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EFFECT OF STIMULATORS AND SILICON COMPLEX FERTILIZERS ON THE NUMBER OF SOYBEAN VARIETIES

Kamalova Nuriya Shamilevna - PhD student of Tashkent State Agrarian University, Uzbekistan

Abstract. This article presents data on the effect of separate and combined application of stimulants and silicon complex fertilizers on soybean varieties on their number of branches. It was found that stimulants and silicon complex fertilizers had a good effect on the number of number of branches, and in both varieties, the number of branches was higher when using Maltamin from the stimulants, when comparing stimulants with silicon complex fertilizer, and when using stimulants with silicon complex, silicon complex fertilizer + Maltamin was taken highest number of branches.

Keywords: soybean, stimulants, Uzbiogumin, Regoplant, Maltamin, Sila silicon, number of branches, Nafis, Vilana.

INTRODUCTION

Soybean plant is a very important plant in the world today. It is grown in more than 60 areas of the world. Soy is the leading crop among legumes. Today, when there is a protein shortage all over the world, the protein content of soybeans, the presence of all the amino acids useful for humans in the protein content, increases the nutritional value of soybeans even more. It is important to note that the advantage of soybeans is that they can be compared with a number of food products in terms of the richness of lysine, methionine, arginine, leucine and other essential amino acids. In many countries where soybeans are grown, this crop is the only source of protein, and it also provides livestock with nutritious food and increases its productivity. Soybean accounts for 40% of the world's gross vegetable oil production [2].

In addition to the adopted cultivation technology, the application and study of stimulants that activate the plant's more active growth, development and crop formation remains a very relevant issue today.

this indicator can be increased under the influence of various stimulants and growth regulators, fertilizers, substances with various active effects [1].

Currently, various complexes are being created at the industrial level, including mineral, micro-fertilizers, growth regulators, stimulants, and seed adhesives. This set of complex substances is used in seed treatment. Seeds are saved when treated in this way. The use of a complex of growth regulators should ensure not only the productivity of the plant, but also its safety [7].

The use of plant growth regulators in agriculture began in the 30s of the last century in the Pieceed States. The first widely used synthetic hormone was ethylene. Since then, synthetic substances imitating natural growth hormones have become an integral part of modern agriculture [4].

The development of the technology of using biostimulants for leguminous crops, which regulate growth and increase immpiecey, is of the most urgent importance [6].

Achievements achieved in the experiments of "Aksayskaya Niva" LLC, Rostov Region, Aksay District. Treatment of soybean seeds with Gumimax drug had a positive effect on the reduction of wilting in soybeans, plant grains and grain yield. The results of the experiment show that the drug "Gumimax" increases the plant's resistance to existing discomforts. Note: pre-sowing seeds simultaneously with rhizorthorphin treatment of the plant allows to increase the productivity of soybean grain up to 0.3–0.4 tons [3].

Growth regulators have the ability to positively affect the yield and quality of soybean seeds. They increase the resistance of the plant to water, temperature and other adverse conditions. In order to achieve the maximum effect, seeds are obtained by step-by-step processing [8].

Ran O.P., Selikhova O.A., Tikhonchuk P.V. (2009) noted that when soybeans are grown in arid regions, they are not irrigated during the rainy season. In some regions, due to the effect of drought, the harvest is reduced, a lot of damage is seen. Damage from drought depends on the duration of the drought period, the period of plant development, evaporation and soil conditions. Water deficit (drying of the soil) is expressed by the closing of the leaf apices, the reduction of transpiration and photosynthesis [5].

Kh.N. Atabaeva., F.B. Namozov., A.A. Kurbanov and S.Sh. Khayrullaev in their experiments conducted in 2018-2020, when they applied micronutrients to the soybean crop, micronutrients affected the height of the soybean stem, leaf, root development, nodule formation, grain quality and productivity, and provided a high yield [10].

According to R.Jo'raeva., J.Toshpol'atov., A.Iminov., Kh.Bozorov and L.Zaynitdinova, S.Khatamov and S. Sh.Khayrullaev, in their experiments conducted in

2015-2017, soybean plant mineral fertilizers and belonging to the rhizobium group it was observed that the yield increased by 12.6-12.8 c/ha when exposed to azotobacteria strains compared to the control variant [11, 14].

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 [16]. 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 [13]. 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 year 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 [12]. 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 [17]. 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 [15]. According to Atabayeva, K.N., Umarova, N.S., Yakubov, S., & Khayrullaev, S.S, positive results were obtained from moderate levels of sulphur and manganese, and low levels of iron. Macro and micronutrients had a positive effect on soy yield. An additional 7.6 quintals (q)/ha was harvested in exchange for macro fertilizer. Compared to the background variant, the yield was 4.6-8.3 q/ha for sulphur and 4.9-9.8 q/ha for manganese. The yield of the iron element was lower than that of the background variant. Grain quality has changed in exchange for macro and micronutrients. In exchange for mineral fertilizers, this figure increased by 2.4%. In exchange for the element sulphur, the protein increased by 3.1-5.8%; an increase of 4.4-8.4% was observed in exchange for the element manganese. It was noted that the protein increased by 7.9-8.7% in exchange for the element iron [18]. According to Ugli Khayrullayev, S.S., & Kizi Usmonova, S.U., mineral fertilizers and sulfur microelements activate the symbiotic activity of soybean variety "Orzu", averaging 32.4-42.3 million nodules per hectare, the number of nodules due to the background of mineral fertilizers increased by 13.6%, and there was an increase of 19.4-23,4% due to sulfur, as well as an average weight of nodules was 6.46-9.56 c / ha, the weight of nodules increased by 5.3% due to mineral fertilizers, and 17.1-32.4% due to sulfur. During the application period, 6.46-9.56 c / ha of nodules mass was accumulated per hectare according to the studied variants, which contributes to the increase of nitrogen and organic matter in the soil and a slight increase in biological efficiency [19]. According to Usmonova Sh.U, Khayrullaev S.Sh, Shomuqimov N.N, & Gaynanova A.F, the influence of stimulants on soybeans affected the weight of 1000 grains of Vilana cultivar, under the influence of Gummat stimulator this figure was 2.2-7.4 grams higher than on basis of mineral fertilizers (Background), and under the influence of Rival stimulator-3.0-6.0 grams [20]. According to Khayrullaev S.S, 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% [21].

METHODS AND MATERIALS

Experiments are carried out in field and laboratory conditions. In the research "Methods of conducting field experiments" (T.UzPITI 2007), "Methodology of field experiment (B.Dospekhov, 1985), “Methodology of the State variety testing of agricultural crops” (1985, 1989), “Methods of agrochemical, agrophysical studies of the soil of Central Asia” (1988) methods are used.

Place and conditions of experiment. The experiments were conducted in the experimental fields of Tashkent State Agrarian University. In this case, the experimental variants were in 4 repetitions for each variety, the number of variants was 10, the number of plots was 40, the length of each plot was 10 m, the width was 2.8 m. The variants were placed in a randomized method. Each option had 4 rows, and the total area of each plot was 28.0 m^2, of which 2 rows in the middle were designated as counting rows, and 2 rows on the edge were designated as protection rows. The number of counting plants was 20. The experiments were carried out in field and laboratory conditions.

Nafis variety. The variety was created by the method of individual selection at the Rice Research Institute of Uzbekistan.

The growing period is 115-120 days. The height of the plant is 145-150 cm. The location of the lower pod is 14-16 cm, the number of branches is 2-4, the number of pods in one plant is 120-130, the number of grains in one pod is 2-4.

Grain quality and technological parameters: weight of 1000 seeds is 165-175 g. The protein content of grain is 40-41%, the oil content is 25-27%. Resistant to lodging, shedding, diseases and mechanized harvesting.

Yield: 30-32 q/ha grain yield and 250-300 q/ha blue mass can be obtained from the variety under favorable conditions.

Vilana varieties: The variety was created at the All-Russian Research Institute of Oil crops. This variety was obtained by cross-breeding the L-309 hybrid generation with the 0240 collection sample and individual and mass selection in the F_2 and F_3 varieties. The plant hairs are gray. The flowers are purple, the pods are brown, the seeds

are yellow, dull, without spots. The variety is mid-ripening, resistant to adverse conditions, drought-resistant, and yields increase when watered. The growing season is 116-120 days. Seed yield without irrigation is 32-34 q/ha, and with irrigation up to 42 q/ha. Plant height is 111-115 cm, the lower pod location is 16-17 cm. The protein content in the grain is 40.1-40.3%, the oil content is 22.4-22.6%.

RESULTS AND DISCUSSION

In the Nafis variety, the number of branches during the budding period varied from 0.8 to 2.3 pieces among the variants under the influence of stimulants and silicon complex fertilizers. During the flowering period, the number of branches was 1.2 pieces in the control (water) variant, 1.4 pieces in the background (N60P120K80) variant, and 1.6 pieces in the background + water variant. In the variants where the stimulants Uzbiogumin (1.8 l/ha); Regoplant (150 ml/ha); Maltamin (3.5 l/ha) and sila silicon complex fertilizer (450 ml/ha) were applied as background, the number of branches was 1.8; 2.0; 2.1 and 2.2 pieces, respectively, with good results recorded for Maltamin and sila silicon complex fertilizers. In the variants where sila silicon fertilizer (450 ml/ha) and Uzbiogumin (1.8 l/ha), Regoplant (150 ml/ha), Maltamin (3.5 l/ha) stimulants were used together, the number of branches was 2.4; 2.6 and 2.7 cm, respectively, and good results were recorded when sila silicon complex fertilizer was used together with Maltamin. During the budding period, the number of branches was 1.9 when applied without fertilizer; 2.0 when applied with mineral fertilizers and 2.4 when applied with mineral fertilizers and water, and the stimulants were Uzbiogumin (1.8 l/ha); When Regoplant (150 ml/ha) and Maltamin (3.5 l/ha) were used, the number of branches increased by 0.6-0.5-0.7 pieces or 31.6-26.3-36.8% compared to the case without fertilizers, by 0.5-0.4-0.6 pieces or 25.0-20.0-30.0% compared to the case with mineral fertilizers, and the Regoplant stimulator showed the same result compared to the case with mineral fertilizers applied together with water, while the other stimulators increased by 0.1-0.2 pieces or 4.2-8.3%. When a complex silicon fertilizer (450 ml/ha) was applied as a background, the number of branches was 2.7, which was 0.8 pieces more than when no fertilizer was applied, 0.7 pieces more than when mineral fertilizers were applied, and 0.3 pieces more than when mineral fertilizers were applied in combination with water. When using a background silicon complex fertilizer (450 ml/ha) in combination with Uzbiogumin (1.8 l/ha), Regoplant (150 ml/ha) and Maltamin (3.5 l/ha) stimulants, the number of branches increased by 1.3 pieces

compared to the case without fertilizer, by 1.2 pieces compared to the case with mineral fertilizers, and by 0.8 pieces compared to the case with mineral fertilizers and water.

Table 1

The effect of stimulants and complex silicon fertilizers on the number of branches of soybean varieties, pieces (2023-2025)

Rates for the use of stimulants and complex silicon fertilizers	Number of branches in developmental phases, piece		
	budding	flowering	podding
Nafis			
Control (without fertilizer)	0.8	1.2	1.9
Background - (N-60, P-120, K-80 kg/ha)	1.1	1.4	2.0
Background - (N-60, P-120, K-80 kg/ha)+suv	1.3	1.6	2.4
Background +Uzbiogumin (1,8 l/ha)	1.5	1.8	2.5
Background +Regoplant (150 ml/ha)	1.7	2.0	2.4
Background +Maltamin (3,5 l/ha)	1.9	2.1	2.6
Background +Sila kremniya (450 ml/ha)	2.0	2.2	2.7
Background +Sila kremniya+ Uzbiogumin (450 ml/ha+1,8 l/ha)	2.1	2.4	2.8
Background +Sila kremniya+ Regoplant (450 ml/ha+150 ml/ha)	2.2	2.6	3.1
Background +Sila kremniya+ Maltamin (450 ml/ha+3,5 l/ha)	2.3	2.7	3.2
Vilana			
Control (without fertilizer)	1.1	1.6	2.5
Background - (N-60, P-120, K-80 kg/ha)	1.5	1.8	2.7

Background - (N-60, P-120, K-80 kg/ha)+suv	1.8	2.1	3.2
Background +Uzbiogumin (1,8 l/ha)	1.9	2.3	3.2
Background +Regoplant (150 ml/ha)	2.2	2.6	3.2
Background +Maltamin (3,5 l/ha)	2.4	2.8	3.4
Background +Sila kremniya (450 ml/ha)	2.6	3.0	3.6
Background +Sila kremniya+ Uzbiogumin (450 ml/ha+1,8 l/ha)	2.7	3.1	3.7
Background +Sila kremniya+ Regoplant (450 ml/ha+150 ml/ha)	3.0	3.4	4.1
Background +Sila kremniya+ Maltamin (450 ml/ha+3,5 l/ha)	3.1	3.6	4.3

In the Vilana variety, the number of branches during the budding period varied from 1.1 to 3.1 pieces among the variants under the influence of stimulants and silicon complex fertilizers. During the flowering period, the number of branches was 1.6 pieces in the control (water) variant, 1.8 pieces in the background (N60P120K80) variant, and 2.1 pieces in the background + water variant. In the variants where the stimulants Uzbiogumin (1.8 l/ha); Regoplant (150 ml/ha); Maltamin (3.5 l/ha) and sila silicon complex fertilizer (450 ml/ha) were applied as background, the number of branches was 2.3; 2.6; 2.8 and 3.0 pieces, respectively, with good results recorded for Maltamin and sila silicon complex fertilizers. In the variants where sila silicon fertilizer (450 ml/ha) and Uzbiogumin (1.8 l/ha), Regoplant (150 ml/ha), Maltamin (3.5 l/ha) stimulants were used together, the number of branches was 3.1; 3.4 and 3.6 cm, respectively, and good results were recorded when sila silicon complex fertilizer was used together with Maltamin. During the budding period, the number of branches was 2.5 when applied without fertilizer; 2.7 when applied with mineral fertilizers and 3.2 when applied with mineral fertilizers and water, and the stimulants were Uzbiogumin (1.8 l/ha); When Regoplant (150 ml/ha) and Maltamin (3.5 l/ha) were used, the number of branches increased by 0.7-0.7-0.9 pieces or 28.0-28.0-36.0% compared to the case without

fertilizer, by 0.5-0.5-0.7 pieces or 18.5-18.5-25.9% compared to the case with mineral fertilizers, and the Uzbiogumin and Regoplant stimulators showed the same results compared to the case with mineral fertilizers applied in combination with water, while the Maltamin stimulator increased by 0.2 pieces or 6.3%. When using a silicon complex fertilizer (450 ml/ha) as a background, the number of branches was 3.6, which increased by 1.1 pieces compared to the case without fertilizer, by 0.9 pieces compared to the case with mineral fertilizers, and by 0.4 pieces compared to the case with mineral fertilizers combined with water. When using a silicon complex fertilizer (450 ml/ha) as a background, in combination with the stimulants Uzbiogumin (1.8 l/ha), Regoplant (150 ml/ha), and Maltamin (3.5 l/ha), the number of branches was the highest when using the Maltamin stimulant, increasing by 1.8 pieces compared to the case without fertilizer, by 1.6 pieces compared to the case with mineral fertilizers, and by 1.1 pieces compared to the case with mineral fertilizers combined with water.

The use of stimulants and silicon-based mineral fertilizers led to an increase in the number of branches, and the number of branches was higher under the influence of the Maltamin stimulant and silicon-based fertilizers, and when both were used together in a complex manner.

CONCLUSIONS

Therefore, it is known from the experimental results that stimulants and complex fertilizers with silicon had a positive effect on the number of branches of soybean varieties, and in both varieties, when the stimulants were Maltamin stimulator, when sila silicon was compared with stimulants, when sila silicon was used together with stimulants, and when sila silicon+Maltamin was used together, the number of branches was higher than in other options.

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