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**ASSESSMENT OF THE ECONOMIC EFFICIENCY OF USING ORGANO-MINERAL FERTILIZERS AND
GROWTH STIMULANTS IN POTATO FIELDS CULTIVATED IN THE CONDITIONS OF FOOTHILL ZONE**

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STIMULANTS IN POTATO FIELDS CULTIVATED
IN THE CONDITIONS OF FOOTHILL ZONE**

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Abstract

The article presents the results concerning calculations of the economic efficiency of the potato harvest, obtained under the influence of the equivalent amounts of organo-mineral fertilizers and different ways of applying growth-stimulating bio-liquid in the post-forest medium capacity brown soils of the foothill zone of the Republic of Artsakh, in the early-ripening impala variety potato sowings, cultivated under arid conditions.

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According to economic calculations of the average data of three-year experimental research studies, it was revealed that the highest yield and economic efficiency in potato plantings was provided by the version of fractional application of bio-liquid and organomix norms (bio-liquid 14 l/ha-1 norm to soak the planting material 3 days before sowing, 5 t/ha-1 of organomix in sowing and 3 t/ha-1 norm to be applied with nutrition), which ensured a high-quality potato harvest of 36.47 t/ha-1 and an additional benefit of 2 million 152.6 thousand AMD. At the same time, providing a high compensation for the additional costs incurred, with the results of impact and post-impact per 1 dram spent, a net profit of 3.95 AMD. The above-mentioned version of fertilization was proposed for wide implementation in the region and in agro-zones with similar soil and climatic conditions of the Republic of Armenia.

Keywords: organomix, mineral fertilizers, growth stimulant, bioliquid, potato, economic efficiency.

Introduction

Potato is one of the leading agricultural crops ensuring the country's food security to a large extent. In terms of acreage, potato is second after cereals and is the most popular in the consumer basket of the population used for the production of a variety of food products. Moreover, it is the most important forage and technical crop [1-3]. The high competitiveness of potatoes and their intended use is largely determined by a number of quality indicators, the most important of which is the bio-chemical composition of tubers [4]. One of the factors affecting the productivity, quality indicators of potato tubers and biochemical composition, is cultivation conditions including soil, climate and optimal mineral fertilizing throughout the growing season [5-8].

In agriculture, one or another agro-measure is widely studied and widely used when it is economically effective and every dram spent provides a certain profit, otherwise the given measure does not pass the test and is not rooted in production.

In general, the efficiency criteria of any agronomic measure are the increase of labor productivity, the increase of production volumes, the reduction of the cost of agricultural products produced, the reduction of the costs incurred on the given measure and the increase of the income received per spent ruble.

Compensation for each ruble is 3.5 rubles in case of applying mineral fertilizers and 3.0 rubles when applying organic fertilizers (manure, poultry droppings, peat, etc.) [9,10].

Z. Banyokh notes that high doses of phosphorus and potassium in potato, sugar beet, corn and alfalfa crops cultivated in watered areas, although they provided low economic results, but in this case it should be taken into account the fact that the mentioned nutrients increase soil fertility [11].

Analyzing the long-term results of field experiments, V. G. Mineev, I. V. Gulyakin, L. M. Derzhavin, M. H. Galstyan, note that expenses on 1 kg of NPK on average provides additional yield of 7 kg of grain, 18—34 kg of potatoes and 19—34 kg of sugar beet [12, 13,14, 15].

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The expenses incurred during the application of a ton of rotted manure provide about 200 kg of potatoes, 60—80 kg of grain, 200—240 kg of sugar beet and the same additional harvest of vegetable and horticultural crops.). Therefore, any research, and especially the agro-measures in respect of which research is being conducted, the economic assessment of the results obtained is extremely important and up-to-date and meets the interests of the requirements presented to the given research.

Materials and methods

The aim of the conducted research is to study and find out for the first time the effect of the equivalent amounts and application dates of the organomix organic fertilizer, growth stimulating bioliquid and organomineral fertilizers obtained by the Armenian-Norwegian joint enterprise (Orwako) from household and agricultural waste using the latest biotechnological methods on the yield of potatoes cultivated in the foothills of the Artsakh and on economic efficiency and compare them with similar results of the influence of the ratio of mineral fertilizers applied in the region. The foothill zone of Artsakh, being one of the most extensive zones of the republic, is somewhat different from other agricultural zones with its physico-geographical conditions, geological structure, climate, soil, water and vegetation characteristics [16].

The low amount of precipitation during the vegetation period, the low content of organic matter in the soil, the plant residues accumulated under the influence of high air temperature are quickly mineralized, a small amount of humus accumulates in the soil, and in such conditions, without the use of scientifically based technologies, it is not possible to provide high and quality harvest, even under conditions of ideal agro-technics.

Therefore, the systematic and unified solution of the mentioned problems is extremely important and up-to-date and derives from the requirements of the strategy for the development of agriculture in the region and the republic, and is considered one of the priorities of ensuring food security.

Based on the results of the research, in terms of yield and economic efficiency, the best option or options are presented for implementation in agricultural production [17-19]. The environmental reaction of the soils of the experimental field: the humus content is 3.3—3.4%, the pH ranged from 6.9 to 7.1, available nitrogen (N) is weakly (3.4—3.6 mg) provided, with mobile phosphorus- medium (P₂O₅ is 5.1—5.3 mg), exchangeable potassium is good (K₂O in 100 g of soil: 34.0—36 mg).

Field experiments were set up with 3 replications, with the following options:

1. Checker (without fertilization)
2. Organomix 8t/ha-1 one time, in sowing
3. Organomix 10t/ha-1 one time, in sowing
4. Organomix 5t/ha-1 one time, (in sowing)+N30P40K40 (in sowing)+ N30 with nutrition
5. Organomix 5t/ha-1 in sowing+ Organomix 3t/ha-1 (with nutrition)+ bio-liquid 14l/ha-1 (nutrition)
6. Bio-liquid 14l/ha-1 soaking the planting material + organomix 5t/ha-1 (in

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sowing)+organomix 3t/ha-1(nutrition)

7.N80P80K80 (in sowing)+ N 40 (nutrition)

In the course of calculating the economic efficiency of the mentioned agro-measures, the starting point was the prices for the purchase of a growth stimulant of mineral (ammonium nitrate, simple superphosphate, potassium salt) and organic (organomix) and of organic origin (bio-liquid), operating during this period in the conditions of market relations in Artsakh, and the prices for the sale of potatoes.

By the way, the prices for the purchase of the above-mentioned agrochemicals and the sale of potatoes do not differ much from each other. In Artsakh, on average, the mentioned prices are only 5—7% higher than those in Armenia.

When calculating the economic efficiency of the agrochemical measures carried out, the standards adopted and applied by the Economic Department of the Ministry of Agriculture of the Republic of Artsakh were taken as a basis, which correspond to the standards approved by the Chair of Agribusiness Management of the National Agrarian University of Armenia.

Conflict Setting

The purpose of the research is assessment of the economic efficiency of using organo-mineral fertilizers and growth stimulants in potato fields cultivated in the conditions of foothill zone.

Research Results

Calculations of the average data of three-year repetitions of field experiments showed that the appropriate doses of organo-mineral fertilizers separately and together (within the framework of nutrient adequacy) application dates, as well as growth-promoting bio-liquid, in potato plantations (fields) cultivated under arid conditions ensured high economic efficiency (tab. 1).

From the data in the table, it can be seen that the equivalent doses of organo-mineral fertilizers compared to the version without fertilization almost equally affected the increase in potato yield, where the increase in yield was 15.08; 14.72 t/ha-1 and the received additional income was 1409.4 and 1506.6 thousand drams.

However, when in the version of the fractional application of organomix, the potato planting material was soaked with a bio-liquid solution (14 l/ha-1) before sowing, in that version, according to the three-year average data, the increase of the crop compared to the version without fertilization was the highest and was 21.52 t/ha-1, and the additional benefit obtained 2 million 152.6 thousand AMD, or 3.34 AMD of additional profit per spent dram. If we add to it the average yield increase for the next two years after the impact of that amount (2.5 t/ha-1) and the profit (390.0 thousand AMD), it turns out that this fertilization technology provided a net income of 2542.6 thousand AMD, and for one dram spent, it provided a profit of 3.95 AMD, which is the highest compared to other tested technologies.

At the same time, it can be seen from the data in the table that by changing the method of application of the same rate of bio-liquid, by soaking the tubers (planting material) before planting, compared to foliar nutrition, the yield increase in the years of impact was 4.6 t/ha-1,

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almost equal to the average of the 2 years after the impact (2.82 and 3.0 t/ha-1), and the net income is more than 400.0 thousand drams more.

Field experiments have proved that fractional application of organomix and mineral fertilizers and their combined equivalent doses, compared with a single application of organomix, had a more beneficial effect on the quantity of the potato crop and economic efficiency.

Table 1.**Economic efficiency of using organo-mineral fertilizers and growth stimulants in potato fields cultivated under arid conditions (average for 2021—2023)**

Indicators	Variants						
	Tester (without fertilization)	Organomix 8t/ha ⁻¹ one time, in sowing	Organomix 10t/ha ⁻¹ one time, in sowing	Organomix 5t (in sowing) N ₃₀ P ₄₀ K ₄₀ (in sowing) + N ₃₀ with nutrition	Organomix 5t/ha ⁻¹ in sowing + organomix 3t/ha ⁻¹ (with nutrition) + bio-liquid 14l/ha ⁻¹ (nutrition)	Bio-liquid 14 l/ha ⁻¹ by soaking the planting material + organomix 5 t/ha ⁻¹ (in sowing) + organomix 3 t/ha ⁻¹	N ₈₀ P ₈₀ K ₈₀ (in sowing)+ N ₄₀ (nutrition)
The average yield of variants, t/ha ⁻¹	14.95	30.03	30.78	30.77	31.87	36.47	29.67
Compared to the tester, the additional yield, t/ha ⁻¹	-	15.08	15.83	15.82	16.92	21.52	14.72
Additional harvest value, thousand AMD	-	1960.4	2057.9	2069.6	2199.6	2797.6	1913.6
The cost of fertilizers and the expenses associated with their application, thousand AMD	-	400.0	496.0	364.0	435.0	430.0	260.0
Expenses for collecting, transporting and storing additional crops, thousand AMD	-	151.0	158.0	158.0	169.0	215.0	147.0
Total expenses, thousand AMD	-	551.0	654.0	522.0	604.0	645.0	407.0

Compared to the option without fertilization, if in the case of one-time application of organo-mineral fertilizers they provided an increase in yield-in the case of organomix in the amount of 15.07 t/ha-1, only for mineral fertilizers-14.72 t/ha-1 and, accordingly, net income in the amount of 1409.4 and 1506.6 thousand drams, then their fractional and equivalent joint doses provided additional harvest in the amount of 158.2 and 16.82 t/ha-1 and, respectively, 1547.6 and net profit of 1595.6 thousand drams (Fig. 1).

In these variants, compensation for additional expenses is also high, which amounts to 2.96 and 2.64 drams per AMD (Fig. 2).

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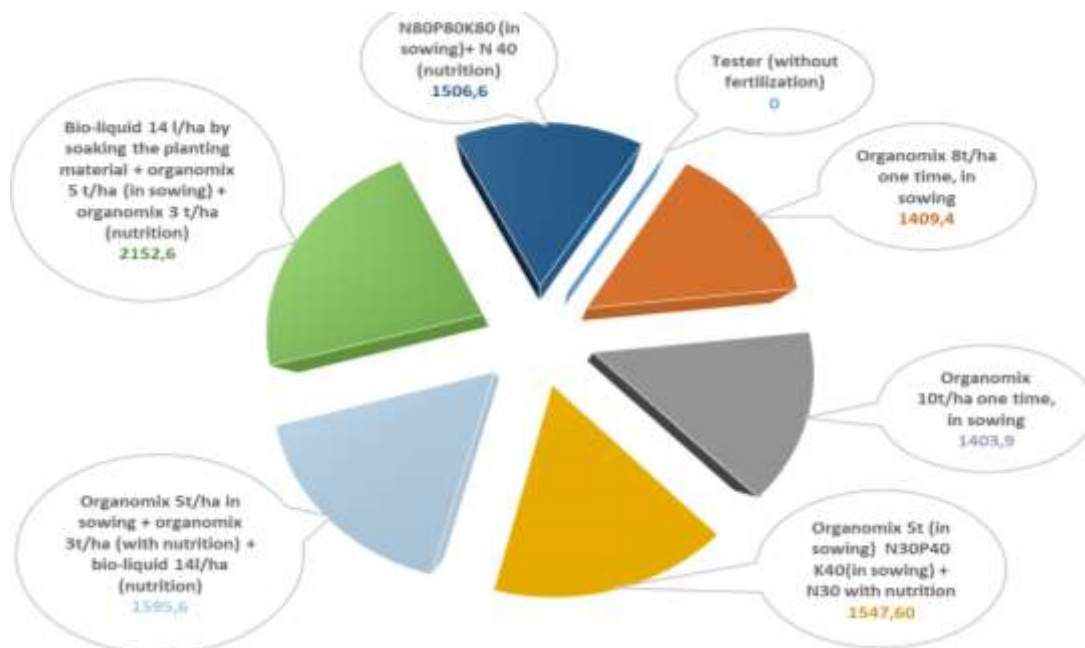


Fig. 1 Additional profit received, thousand AMD (average for 2021-2023)

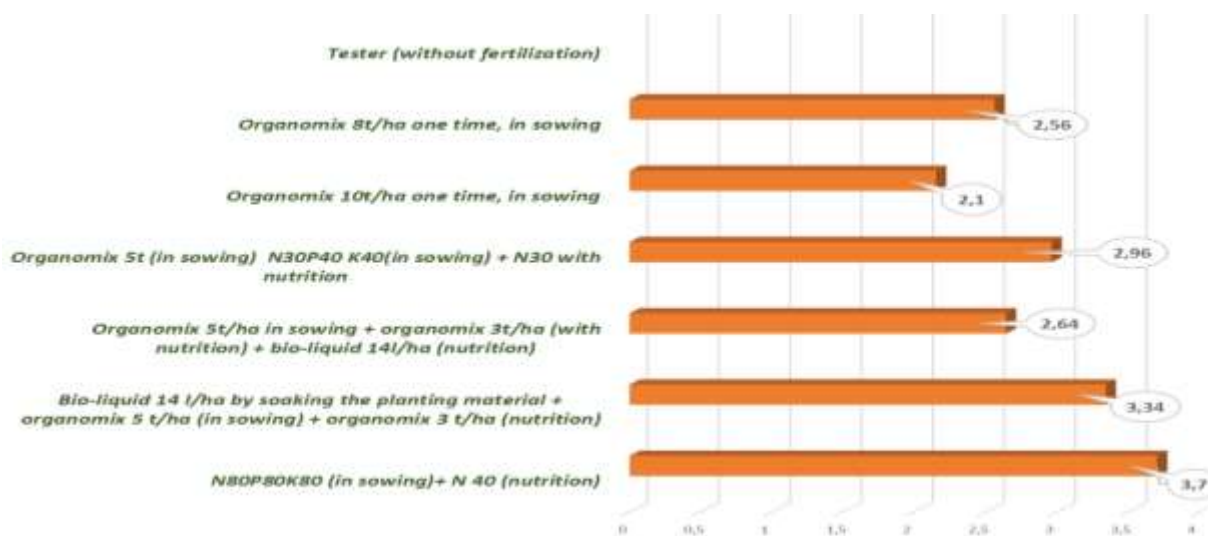


Fig. 2 Additional profit received per dram spent, AMD (average for 2021-2023)

Conclusion

The analysis of the results of the experimental work and economic calculations allow us to come to the following conclusions:

1. In the post-forest brown soils of the Askeran region of the Republic of Artsakh, the one-time application of equivalent amounts of organic and mineral fertilizers in impala potato sows grown in arid conditions equally affected the quantity and economic efficiency of the potato crop, while the fractional application of these fertilizers had a more beneficial effect on the aforementioned indicators of potatoes, than their one-time application.

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2. Bio-liquid, as a growth stimulator, contributed to the rapid germination, growth and development of potato seedlings and as a result, compared to the same rate of foliar nutrition, it significantly increased the amount of potato harvest (4.6 t/ha-1), contributing to the highest net income by summing up the impact and subsequent impact.
3. In potato sowings, the highest yield and economic efficiency was achieved by soaking the planting material with bio-liquid 14 l/ha-1 + organomix 5 t/ha-1 in sowing + organomix 3 t/ha-1 with nutrition, which provided a harvest of 36.47 t/ha-1 (in tester-14.95 t/ha-1), 2 million 152.6 thousand drams of additional benefit and high reimbursement for additional expenses - per 1 dram, net profit in the amount of 3.95 drams-taking into account the impact and post-effect.

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ASSESSMENT OF THE ECONOMIC EFFICIENCY OF USING ORGANO-MINERAL FERTILIZERS AND GROWTH STIMULANTS IN POTATO FIELDS CULTIVATED IN THE CONDITIONS OF FOOTHILL ZONE**ՕՐԳԱՆԱՀԱՆՔԱՅԻՆ ՊԱՐԱՐՏԱՆՅՈՒԹԵՐԻ և ԱՃԻ ԽԹԱՆԻՉԻ ԿԻՐԱՌՄԱՆ ՏՆՏԵՍԱԿԱՆ ԱՐԴՅՈՒՆԱՎԵՏՈՒԹՅԱՆ ԳՆԱՀԱՏՈՒՄԸ ՆԱԽԱԼԵՌՆԱՅԻՆ ԳՈՏՈՒ ՊԱՅՄԱՆՆԵՐՈՒՄ ՄՇԱԿՎՈՂ ԿԱՐՏՈՖԻԼԻ ԴԱՇՏԵՐՈՒՄ**Վ. Ա. Ալեքսանյան¹, Մ. Շ. Միրզոյան², Մ. Հ. Գալստյան³, Ս. Բ. Գալստյան⁴¹ ՀՀ ԳԱԱ Էկոլոգոնոսֆերային հետազոտությունների կենտրոն² ՀՀ ԳԱԱ Բուսաբանության ինստիտուտ³ ՀՀ Էկոնոմիկայի նախարարության երկրագործության գիտական կենտրոն⁴ Հայաստանի ազգային ագրարային համալսարան

Ներկայացված է Արցախի նախալեռնային գոտու հետանտառային միջին հզորության շագանակագույն հողերում, անջրդի պայմաններում մշակվող վաղահաս իմպալա սորտի կարտոֆիլի ցանքերում օրգանահանքային պարարտանյութերի համարժեք չափաքանակների և աճի խթանիչ կենսահեղուկի կիրառման տարբեր եղանակների ազդեցությամբ ստացված կարտոֆիլի բերքի տնտեսական արդյունավետության վերաբերյալ կատարված հաշվարկների արդյունքները: Փորձարարահետազոտական եռամյա ուսումնասիրությունների միջին տվյալների տնտեսագիտական հաշվարկներով բացահայտվել է, որ կարտոֆիլի ցանքերում առավել բարձր բերք և տնտեսական արդյունավետություն է ապահովել կենսահեղուկի և օրգանոմիքսի նորմայի կոտորակային կիրառման տարբերակը (կենսահեղուկ 14լ/հա նորմայով տնկանյութը ցանքից 3 օր առաջ թրջելու, օրգանոմիքսի 5տ/հա չափաքանակը ցանքակից և 3տ/հա նորման՝ սնուցմամբ կիրառելու), որը ապահովել է 364,7 գ/հա կարտոֆիլի բարձրորակ բերք և 2մլն 152,6 հազար դրամ լրացուցիչ օգուտ: Միևնույն ժամանակ ապահովվելով կատարված լրացուցիչ ծախսերի բարձր հատուցում՝ ծախսված 1 դրամի հաշվով ազդեցության և հետազոտության արդյունքներով, 3,95 դրամ մաքուր շահույթ: Պարարտացման վերոհիշյալ տարբերակը առաջարկվել է տարածաշրջանում և Հայաստանի Հանրապետության համանման հողակլիմայական պայմաններ ունեցող ագրոգոտիներում լայնորեն ներդնելու համար:

Բանալի բաներ. օրգանոմիքս, հանքային պարարտանյութեր, աճի խթանիչ, կենսահեղուկ, կարտոֆիլ, տնտեսական արդյունավետություն, զուտ եկամուտ:

ОЦЕНКА ЭКОНОМИЧЕСКОЙ ПРОДУКТИВНОСТИ ПРИМЕНЕНИЯ ОРГАНО-МИНЕРАЛЬНЫХ УДОБРЕНИЙ И СТИМУЛЯТОРОВ РОСТА НА ПОЛЯХ КУЛЬТИВИРУЕМОГО КАРТОФЕЛЯ В УСЛОВИЯХ ПРЕДГОРНОЙ ЗОНВ. А. Алексанян¹, М. Ш. Мирзоян², М. Г. Галстян³, С. Б. Галстян⁴¹ Центр эколого-ноосферных исследований НАН РА² Институт ботаники НАН РА³ Научный центр земледелия министерства экономики РА⁴ Национальный аграрный университет Армении

Представлены результаты расчетов, проведенных относительно экономической продуктивности урожайности посевов скороспелого картофеля сорта «Импала»,

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культивируемого в неорошаемых условиях в постлесных буроземах средней мощности предгорной зоны Арцаха, полученного путем применения различных методов воздействия эквивалентных доз органо-минеральных удобрений и ростостимулирующей биожидкости. По средним данным экономических расчетов трехмесячного экспериментального исследования было выявлено, что в посевах картофеля наиболее высокую урожайность и экономическую продуктивность обеспечила версия частичного применения нормы биожидкости и органомикса (биожидкостью нормой 14 л/га замачивая посадочное сырье за 3 дня до посева, органомиксом нормой 5 т/га из посева и нормой 3 т/га – применяя с питанием), которая обеспечила 364,7 ц/га высокого урожая картофеля и 2 млн 152,6 тыс. драмов дополнительной пользы. В то же время обеспечивая высокую компенсацию проведенных дополнительных расходов: по результатам воздействия и последствия подсчетов потраченного 1 драма, 3,95 драмов чистой прибыли. Вышеупомянутая версия внесения удобрений была предложена в регионе и для широкого внедрения в агрозоны Республики Армения, имеющие схожие почвенно-климатические условия.

Ключевые слова: органомикс, минеральные удобрения, стимулятор роста, биожидкость, картофель, экономическая продуктивность, чистая прибыль.

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