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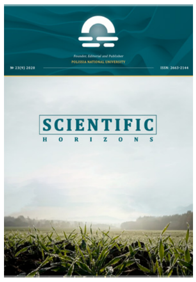

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The impact of biologically enhanced fertilisation systems on sweet potato (*Ipomoea batatas*) productivity and quality

Oleksandr Kuts
Doctor of Agricultural Sciences, Senior Research Fellow
State Biotechnological University
61002, 44 Alchevskikh Str., Kharkiv, Ukraine
https://orcid.org/0000-0003-2053-8142

Vasyl Kokoiko*
PhD in Agricultural Sciences, Senior Research Fellow
Institute of Climate-Smart Agriculture of the National Academy of Agrarian Sciences
67667, 24 Mayatska Doroga Str., Khlybodarske Village, Ukraine
https://orcid.org/0000-0002-2528-7920

Svitlana Semenenko
Doctor of Philosophy, Research Associate
Donetsk Research Station of Institute of Vegetable and Melon Growing
of the National Academy of Agrarian Sciences
62478, 5 Prykordonnykiv entry, Selektsiyne Village, Ukraine
https://orcid.org/0000-0002-6606-1151

Ivan Semenenko
PhD in Agricultural Sciences, Senior Researcher
Donetsk Research Station of Institute of Vegetable and Melon Growing
of the National Academy of Agrarian Sciences
62478, 5 Prykordonnykiv entry, Selektsiyne Village, Ukraine
https://orcid.org/0000-0002-6485-0077

Valery Romanov
Postgraduate Student
Institute of Vegetable and Melon Growing of the National Academy of Agrarian Sciences
62478, 1 Institutska Str., Selektsiyne Village, Ukraine
https://orcid.org/0009-0008-7407-4084

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Abstract. The relevance of this research lies in determining the potential use of microbial preparations with varying functionalities to optimise the nutrition and stimulate the growth processes of sweet potato plants, as well as the synergistic effects of different preparations. The developed nutrient optimisation systems are designed to restore soil

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**Corresponding author*

fertility, reduce the anthropogenic load on vegetable agroecosystems, produce high-quality yields, and increase sweet potato productivity without relying on energy-intensive production methods. This study aimed to investigate the impact of biological fertilisation systems on the biometric parameters, yield, and quality of sweet potato tubers. The research programme was implemented through field, statistical, computational-analytical, and laboratory methods. An increase in the number (7.33-9.83 per plant) and length (175.55-184.89 cm) of shoots was observed with the application of the biological preparations "Groundfix" + "Humifriend", "Help-Rost for vegetables", and "Mycofriend". The use of foliar fertilisations in three terms of "Help-Rost for vegetables", both in combination with "Mycofriend" during fertigation and with the foliar fertilisation "Humifriend", resulted in maximal leaf mass formation on the plant (2.41-2.56 m^2/ha in the third decade of June and 23.12-27.45 m^2/ha in the third decade of August). Microbial preparations significantly increased net photosynthetic productivity by 28.9-63.9% during the period from the third decade of June to the third decade of July, especially when "Groundfix" and "Humifriend", or "Humifriend" and "Help-Rost for vegetables" were combined. A substantial commercial yield of tubers (17.4 t/ha) was achieved by applying the mycorrhizal preparation "Humifriend" (1.5 L/ha) in the first fertigation and conducting three foliar applications of "Help-Rost for vegetables" at 2.0 L/ha. Treatments involving biological preparations demonstrated improvements in key biochemical parameters. The use of "Groundfix" + "Humifriend" and "Humifriend" + "Help-Rost for vegetables" resulted in a decrease in nitrate levels in the produce. The authors hypothesise that the optimal supply of micronutrients, particularly iron, manganese, and molybdenum, enhances the transformation of nitrates into organic matter. This research provides valuable insights for the rational application of biologically enhanced fertilisation systems to achieve high yields and quality of sweet potato tubers in various agricultural settings

Keywords: *Ipomoea batatas* L.; biopreparations; irrigation; photosynthetic productivity; yield

INTRODUCTION

Considering the fact that sweet potato tubers are rich in glucose, protein, minerals, and vitamins, making them a valuable product for dietary nutrition (especially for individuals with diabetes), the increase in crop productivity is associated with rising levels of mineral fertilisers and phytopharmacological agents. Such technological approaches, however, can lead to a decline in soil fertility, heightened pollution of agrocenoses, and the introduction of contaminants into agricultural products. As highlighted by K. Nadarajah and N.S.N. Abdul Rahman (2023), in developed countries, despite the use of high levels of mineral fertilisers, a significant direction for the development of the agricultural sector is the biological enhancement of production processes. The biological enhancement of agricultural production is fundamentally more than merely forgoing mineral fertilisers and protective agents; it represents a balanced complex of technological, agrochemical, and biological measures, combined with integrated pest management and scientifically grounded crop rotations.

A key element of biologically enhanced agriculture is the widespread use of microbial preparations to optimise plant nutrition. These preparations activate a range of physiological processes within the soil and plant, such as nitrogen fixation, mobilisation of soil-bound phosphorus and potassium, and growth regulation. Each of these processes has the potential to significantly impact crop yield and quality. For example, according to M. Lopes *et al.* (2021), the use of biopreparations containing associative nitrogen-fixing bacteria can provide plants with an additional 20-50 kg/ha of nitrogen. Nitrogen-fixing microorganisms can fix 40-300 kg/ha of nitrogen annually from the atmosphere, without causing environmental pollution and with minimal energy requirements. Data from R. Gupta *et al.* (2021) reveals that globally, approximately 35 million tonnes of nitrogen are added to soils annually through mineral fertilisers, while plants absorb around 75 million tonnes during the same period. The difference between these figures is largely attributed to the activity of soil nitrogen-fixing microbes.

D. Minemba *et al.* (2020 highlight the potential for improving the phosphorus regime of the soil through the use of microbial preparations containing phosphorus-mobilising microorganisms. These preparations facilitate the conversion of poorly soluble soil phosphates into more soluble forms that are readily available to plants. To transform phosphorus-containing compounds in the soil and release mobile forms of phosphorus, fungi, actinomycetes, and spore-forming bacteria from the genera *Pseudomonas*, Micrococcus, Corinebacterium, and *Alcaligenes* can be effectively utilised.

The primary aim of using microbial preparations in the cultivation of agricultural plants is to establish a specific pool of microorganisms in the soil rhizosphere. According to the opinion of the authors, healthy microflora contributes to the creation of comfortable conditions for plant nutrition and the trophic relationship between soil and plant. According to G. Koskey *et al.* (2021) and P. Trivedi *et al.* (2020), microbial communities facilitate the contact between plant root systems and distant soil aggregates, which contain absorbed nutrient elements. This interaction occurs through chains of bacterial cells, hyphae, and the mycelium of microscopic fungi, among other means. Consequently, the total absorption capacity of microbial-plant associations significantly exceeds that of the plant roots alone. Research by Y. Syromyatnikov *et al.* (2022; 2023) indicate that the quantitative and qualitative composition of soil microbial communities is influenced by various technological practices, particularly irrigation, soil cultivation, and fertiliser use.

An important aspect in recent decades has been the development and implementation of new multifunctional microbial preparations produced from highly effective strains of associative microorganisms that do not adversely affect the natural environment. The use of microbial preparations does not require high energy and material costs, especially when compared to the application of mineral fertilisers or soil cultivation. As noted in the research by L. Gonçalves *et al.* (2023), the productivity of sweet potatoes can be enhanced by using microbial preparations with various functional types of microorganisms to optimise nutrition. According to I. Khan (2023), microbial preparations are effective in combination with both green manures or organic fertilisers and mineral fertilisers. The application of microbial preparations not only increases yield but also improves the quality composition of tubers, including an increase in the dry matter content, β-carotene, and starch levels in the tubers.

Thus, in the context of biological enhancement for sweet potato cultivation, various functional microbial preparations can be utilised to optimise plant nutrition. These preparations enhance processes such as associative nitrogen fixation, phosphorus and potassium mobilisation, the decomposition of plant residues in the soil, and the reduction of pathogenic pressure, among others. This study aimed to establish the impact of different nutrient systems on the biometric parameters of the plants, as well as the yield and quality of sweet potato tubers under irrigation conditions.

MATERIALS AND METHODS

The research was conducted from 2021 to 2023 at the Institute of Vegetable and Melon growing of the National Academy of Agrarian Sciences of Ukraine. The experiments were carried out on a typical low-humus light loamy chernozem (the arable layer contained 4.3% humus, 139 mg/kg of hydrolysable nitrogen, 120 mg/kg of mobile phosphorus, and 93 mg/kg of exchangeable potassium; pH of the salt extract was 5.7; hydrolytic acidity was 2.8 meq per 100 g of soil). The climatic features of the research area include an average annual precipitation of 471 mm, with 57-73 mm of precipitation falling in June and July; relatively dry conditions were formed in early spring and autumn (Archive of meteorological data, n.d.). The research was conducted according to the generally accepted methodology (Bondarenko & Yakovenko, 2001). The total plot area for the experiment was 33.6 m^2, with a plot area of 21 m^2, and the experiments were replicated three times. In the experiments, the sweet potato variety Admiral was grown under drip irrigation and soil mulching with a black polyethene film 120 microns thick, using a planting scheme of (100+40)×25 cm.

The following microbial preparations were used in the study: "Mycofriend" is a microbial preparation containing a complex of agronomically valuable microorganisms, including mycorrhizal fungi such as *Glomus* sp.; rhizospheric microorganisms that enhance mycorrhiza formation (*Trichoderma harzianum, Pseudomonas fluorescens, Streptomyces* sp.); phosphate-mobilising bacteria; and bacteria with fungicidal and bactericidal properties (*Bacillus subtilis, Bacillus megaterium var. phosphaticum, Bacillus muciloginosus, Enterobacter* sp.). The total number of viable cells is not less than 1.0×10^8 CFU/g.

"Humifriend" is a comprehensive fertiliser based on potassium humate, containing microorganisms, humic and fulvic acids, a complex of microorganisms with fungicidal properties, amino acids, peptides, succinic acid, and micronutrients. It accelerates the uptake of nutrients by plants, stimulates the growth and development of the root system and the above-ground parts of the plants, and enhances plant resistance to frost, drought, high temperatures, and moisture deficiency. Additionally, it increases the yield and quality of agricultural products, activates the synthesis of proteins, carbohydrates, and vitamins in plants, improves soil health, and restores its fertility (Brochure about HUMIFRIEND, n.d.).

"Groundfix" is a soil bio-fertiliser that contains cells of the bacteria *Bacillussubtilis, Bacillusmegateriumvar. phosphaticum, Azotobacter chroococcum, Enterobacter,* and *Paenibacillus polymyxa*. The total number of viable cells ranges from $(0.5 - 1.5) \times 10^9$ CFU/cm^3. This bio-fertiliser enhances the mobility of phosphorus and the availability of potassium from the soil and mineral fertilisers, prolongs the availability of nutrients, improves the biological activity of the soil, and suppresses the development of phytopathogens (Brochure about GROUNDFIX, n.d.).

"Azotophyt" is a microbial preparation containing cells of the natural nitrogen-fixing bacterium *Azotobacter chroococcum*, along with biologically active products produced by the bacteria (amino acids, vitamins, phytohormones, and fungicidal substances). The total number of viable microorganisms in the product is no less than 1×10^{10} CFU/cm^3 (Brochure about AZOTOPHYT, n.d.).

"Help-Rost for vegetable plants" is used in agriculture for fertilising vegetable crops to improve the yield, marketability, and flavour qualities of the final product. "Help-Rost for vegetable plants" is classified as an organo-mineral fertiliser, containing macro- and micronutrients, amino acids, and more (Brochure about HELP-ROST, n.d.).

Foliar applications of microbial preparations were conducted in three terms: the first treatment was 30 days after transplanting the seedlings, and subsequent treatments were carried out at intervals of 25 days (Table 1).

No.	Application of microbial preparations
1	Control (without microbial preparations)
2	Mycofriend application in the first fertigation (1 L/ha)
3	Mycofriend application in the first fertigation (1 L/ha) + Help-Rost for vegetable, foliar application in 3 terms (2 L/ha each)
4	Help-Rost for vegetable, foliar application in 3 terms (2 L/ha each)
5	Groundfix applied in the first fertigation (5 L/ha) + Humifriend, foliar application in 3 terms (1.5 L/ha each)
6	Humifriend, foliar application in 3 terms (1.5 L/ha each) + Help-Rost for vegetables, foliar application in 3 terms (2 L/ha each)

***Table 1**. Biometric parameters of sweet potato plants of the Admiral variety*

***Source:** compiled by the authors*

At the end of the growing season, the content of the following was determined: dry matter according to DSTU 7804:2015 (2016), vitamin C according to DSTU 7803:2015 (2016), total sugar according to DSTU 4954:2008 (2009), nitrates according to DSTU 4948:2008 (2009), and starch (Kucherenko *et al.,* 2002). During the research, the authors adhered to the standards of the Convention on Biological Diversity (n.d.) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (n.d.).

RESULTS AND DISCUSSION

Throughout the years of research, the biometric parameters of the sweet potato plants during the first decade of July did not differ significantly, except for the control variant (without fertilisers), where the lowest number of shoots was recorded at 4.97 shoots per plant, with an average shoot length of 96.2 cm. In the second term (the second decade of August), the most positive impact on the biometric parameters of the sweet potato plants was observed with the application of the preparations "Groundfix" + "Humifriend", which resulted in an average number of shoots per plant of 7.33 and an average shoot length of 184.9 cm. With the preparation of "Help-Rost for vegetables", an increase in the average number of shoots to 9.83 and an average shoot length of 183.6 cm was noted. The variant using "Mycofriend" demonstrated a positive effect as well, with an average of 8.33 shoots and an average shoot length of 175.6 cm (Table 2).

***Table 2**. Biometric parameters of sweet potato plants of the Admiral variety (average for 2021-2023)*

Fertilisation system	First term (1st decade of July)		Second term (1st decade of August)	
	Shoots (pcs)	Length (cm)	Shoots (pcs)	Length (cm)
Control	4.97	96.2	7.58	128.4
Mycofriend (1 L/ha)	5.97	128.5	8.33	175.6
Mycofriend (1 L/ha) + Help-Rost for vegetables (2 L/ha)	6.13	110.2	6.33	133.1
Help-Rost for vegetables (2 L/ha)	6.30	111.7	9.83	183.6
Groundfix (5 L/ha) + Humifriend (1.5 L/ha)	5.63	118.9	7.33	185.0
Humifriend (1.5 L/ha) + Help-Rost for vegetables (2 L/ha)	5.80	100.7	7.83	148.2
$LSD_{0,95}$	0.9	16.7	1.2	24.7

***Source:** compiled by the authors*

It has been noted that the maximum impact on leaf formation throughout the entire growing season of sweet potato plants is achieved through the application of foliar fertilisations with "Help-Rost for vegetables" in three terms, both in combination with "Mycofriend" during fertigation and with "Humifriend" for foliar application in three terms (Fig. 1). In this context, the leaf area varied from 2.41 to 2.56 m^2/ha in the third decade of June, from 19.47 to 20.45 m^2/ha in the third decade of July, and from 23.12 to 27.45 m^2/ha in the third decade of August. It is important to note that the use of "Help-Rost for vegetables" alone resulted in significantly lower leaf area values, indicating a certain synergistic effect of the various preparations on this parameter. Mycorrhisation of the sweet potato roots also positively influences the increase in leaf area. Specifically, the application of "Mycofriend" during the first fertigation resulted in a consistent increase in leaf area compared to the control, ranging from 23.5% to 28.5%.

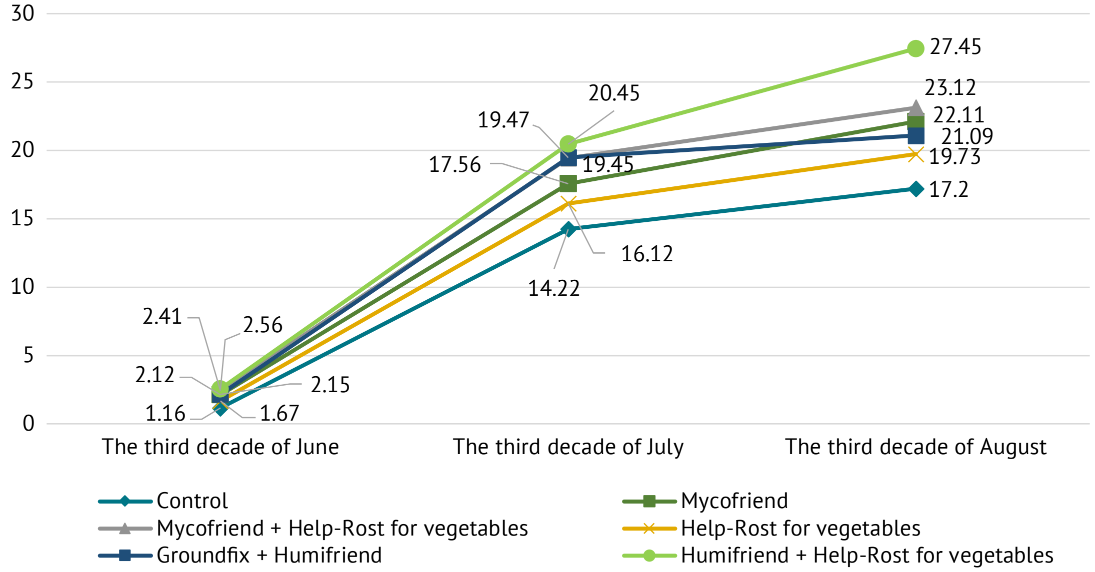

Figure 1*. Leaf area of sweet potato plants, thousand m²/ha (average for 2021-2023)*

Source: *compiled by the authors*

The maximum growth of leaf mass was observed in June and July. During the tuber growth period (from the third decade of July to the third decade of August), the increase in leaf area occurs very slowly, which is associated with the redistribution of organic matter synthesised by the plant towards tuber formation. Depending on the rate of leaf development in sweet potato plants, the net productivity of photosynthesis also varies. The parameter of net photosynthetic productivity significantly depends on the level of accumulated dry biomass, which is influenced by technological and agro-meteorological factors, as well as the biological characteristics of the crop and variety.

It has been established that optimising plant nutrition through the use of various types of microbial preparations contributes to an increase in net photosynthetic productivity during the period from the third decade of June to the third decade of July, by 28.9% to 63.9% (Figure 2). The highest levels were observed with the application of "Groundfix" and "Humifriend" (25.8 g/m^2 per day), as well as with "Humifriend" and "Help-Rost for vegetables" (27.2 g/ m^2 per day).

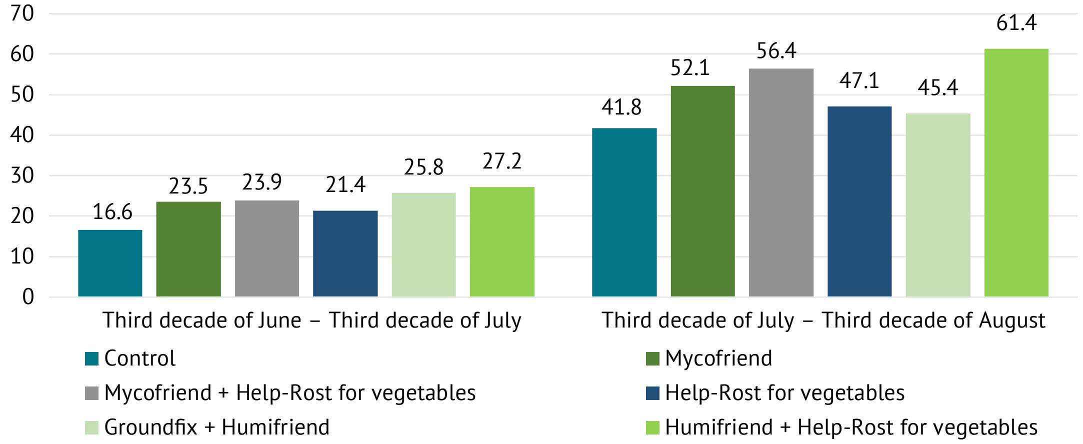

Figure 2*. Net photosynthetic productivity of sweet potato plants, g/m² per day (average for 2021-2023)*

Source: *compiled by the authors*

In the later period (from the third decade of July to the third decade of August), the use of microbial preparations resulted in an increase in net photosynthetic productivity by 8.6% to 46.9%. Significantly high values relative to the control group were observed with the application of "Mycofriend" (52.1 g/m^2 per day), "Mycofriend" combined with "Help-Rost for vegetables" (56.4 g/m^2 per day), and "Humifriend" together with "Help-Rost for vegetables" (61.4 g/m^2 per day). Throughout the years of research, microbial preparations for optimising plant nutrition have led to an increase in sweet potato yields (Table 3). The maximum productivity of 17.4 t/ha was achieved with the application of the mycorrhiza-forming preparation "Humifriend" (1.5 L/ha) during the first fertigation, alongside three foliar applications of "Help-Rost for vegetables" at 2.0 L/ha.

***Table 3**. Indicators of marketable yield of sweet potato tubers of the Admiral variety, t/ha*

Fertilisation system	Tuber yield, t/ha			
	2021	2022	2023	Average for 2021-2023
Control	15.9	9.2	8.6	11.2
Mycofriend (1 L/ha)	18.1	9.6	14.7	14.1
Mycofriend (1 L/ha) + Help-Rost for vegetables (2 L/ha)	19.1	10.0	15.4	14.8
Help-Rost for vegetables (2 L/ha)	17.6	10.4	12.2	13.4
Groundfix (5 L/ha) + Humifriend (1.5 L/ha)	18.1	10.7	13.7	14.1
Humifriend (1.5 L/ha) + Help-Rost for vegetables (2 L/ha)	22.7	13.6	16.1	17.4
$LSD_{0.95}$	1.67	0.95	1.21	1.3

***Source:** compiled by the authors*

The high yield of marketable tubers is achieved through the combined use of the preparations "Groundfix" and "Humifriend", resulting in a yield of 14.1 t/ha. The combination of the biological preparations "Mycofriend" and "Help-Rost for vegetables" leads to a sweet potato yield of 14.8 t/ha. It is noted that no synergistic effect from the actions of these preparations was observed, as the differences between the treatments with the individual applications of these microbial preparations were not significant, with no substantial difference compared to the treatment involving only "Help-Rost for vegetables" (13.4 t/ha) and the application of "Mycofriend" at 1 L/ha (14.1 t/ha). Regarding the influence on the biochemical composition of the tubers, the action of microbial preparations was ambiguous (Table 4). A positive trend was observed with the use of "Mycofriend" and the combined application of "Mycofriend" and "Help-Rost for vegetables", which increased the dry matter content in the tubers to 19.07-19.12%.

***Table 4**. Influence of microbial preparations on the quality of sweet potato tubers of the Admiral variety (average for 2021-2023)*

Fertilisation system	The content in tubers:					
	Dry matter (%)	Starch (%)	Total sugar (%)	Vitamin C (mg/100 g)	Carotene (mg/100 g)	Nitrates (mg/kg)
Control	18.66	12.55	3.38	5.51	2.55	165.7
Mycofriend (1 L/ha)	19.07	13.46	3.56	5.27	6.02	101.22
Mycofriend (1 L/ha) + Help-Rost for vegetables (2 L/ha)	19.12	13.97	3.73	4.75	4.09	100.6
Help-Rost for vegetables (2 L/ha)	18.69	13.17	3.65	4.28	5.44	90.3
Groundfix (5 L/ha) + Humifriend (1.5 L/ha)	18.66	12.97	3.85	5.21	5.00	76.0
Humifriend (1.5 L/ha) + Help-Rost for vegetables (2 L/ha)	18.85	14.45	3.90	4.61	4.76	55.5
$LSD_{0.95}$	0.94	0.66	0.18	0.25	0.20	12.81

***Source:** compiled by the authors*

The combined application of "Groundfix" + "Humifriend" and "Humifriend" + "Help-Rost for vegetables" demonstrates a positive trend in the increase of total sugar content in sweet potato tubers, ranging from 3.85% to 3.90%, compared to a control value of 3.38%. A significant increase in starch content in the tubers is achieved with the application of "Groundfix" + "Humifriend" (14.45%), "Mycofriend" (13.46%), and the combined use of "Mycofriend" + "Help-Rost for vegetables" (13.97%). In contrast, a decrease in starch content is noted in the control (12.55%) and with the combined application of "Groundfix" + "Humifriend" (12.97%). Across all variants of microbial preparation applications, an increase in carotene content (4.09-6.02 mg) is observed compared to the control (2.55 mg).

The use of various microbial preparations results in a significant reduction in the nitrate content of sweet potato tubers, bringing levels down to 55.5-101.2 mg/kg of raw mass. Preliminary data indicate a positive effect on reducing nitrate levels in the produce with the application of "Groundfix" + "Humifriend" and "Humifriend" + "Help-Rost for vegetables". The authors believe that the transformation of nitrates into organic matter is enhanced when an optimal level of micronutrient availability is established for the plants, particularly for iron, manganese, and molybdenum.

In conclusion, it is important to note that microbial preparations, within the context of biologically enhanced processes of cultivating crops, provide an effective alternative to the application of mineral fertilizers. They enhance crop yields, improve product quality, and reduce the chemical burden on agrobiocenoses. In this research, the use of microbial preparations with different functional actions proved to be effective for sweet potato cultivation. Thus, with the use of preparations with mycorrhizal-forming agents (Mycofriend), an improvement in the biometric parameters of sweet potato plants, an increase in leaf area and net photosynthetic productivity was noted, which coincides with the results of studies by M. Sakha *et al.* (2019), where the application of preparations with mycorrhizal-forming microorganisms also provided high efficiency on the growth and productivity of sweet potato.

Another key aspect of biologically enhanced sweet potato fertilisation technology is the use of preparations containing rhizospheric microorganisms, whose actions are directed towards various processes: associative nitrogen fixation, mobilisation of readily available forms of phosphorus and potassium in the arable layer of soil, and stimulation of root system development, among others. In the current studies, the application of the microbial preparation Groundfix, which contains both rhizospheric nitrogen-fixing and phosphorus-mobilising microorganisms, combined with the stimulation of growth processes through foliar applications with humic fertilizers, resulted in a 25.9% increase in sweet potato yield, an increase in total sugar content, and a reduction in nitrate levels in the tubers. Similar results were obtained in research conducted by Colombian scientists A. Ariza-Gonzáles *et al.* (2019), where the use of microbial preparations containing *Pseudomonas denitrificans* and *Azotobacter vinelandii* led to increased yields and higher dry matter and sugar content in the tubers. This approach effectively forms a technology that utilises agrocenoses with fully autonomous and regenerative systems for optimising nutrient supply, where a significant portion of the nutrients is supplied to the plants through biological processes such as nitrogen fixation, mineral weathering, and the decomposition of plant residues. These findings align with the practical results of other researchers. According to L. Wang *et al.* (2022), atmospheric nitrogen fixation by free-living diazotrophs can meet 20-40% of the nitrogen requirements of sweet potato plants. Moreover, biological nitrogen fixation is considered more environmentally friendly and economically efficient.

The current research also noted a lack of synergistic effects with certain combinations of preparations. Specifically, no significant increase in yield was observed from the combination of applying "Mycofriend" during fertigation and foliar fertilisation with "Help-Rost for vegetables" compared to the individual use of these preparations. The authors suggest that these products affect the same physiological processes in plants (such as nutrient absorption and growth stimulation), which results in only modest yield increases from their combined application.

CONCLUSIONS

For the Admiral variety of sweet potato, the use of the biological preparations "Groundfix" + "Humifriend", "Help-Rost for vegetables", and "Mycofriend" resulted in an increase in the number of shoots (ranging from 7.33 to 9.83) and their length (from 175.6 to 184.9 cm). The application of foliar fertilisation with "Help-Rost for vegetables" over three terms, both in combination with "Mycofriend" during fertigation and with "Humifriend", maximised leaf mass formation in the plants (measuring 2.41-2.56 m^2/ha in the third decade of June and 23.12-27.45 m^2/ha in the third decade of August). The use of "Mycofriend" during fertigation showed a stable increase in leaf area relative to the control, ranging from 23.5% to 28.5%. Optimising plant nutrition through the use of various microbial preparations contributed to an increase in net photosynthetic productivity during the period from the third decade of June to the third decade of July, achieving an increase of 28.9% to 63.9%, particularly with the use of "Groundfix" and "Humifriend" (25.8 g/ m^2 per day) and "Humifriend" combined with "Help-Rost for vegetables" (27.2 g/m^2 per day).

A significant commercial yield of sweet potato tubers (17.4 t/ha) was achieved through the application of the mycorrhizal-forming preparation "Humifriend" (1.5 L/ha) during the first fertigation, alongside foliar application with "Help-Rost for vegetables" at a rate of 2.0 L/ha over three terms. The use of biological preparations increased key biochemical indicators. Additionally, a positive effect was noted in the reduction of nitrate levels in the produce when using "Groundfix" combined with "Humifriend" and "Humifriend" with "Help-Rost for vegetables". According to the authors of this article, the transformation of nitrates into organic matter is enhanced when the optimal level of plant supply of trace elements (especially iron, manganese, and molybdenum) is formed. Future research in this area will focus on assessing the effectiveness of the comprehensive use of microbial preparations by determining the synergy between their actions, as well as examining the impact of various microbial preparations on the agrochemical and microbiological parameters of the soil.

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None.

CONFLICT OF INTEREST

None.

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Вплив біологізованої системи удобрення на формування продуктивності та якості батату (*Ipomoea batatas*)

Олександр Куц
Доктор сільськогосподарських наук, старший науковий співробітник
Державний біотехнологічний університет
61002, вул. Алчевських, 44, м. Харків, Україна
https://orcid.org/0000-0003-2053-8142
Василь Кокойко
Кандидат сільськогосподарських наук, старший науковий співробітник
Інститут кліматично орієнтованого сільського господарства Національної академії аграрних наук
67667, вул. Маяцька дорога, 24, смт. Хлібодарське, Україна
https://orcid.org/0000-0002-2528-7920
Світлана Семененко
Доктор філософії, науковий співробітник
Донецька дослідна станція Інституту овочівництва і баштанництва Національної академії аграрних наук
62478, в'їзд Прикордонників, 5, с. Селекційне, Україна
https://orcid.org/0000-0002-6606-1151
Іван Семененко
Кандидат сільськогосподарських наук, старший дослідник
Донецька дослідна станція Інституту овочівництва і баштанництва Національної академії аграрних наук
62478, в'їзд Прикордонників, 5, с. Селекційне, Україна
https://orcid.org/0000-0002-6485-0077
Валерій Романов
Аспірант
Інститут овочівництва і баштанництва Національної академії аграрних наук
62478, вул. Інститутська,1, с. Селекційне, Україна
https://orcid.org/0009-0008-7407-4084

Анотація. Актуальність проведених досліджень полягає у визначенні можливості використання мікробних препаратів різного функціоналу для оптимізації живлення та стимуляції ростових процесів рослин батату, синергізму дії різних препаратів. Розроблені системи оптимізації живлення забезпечать відтворення родючості ґрунту, зниження техногенного навантаження на овочеві агроценози, отримання продукції високої якості, збільшення продуктивності батату без використання високоенергоємних засобів виробництва. Метою проведення дослідження було вивчення впливу біологізованих систем удобрення на біометричні параметри, врожайність та якість бульб батату. Програму досліджень виконано за рахунок проведення польових, статистичних, розрахунково-аналітичних та лабораторних методів. Встановлено збільшення кількості (7,33-9,83 шт.) та довжини (175,55-184,89 см.) пагонів за використання біологічних препаратів «Граундфікс» + «Гуміфренд», «HelpRost для овочевих» та «Мікофренд». Використання позакореневих підживлень в три строки «HelpRost для овочевих» як в поєднанні з використанням «Мікофренду» у фертигацію, так і з позакореневими підживленнями «Гуміфренд» забезпечує максимальне формування маси листків на рослині (2,41-2,56 $м^2$/га в третій декаді червня та 23,12-27,45 $м^2$/га , в третій декаді серпня). Мікробні препарати підвищують чисту продуктивність фотосинтезу в період третя декада червня – третя декада липня на 28,9-63,9 %, особливо за використання «Граундфіксу» та «Гуміфренду», «Гуміфренду» та «HelpRost для овочевих». Значну товарну урожайність бульб (17,4 т/га) отримана за внесення в першу фертигацію мікоризоформуючого препарату «Гуміфренд» (1,5 л/га) та проведення позакореневих підживлень в три строки «HelpRost для овочевих» по 2,0 л/га. На варіантах із застосуванням біологічних препаратів відзначено підвищення основних біохімічних показників. Встановлено позитивну дію на зниження рівня нітратів в продукції за використання «Граундфікс» + «Гуміфренд» та «Гуміфренд + «HelpRost для овочевих». На нашу думку, за формування оптимального рівня забезпеченості рослин мікроелементами (в особливості залізо, марганець, молібден) трансформація нітратів в органічну речовину посилюється. Практична цінність полягає у отриманні результатів для раціонального застосування біологізованої системи удобрення для забезпечення високої врожайності та якості бульб батату в господарствах різних форм власності

Ключові слова: *Ipomoea batatas* L; біопрепарати; зрошення; продуктивність фотосинтезу; урожайність