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Determination of the effect of the bio stimulant (BioProFito) on the water-physical properties of the soil in the conditions of the saline soils of the Bukhara oasis

A.K.Juraev[1], M R Kudratov[2].
Doctor of agricultural sciences of Bukhara Institute of Natural Resources Management [1]
Assistant of Bukhara Institute of Natural Resources Management [2]

Abstract: The article presents the comprehensive results of a research study aimed at determining the impact of the biostimulant BioProFito on the water-physical properties of soil in the saline conditions of the Bukhara oasis. The study was conducted on an experimental field where BioProFito was applied, and meticulous monitoring was carried out at both the beginning and the end of the growing season across various test variants. The research focused primarily on observing changes in the volumetric weight of the soil, which is a crucial indicator of soil compaction and overall health. The findings revealed that the volumetric weight of the soil ranged between 1.31 to 1.29 g/cm³. This slight but significant reduction indicates an improvement in soil structure, potentially enhancing root penetration and water retention capabilities. The integration of biostimulants with drip irrigation technology showed promising results. Enhanced water permeability was observed, indicating that the soil's ability to absorb and distribute water had improved. This is particularly beneficial for cotton cultivation, which requires consistent moisture levels for optimal growth. The combination of these technologies not only supports better crop yields but also contributes to the sustainability of agricultural practices in challenging environments.
Key words: BioProFito, cotton, soil salinity, water-physical properties.

Introduction

The wide use of available water resources, water saving, and the widespread implementation of cost-effective, innovative irrigation technologies are becoming important around the world. Only 2.0% of the world's water resources are fresh water reserves, of which 79% are permafrost, 20% are groundwater, and 1.0% are lake and river water, which is very scarce for human needs. The application of biostimulants in the planting and cultivation of cotton, the use of liquid fertilizers in drip irrigation, and the saving of mineral fertilizers by dissolving them in water, while increasing the yield and quality of crops, are urgent tasks.

In the cotton-growing countries of the world, scientific research is being conducted on the economy of water and other resources in the seasonal irrigation of crops using water- and resource-saving advanced technologies. By employing drip, rain, and subsurface irrigation methods for cotton and cotton-complex crops, researchers aim to achieve uniform wetting of the active soil layers where the crop root system is spread, prevent high filtration and waste to sewage, and reduce physical evaporation. Developing and widely implementing these advanced irrigation methods is crucial in the face of global climate change.

The object of the study: Drip irrigation technology using BioProFito biostimulators was selected for the irrigated areas of farms operating in the saline and salinity-prone soils of the Bukhara region. This technology was applied to the "Bukhara-10" variety of cotton for its planting and cultivation.

Research methods: During the research, the methods used included "Methods of Conducting Field Experiments" for determining the water-physical and agrochemical properties of the soil and the amount of salts in it, as outlined in named "Методика агрохимических, агрофизических и микробиологических исследований в поливных районах." Additionally, B.A. Dospehov's "Methodology of Field Experiments" was utilized for the mathematical-statistical analysis of the data obtained.

Research results: One of the water-physical properties of the experimental field soil is its bulk density. It is one of the main factors that determine the volumetric weight of the soil, which in turn affects the rate of irrigation, water permeability, and plant growth. During the studies, the volumetric weight of the soil was monitored in the experimental field at the beginning and the end of the growing season for each option.

In the experimental field, it can be seen that the volume weight of the soil is less compacted. Table 1 and Figure 1 show the effect of biostimulants on soil bulk density in medium loamy soils.

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Table 1.
Volumetric weight of experimental field soil, g/cm^3

Layers , см	Volumetric weight of soil, g/cm3			
	At the beginning of the growing season	At the end of the growing season		
		B-1	B-2	B-3
0-10	1,34	1,35	1,31	1,33
10-20	1,35	1,36	1,30	1,34
20-30	1,37	1,34	1,36	1,38
30-40	1,32	1,33	1,32	1,31
40-50	1,42	1,40	1,36	1,38
50-60	1,41	1,35	1,31	1,33
60-70	1,36	1,33	1,30	1,31
70-80	1,35	1,31	1,33	1,30
80-90	1,32	1,33	1,32	1,31
90-100	1,34	1,31	1,30	1,29
0-30	1,32	1,29	1,28	1,27
0-100	1,31	1,30	1,29	1,29

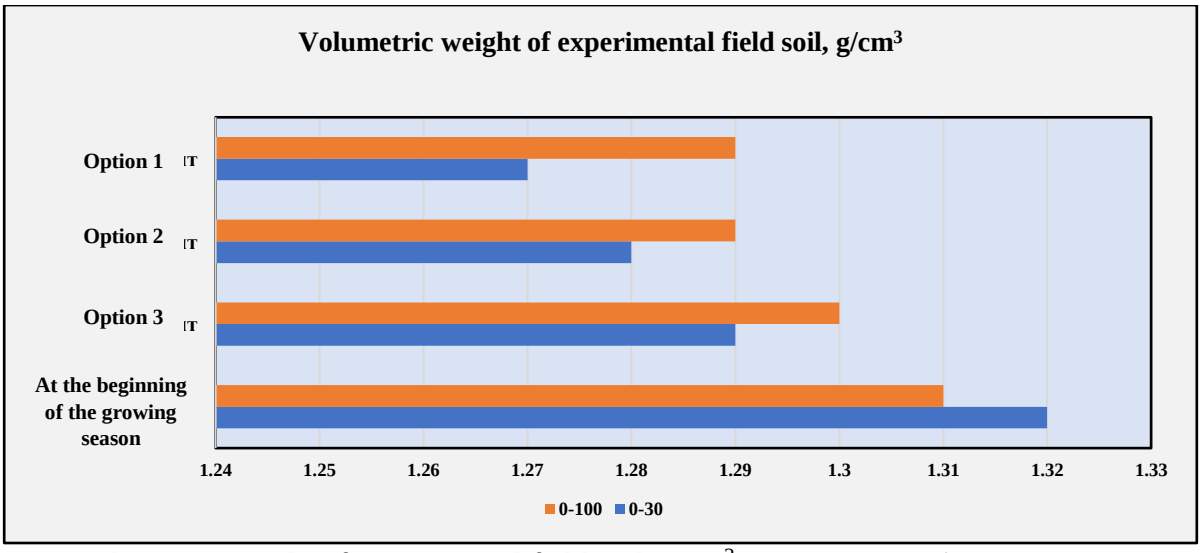

Figure 1. Volumetric weight of experimental field soil, g/cm^3 (0-30, 0-100 см)

It is known that one of the water-physical properties of the soil is its water permeability. The water permeability of the soil is an important indicator necessary for determining the periods and rates of irrigation of crops and for studying the leaching of salts from the soil. In the experimental areas, the water permeability of the soil was determined at the beginning of the growing season before sowing seeds and at the end of the growing season using the “inner and outer circles” method for 6 hours in the 3rd repetition. The determined average data are presented in the table.

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Scientific research was carried out to determine the effect of soil water permeability during the introduction of drip irrigation technology with the use of biostimulants in the planting and cultivation of cotton. In the study, biostimulants were not used in the control field, resulting in lower soil water permeability values compared to other options. In this field, the water permeability of the soil in the first hour of the experiments was 258.2 m³/ha. In the second hour, it was 175.3 m³/ha, and by the fifth hour, this value had decreased to 82.4 m³/ha. By the sixth hour, the water permeability of the soil reached the lowest value of 79 m³/ha. Overall, in the control option, the soil water permeability over 6 hours was 848.3 m³/ha, or 0.241 mm/min.

In option 2, where biostimulants were used, the water permeability of the soil was 231.6 m³/ha in the first hour, and 174.2 and 125.1 m³/ha in the second and third hours, respectively. By the end of the observation period, in the fifth and sixth hours, the water permeability of the soil was 73.5 and 70.8 m³/ha, respectively. The total amount of water absorbed during 6 hours was 794.3 m³/ha.

Tabel 2.
Effect of biostimulants on soil water permeability in order to improve the efficiency of cotton drip irrigation technology in saline soils

Term	Option number	Watch hours						The amount of water absorbed in 6 hours, m^3/ha	Water permeability speed, average in 6 hours, mm/min
		1	2	3	4	5	6		
At the beginning of the growing season		258,2	175,3	132,4	121	82,4	79	**848,3**	**0,241**
At the end of the growing season	**B-1**	231,6	174,2	125,1	107,3	72,8	70,6	**781,6**	**0,238**
	B-2	238,3	178,4	125,7	107,8	73,5	70,8	**794,3**	**0,237**
	B-3	244,3	185,4	127,7	112,5	75,4	71,7	**817,2**	**0,234**

We observed the best indicator of soil water permeability in option 3, with 244.3 m³/ha in the first hour of observations. In the following hours, the water permeability decreased compared to the first hour. In the fifth and sixth hours of observation, the water permeability of the soil was 75.4 and 71.7 m³/ha, respectively, and the total water permeability over 6 hours was 817.2 m³/ha. This showed that the water permeability of the soil was 35.6 m³/ha higher than the control option. It can be seen that in all variants where biostimulants were applied, the water permeability of the soil was higher compared to the control field.

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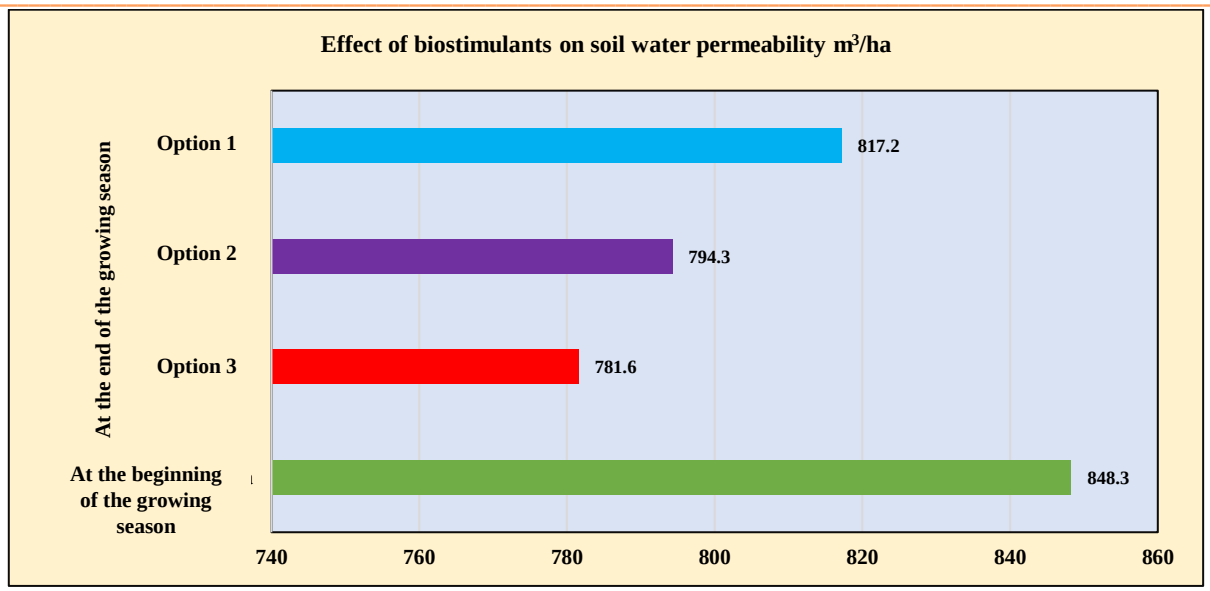

Figure 2. Effect of biostimulants on soil water permeability

In conclusion: Summarizing the results of the research on the effect of the biostimulant BioProFito on the water-physical properties of soil in the saline conditions of the Bukhara oasis, it was observed that the volumetric weight of the soil in the field where BioProFito was used was monitored at both the beginning and end of the growing season for each option. The volumetric weight was found to be 1.31-1.29 g/cm³. Additionally, the water permeability of the soil was higher compared to the control field in all options where biostimulants were applied.

References

1. Khamidov, M., Juraev, A., Juraev, U., Atamuradov, B., Rustamova, K., Najmiddinov, A., & Nurbekov, A. (2022, July). Effects of deep softener and chemical compounds on mechanical compositions in heavy, difficult-to-ameliorate soils. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1068, No. 1, p. 012017). IOP Publishing.
2. Atamurodov, B.N., Sobirov, K.S., & Najmiddinov, M.M. (2022). Rational Use of Water in Agricultural Regions. *Miasto Przyszłości*, *25*, 88-89.
3. Rustamova, K.B., Najmiddinov, M.M., & Sobirov, K.S. (2022). Economical Use of Water Resources and Fertilizers in Irrigation of Crops. *Miasto Przyszłości*, *25*, 84-87.
4. Atamurodov, B.N., & Najmiddinov, M.M. (2022). The Effectiveness of Farming in Greenhouses Drip Irrigation Method. *Journal of Intellectual Property and Human Rights*, *1*(1), 14-18.
5. Jurayev, A.K., Jurayev, U.A., Atamurodov, B.N., Sobirov, K.S., & Najmiddinov, M.M. (2022). Irrigation of cotton by water-saving.
6. Jurayev, A.K., Jurayev, U.A., Atamurodov, B.N., Sobirov, K.S., & Najmiddinov, M.M. (2022). Watering their crops with water of different quality. *Oriental renaissance: Innovative, educational, natural and social sciences*, *2*(6), 1251-1257.
7. Jurayev, U. A., Atamurodov, B.N., Sobirov, K.S., & Najmiddinov, M.M. (2022). Technology of Irrigation of Agricultural Crops with Water of Different Quality. *American Journal of Social and Humanitarian Research*, *3*(7), 45-49.
8. Jurayev, A.K., Jurayev, U.A., Atamurodov, B.N., Sobirov, K.S., & Najmiddinov, M. M. (2022). Scientific and practical importance of efficient use of water in irrigated land.
9. Jurayev, A.K., Jurayev, U.A., Atamurodov, B.N., Sobirov, K.S., & Najmiddinov, M.M. (2022). Soybeans are transplanted into saline and saline soils to justify the effectiveness of drip irrigation.
10. Atamurodov, B.N., Sobirov, K.S., & Najmiddinov, M.M. (2022). Use of resource-efficient irrigation technology in the republic of uzbekistan. *Science and innovation*, *1*(D2), 96-100.
11. Jurayev, A.K., Jurayev, U.A., Atamurodov, B.N., Sobirov, K.S., & Najmiddinov, M.M. (2022). Growing tomatoes hydroponically in greenhouses. *Science and innovation*, *1*(D2), 87-90.

ISSN NO: 2771-8840
July 2024

12. Jurayev, A.K., Jurayev, U.A., Atamurodov, B.N., Najmiddinov, M.M., & Sobirov, K.S. (2022). Effective Use of Water in Irrigated Areas. *Oriental renaissance: Innovative, educational, natural and social sciences*, *2*(6), 810-815.
13. Khamidova, S.M., Juraev, U.A., & Atamurodov, B.N. (2022). Evaluation of the effectivenes of phytomeliorative measures in the treatment of reclamation of saline soils. *Web of Scientist: International Scientific Research Journal*, *3*(6), 835-841.
14. Rustamova, K.B., Sobirov, K.S., & Najmiddinov, M.M. (2022). Agriculture feed chapter the basics of crop irrigation. *Academicia Globe: Inderscience Research*, *3*(6), 1-6.
15. Rustamova, K.B., Najmiddinov, M.M., & Sobirov, K.S. (2022). Economical Use of Water Resources and Fertilizers in Irrigation of Crops. *Miasto Przyszłości*, *25*, 84-87.
16. Rustamova, K.B., Sobirov, K.S., & Najmiddinov, M.M. (2022). Norms of Irrigation and Fertilization of Grain Crops with Spike. *Miasto Przyszłości*, *25*, 77-79.
17. Jurayev, A.K., Rustamova, K.B., Sobirov, K.S., & Najmiddinov, M.M. (2022). Watering the cotton by drip irrigation method. *Spectrum Journal of Innovation, Reforms and Development*, *4*, 605-610.
18. Rustamova, K.B., Najmiddinov, M.M., & Sobirov, K.S. (2022). Intensiv bog'larni sug'orishda tejovchi usullar. *Oriental renaissance: Innovative, educational, natural and social sciences*, *2*(7), 294-300.
19. Khamidova, S.M., Juraev, U.A., Juraev, A.K., & Khamidov, M.K. (2023, February). Evaluating the effect of phytoameliorative measures on the land reclamation status. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1138, No. 1, p. 012022). IOP Publishing.
20. Khamidova, S.M., Juraev, U.A., & Sadullayev, A.N. (2022). The effect of phytomeliorant crops on the accumulation of salt in the soil, norms for washing soil brine. *Spectrum Journal of Innovation, Reforms and Development*, *5*, 78-82.
21. Khamidov, M.K., Balla, D., Hamidov, A.M., & Juraev, U.A. (2020). Using collector-drainage water in saline and arid irrigation areas for adaptation to climate change. In *IOP Conference Series: Earth and Environmental Science* (Vol. 422, No. 1, p. 012121). IOP Publishing.