1.5 mg / 100 g) it is necessary to apply 120 kg of pure substance per hectare, at least 90 kg, on average 75 kg of phosphorus fertilizer [6].

According to the results of scientific studies, to provide the soil with phosphorus-potassium, phosphorus and potassium fertilizers should be applied 20 kg per hectare before plowing in the fall. and 120 kg. recommended until [11]. In order to get a yield of 30 ts per hectare, it is necessary to apply mineral fertilizers at the rate of P 90 K 60. The effectiveness of phosphorus and potassium fertilizers under irrigated conditions depends on water supply, the demand for phosphorus and potassium fertilizers increases significantly when legumes are harvested in symbiosis with nitrogen, which is 34-36 ts / ha higher than the shade when used normally [5]. Lack of potassium in the plant reduces productivity, reduces resistance to external conditions and disease. When potassium is sufficient, the plant becomes vigorous, grows and develops well, increases resistance to drought and disease, and is well preserved [7].

Experimental style and conditions. The experiment was conducted on the experimental farm of the Uzbek Rice Research Institute in 2018-2019. The soil is swampy. The soil of the experimental field is not saline, the driving layer is 30-40 cm. The pH of the soil solution is 6.8-7.3 units, which is a heavy clay in terms of mechanical composition. Rice was a predecessor to the soybean crop. Field experiments In 4 kaytars, the piles were 10 m long and 2.4 m wide. There are 4 rows, the total area of each pile is 24.0 m2, of which 2 rows in the middle, 2 rows of protection rows on the edges. The options are placed by the randomization method.

Conducting field calculations, calculations and observations were carried out on the basis of

"Methodological guidelines of the State Commission for Variety Testing of Agricultural Crops (1989)", "Methods of field experiments (UzPITI, 2007)" and BA Dospekhov's "Methodology of field experiment." Leaf surface was determined in the method of A.A. Nichiporovich by leaf cuttings, for which 5 typical plants were taken from the protective rows and analyzed. Leaf level was detected during flowering and legume phase, when 4 leaves appeared during the application period. During this period, the number and weight of tufts were determined by the method of GS Posypanov. To determine the weight of the roots, a monolith of 60x5x30 cm is dug, the roots are washed and weighed in a wet and dry state. Biometric measurements were performed on the calculated plants before harvest. The plant height, number of leaves, leaf surface, weight of 1000 grains were determined. To determine the yield, beans were collected, pulverized, milled, and grained from the accounted area of the stalks. Yield was determined by converting the yield per hectare using the number of bushes per acre. The amount of protein and fat in the grain was determined in special laboratories.

Experimental options: the experiment involved Orzu and Nafis varieties of soybeans, mineral fertilizer background-nitrogen 50, phosphorus-100, potassium 75 kg / ha, manganese and iron standards 2.1 and 4.2 kg / ha. g to 10 l of water, this solution was applied by the method of suspension at the end of the flowering and flowering period.

Results

Against the background of mineral fertilizers, micronutrients affected the growth, development, germination and grain quality of soybean varieties. Under the influence of micronutrients, the shelf life of soybean varieties was extended. coincided. The service life is extended by 4-6 days. Under the influence of the iron element, the service life is extended by 5 days (Table 1).

The delicate variety lasted 124-130 days. It was found that the application period was extended by 2-6 days due to macro and micro fertilizers.

In the experiment, when the manganese was used in small amounts in the Orzui variety, the stem height was 109.6 cm, which was 7.2 cm higher than the control variant; when the manganese medium was applied, the stem height was 111.0 cm, which was 8.6 cm higher than the control; The stem height was 114.0 cm when the iron was used in moderation, which was 11.6 cm higher than the control variant. The stem height was 6.6 cm higher when the iron element was used in moderation.

In the control variant of the shade variety "Nafis", the height of the stem was 133.5 cm. In the variant where mineral fertilizers were applied, the stem height was 137.5 cm, which was 4.0 cm higher than the control;

In the experiment, when manganese was used in small amounts, it was observed that the stem height was 146.2 cm, which was 12.7 cm higher than the control variant; when manganese was used in moderation, the stem height was 144.7 cm, which was 11.2 cm higher than the control; When the iron was used in small amounts, the height of the stem was 168 cm, which was 34.5 cm higher than the control. When the amount of iron element was increased, the height of the stem decreased.

During the period of budding, 28.8-34.1 leaves developed in the control variant, and the number of leaves increased by 1.2-4.6 due to macronutrients. When the element manganese was used in small amounts, the number of leaves increased by 6.4-5.7 per variety; when manganese was used in moderation, the number of leaves increased by 8.4–8.6 compared to the control; when iron is used in small amounts, the number of leaves in varieties increased by 3.2-5.1 compared to the control; it was found that the number of leaves decreased by 1.8 in the Orzu variety compared to the control, and increased by 1.9 in the Nafis variety when the iron content increased.

Table 1

Growth and development of soybean varieties under the influence of trace elements

№	Variants	Validity period, days	Stem height, cm	Number of leaves, pcs	Leaf surface, thousand m2 / ha	Number of knots, pcs	Number of knots, weight
	Орзу sort						

1	Control	107	102,4	28.8	48,9	75,5	1.77
2	Fon-$N_{50}P_{100}K_{70}$	106	108,8	30.0	50,1	89.5	1.88
3	Fon+Mn-2,5	111	109,6	35.2	53,3	92,7	2.08
4	Fon +Mn-5,0	113	111,0	37,2	55,9	95,4	2.10
5.	Fon +Fe-2,5	112	114,0	32,0	52,9	44,0	1,22
6	Fon +Fe-5,0	112	109,0	27,0	47,9	43,0	1,18
	Нафис sort						
1	Control	124	133,5	34.1	50,8	80,5	2.28
2	Fon-$N_{50}P_{100}K_{70}$	126	137,5	38.7	52,6	83.7	2.35
3	Fon +Mn-2,5	130	146,2	39.8	55,6	82.7	2.38
4	Fon +Mn-5,0	129	144,7	42.7	56,9	87.7	2.33
5	Fon + Fe-2,5	130	168,0	40,0	53,0	59,0	1,56
6	Fon + Fe-5,0	130	157,0	36,0	50,1	37,0	1,13

The formation and development of the leaf surface depends on the conditions of growth and development of the plant and the applied agronomic measures. The leaf surface of soybean varieties varied considerably in options in exchange for the minerals and micronutrients used. During the budding period, the leaf surface of the varieties in the control variant was 48.8-50.8 thousand m2 / ha in the control variant; leaf area increased by 1.2-1.8 thousand m2 / ha in exchange for macro fertilizer. When the element manganese is used in small amounts, the leaf surface increased by 4.4-4.8 thousand m2 / ha by varieties; when manganese was used in moderation, the leaf surface increased by 7.0-6.1 thousand m2 / ha compared to control; when the iron element was used in small amounts, the leaf surface was higher by 4.0-2.2 thousand m2 / ha by varieties; when the iron element was used in high doses, the leaf surface of both varieties was reduced relative to control (Table 1).

In soybean varieties, due to the presence of rhizobium bacteria in the experimental field, nodules developed, and in soybean varieties, 75.5-80.5 nodules developed in the control variant. When applying mineral fertilizers, the number of cuttings increased by 14.0-3.2 pieces by variety. When the element manganese is used in different amounts, the number of ends in the Orzu variety increased by 12.3-19.9, and in the Nafis variety by 2.7-7.7. decreased grain; has been found to decrease by 32.0-43.5 units when applied at high doses.The symbiosis passes well when the tubers are large and this helps to increase nitrogen and organic matter in the soil. In the control variant in the budding phase, the buds weighed 1.77 -2.28 grams, which was 0.11-0.07 grams higher than in the background of mineral fertilizers. It was found that due to micronutrients, the weight of the tubers increased by 0.07-0.35 grams when using the element manganese, and decreased by 0.59-1.15 grams when using the element iron (Table 1).

The studied mineral fertilizers as a background and the norms of manganese and iron elements from microelements affected the yield of soybean varieties. The yield of the dream variety from the 2018 data in the control variant was 18.8 ts / ha per year. The variant of application of mineral fertilizers increased the yield by 6.2 ts / ha. When the manganese element was added to the background variant in small amounts, the grain yield was 33.0 ts.

Yield was 14.2 ts / ha higher than the control and 8.0 ts / ha higher than the background variant. When manganese was used in moderation, the grain yield was 38.0 ts / ha, 19.2 ts / ha more than the control variant and 13.0 ts / ha more than the background variant.

When the iron element was used in small quantities, an additional yield of 6.5 ts / ha was obtained compared to the control option. It was observed that the yield increased by 0.3 ts / ha compared to the background variant. When iron was used in moderation, an additional yield of 2.0 ts / ha was obtained compared to the control option.

The yield of the fine variety was 22.6 ts / ha in the control variant. The yield of the variant with mineral fertilizers increased by 11.8 ts / ha, the yield of manganese in the background was low at 37.5 ts / ha, which is 14.9 ts / ha compared to the control, and the grain yield was 37, 5 ts / ha. 14.9 ts / ha more than

the control and 3.1 ts / ha more than the background variant. When manganese was used in moderation, the grain yield was 41.3 ts / ha, 18.7 ts / ha more than the control variant and 6.9 ts / ha more than the background variant. 34.0 ts / ha was obtained when the iron element was used in small amounts, 11.4 ts / ha was obtained in addition to the control variant, but 26.0 ts / ha was obtained when the iron element was used in moderation. equal to or more than 3.6 ts / ha. But it turned out that the two-year yield was lower than the background option.

According to the results of the experiment in 2019, the yield of the Dream variety in the control variant was 19.1 ts / ha. In the variant where mineral fertilizers were applied, the yield increased by 5.5 ts / ha, when manganese element was added to the background variant in small amounts, the grain yield was 7.7 ts / ha compared to the control and 2.2 ts / ha compared to the background variant. When manganese was used in moderation, the grain yield was found to be 10.1 ts / ha higher than the control variant and 4.6 ts / ha higher than the background variant. When the iron element was used in small amounts, an additional yield of 6.9 ts / ha was obtained compared to the control option. It was observed that the yield increased by 1.4 ts / ha compared to the background variant. When iron was used at a moderate rate, an additional 1.9 ts / ha was obtained compared to the control variant, and 3.6 ts / ha less than the background variant.

The yield of the fine variety was 21.1 ts / ha in the control variant. In the variant where mineral fertilizers were applied, the yield increased by 5.3 ts / ha, when manganese was applied in small amounts in the background variant, it was 8.7 ts / ha higher than in the control, and 3.4 ts / ha higher than in the background variant. When the manganese element was added to the background variant in small amounts, the grain yield was 8.4 ts / ha higher than the control and 3.1 ts / ha higher than the background variant. When manganese was used in moderation, it was found that the grain yield was 10.6 ts / ha higher than the control variant and 5.3 ts / ha higher than the background variant. The yield was 26.0 ts / ha when the iron element was used in moderation, which is 4.9 ts / ha more than the control variant, but equal to the background variant. When the iron element was used in moderation, the yield was equal to the control variant, 5.4 ts / ha compared to the background variant. was found to be less than /

The micronutrients applied affected the grain quality of soybean varieties against the background of mineral fertilizers. In the background variant, the protein content in the varieties was almost the same: protein 38.8-38.6 and fat 19.3-19.2%. With the addition of manganese in small amounts, the protein content increased by 4.4-6.1% by varieties, the fat content was 0 , Decreased by 4-0.5%. When manganese was used in moderation, the protein content increased by 6.3-7.2% in varieties, the oil content decreased by 0.7% in Orzu variety, and increased by 0.2% in Nafis variety. When iron element was used, the protein content was 7.5%. Increased by 8.6%, oil content decreased by 0.3%. In the delicate variety, the protein content increased by 5.1-7.1%, and the fat content increased by 0.3-0.8%. The fact that the laws are not the same in varieties is due to the biological properties of these varieties and the demand of the varieties for the element iron

In practice, the total income from the cultivation of Orzu variety is around 7144-14440 thousand soums, and the highest total income was obtained when manganese fertilizers are used in moderation. The profit amounted to 4220-9544 thousand soums. High benefits were obtained when manganese fertilizers were applied in moderation. In the experiment, the cost of one kilogram of soybeans was 1259-2743 soums. The cheapest grain was formed when manganese fertilizers were applied in moderation. High economic efficiency has also been achieved in the cultivation of fine varieties.

CONCLUSIONS:

1. Mineral fertilizers and micro-fertilizers affect the development of soybean varieties, the shelf life of soybean varieties is extended by 1-2 days due to mineral fertilizers, 3-6 days due to manganese and iron elements.
2. Mineral fertilizers and micronutrients affected the growth of soybean varieties, mineral fertilizers had a positive effect on the growth of both varieties, ensuring stem growth by 6 cm.The stem height of soybean varieties was 11-20 cm higher due to manganese and 5-6 cm higher due to iron.
3. It was noted that when using the manganese element, the leaf surface was 5-7 thousand m2 / ha

compared to the control option, and 0.7-2.2 thousand m2 / ha in exchange for the iron element.
4. Increase in the number of soybean varieties by 2.7-19.9 due to mineral fertilizers, manganese; It was found that the number of ends in exchange for the iron element decreased by 31.5-32.5 pieces in the Orzu variety and 21.5-43.5 pieces in the Nafis variety.
5. In the variant where mineral fertilizers were used in soybean varieties, an additional 5-6 ts / ha was obtained compared to the control. According to the norms of the element manganese, 12-20 ts / ha, in the case of soybeans with the use of iron, the yield was 2.0-11.4 ts / ha.
6. Against the background of mineral fertilizers, the quality of grain has changed due to micronutrients. With the use of manganese and iron elements, the protein content of the Dream variety increased by 4.4-8.6%, the oil content decreased by 0.3-0.5%; In the Nafis variety, the protein content increased by 5.1-7.2% and the fat content by 0.1-0.8%.

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