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Review Article

The Effects of Fertilizing with Biostimulant Meliorant "Kazniivh-1" On the Growth and Development of Sorghum

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Abstract

Annotation. In recent years, there has been a general trend of soil degradation in arid zones, caused primarily by the influence of the human factor. Therefore, there is an urgent need to find methods and ways to restore degraded lands by introducing resource-saving technologies. In this regard, as evidenced by our long-term observations, in order to optimize the soil-reclamation condition of irrigated lands, it is necessary to refrain from using mineral fertilizers against the background of abundant irrigation of agricultural crops, since their annual application over many years has led to a radical depletion of land resources. Therefore, the study of the issues of leaf nutrition of plants can be defined as the process of absorption of nutrients in various chemical forms through the leaf and other plant surfaces with their subsequent assimilation. Since the efficiency of assimilation of nutrients with non—root nutrition can reach 85%, whereas with soil application only 30 - 60% of the applied number of fertilizers is absorbed by plants, which contributes to the rational use of water and land resources. The tested biostimulator is a meliorant consisting of the following materials: manure, glauconite clay, phosphogypsum and camel thorn (or licorice), which are available to every household without much difficulty. The concentration of displacement, as evidenced by our field studies is 50 -15[20] – 30[35] %, that is, 50% of the area of the harvested sharbat is filled with manure, 15 [20] % is added glauconite clay or phosphogypsum, 5-8% of crushed camel thorn (or licorice) and adds the remaining 25 [27%] irrigation water and after 15-20 days, irrigation of agricultural crops is carried out through this container. The diluted concentration enhances the parameters and limits of regulation of water-salt and food regimes in the root layer of soils.

Keywords: cardiogenic syncope; vasovagal syncope; children; mortality

Introduction

The geochemical cycle of the substance in soils is open: the substance from the soil is lost into the atmosphere, hydrosphere, lithosphere, and other geospheres; it remains outside the biosphere for a long time in geological water and land deposits. Irrigated agricultural lands have been compacted, salinized, slitized, have led to the depletion of soils with humus and nutrients, and the large doses of mineral fertilizers applied annually do not give the expected effect [1]. This negatively affects the interaction of the mineral and organic phases of the soil, worsens the conditions of aggregation of natural dispersed structures [2,3], therefore, the farming system at the present stage requires radical restructuring.In this regard, the study of the issues of expanded reproduction of soil fertility determines the identification of adverse effects in soils, landscapes, natural and territorial complexes and more successfully solve the agrochemical problem of plant nutrition, overcome problems related to environmental protection [4].Nutrition is the metabolism between a plant and the environment. This is the transition of substances from the environment (soil, air) into the composition of plant tissue, into the composition of complex organic compounds synthesized by the plant, and the removal of a number of substances from it [5]. The plant builds its body from certain chemical elements in the environment. it consists of a dry substance and contains a significant amount of water. In most vegetative organs of agricultural crops, the water content is 70-95%, and in seeds — from 5 to 15%. The composition of the dry matter of the plant includes 90-95% of organic compounds and 5-10% of mineral salts. The main organic substances are represented in plants by proteins and other nitrogenous compounds, fats, starch, sugars, fiber, pectin substances.Unfavorable processes contribute to the leaching of organic matter, calcium and other biophilic elements from the soil, especially in conditions of increased moisture and irrigation, and to the greatest extent – in rice culture, it is noted [6,7].In recent years, there has been a general trend of soil degradation in arid zones, caused primarily by the influence of the human factor. Therefore, there is an urgent need to find methods and ways to restore degraded lands by introducing resource-saving technologies. In this regard, as evidenced by our long-term observations,

in order to optimize the soil-reclamation condition of irrigated lands, it is necessary to refrain from using mineral fertilizers against the background of abundant irrigation of agricultural crops, since their annual application over many years has led to a radical depletion of land resources.Leaf nutrition of plants can be defined as the process of absorption of nutrients in various chemical forms through the leaf and other plant surfaces with their subsequent assimilation. Most plants can receive nitrogen, phosphorus, potassium, calcium, magnesium, cepy and trace elements in this way (through the surface of leaves, stems, generative organs). The main penetration is carried out directly through the cuticle of the leaves. The penetration of nutrients also occurs through the stomata. This type of nutrition exists in parallel with the root. Leaf nutrition is a quick way to eliminate nutrient deficiencies and accelerate metabolism in plants at certain physiological stages. In the conditions of competition between agricultural crops and weeds, this type of nutrition focuses nutrients only on those plants to which they are intended.

The undoubted advantage of foliar nutrition is a shorter and more effective way of penetration and assimilation of nutrients by the plant, especially in ionic form, compared to soil. Minerals are immediately included in the composition of proteins, enzymes, etc. The efficiency of assimilation of nutrients with non—root nutrition can reach 85%, whereas with soil application, only 30 - 60% of the number of fertilizers applied is absorbed by plants. The higher the rate of absorption of nutrients by the surface of plants, the more effective leaf nutrition. At the same time, nitrogen in the amide form is absorbed fairly quickly, within O.5 — 1 hours, and it takes several days for phosphorus to be completely absorbed. Calcium, manganese, zinc can be on the surface of the leaves for l—2—x days, while iron and molybdenum —more than one.it is important to know that nutrients are divided into three groups according to their ability to move inside plant tissues: - mobile: nitrogen (N), phosphorus (P), potassium (K), cepa(S), chlorine (CI); -sedentary: zinc (Zn), copper (Si), manganese (Mp), iron (Fe), molybdenum (Mo); boron (B); -stationary: calcium (Ca), magnesium (Mg).A number of nutrients that are in inaccessible or low—yielding forms can be easily absorbed and assimilated precisely when applied to leaves, which contributes to the speedy elimination of their shortage in plants.The development of technologies for intensive cultivation of agricultural crops, the emergence of new, highly productive varieties and hybrids requires high levels of agricultural background and high balance in all nutrition elements (macro-, microelements). Objectively, there is an increase in the consumption of basic fertilizers. But at the same time, almost only the main nutrients, nitrogen, phosphorus, potassium, without trace elements, are often introduced into the soil. This can lead to an imbalance of micronutrient nutrition and, according to Liebig's law, to crop losses that are not compensated by an excess of other nutrients. All the diversity of the world's soils is used mainly for one purpose – to get more biological products, which are then used as food and raw materials. This task is solved by agrotechnics – a system of measures is used to create the starting conditions for the development of agrocenosis and care for it, in particular, additional nutrition of plants – fertilizer. Due to the fact that the soil is a dynamic system that evolves quite rapidly with changing development conditions, climatic fluctuations [8,9,10] and anthropogenic impact, medium– and long-term measures of correction of soil properties – land reclamation are used to increase the yield of biological product. The most common object of soil reclamation in the world is saline soils, and the same term is quite widespread in foreign literature. The generally accepted fundamental scheme of the genesis and evolution of saline soil is the sequence "solonchak – solonets – malt" proposed by K.K. Giedroyc. From this scheme follows the task of reclamation of saline soil – to replace the sodium contained in the soil absorbing complex (ACC) of the illuvial horizon of the saline (15-30 cm: the depth of the location of the illuvial horizon varies for different soil objects) with calcium. This improves the structure, increases the water permeability of the soil, ensures the leaching of easily soluble salts, optimizes the conditions for the development of the root system, plant nutrition and soil biota and, accordingly, increases the biological productivity of agricultural plants. Apply a meliorant that contains calcium. The dose of meliorant is determined by calculating the amount of calcium introduced into the soil equivalent to the sodium content in the PPK in the calculated soil layer [11,12].

Conditions and methods of research: The object of research was to study the effect of foliar nutrition of the biostimulator "KazNIIVH-1" on the growth, development and yield of sorghum of the Dwarf variety of Uzbekistan on grain. The research was carried out at the field site of the Department of "Melioration, Ecology and Water Supply", LLP "Kazakh Research Institute of Water Management" (2022). Field research was carried out according to the methodology of B.A. Dospekhov in threefold repetition, according to the following scheme.

Option number	Variants	Culture
1	Without top dressing	Sorghum of the variety "Dwarf of Uzbekistan"
2	Biostimulator 1:3 in phases 3-4 and 6-8 present.leaves.	
3	Recommended NPK	
4	Biostimulator 1:5 in phases 3-4 and 6-8 present. leaves.	

Scheme of experience

The recommended rate of application of mineral fertilizers: Nitrogen-120 kg / ha d.v., Phosphorus – 120 kg / ha d.v. and Potassium – 90 kg /ha d.v. The volume mass of the soil in the arable horizon (0-30cm) was 1.42 g/cm3, and the lowest moisture capacity was at the level of 15.92%. According to the classification of N.A. Kachinsky, the soils of the experimental site belong to light loamy (Table 1).

Horizons, cm	Volume weight, g/cm3	The lowest moisture capacity,%
0-10	1,25	18,30
10-20	1,52	13,76
20-30	1,49	15,86
30-40	1,69	18,35
40-50	1,65	14,75
50-60	1,60	13,31
60-70	1,79	14,66
70-80	1,78	14,71
80-90	1,71	13,32
90-100	1,64	11,81
0-30	1,42	15,92
0-50	1,52	16,17
0-80	1,58	15,56
0-100	1,61	14,88

Table 1: Water-physical properties of the soil.

Goals and objectives of research: The purpose of the study is to optimize the effectiveness of using a biostimulator – meliorant for the growth, development and yield of sorghum of the Dwarf variety of Uzbekistan for grain.To achieve this goal, the following tasks were set: conduct field research to determine the rate of application of biostimulant- meliorant;

 to study the growth, development of sorghum and yield at different doses of biostimulant- meliorant application;

- to evaluate the effectiveness of using a biostimulator-meliorant;
- develop recommendations for agricultural cooperatives and water management organizations and exchange knowledge and technologies to improve water and land resources in the arid zone farming system.

The results of the study and their discussion: Currently, in conditions of radical degradation of irrigated lands, the need for widespread use of low-cost technologies is necessary to stabilize the gross crop production. One of such directions is the use of biologically active drugs to increase the stability and productivity of plants.

At the present stage, not only a variety of fertilizers are widely used in crop production to increase plant yields, but also a wide range of additives, biologically active substances. These drugs are combined into a class of biostimulants or phytohormones.

Phytohormones mean three main (there are other) groups of substances and drugs.

First of all, these are phytohormones produced by plants, or estrogens that are used in medicine. Phytoestrogens also include mycoestrogens produced by fungi that parasitize plants. Steroid plant hormones close to estrogens (in effect).

Secondly, phytohormones are called preparations intended for plants. Some of them are used for fertilizing and inlays – these are various biostimulants. The third group is transgenic phytohormones, which are used to change plants at the genetic level.

Therefore, drugs designed to increase the viability of plants are more correctly called biostimulants. There are a lot of them – different in composition and mechanism of action (stimulation of growth or root formation, regulation of vital processes in plant cells, adaptation to adverse environmental conditions and protection from diseases by increasing plant immunity). Biostimulants consist of plant extracts and contain trace elements, amino acids, proteins (proteins), fatty acids, vitamins, enzymes and extracts from compost in various proportions.

Plants in the process of growth, absorb nutrients from the soil, so their reserves need to be replenished regularly. The most popular method is the application of mineral fertilizers, in which the necessary useful elements are in the form of various mineral salts. However, in the conditions of a market economy and high prices for fertilizers, the introduction of the necessary amounts of mineral fertilizers in the process of cultivating crops is not carried out by many farmers. In addition, the mineral fertilizers used have the following disadvantages:

- nitrogen is quickly washed out of the soil during irrigation;
- undeveloped fertilizer elements remain in the soil, which leads to its salinization, increased acidity and accumulation of nitrates;
- groundwater is polluted;
- excess chlorine inhibits the flow of phosphorus to plants;
- if the rules of application and dosage are not followed, mineral fertilizers can cause irreparable damage to plants and cause burns of the root system.

Based on the above, we have created a universal biostimulator-meliorant that provides fast and effective results.

In the course of research, optimal ratios of biostimulator elements were determined, allowing to comprehensively improve soil fertility of lands, reduce evaporation from the daytime soil surface, restrain the process of soil salinization and reduce the mineralization of irrigation water.

This preparation is made on the basis of highly effective biological, chemical and other meliorants.

The proposed biostimulator is a meliorant consisting of the following materials: manure, glauconite clay, phosphogypsum and camel thorn (or licorice), which are available to every household without much difficulty. The concentration of displacement, as evidenced by our field studies is 50 -15(20) – 30(35)% , that is, 50% of the area of the harvested sharbat is filled with manure, 15 (20)% is added glauconite clay or phosphogypsum, 5-8% of crushed camel thorn (or licorice) and adds the remaining 25 (27%) irrigation water and after 15-20 days, irrigation of agricultural crops is carried out through this container. The diluted concentration enhances the parameters and limits of regulation of water-salt and food regimes in the root layer of soils. The proposed method creates prerequisites for improving the growth and development of cultivated crops from the very initial stage of its development, rational use of water and land resources.

In addition, the widespread introduction of this biostimulator-meliorant in the agro-industrial complex to ensure a stable economic effect by significantly reducing the use of expensive mineral fertilizers such as nitrogen, phosphorus and potassium.

The results of field studies indicate that the introduction of the recommended biostimulator-meliorant allows to obtain optimal growth and development of forage crops in degraded soils (Table 2).

It follows from this that the tested biostimulator-meliorant when applied to the soil has a certain advantage over mineral fertilizers, i.e. the height of plants on the 1st of July exceeded 1.5 and 10.5 cm.The most favorable dose of application according to preliminary indicators is considered to be a concentration of 1:5 compared to a concentration of 1:3, which is 9.0 cm higher. In comparison with the absolute control at 39.6 cm above, this gives us to believe that the biostimulator-meliorant significantly improves

the plasticity of the soil, reduces the compressive strength of the soil, and also improves its structure.

Variants	When applied to the soil		With foliar nutrition	
	Plant height , cm.	Number of leaves, pcs.	Plant height , cm	Number of leaves, pcs.
As of July 1				
Abs. control	94,3	8,6	79,4	6,2
Biostimulator 1:3	124,9	10,5	85,4	8,0
NPK	123,4	10,1	103,1	8,9
Biostimulator 1:5	133,9	10,3	94,8	8,1
On August 1				
Abs. control	134,0	9,9	89,9	9,1
Biostimulator 1:3	182,6	11,9	96,8	11,1
NPK	180,1	11,0	138,2	11,0
Biostimulator 1:5	187,7	11,0	144,2	13,0

Table 2: Accounting for the growth and development of sorghum Dwarf Uzbekistan

According to preliminary studies, it follows that with foliar nutrition, the tested biostimulator-meliorant for the accumulation of the number of leaves is not inferior to the options with introduction into the soil. This gives us a reason to study more and more deeply the effect of this drug on increasing soil fertility, soil salinization of the aeration zone, stabilization of the ecological situation of irrigated agriculture.

Conclusion

Thus, the widespread introduction of this biostimulator-meliorant in the agro-industrial complex will ensure a stable economic effect by significantly reducing the use of expensive mineral fertilizers such as nitrogen, phosphorus and potassium.

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