



## RESULTS OF THE USE OF BIOLOGICAL AGENTS PRODUCED IN GEORGIA FOR THE RESTORATION OF DEGRADED LANDS

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<p><b>Received:</b> 6<sup>th</sup> July 2021 <b>Accepted:</b> 6<sup>th</sup> August 2021 <b>Published:</b> 18<sup>th</sup> September 2021</p>	<p>Reducing the fertility of the soil or its degradation is one of the most important problems of our time. The importance of this problem is betrayed in the fact that it poses a danger to the world's population in providing food products and environmental safety of the environment. In Georgia, the process of soil degradation is of sufficient intensity and poses the main problem for the development of agriculture. In order to restore soil fertility in 2018-2019, experiments were conducted in three regions of Georgia using organic-bacterial fertilizer-"organics" and biological preparations - "biocamera" and "photopicture", produced by the center for biological plant protection, the company "Biogro." For the work envisaged research, areas in the municipalities of Telavi were selected,</p>

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Kutaisi and Akhaltsikhe. Organics and biological preparations were treated with 0.5-0.5 hectares of telavi and Kutaisi area, and in Akhaltsikhe 1 ha.

The results of the study showed that after applying a combined mixture of fertilizers and biologics, the composition of the existing essential nutrients (NPK) in the pochba significantly improved. Accordingly, the fertility of the soil has been increased, which is an indicator of the turning of the nutritional value of the pochba. Our righteous experiments proved that the use of a combined mixture of liquid organic-bacterial fertilizer of organics and biological products from an economic point of view is effective.

Modern biotechnologies for soil protection and fertility restoration, today are an urgent issue all over the world, including in Georgia. Georgia is a low-land country, its territory is 69.2 thousand square kilometers, of which the area of land used is 30.2 thousand square kilometers, of which the land plots occupy 10.7 thousand square kilometers. In Georgia, 48 soil types are common. 6.7% (205 thousand hectares) of agricultural used land is occupied by acidic soils, 7.3% (210 thousand hectares) are marsh soils.

In terms of fertility in Georgia, 62.2% are of average quality, 3.4% are below average quality and 0.1% are the best soils. Soil, as a natural body, is characterized by the property of fertility, which depends on soil-forming conditions. In the process of education, this property is exhausted, both due to natural factors and due to human pressure, increases or decreases depending on what are the active factors on fertility, which ultimately determines the system of agriculture.

Reducing the fertility of the soil or its degradation is one of the most important problems of our time. The importance of this problem is betrayed in the fact that it poses a danger to the world's population in providing food products and environmental safety of the environment. In Georgia, the process of soil degradation is of sufficient intensity and poses the main problem for the development of agriculture.

As a consequence of the above, it is necessary to restore the fertility of the soil, increase its productivity, but so that there is no pollution of the environment with various chemicals, i.e. modern biotechnological methods should be applied.

In order to restore soil fertility in 2018-2019, experiments were conducted in three regions of Georgia using organic-bacterial fertilizer-"organic" and biological preparations - "biocamera" and "phytocatena", produced by the center for biological plant protection, the company "Bioagro." For the work envisaged, the areas in the municipalities of Telavi, Kutaisi and Akhaltsikhe were chosen. Organics and biological preparations were treated with 0.5-0.5 hectares of telavi and Kutaisi area, and in Akhaltsikhe 1 ha.

At the test sites, we applied liquid organic-bacterial fertilizer of organic matter on an area of 1 ha (Akhaltsikhe) with a flow rate of 20 liters, biological preparations: biocaten-10 liters and phytocaten-10 liters,

respectively on 0.5 hectares (Telavi and Kutaisi) fertilizer 10 liters and biological products of 5 liters, the area was treated with a combined mixture of fertilizer and biological products.

Organic-bacterial fertilizer-organics is a complex of natural organic compounds, microorganisms and biodynamic preparations that can solve the problems of ensuring imitation of natural processes of restoring soil fertility, improving environmental processes and biocenosis of the soil, which in turn contributes to the process of utilization of agricultural residues. The use of organic fertilizer as a cheap and affordable drug to make it possible to easily restore productivity on devastated lands. Efficiency: causes an increase in yield by 20-30%, accelerates the process of disintegration of organic residues in the soil. Application to the soil - in spring or autumn in humidity conditions, spraying plants for fertilizing with +15 degrees at a humidity of 60-70%.

The use of fertilizer and biological products is convenient in the early morning or evening - in order to protect the mixture from sunlight. Compatibility with other drugs: it is possible to mix with both biological and chemical preparations except for chemical bactericides and fungicides: toxicity class-4 is not toxic to humans, animals, fish, birds, bees and other beneficial insects. advantage: it is not phyto toxic, does not clog the environment, contributes to the development of beneficial microflora in the soil. Storage conditions: store in dry from +4 to +30 degrees cession. protected, a place from the sun's rays, in a tightly sealed full vessel, shelf life 3 years. Biocatena is a therapeutic prophylactic against plant disease, mainly against pathogenic fungi of the soil. also used for seed treatment.

The composition-culture liquid, which has in the composition of spores, the fungus *Trichoderma lignorum* and mycelium, is also biologically more active than the substances produced during cultivation.

**Efficiency:** the biological efficiency of its application is 65-70%, and the host's efficiency is 10-15%. Time and timing of application - in order to prevent the biological product should be introduced into the soil before sowing or before planting the plant. Also, for the purpose of treatment, it is possible to introduce it into the soil or spray plants. at a temperature of +18 degrees Celsius and 60-70% soil moisture.

**Compatibility with other drugs:** Mixing with both biological and chemical preparations is possible except for some chemical fungicides. toxicity class-4 is not toxic to humans, animals, fish, birds, bees and other beneficial insects. advantage: is not phyto toxic; there is no resistance to pests. It is not normalized in agricultural products and environmental objects, is safe for the ecosystem, provides environmentally friendly yields. Storage conditions: store in dry temperature from +15 +25 degrees. protected, a place from the sun's rays, in a tightly sealed full vessel, in an inaccessible place for children of animals, separately from other products, the shelf life of the drug is 6 months. without changing the properties, but including violations of storage conditions, its effectiveness is reduced. Phytocatena-therapeutic prophylactic agent both against soil pathogens and aepogenic pathogens, contributes to the processes of reincarnation of the existing phosphorus in the soil. The composition is a culture content that contains spores of the bacterium *Pseudomonas Fluorescens*, as well as biologically active properties formed in its cultured process.

**Efficiency:** The biological efficiency of the use of photographic images is 65-70%, and the economic efficiency of 12-15%. Time and timing of use - in order to prevent the biological product should be introduced into the soil before or after its processing. It is also possible for medicinal purposes to apply it to the soil or spraying the plant during the growing season. Compatibility with other drugs: It is possible to mix with both biological and chemical preparations except chemical fungicides. toxicity class-4 is not toxic to humans, animals, fish, birds, bees and other beneficial insects. advantage: it is not phytotoxic, in addition to fungicidal and bacteriocidal properties, has a stimulating effect, does not limit the viability of the native bacterial microflora. Safe for the ecosystem provides environmentally friendly yields.

**Storage conditions:** stores the sealed vessel in a dry place protected from the sun, at a temperature of +5 to +25 degrees Celsius. shelf life of the drug 6 months. without changing the properties, but including violations of storage conditions, its efficiency is reduced.

After the introduction of a combined mixture of fertilizer with preparations from three experimental precinct, soil samples were taken, over which a laboratory examination was performed.

In order to establish the fertility of the soil, some test indicators were determined before treatment (control option), and after treatment (experimental version). We present the results of the main indicators of soil analysis on the example of the experimental site of the Telavi State University named after Jacob Gogebashvili.

Results of soil analysis on the control of the site (sample #1, Telavi, university, vineyard 0-20 cm).

**Table N1**

Characteristics	Result Analysis	Category	Limit
pH ( Dissected Waters )	7.40	Slightly Alkaline	7.3-7.8
Organic Matter (%)	4.12	Average	4-6
Nitrogen (N) Mg/Kg (Available For Plants)	30.81	Very Low	0-40
Phosphorus (P2O5) Mg/Kg (Available	3.09	Very Low	0-15

For Plants)			
Potassium (K <sub>2</sub> O) Mg/Kg (Available For Plants)	242.59	High	241-400
Gidrosopic Water (%)	2.67	-	-

Results of soil analysis on the experimental plot (sample N2, Telavi, university, vineyard 0-20 cm).

**Table N2**

Characteristics	Result Analysis	Category	Limit
ph ( Dissected Waters )	7.35	Slightly Alkaline	7.3-7.8
Organic Matter (%)	2.87	Average	2-4
Nitrogen (N) Mg/Kg (Available For Plants)	46.56	Very Low	40-70
Phosphorus (P <sub>2</sub> O <sub>5</sub> ) Mg/Kg (Available For Plants)	5.29	Very Low	0-15
Potassium (K <sub>2</sub> O) Mg/Kg (Available For Plants)	266.40	High	241-400
gidrosopic water (%)	2.88	-	-

As can be seen from Table N2 after the application of a combined mixture of fertilizers and biologics, the composition of the existing essential nutrients (NPK) has significantly improved. In table N1 table N2, the number of nitrogen (N), phosphorus (P<sub>2</sub>O<sub>5</sub>), and potassium (K<sub>2</sub>O), available forms for the plant, increases. Accordingly, the fertility of the soil is taken away, which is an indicator of the turning of the nutritional value of the pochba. In addition, to a lesser extent, but still increased the percent composition of hydrosopic water. The reaction (pH) of the soil is close to neutral, which is the desired indicator for almost all crops.

It should be noted that as a result of soil analysis of impregnated areas in other regions, an approximately similar picture is recorded. The experiments conducted established that as a result of the joint use of organic-bacterial fertilizer of organics and biological products, the yield and quality of agricultural products will increase on a number of ways to improve the fertility of the soil

Yield of agricultural crops in experimental variants and household control

**Table N3**

NO	Location	Square Ha	Agriculture Culture	Urogynamic Tone		Increase In Yield	
				Opitiy Variant	Master's Control	Tone	%
2	0,5	Vine	3,75	3,1	0,65	21,0	
3	Akhaltsikhe Klde	1,0	Potato	18,6	16,8	1,8	10,7
4		1,0	Potato	21,4	19,5	1,9	9,7
5	Kutaisi Tskaltubo	0,5	Corn	2,2	1,8	0,4	22,2
6		0,5	Corn	2,6	2,0	0,6	30,0

As can be seen from Table N3, as a result of the use of a combined mixture of organic-bacterial fertilizer and biological preparations, the yield of grapes increased by 17.9-21.6%, potatoes by 9.7-10.7%, and corn by 22.2-30.0%.

Based on the above data, we determined the economic efficiency and profitability of the use of fertilizers and biological products for crops.

Table N4

NO	Location	Square	Rural- Economic Culture	The Whole Harvest Received (In Lars)	Cost Of Everything Received (In Lars)	Kutaisi	Cost Growth Arajaya (In Lars)	Organic Costs And Biologics (In Lars)	Chust Income (Profit)	Cost Recovery For Organics And Biologics	Profitability In 0%
1	Telavi	0,5	Vine	3,3	2310	0,5	350	160	190	2,19	119
2		0,5	Vine	3,75	2625	0,65	455	160	295	2,84	184
3	Akhaltsikhe	1,0	Potato	18,6	9300	1,8	900	160	740	5,63	463
4		1,0	Potato	21,4	10700	1,9	950	160	790	5,94	494
5	Kutaisi	0,5	Corn	2,2	1760	0,4	320	160	160	2,00	100
6		0,5	Corn	2,4	2080	0,6	480	160	320	3,00	200

Our righteous experiments proved that the use of a combined mixture of liquid oragnicho-bacterial fertilizer of organics and biological preparations is effective, which is confirmed by the data given in table N4. As can be seen from the table for each lar spending on the resulting grape yield growth is 1.19-1.84 gel, for potatoes 4.63-4.94 lari, for kukurizi 1.00-2.00 gel.

**RECOMMENDATIONS**

1. A good means of restoring soil yield is its temporary treatment with a combined mixture of organic-bacterial fertilizer of organics and biological preparations (biocamera in phytocaten), from the consumption of 20 l of organic matter per 1 ha + 10 l of biocaten + 10 l of phytocaten.
2. Gradual implementation of the rakyh measures provided for by the agor rules as compliance with the correct technological cycle of tillage; correct order in sowing turnover of crops; compliance with the correct irrigation regimen, etc.
3. The use of green fertilizers together with organic matter to increase the composition of nutrients in the soil.

**LITERATURE**

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At the end, based on the results of our study, recommendations for farmers were developed.