

BACILLUS THURINGIENSIS ՏԵՊԱԿԻ ՏԵՊԱԿԱՆ ԲԱԿՏԵՐԻԱԿԱՆ ՄԻՋԱՏԱՊԱՂԱՆՆԵՐԻ ՍՈՐՏՈՒՆԳԻԱԿԱՆ, ՏԻՋԻՈՒՆԳԻԱԿԱՆ ԵՎ ԿԵՆՍԱԲԻՄԻԱԿԱՆ ԱՌԱՆՁՆԱԲԱՏՎՈՒԹՅՈՒՆՆԵՐԸ

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Աննդամթերքի անվտանգության ոլորտի ռիսկերի գնահատման և վերլուծության գիտական կենտրոն

Հետազոտության արդյունքում բացահայտվել են բնական ճանապարհով մահացած թրթուրներից մեր կողմից անջատված *Bacillus thuringiensis* տեսակի բակտերիական երեք շտամների ($Bt_{ECHS-68}$, $Bt_{ECHS-73}$, $Bt_{ECHS-92}$) գաղութների, վեգետատիվ բջիջների, էնդոսպորների և բյուրեղային մարմնիկների չափերը ՄՊԱ, ՕԱԱ և Չապեկի սննդային միջավայրերի պայմաններում, ինչպես նաև շտամների կողմից ածխածնի աղբյուրների յուրացումը, ֆերմենտային ակտիվության դրսևորումը, կաթի պեպտոնացումը, ժելատինի հեղուկացումը և այլ հատկանիշներ:

МОРФОЛОГИЧЕСКИЕ, ФИЗИОЛОГИЧЕСКИЕ И БИОХИМИЧЕСКИЕ ОСОБЕННОСТИ МЕСТНЫХ БАКТЕРИАЛЬНЫХ ИНСЕКТИЦИДОВ ВИДА BACILLUS THURINGIENSIS

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В ходе исследований установлены размеры колоний, вегетативных клеток, эндоспор и кристаллических телец на питательных средах МПА, КАА и Чапека, а также исследованы усвояемость источников углерода, проявление ферментативной активности, пептонизация молока, разжижение желатина и другие свойства трех бактериальных штаммов ($Bt_{ECHS-68}$, $Bt_{ECHS-73}$, $Bt_{ECHS-92}$) вида *Bacillus thuringiensis*, выделенных нами из гусениц, погибших естественным путем.

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ECONOMICAL-ECOLOGICAL EFFICIENCY OF DIFFERENT DOSAGES AND APPLICATION TIMES OF ORGANOMIX AND BIO-LIQUID IN THE POTATO SOWINGS UNDER THE CONDITIONS OF GEGHANIST COMMUNITY, MASIS REGION

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Keywords: Organomix, bio-liquid, potato, application times, economic efficiency

Under the conditions of the intensification of agriculture the production of ecologically safe food products has become an urgent issue, which is intricately related to the quality assurance of the environment. It is necessary to gradually reject energy-consuming means, agro-chemicals and chemical methods of plant protection substituting them with organic fertilizers and compost, particularly when they are resulted from the organic wastes generated in the result of the household and agricultural activities or from herbal tinctures and growth stimulants, which increase the biological activity of soil and promote the acceleration of humification process (Galstyan, 2007, Galstyan, 2006, Mineevet al., 2007).

Taking into account the significance of the solution of the above-mentioned issues an objective has been set up to study and disclose the impact of the number of applications and various dosages of the fertilizer organomix and bio-liquid on the qualitative and quantitative indicators and economic efficiency of the yield of mid-early potato variety "Ausonia" in conditions of Geghanist community, Masis region of Ararat marz and to compare them with the results of the mineral fertilizers ratio applied in the Republic.

The studies were carried out in 2017-2018 in Geghanist community, Masis region (in lands belonging to the farmer Hrahat Hoveyan). The field experiments were implemented with three repetitions and the size of the experimental bed was 20m² in each repetition.

The soils of the experimental plot were irrigated meadow gray of semi-desert type, where the humus content was only 1.4%, they have an environmental reaction close to neutral (pH6.9-7.1) and are easily hydrolyzed; the nitrogen content is 2.49mg in 100g soil, the mobile P₂O₅ is 7.8mg, and the exchangeable potassium is 40.0mg/100g soil. The soils of experimental plot are poor in humus and are weakly provided with available nitrogen, while they are well provided with mobile phosphorus and potassium (Galstyan, 2016).

The aim of the investigations was to study for the first time the impact of different dosages and number of simultaneous and fractional applications of organo-mix organic fertilizer and the bio-liquid growth stimulant on the growth, development, yield amount and marketability of the "Ausonia" potato variety.

The field experiments have been implemented in 8 variants:

1. Control (without fertilization),
2. Organo-mix 8t/ha,
3. Organo-mix 10t/ha,
4. Organo-mix 12t/ha
5. Organo-mix 6t/ha (with sowing) + Organo-mix 4t/ha (through nutrition),
6. Organo-mix 6t/ha (with sowing) + Organo-mix 4t/ha + bio-liquid 14l/ha (through nutrition),
7. Bio-liquid (to wet up the seeds) 14 l/ha + organo-mix 6t/ha (with sowing) + organomix 4t/ha (through nutrition),
8. N₉₀P₉₀K₉₀ + N₆₀.

In the 2nd, 3rd and 4th variants the organo-mix was introduced simultaneously together with sowing in spring and in the 5th, 6th and 7th variants it was done in fractions: 60% was introduced with sowing and 40 % through nutrition at the start of budding stage, besides, in one case the bio-liquid was introduced with the amount of 14 l/ha in the 6th and 7th variant (in the 6th variant) through spraying at the blossoming stage and in another case the potato tubers were moistened with the bio-liquid 3 days before planting and out of the mineral substances N₉₀P₉₀K₉₀ was introduced with the sowing, while N₆₀ at the budding stage through nutrition.

The potato yield has been determined through common yield accounting method during the harvesting period. While estimating the economic efficiency of the conducted agro-chemical activities, the methods and standards used in the Republic and adopted by the ANAU Chair of Economics and the Scientific Research Institute of Economics of the RA Ministry of Agriculture, as well as the current purchasing prices of mineral fertilizers, organomix and bio-liquid and potato selling prices in today's market relations have been taken as a background.

The data on yield capacity have been subjected to mathematical analyses upon the determination of the error (Sx, %) of the experiment and the least significant difference (LSD 0.95g) through the method of dispersion analyses (Matevosyan, 2000).

Upon the results of the field experiments it has been found out that the organic and mineral substances have had a certain influence on the increase of potato yield amount. The average data of the two-year experiments with three repetitions have shown that both simultaneous, fractional use of organomix and organomix-bio-liquid and mineral fertilizers have increased the potato yield capacity by 97.0-198.0c/ha or 56.7-115.8% against the control variant (without fertilization). It is worth mentioning that the fractional use of the same dosage of organomix has had more favorable effect on the potato yield than the equal dosage (10t/ha) used simultaneously. If in the variant of organomix 6 t/ha (with sowing) + organomix 4 t/ha (in nutritional form) the yield surplus was 153.0c/ha or 89.5% against the control variant, then in case of simultaneous (with sowing) use of organomix with 10 t/ha the yield excess it was 131.0 c/ha or 76.6% (Table 1).

Table 1. The Impact of Different Dosages and Number of Application of Organomix, Bio-Liquid and Mineral Fertilizers on the Potato Yield and Structure (Average Data for 2017-2018)

Variants		Yield according to repetitions, c/ha			The average tuber yield, c/ha	Yield surplus		Tubers according to fractions			Tubers marketability, %	Average weight of commercial tubers, g
		I	II	III		c/ha	%	100g	50-100g	Up to 50g		
1	Without fertilization (control)	165.0	173.0	175.0	171.0	-	-	33.6	32.0	34.4	65.6	68.0
2	Organomix 8 t/ha with sowing	270.0	267.0	267.0	268.0	97.0	56.7	43.0	31.4	25.6	74.4	80.5
3	Organomix10 t/ha with sowing	297.6	302.0	306.4	302.0	131.0	76.6	46.0	39.0	15.0	85.0	84.0
4	Organomix12 t/ha with sowing	310.0	303.6	310.4	308.0	137.0	80.1	45.6	40.6	13.8	86.2	85.0
5	Organomix6 t/ha with sowing+4t/ha nutrition	320.8	325.0	326.2	324.0	153.0	89.5	46.0	40.0	14.0	86.0	86.0
6	Organomix 6 t/ha with sowing+organomix4 t/ha nutrition+bio-liquid 14 l/ha nutrition	329.0	338.0	335.0	334.0	163.0	95.3	45.0	43.4	11.6	88.4	85.2
7	Bio-liquid 14l/ha + organomix 6 t/ha with sowing+ organomix 4 t/ha nutrition	371.0	366.0	370.0	369.0	198.0	115.8	46.5	43.5	10.0	90.0	88.0
8	N ₉₀ P ₉₀ K ₉₀ with sowing + N ₆₀ nutrition	294.0	296.0	300.0	296.0	125.0	73.1	44.4	39.6	16.0	84.0	83.5

Sx, %
LSD_{0.95}, g

1.8
7.9

At the same time in the variants of organomix fractional use where the same dosage of bio-liquid (14 l/ha) in one case was introduced before planting of the potato tubes (3 days before by wetting up the planting material) the yield was higher than in the case when the dosage of the bio-liquid was used in the blossoming stage of the plants in nutrition form (through spraying). As a result in the variant where the potato tubes were soaked up with bio-liquid before planting the yield surplus was 45.0 c/ha against the variant where the organomix was used fractionally and when the bio-liquid dosage was used in the same fractional variant in the form of nutrition, the yield surplus was 10 c/ha which is within the range of the least significant difference (LSD). Upon the impact of simultaneous and fractional use of organomix, as well as upon the impact of bio-liquid and mineral fertilizers used in the potato sowings of the republic the average weight and marketability of the potato tubers have increased. Thus, if in the control variant the marketability of the potato tubers was 65.6 % in the yield fraction and the average weight of the commercial tubers was 68.0 g, then in the variants of organomix 8-12 t/ha (used simultaneously) the mentioned indicators have fluctuated within 74.4-86.2% and 80.5-85g respectively.

In case of fractional use of organomix with 10t/ha or in case of using the same variants in different times of bio-liquid application the marketability of the potato tubers has fluctuated within the range of 86.0-90% and the weight of the commercial tubers within the range of 85.2-88.0g, while in N₉₀P₉₀K₉₀ + N₆₀ variant the marketability of the potato tubers was 84.0%, and the average weight of commercial tubers – 83.5g.

The calculations have indicated that different dosages and number of applications of organomix and bio-liquid have had specific impact on the process of potato production and have significantly promoted the increase of economic efficiency (Table2).

Table 2. The Economic Efficiency of Different Application Times of Various Dosages for Organomix and Bio-liquid in Potato Plantings/Sowings

Indicators	Two year average							
	Without fertilization (control)	Organomix 8 t/ha (with sowing)	Organomix 10t/ha (with sowing)	Organomix 12t/ha (with sowing)	Organomix 6t/ha with sowing + 4t/ha nutrition	Organomix 6t/ha with sowing + organomix 4t/ha nutrition + bio-liquid 14l/ha nutrition	Bio-liquid 14l/ha + organomix 6t/ha with sowing + organomix 4t/ha nutrition	$N_{90}P_{90}K_{90}$ with sowing + N_{60} nutrition
Average yield capacity of the variants, c/ha	171.0	268.0	302.0	308.0	324.0	334.0	369.0	296.0
Excess of potato yield against the control variant, c/ha	-	97.0	131.0	137.0	153.0	163.0	198.0	125.0
The cost of the excess yield, thousand drams	-	970.0	1310.0	1370.0	1530.0	1630.0	1980.0	1250.0
Expenses for the fertilizers and growth stimulants application, thousand drams	-	400.0	500.0	600.0	510.0	534.0	538.0	230.0
Expenses of excess yield harvesting, transportation and storage, thousand drams	-	39.0	52.0	56.0	61.0	65.0	79.0	50.0
Total expenses, thousand drams	-	439.0	552.0	656.0	571.0	599.0	617.0	280.0
Resulted extra-profit, thousand drams	-	531.0	758.0	714.0	959.0	1031.0	1363.0	970.0
Resulted extra-profit per one dram spent, dram	-	1.21	1.37	1.09	1.68	1.72	2.21	3.16

The data analyses of Table 2 on the two-year field experiment show that the fractional use of the same dosage of organomix, having a more favorable impact on the potato yield and marketability against simultaneous (with sowing) use, has also provided higher profit.

So, if in the variant of organomix application with the dosage of 10t/ha, where the whole dosage of organomix was introduced simultaneously (with sowing) the profit was 758.0 thousand drams and an excess profit equal to 1.37 drams per one dram spent has been provided, then in the variant where 60 % of the same dosage of organomix has been used simultaneously (with sowing) and 40 % in the form of nutrition a profit of 959.0 thousand drams and an excess profit equal to 1.68 drams per one dram spent has been provided. At the same time when in the variants of fractional use of organomix the potato planting material had been soaked up with the growth stimulant bio-liquid (14 l/ha) 3 days before planting it has provided higher profit as compared to the variant where the bio-liquid with the same dosage through apical (base) nutrition has been used making 1031.0 and 1363.0 thousand drams respectively, so the mentioned variant is recommended for the use in potato plantings when organizing fertilization activities.

Based on the study results we have come to the following conclusions:

1. The increase of the dosages of organomix organic fertilizer produced by the "ORWACO" Armenian-Norwegian joint venture has promoted the increase of the potato yield marketability and economic efficiency.
2. In case of applying the same dosage of organomix through the fractional method (with sowing and through nutrition) it has had a more efficient impact on the potato yield amount and structural elements than in case of applying it simultaneously (with sowing) or the variant of combined mineral fertilizers common in the area: $N_{90}P_{90}K_{90} + N_{60}$.

3. As a growth stimulant the bio-liquid has promoted the rapid germination of potato planting material, the regular growth and development of the plants significantly increasing the yield amount, improving the tubers marketability and providing a high profitability rate.
4. When implementing fertilization activities in mid-early and early potato sowings it is necessary to moisten the potato tubers with bio-liquid before planting, to fertilize them with 10 t/ha dosage of organomix, out of which 60% (6t/ha) should be applied with sowing and 40% at the budding stage in nutritional form, as a result of which a high-quality potato yield is produced (369.0 c/ha) and the highest profitability (1363.0 thousand drams) per hectare is recorded.

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ՕՐԳԱՆՈՍԻԶՄԻ ԵՎ ԿԵՆՍԱՔԵՂՈՒԿԻ ՏԱՐՔԵՐ ԶԱՓԱՋԱՆԱԿՆԵՐԻ ԵՎ ԿԻՐԱՊՄԱՆ ՏԱՐՔԵՐ ԺԱՄԿԵՏՆԵՐԻ ՏՆՏԵՍԱԿԱՆ ԱՐԴՅՈՒՆԱՎԵՏՈՒԹՅՈՒՆԸ ԿԱՐՏՈՑԻԼԻ ՑԱՆՔԵՐՈՒՄ ՄԱՍԻՍԻ ՏԱՐԱԾԱՇՐՋԱՆԻ ԳԵՂԱՆԻՍՏ ՀԱՄԱՅՆՔԻ ՊԱՅՄԱՆՆԵՐՈՒՄ

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 Հայաստանի ազգային ագրարային համալսարան

Դաշտային և լաբորատոր փորձերը կատարվել են Արարատի մարզի Մասիսի տարածաշրջանի կիսաանապատային և մարգագետնային գորշ հողերում:

Երկարամյա հետազոտությունները բացահայտել են օրգանոմիքսի նույն չափաքանակի (10 տ/հա) կոտորակային (տնկման և սնուցման ընթացքում) կիրառման դրական ազդեցությունը կարտոֆիլի բերքի որակի և քանակի վրա՝ դրա մեկանգամյա օգտագործման (տնկման ժամանակ) կամ $N_{90}P_{90}K_{90}+N_{60}$ հանքային պարարտանյութերի հետ կիրառման համեմատությամբ: Աճի խթանիչի՝ կենսահեղուկի 14 լ/հա չափաքանակը, որը կիրառվում է նախքան տնկումը (տնկանյութը թրջելու եղանակով), աճի ընթացքում նույն չափաքանակով ոչ արմատային սնուցման եղանակով կիրառելու տարբերակի համեմատությամբ կարտոֆիլի բերքատվությունը ավելացնում է 20,5 %: