ACADEMICIA
An International Multidisciplinary Research Journal
(Double Blind Refereed & Peer Reviewed Journal)

DOI: 10.5958/2249-7137.2021.00582.6

EFFECT OF SULFUR AND MANGANESE MICRO NUTRIENTS ON GRAIN QUALITY OF SOYBEAN VARIETIES

Khayrullayev Sardor Shamsiddinugli*

*PhD Student,
Tashkent State Agrarian University,
UZBEKISTAN

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 the grain quality, the protein content in the Orzu variety was 38.0-47.2%, and in the Nafis variety 38.6-47, also, it was reported that the amount of oil was 18.5-19.3% in the Orzu variety, 18.6-19.8% in the Nafis variety, and the grain quality increased slightly.

KEYWORDS: *Manganese, Mineral Fertilizer, Micronutrients, Oil, Sulfur, Protein, Soybean, Suspension.*

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.

LITERATURE REVIEW

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.

Micronutrients optimize plant nutrition [6], increase resistance to stress, stimulate growth [7]. Such cases are also observed in the soybean plant [3, 4].

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 [2].

Sulfur promotes the formation of certain amino acids, namely protein. Sulfur is involved in the formation of chlorophyll, and soy absorbs a lot of sulfur during this period. Sulfur in the seeds yields 27–66% relative to the total amount. Kazakh scientists have studied the importance of sulfur and recommended the use of sulfur-containing nanopreparations to increase the germination of soybean seeds and increase the overall yield and quality. Among the various preparations, a good result was obtained from the dry nanopreparation [5].

Micronutrients are less absorbed by the soybean plant than nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur. Nevertheless, their importance is not small, the lack of microelements in the soil slows down the growth rate of the plant, the yield is reduced.

Zinc activates enzymes, participates in plant nitrogen metabolism and protein formation.

Iron is a component of chlorophyll and is important in respiration and photosynthesis.

Symptoms of calcium deficiency: slow development of meristem tissue of the stem, leaf and root tips. Due to the slow mobility of calcium, its deficiency is first seen in young leaves and growth points.

Manganese, barium, and molybdenum do not form seeds in legumes unless they are sufficient. At the beginning of the application period, molybdenum and barium have a positive effect on the plant [1].

Magnesium deficiency begins with yellowing of the veins of aged leaves. The yellowing of the leaves begins at the bottom and reaches the young leaves as the deficiency intensifies. Symptoms of magnesium deficiency are similar to those of potassium, iron, or manganese.

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. Soybean varieties have different approaches to iron deficiency. In resistant varieties, iron assimilation begins in the root system, while in the developed root system, iron is assimilated from various root wastes. As the pH of the soil increases, the absorption of manganese becomes more difficult.

To support and activate physiological processes in the development of soybeans, it is recommended to feed soybean varieties with micronutrients during the period of deficiency of

micronutrients outside the root (chelate feeding). Periods demanding to micronutrients: during the development of 4-6 leaves, during the period of branching and pod formation.

X.N.Atabaeva, F.B.Namozov, A.A.Kurbanov and S.Sh.Khayrullayev 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 [8].

According to R.Juraeva, J.Tashpulatov, A.Iminov, H.Bozorov, Khatamov S.R, KhayrullaevS.Sh and L.Zaynitdinova, 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, [9; pp.72-79], [10; p.172].

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 (Table 1).

TABLE 1 AGROCHEMICAL COMPOSITION OF THE SOIL IN THE DRIVING LAYER

Years	Humus, percent	Total, percent			Moving Forms, mg / kg		
		азот	фосфор	калий	$N\text{-}NH_4$	P_2O_5	K_2O
2018	1,63	0,30	0,21	0,76	26,30	35,6	188,6
2019	1,77	0,23	0,19	0,71	29,60	43,0	198,3
2020	1,95	0,27	0,17	0,72	17,53	38,6	183,0

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 60x5x30 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 soybean varieties 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.

“Nafis” variety was created at the Uzbek Rice Research Institute by individual selection. Growth period is 115-120 days. Plant height is 145-150 cm. The location of the lower pods is 14-16 cm, the number of branches is 2-4. The number of pods per plant is 120-130, the number of grains per pod is 2-4.

Grain quality and technological parameters: weight of 1000 seeds is 165-175 g. The protein content of the grain is 40-41%, the oil content is 25-27%. The variety is designed to lie down, shed, be disease resistant and mechanized harvesting.

Yield: The variety can yield 30-32 c / ha of grain and 250-300 c / ha of green mass under favorable conditions.

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 on May 7. 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

The agro-measures used in the cultivation of soybean varieties affect not only the grain yield, but also its quality. According to soy biology, it is a fertile plant, but under the influence of growing conditions, this figure may decrease or increase.

The protein content of the "Orzu" variety was 38.8% in the control variant,due to mineral fertilizers, this figure increased by 1.6%. In case of the sulfur element, the protein increased by 3.1-5.8%; an increase of 4.4-8.4% was observed in exchange for the manganese element. High norms of sulfur and manganese had a major impact on grain quality from the micronutrients studied.

In the control variant of "Nafis" variety, the protein content was close to "Orzu" variety. In case of mineral fertilizers, protein increased by 2.8%. It was found that the amount of protein increased by 6.2-8.5% due to the applied sulfur microelement. It was found that the amount of protein increased by 6.1-8.0% due to the manganese element.

TABLE 2 INFLUENCE OF MINERALS AND MICRONUTRIENTS ON GRAIN QUALITY OF SOYBEAN VARIETIES (DRY MATTER,%)

№	Options	"Orzu" variety		"Nafis" variety	
		protien	oil	protien	oil
1	Control	38,8	19,2	38,6	19,2
2	Background-$N_{50}P_{100}K_{70}$	40,4	19,3	41.4	19.3
3	Background+S-1,5	41,9	18,8	44,8	18,6
4	Background+S-3,0	43,0	18,5	46,1	19,1
5	Background+S-4,5	44,6	19,1	47,1	19,9
6	Background+Mn-2,5	43,2	18,8	44,7	18,8
7	Background+Mn-5,0	45,1	18,6	45,8	19,4
8	Background+Mn-7,5	47,2	18,6	46,6	19,8

The oil content in the Control variant of the Orzu variety was 19.2%. Mineral fertilizers accounted for 19.3% in the applied variant, which was 0.1% higher than in the control variant. It can be observed that the oil content in the variants using sulfur and manganese was slightly

lower than in the control variant. In the "Nafis" variety, it can be observed that the amount of oil in the background, high norms of sulfur, medium and high norms of manganese are slightly higher than control option (Table 2).

CONCLUSION

In conclusion, 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.

REFERENCES

[1] Babich A.A. - Soybeans in U.S.A (1987). Oil crops.№ 6.P.33 - 34.

[2] Basibekov B.O, Gusev V (1982). Scientific basis and recommendations on using fertilizers in KazakstanOlma - ota, Kaynar, p.74 - 77.

[3] Vavilov P.P. Posypanov G.S, (1983). – Legume crops and problem of plant oil - M: Rasselxozizdat, 256 p.

[4] Kochurko V.I, Abarova E.E, (2014). Foliar application, №8, Farming,

[5] Kurmanbaeva M.S, Burkitbaev M.M, Bachilova N.V, and others.Obtaining high germination of soybeans using new sulfur-containing nanocomposites and preparations.(Collection of scientific conference, 2019), Almata.

[6] Lisina. K.I, Stepkin N.N, Kolesnik L.F, (1982).Soybean far from East. Forage crops. № 2, pp. 27-28.

[7] Nagorniy V.A, Gubanov P.E, Panchenko Y.I, (2010). –The Volga region is a promising area for soybean cultivation. Farming.№ 3.P.13-14.

[8] Atabayeva Khalima Nazarovna., Namozov Fazliddin Bakhromovich., Kurbonov Akhmad Alavkhonovich., Kayrullayev Sardor Shamsiddin Ugli. Effects of Sulfur and Manganese Micronutrients on the Yield of Soybean Varieties.J. Agricultural Sciences, 2020, Vol.11. pp.1048-1059.https://www.scirp.org/journal/as

[9] (Juraeva R., Tashpulatov J., Iminov A., Bozorov X., Zaynitdinova L., & Kukanova S. (2020). Efficiency of symbiotic nitrogen fixation of soy nodule bacteria after preservation. Plant Cell Biotechnology and Molecular Biology, 21(61-62),2020,P.72-79).https://www.ikprress.org/index.php/PCBMB/article/view/5644.

[10] AbduvaliAbdumannobovichIminov, HatamovSalimjonRakhimjonUgli, KhayrullaevSardorShamsiddinUgli.Effect of Nitragine and Mineral Fertilizers On Soil Microbiological Properties in Planted as Secondary Legume Crops. The American Journal of Agriculture and Boimedical Engineering, 02 Issue 08-2020, P.172 // https://www.researchgate.net/publication/348554421