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SOYBEAN GROWING USING ORGANIC HUMIC FERTILIZER TUMAT ON IRRIGATED MEADOW SOILS IN ANDIJAN REGION

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Abstract. The article presents experimental data on the study of the impact of organic humic fertilizer "Tumat" on productivity of soybeans in the conditions of irrigated meadow soils of the Asaka district of the Andijan region. Meadow soils are characterized by a low concentration of humus, mobile forms of phosphorus and potassium, they are slightly saline, the granulometric composition is medium loamy, the depth of groundwater is 2-3 m. Liquid humic fertilizer "Tumat" is produced from brown coal (leonardite and lignite) and specially prepared water. Contains salts of humic acids, fulvic acids, amino acids, organic salts, organic acids, natural auxins, cytokinins and a number of essential macro- and microelements in a form which is available to plants. The working solution of humic fertilizer was used for pre-sowing treatment of seeds and foliar feeding of plants in the initial period of vegetation in the phases of formation of three true leaves and branching. Pre-sowing treatment increases stress resistance and seed germination. Double foliar feeding of soybean improves soil nutritional regime, increases growth and development, increases the yield of soybean grain from 50 to 90 % with combined use of a bacterial preparation on the background of mineral fertilizers. The use of Tumat fertilizer is considered as an environmentally friendly and cost-effective way to increase crop productivity, contributing to a more complete realization of natural potential. According to the results of production tests, the organic humic fertilizer "Tumat" is recommended for widespread use in the irrigated areas of Uzbekistan in growing leguminous crops.

Key words: meadow soils, fertility, soybeans, yield capacity, foliar feeding, humic and bacterial fertilizer.

INTRODUCTION

Long-term use of soils for growing crops leads to a change in natural properties and natural state. The main change is expressed in decreased soil fertility, which is due to a change in all soil properties: biological, chemical, physical, water, etc. [1].

Currently, more than 60 % of soil surface in Central Asia is degraded to varying degrees. Depending on natural conditions and their use, the decrease in soil fertility, deterioration of soil-reclamation state, and development of secondary salinization is observed. As a result, the yield capacity of agricultural crops is significantly reduced [2-4].

In Uzbekistan, protein problem has become especially critical in connection with organization of large livestock complexes and poultry farms, which need protein-balanced feed. This aroused interest in soybean crop and in 2016 the first experiments were conducted to study the characteristics of soybean biology in a hot climate on meadow soils.

In accordance with the resolution aimed to increase production of soybean grain on the irrigated lands of the republic in 2017-2020, soybean, as the main crop, was grown on an area of more than 40,000 ha. In the future, it is planned to expand soybean crop areas, create an association of producers, build a soybean grain processing plant and produce various products in the country. Soybean can be grown both as a main crop and as an intermediate crop in all regions of the country.

In Uzbekistan, soy is considered a new crop. Soybean grains contain 30-52 % protein, 18-25 % oil and 20 % carbohydrates. Diet dishes for diabetics are pre-

pared from soybean seeds. Soybean seeds are used in confectionery industry for preparation of soybean milk, kefir, cottage cheese, margarine, flour, various canned products, vegetarian sausages, and dietary oils.

In recent years, interest has increased in soluble drugs that can be used with greater production and economic effects through combination with other bio preparations or the latest technologies.

The use of biopreparations in growing various crops stimulates the growth and development of plants, improves nitrogen and phosphorus nutrition, soil humus state and, as a result, enhances the increased productivity and product quality, and also creates a favorable background for agriculture in general, and improves soil fertility.

In different soil-climatic zones of Kazakhstan and Uzbekistan, the impact of non-traditional organic fertilizers, as well as bio preparations used in agriculture, is being studied. Based on the results of these studies, their positive effect on concentration of soil organic matter and nutrients was revealed.

Through joint efforts of scientists from Kazakhstan and Uzbekistan, production tests of the Tumat fertilizer were carried out in various regions of the Republic of Uzbekistan on an area of 80,681 ha. The results of these scientific studies are published in foreign and republican editions, as well as the proceedings of international conferences.

Organic humic fertilizer of the new generation "Tumat" can become one of the effective environmentally friendly fertilizers, which is produced from organic substances - leonardite and lignite. "Tumat" fertilizer of prolonged action in liquid form is convenient for dosing at the time of spraying, taking into account various conditions, rates and stages of plant development. This allows to control plant development, as well as to replenish the needs of a particular crop throughout the entire growth process. "Tumat" is absolutely safe for soil, plants and human health. As practice shows, plants fed with organic fertilizer are of better quality and productivity [5-12].

Also, research works on the study of the effective use of liquid humic fertilizer "Tumat" for cereals, grain legumes and industrial crops in Almaty and Turkestan regions of Kazakhstan are being conducted [13]. In the south and southeast, a test of domestic liquid bioorganic fertilizer "BioEcoGum", which is produced from biocompost by enrichment with macro- and microelements in a form accessible to plants, was carried out.

According to the researches of the scientists of the U.U. Uspanov Kazakh Research Institute of Soil Science and Agrochemistry, bioorganic fertilizer "BioEcoGum" increases stress resistance, stimulates plant growth, increases crop yields, and improves quality indicators. Biofertilizer is recommended for widespread introduction into production in growing grain and leguminous crops [14-16].

The aim of these studies is to develop scientific basis for technology of soybean production on irrigated meadow soils of Uzbekistan using organic humic fertilizer "Tumat".

MATERIALS AND METHODS

Production tests were carried out in conditions of the "Uzbekistan Mustakklighi" farm in the Asaka district of Andijan region. The object of the study is irrigated meadow soils, soybeans and organic humic fertilizer Tumat.

The climate of Asaka district of Andijan region is sharply continental. The average temperature in July is +26,1°C, in February -2.9°C. The growing season lasts 220 days. The average annual precipitation is up to 180-190 mm [17].

Soils are predominantly gray soils, irrigated meadow soils, which are tilled

and irrigated. In spring, adyrs are covered with ephemeral plants. Wormwood and quinoa grow in virgin areas. The rivers Akbura and Aravansai, the Big Ferghana channel, Shakhrihansai, the irrigated system Abikhayat, the Asaka skid, flow in the south of the region [18].

Irrigated agriculture has a key significance for livelihoods in Central Asian region, especially in Uzbekistan. In terms of arid climate irrigation is the basis of food security, rural population welfare, protection and improvement of land productivity, as well as the basis for rapidly growing agro-industrial complex development. When studying soil fertility, it is very important to take into account the impact of salinization processes. Loess and saz soils of Uzbekistan are characterized by natural and secondary salinization. Salinization in the republic has three main sources: salt concentration in irrigation water, initial salt concentration in soils, inflow of ground pressure water, and enrichment of the aeration zone with mineralized ground water [19].

In production experiments, a late-ripening soybean variety "Uzbekistan-6" was grown. Plant height is 115-160 cm, the lowest beans are located at a height of 13-17 cm above ground. Vegetation period is 140-145 days. The protein content in grain is from 39 to 43 %, oil from 19 to 24 %, resistance to lodging and shedding is 4-5 points. The maximum yield capacity is - 4.0-5.3t/ha.

Soybean sowing begins when the soil warms up to 18-20ºC. Seeds of soybeans "Uzbekistan-6" were sown on April 15, at soil temperature of 20^0C, to a depth of 4-5 cm, in furrows with row spacing of 70 cm at the rate of 90-100 kg of seeds per 1 ha. Grain harvesting was carried out on September 20, when grain moisture reached 14-15 %. Harvesting was done by John Deere combines. Cutting height is 10-12 cm. Seed cleaning was done by the "Super-Pectus" machine.

Pre-sowing treatment of soybean seeds was carried out with working solutions at the rate of 300 ml of Tumat fertilizer per 100 liters of water. The consumption of working solution is: 20 liters per 1 ton of seeds. Foliar treatment - spraying of soybean plants was carried out during the growing season in the phase of formation of three true leaves and branching. Preparation of a working solution - 1 liter of Tumat fertilizer is diluted in 200 liters of water. The consumption of working solution is 200 liters per 1 ha.

For pre-sowing seed treatment and foliar feeding of soybean plants, liquid organic humic fertilizer "Tumat" was used. Humic fertilizer is obtained from brown coal (leonardite and lignite) and specially prepared water, it contains humic acids, fulvic acids, amino acids, organic salts, organic acids, natural auxins, cytokinins and a number of essential macro- and microelements in a form available to plants.

Production experiment was conducted based on the following scheme on the background of application of mineral fertilizers $N_{70}P_{70}K_{30}$: 1) Control, without treatment; 2) Pre-sowing treatment of seeds; 3) Pre-sowing treatment of seeds and 2-fold spraying of plants in the initial phases of formation of three true leaves and branching. Before sowing, soybean seeds, along with the “Tumat” fertilizer, were treated with Nitrofix Zh bacterial fertilizer. Inoculant for treatment of soybean seeds on dry sterile peat. It is designed for the formation of nodules, providing plants with available nitrogen and its accumulation in soil. Content: living cells of nodule bacteria Bradirhizobiumjaponicum.

On irrigated lands in soybean crops, inter-row cultivation, plant fertilization, weed removal, watering, disease and pest control works are carried out. Inter-row cultivation is usually carried out every 10-15 days, their number is determined by the condition of the crops. The first cultivation is carried out at a depth of 6-8 cm, the sub-

sequent ones at 10-15 cm. In growing soybean as the main crop, taking into account the depth of groundwater and soil mechanical composition, 4-6 irrigations are carried out, when soil reaches physical ripening, cultivation is carried out.

Field experiments aimed to study the effective use of organic humic fertilizer "Tumat" were carried out according to the method of F.A. Yudin.[20]

Soil analyzes were carried out in the laboratory of the Andijan branch of the "UZGIPROZEM" Institute according to generally accepted methods. Chemical composition of water extracts was determined according to the method described in the manual for general soil analysis [21] - preparation of water extracts from soils according to K.K. Gedroits, pH, CO_3, HCO_3 - potentiometrically, Cl and SO_4 - by titration, Ca and Mg - on atomic absorption spectrometer, K and Na - on flame photometer. Total humus according to Tyurin, mobile phosphorus and potassium according to GOST-26205-91, granulometric composition according to Kachinsky.

RESULTS AND DISCUSSION

Soil and climatic conditions are one of the important factors determining productive state of soil surface, its features and prospects for use in agricultural production. Climate, as a factor of soil formation, has a direct effect on biological, chemical, and physical properties, as well as on water-thermal regime of soil surface [22].

Total humus concentration in experimental plot of meadow soil is 1.33 % (table 1). Low availability of mobile phosphorus (20.3 mg/kg) and exchangeable potassium (260.0 mg/kg) is observed. The degree of soil salinity is low (the sum of salts is 0.200-0.250 %). The depth of groundwater is 2-3 m.

Table 1 - Chemical analysis of arable layer of meadow soil

Soil layer	Total humus, %	Mobile forms, mg/kg	
0-30	1,33	20,3	260,0

According to table 2, granulometric composition of meadow soil is medium loam. The coarse dust fraction 0,05-0,01 mm (loess-like fraction) predominates - sections 1-3, as well as medium dust - sections 2-3.

Table 2 - Granulometric composition of meadow soil

№ Of cuts	Depth, cm	Fraction content in % on absolute dry soil						
		Fraction size, mm						Physical clay, % <0.01
		sand		dust			silt	
		1-0,25	0,25-0,05	0,05-0,01	0,01-0,005	0,005-0,001	<0,001	
1	0-30	0,15	24,35	35,50	10,25	19,25	10,50	40,00
	30-53	0,17	18,33	37,00	16,50	18,00	10,00	44,50
	53-70	0,03	10,22	53,25	9,50	18,25	8,75	36,50
2	0-31	0,02	29,73	38,25	32,00	-	-	32,00
	31-53	0,03	19,72	37,75	42,50	-	-	42,50
3	0-31	0,29	27,21	36,50	36,00	-	-	36,00
	31-50	0,68	34,32	28,00	37,00	-	-	37,00

Producers consider soybean as one of the best and most demanded crops that contribute to resource saving and better environment formation, as it is able to fix air nitrogen and leaves up to 250 kg/ha of nitrogen in soil [23]. Currently, the intensity of soybean growing is gradually increasing. Nevertheless, the efficiency of its production in the districts of the region is not high. Therefore, it is relevant to study, in the conditions of crop production, soybean varieties, their productive and adaptive capabilities, reactions to the elements of agritechnics and realization of biological potential by plants [24].

Recently, in modern agriculture, much attention has been paid to organic and humic fertilizers, which are used to obtain higher crop yields [14, 15].

Organic humic fertilizer "Tumat" has a positive effect on the plant growth processes, soil biota development, which is suffering from the use of high doses of mineral fertilizers and chemical plant protection products. New organic fertilizers, which are proposed for production, need further testing and comprehensive verification [6-8]. The use of the new fertilizer "Tumat" in growing winter wheat promotes humus accumulation, improves nutritional regime and biological activity of soil, increases grain yield, which is a reliable guarantee for widespread introduction into production.

According to our data, seed treatment before sowing and spraying of soybean plants in the initial period of development has an impact on the growth, development, yield capacity and quality of grain. So, pre-sowing treatment of soybean seeds with working solution "Tumat" increases the height of soybean plants up to 100-110 cm, seed diameter up to 5.0-5.3 mm and the number of seeds on plants up to 25-30 pieces compared to control variant without treatment during seed filling (table 3). Pre-sowing seed treatment and 2-fold spraying of plants in the phases of formation of three true leaves and branching significantly increases the diameter of seeds (+47 %) and the number of seeds per plant (+117 %) (table 3).

Table 3 - Productivity of soybean in the seed filling phase

Variant	Average plant height, cm	Seed diameter, mm	Number of seeds per 1 plant, pcs.
Control, no treatment	70-80	4,0-4,5	18-22
Seed treatment before sowing	100-110	5,0-5,3	25-30
Seed treatment and 2-fold spraying of plants	130-140	6,0-6,5	42-45

According to previous studies, humic fertilizers on light chestnut soils increase stress resistance to adverse environmental conditions, as well as seed germination, seed weight, and increase the yield gain by more than 33 % [25].

In the conditions of production experiment on meadow soils, the use of humic fertilizer affected the growth and development, and ultimately the yield of soybeans. Pre-sowing treatment of seeds with humic fertilizer increased the yield of soybean grain by 10 c/ha, in yield 22 c/ha without treatment in control (figure 1). The most promising variant was with pre-sowing seed treatment and spraying of plants in the initial phases of formation of three true leaves and branching with the Tumat working solution mixed with Nitrofix Zh bacterial fertilizer, which provides increased grain yield up to 44 c/ha, an increase in yield of 22 c/ha, which is 100 % compared with control.

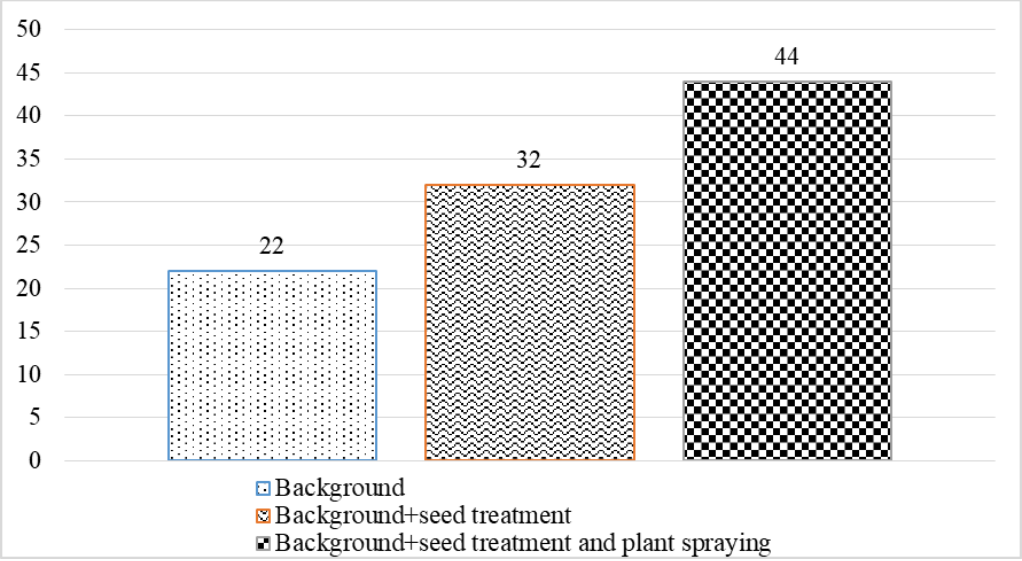

Figure 1 - Soybean grain yield, c/ha

Figure 2 - Phenological observations and accounting of soybean yield

Figure 2 shows the process of conducting phenological observations and accounting for the soybean crop.

According to A.K. Imanbekova and M.B. Khusainov [26], bacterial bio preparations have a positive effect on seed germination and plant biomass, improve mineral nutrition, suppress the development of phytopathogenic microorganisms, increase resistance to adverse conditions, and also regulate the accumulation of heavy metals, radionuclides, nitrates, and other harmful compounds. Also, bio preparations protect soils from depletion, restore natural fertility and maintain biological diversity of plant communities [27].

The results of experimental study showed that treatment of soybean variety "Dekabit" with bio preparations "BioEcoGum" and "Rizovit-Ax" had a positive effect on plant growth and development, contributed to the increase in yield. The plants treated with fertilizer were significantly taller with a more developed leaf apparatus and stable passage of the main phenological phases [28].

In production experiments on meadow soils, nodules formed on the roots on 12–14th day after germination. Later, as the plants developed, the number and mass of nodules on the plant roots increased. During the growing season of soybeans, development of nodule bacteria on soybean roots was monitored. Due to nodule bacteria soybean accumulates up to 150-250 kg of nitrogen per 1 ha per season. The accumulation of biological nitrogen depends on productivity of crops, and it increased as productivity increased. Of the total amount of nitrogen accumulated on 1 ha in the soil, 60-80 kg remains due to the decay of nodules, roots and crop residues.

The conducted studies of microflora of light chestnut soil during growing soybeans and safflower showed a positive effect of liquid fertilizers "BioEcoGum" and "Tumat" on concentration of ammonifiers and actinomycetes, which are activators of soil processes. At the same time, the predominance of actinomycetes of the genus *Streptomyces* (from 20 to 30 %) was determined, the presence of which can serve as an indicator of the entry of hard decomposable organic matter into the soil. The number of microscopic fungi in the studied soil remained low, which is typical when the processes of accumulation of organic substances predominate over decomposition. A lowering effect of fertilizer on this group of microorganisms was also revealed, which can positively affect the phytosanitary state of crops [13].

Thus, in soybean crops, soil water-physical properties, its ameliorative state improve, fertility increases, microflora that causes pathogenic diseases decreases, and the number of beneficial microorganisms increases, soil ecological state changes in a positive direction.

CONCLUSION

Due to its rich composition of organic, mineral, stimulating and bioactive substances, liquid organomineral humic fertilizer "Tumat" creates various independent mechanisms of impact on soil and plants, which give a positive total effect, due to their microbiota accelerate the process of humification of soil organic matter, increase humus concentration, improve soil nutritional regime, promotes absorption of nitrogen, phosphorus and potassium, prevents the formation of nitrates, increase the resistance of plants to diseases and adverse weather conditions. This technology makes it possible to refuse from a large number of chemicals used in traditional technology, which allows to use its low concentrations in order to obtain a high effect in crop production.

REFERENCES

1 Akhanov Zh.U. Soil science in the developed countries of the world and priority issues of soil science in Kazakhstan// Scientific bases of reproduction of fertility, protection and rational use of soils in Kazakhstan. - Almaty: Tethys, 2001. - P. 33.

2 Akhanov Zh.U., Jalankuzov T.D., Abdykhalykov S.D. The main directions of scientific research of the Institute of Soil Science, MES RK for the next decade// Issues of genesis, fertility, reclamation, soil ecology, assessment of land resources. - Almaty: Tethys, 2002. - P. 5-72.

3 Tanirbergenov S., Suleimenov B., Saparov A. Soltanayeva A., Kabylbekova B. The Fertilizer System Increasing the Salt Tolerance and Productivity of Cotton in The Conditions of Saline Soils in Southern Kazakhstan// ISSN: 0975-8585Research Journal of Pharmaceutical, Biological and Chemical Sciences. November – December 2016. 7(6) - P. 147-155.

4 Tanirbergenov S., Suleimenov B., Cakmak, D., Saljnikov, E, Smanov, Zh. The ameliorative condition of the irrigated light serozem of the Turkestan region// PeriódicoTchêQuímica. - 2020. - vol. 17 (n36). - P. 920-933.

5 Tagaeva A. M., Kadyrov O. S., MamadalievaS. B., Tukhtabaeva A. Results of testing a new organic humic fertilizer Tumat in the Andijan region of Uzbekistan// The 9th International scientific and practical conference "European scientific discussions" PoteredellaragioneEditore, Rome, 2021. - P. 31-36.

6 Kaisanova G.B., Suleimenov B.U. The effectiveness of humic preparations on fruit and berry crops in Uzbekistan// The 11th International scientific and practical conference “Science and education: problems, prospects and innovations” CPN Publishing Group, Kyoto, 2021. - P. 148-157.

7 Kaisanova G.B. Efficiency of organic humic fertilizer Tumat in growing cotton on irrigated greysoil -meadow soils of the Andijan region// Issues of modern science: joint scientific monograph; [ed. A.A. Enikeev]. – M.: Ed. Internauka, 2021. V. 64. Chapter 2. – P. 22-37.

8 Kaisanova G.B., Komilov K.S. Technology for growing cucumbers in a greenhouse using organic humic fertilizer Tumat// The 1st International scientific and practical conference "International scientific innovations in human life" Cognum Publishing House, Manchester, 2021. - P. 210-214.

9 Kaisanova G.B., Suleimenov B.U., Uraimov T., Davranov A.M. Cultivation of vegetable crops in the Andijan region with the use of organic humic fertilizer Tumat// Relevant scientific research: collection of articles of the International Scientific and Practical Conference. Penza: ICNS "Science and Education", 2021. - P. 84-86.

10 Kaysanova G., Suleimenov B. Influence of organic humic fertilizer Tumat on the structure of oat and barley crops cultivated on irrigated meadow soils of Andijan region// Proceedings of the XXIII International Multidisciplinary Conference «Recent Scientific Investigation». Primedia E-launch LLC. Shawnee, USA. - 2021. - C. 45-49

11 Kaisanova G.B. The use of organic humic fertilizer Tumat in cultivation of rapeseed// The 2nd International scientific and practical conference "Modern directions of scientific research development" BoScience Publisher, Chicago. 2021. - P. 300-304.

12 Suleimenov B.U., Kaisanova G.B., Uraimov T., Ruziev I., Tursunov Kh.O., Atabayeva M.S.) Influence of TUMAT humic fertilizer on soil fertility and productivity of winter wheat// Proceedings of the International Scientific -practical conference “Biologically active preparations for crop production. Scientific justification - recommendations - practical results. - Minsk, 2020. - P. 148-150.

13 Seitmenbetova A.T., Suleimenov B.U., Nysanbayeva A.A. Influence of fertilizers "BioEcoGum" and "Tumat" on microflora of light chestnut soil during c/ultivation of soybeans and safflower // Soil Science and Agrochemistry No. 1, 2022. - P. 40-51.

14 Suleimenov B., Saparov A., Kan V., Kolesnikova L., Seitmenbetova A., Karabayev K. The Effect of Bioorganic Liquid Fertilizer «BioEcoGum» on Productivity of Grain Maize in the Conditions of South east Kazakhstan// Eurasian Journal of Biosciences. - 2019, 13. - P. 1639-1644.

15 Suleimenov B.U., Kolesnikova L.I. The effectiveness of the use of biofertilizers in increasing productivity of grain and leguminous crops on light chestnut soils// Soil Science and Agrochemistry No. 3. 2020. - P. 73-82.

16 Suleimenov B.U., Seitmenbetova A.T. The influence of humic preparation "BioEcogum" on biochemical indicators of quality of winter wheat grain// Soil Science and Agrochemistry No. 1, 2021. - P. 64-73.

17 Climate of Andijan Editor L.V. Kovel. Art editor V.V.Bykov. Gidrometeoizdat: Leningrad, 1999.

18 Uraimov T. Soils of the Andijan region and their fertility// Materials of the V Congress of soil scientists and agrochemists of Uzbekistan. - Tashkent, 2010. - P. 102-164.

19 Dukhovny V.A., Sokolov V.I., Khamraev Sh. Irrigated agriculture in Uzbekistan: are there water supply reserves for sustainable development? Scientific Information Center of the Interstate Coordinating Water Commission of Central Asia (SIC ICWC). - Tashkent, 2017. - 76 p.

20 Yudin F. A. Methods of agrochemical research. - M., 1980. - 251 p.

21 Arinushkina E.P. Guide to soil chemical analysis. - Moscow: Publishing House of Moscow State University, 1977. - 489 p.

22 Suleimenov B., Saparov A., Saparov G., Kulymbet K., Saduakhas A. Agrochemical assessment of soil fertility in Agropark Ontustik// Soil Science and Agrochemistry. - 2020. No. 1. - P. 50-61.

23 Kuznetsov, I.I. Potential possibilities of plant production process in soybean varieties of the northern ecotype in the conditions of the Central black soil region of Russia / I.I. Kuznetsov, A.V. Amelin // Bulletin of the Oryol State Agrarian University. - 2012. - No. 2 (35). - P. 11-13.

24 Bykov E.S., Zharkova S.V., Manylova O.V. The effectiveness of the use of rhizobial preparations on soybeans// Scientific works of SKFNCCVV. Promising technologies in the field of production, storage and processing of crop products (Materials of the IXth International Remote Scientific and Practical Conference of Young Scientists. – Vol. 26. - 2019. - P. 120-122.

25 Kolesnikova L.I., Suleimenov B.U., Zarip Z.A. Impact of treatment with biopreparation "BioEcoGum" on the yield of soybeans in the conditions of Almaty region// -industrial complex: state, problems, prospects XIV International scientific and practical conference. Digest of articles. Part I. - 2019. - P. 10-14.

26 Imanbekova A.K., Khusainov M.B. The use of bio products as one of the ways to solve the food problem// Scientific community of students in XXI century: materials of the III Int. scientific-practical. conf. part 3. Russia. Novosibirsk.: Siberian Association of Consultants. - 2012.

27 A. G. Mertasov, V. A. Babak, E. Zh. Zhakupov, A. K. Mukhamedzhanov, and S. T. Mertasova, Suranshiev Zh.A. The effectiveness of biological fertilizer "BioAzoPhosphite" on agricultural crops// Young scientist. - 2018. - No. 48. - P. 347-351.

28 Seitmenbetova A.T., Kan V.M., Asimzhanov N. The effect of liquid biopreparations "BioEcoGum" and "Rizovit-Ax" on productivity of soybean variety "Dekabit" in the conditions of gray soils of Almaty region// Soil Science and Agrochemistry. - No. 1. - 2020. - P. 42-49.

ТҮЙІН

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СУАРМАЛЫ ШАЛҒЫНДЫ ТОПЫРАҚТАРДА ТУМАТ ОРГАНИКАЛЫҚ ГУМИНДІ ТЫҢАЙТҚЫШЫН ҚОЛДАНА ОТЫРЫП МАЙБҰРШАҚ ӨСІРУ

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Мақалада Әндіжан облысы Асакин ауданының суармалы шалғынды топырақтар жағдайында майбұршақ өнімділігіне «Тумат» органикалық гуминді тыңайтқышының әсерін зерттеу бойынша жүргізілген тәжірибе мәліметтері келтірілген. Шалғынды топырақтар қарашіріктің, фосфор мен калийдің жылжымалы түрлерінің төмен мөлшерімен, әлсіз тұзданған, орташа сазды түйірөлшемдік құрамымен, жер асты суларының 2-3 м тереңдікте жатуымен сипатталады. «Тумат» сұйық гуминді тыңайтқышы қоңыр көмірден (леонардит және лигнит) және арнайы дайындалған судан өндіріледі. Құрамында гумин қышқылдарының тұздары, фульвоқышқылдар, амин қышқылдары, органикалық тұздар, органикалық қышқылдар, табиғи ауксиндер, цитокининдер және өсімдіктер үшін қолжетімді түрдегі бірқатар қажетті макро - және микроэлементтер бар. Гуминді тыңайтқыштың жұмыс ерітіндісі тұқымдарды егу алдында өңдеуде және вегетация кезеңінің басында үш нақты жапырақ пен бұтақтардың пайда болу кезеңінде өсімдіктерді тамырдан тыс қоректендіру үшін қолданылды. Егу алдындағы өңдеу тұқымның стресске төзімділігін және өнгіштігін арттырады. Майбұршақты екі рет тамырдан тыс қоректендіру топырақтың қоректік режимін жақсартады, дақылдың өсуі мен дамуын арттырады, минералды тыңайтқыштар аясында бактериялық препаратты бірге қолданған кезде майбұршақ дәнінің өнімділігін 50-ден 90% - ға дейін арттырады. «Тумат» тыңайтқышын қолдану табиғи әлеуетті неғұрлым толық іске асыруға ықпал ететін ауыл шаруашылығы дақылдарының өнімділігін арттырудың экологиялық таза және экономикалық тиімді тәсілі ретінде қарастырылады. Өндірістік сынақтардың нәтижелері бойынша «Тумат» органикалық гуминді тыңайтқышын дәнді-бұршақты дақылдарды өсіру кезінде Өзбекстанның суармалы алқаптарына кеңінен енгізу үшін ұсынылады.

Түйін сөздер: шалғынды топырақтар, құнарлылық, майбұршақ, өнімділік, тамырдан тыс қоректендіру, гуминді және бактериалды тыңайтқыштар.

РЕЗЮМЕ

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ВОЗДЕЛОВАНИЕ СОИ С ПРИМЕНЕНИЕМ ОРГАНИЧЕСКОГО ГУМИНОВОГО УДОБРЕНИЯ «ТУМАТ» НА ОРАШАЕМЫХ ЛУГОВЫХ ПОЧВАХ АНДИЖАНСКОЙ ОБЛАСТИ

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В статье представлены экспериментальные данные по изучению влияния органического гуминового удобрения «Тумат» на продуктивность сои в условиях орошаемых луговых почв Асакинского района Андижанской области. Луговые почвы характеризуются низким содержанием гумуса, подвижных форм фосфора и калий, слабо

засолены, гранулометрический состав среднесуглинистый, глубина залегания грунтовых вод 2-3 м. Жидкое гуминовое удобрение «Тумат» вырабатывается из бурого угля (леонардит и лигнит) и специально подготовленной воды. Содержит соли гуминовых кислот, фульвокислоты, аминокислоты, органические соли, органические кислоты, природные ауксины, цитокинины и ряд необходимых макро- и микроэлементов в доступной для растений форме. Рабочий раствор гуминового удобрения применяли для предпосевной обработки семян и внекорневой подкормки растений в начальный период вечетации в фазы образования трех настоящих листьев и ветвления. Предпосевная обработка повышает стрессоустойчивость и всхожесть семян. Двукратная внекорневая подкормка сои улучшает пищевой режим почвы, повышает рост и равитие, увеличивает урожайность зерна сои от 50 до 90 % при совместном использовании бактериального препарата на фоне минеральных удобрений. Применение удобрения «Тумат» рассматривается как экологически чистый и экономически эффективный способ повышения продуктивности сельскохозяйственных культур, способствующий более полной реализации природного потенциала. По результатам производственных испытаний органическое гуминовое удобрение «Тумат» рекомендуется для широкого внедрения на орошаемых массивах Узбекистана при возделывании зернобобовых культур.

Ключевые слова: луговые почвы, плодородие, соя, урожайность, внекорневая подкормка, гуминовое и бактериальное удобрение.