

RA MINISTRY OF EDUCATION AND SCIENCE
ARMENIAN NATIONAL AGRARIAN UNIVERSITY



Problem Laboratory of Ecology and Organic Agriculture

REPORT

on

Research Works in 2012 of the Problem laboratory of Ecology and Organic
Agriculture

Subject: Efficiency of biohumus produced from industrial wastes in agricultural
crops sown areas

M.H. Galstyan

Doctor of Science in Agriculture (DScAg)

Head of the Problem Laboratory

Yerevan 2012



Սույն տեղեկատվական նյութը ստեղծվել է «Հայ կանայք հանուն առողջության և առողջ շրջակա միջավայրի» ՀԿ-ի կողմից՝ ՄԱԶԵ/ԳԷՀ Փոքր դրամաշնորհների ծրագրի ֆինանսավորմամբ իրականացվող «Հետևյալ ոչ քիմիկատներին մեր շրջապատում» ծրագրի շրջանակներում:

Efficiency of biohumus produced by industrial wastes in agricultural crops sown areas

In 2012 the Problem Laboratory of Ecology and Organic Agriculture conducted considerable researches also for determining the efficiency of biohumus produced from industrial waste (waste of mushroom production and liquid poultry manure discharged from Lusakert biogas station).

For this purpose field experiments were carried out in areas under potato cultivation on the lands of river and valley heights in Dzoragyugh community of Gegharkunik marz and in the sown areas of tomato on the semi-desert gray lands in Taperakan community of Ararat marz to determine the efficiency of the industrial waste biohumus on the quantity and quality of the above - mentioned crops harvest. Also in parallel with this the same norm of biohumus produced by horned cattle manure was tested for performance comparison.

In Gegharkunik marz the potato field soils contain small amount of nitric allowing for easy hydrolysis, average amount of phosphorus, and good amounts of available potassium. The semi-desert gray soils in tomato fields contain only 0,95% of humus, small amounts of nitrogen and phosphorus and average amount of potassium.

The field experiments in areas under potato were conducted in the following two schemes. First of all through field experiments the influence of growing norms of biohumus made from industrial waste was studied, then by the second experiment the influence of the same norms of biohumus, prepared separately from industrial waste and cattle manure, on potato crop quantity and quality has been compared.

The 1st scheme: biohumus produced only from industrial waste.

1. Control (without fertilization)
2. Biohumus 5 t/ha
3. Biohumus 7 t/ha
4. Biohumus 9 t/ha
5. Biohumus 11 t/ha

In the same field the cattle manure biohumus was applied using 7 t/ha and 9 t/ha norms.

The field experiment in the tomato field was carried out only for the comparison of only one norm of two types of biohumus:

1. Control (without fertilization)
2. Biohumus from industrial waste 6 t/ha
3. Biohumus from horned cattle manure 6t/ha

The experiments both in potato and tomato fields were conducted with 3 repetitions. The size of the beds in the areas under potato was 50 sq. m, and in the sown areas of tomato was 540 sq. m.

The crop sowing, cultivation and harvest works for both of the crops were done in compliance with the agro-technical rules acceptable to these zones. During the vegetation the potatoes have been watered for 5 times, and the tomatoes for 16 times using 500 cubic meters watering norm.

The results of field experiments have shown that, both the norms of biohumus made from industrial waste and that of the cattle manure biohumus have had significant impact on the increase of the harvest yield and improvement of the quality indexes of potatoes and tomatoes.



Figure 1. Fertilization of the experimental field



Figure 2. Potato experimental field



Figure 3. Tomato experimental field

In parallel with the increase in the norms of biohumus there was an increase in potato crop. Thus, if the potato crop in the control sample (without fertilization) totaled 204, 3 q/ha, then in case the norm of biohumus increased from 5 t/ha up to 11 t/ha, the yield reached from 284, 6 q/ha to 339,2 q/ha, or the surplus yield during the application of 5; 7; 9 and 11 t/ha norms of biohumus as compared with the control sample totaled 80,3; 125,1; 131,5 and 134,9 q/ha (Table 1). At the same time the table data show that despite the application of 11 t/ha norm the surplus yield as compared with the norm of 7 t/ha made 3,4 -6,4 or 1,6 – 3,2 %, however, they are not essential and are within the error of the experiment.

Survey results also showed that the same norms of biohumus produced from industrial waste and from cattle manure differently affected the quantity and quality of the potato crop. On the whole, the same amount of biohumus, produced from industrial waste, had a more positive impact on the crop of potatoes and tomatoes, than it was in case of use of cattle manure biohumus (Table 2).

Thus, if the surplus yield in the areas under potato in case of application of norms of 7 t/ha and 9 t/ha of biohumus, produced from industrial waste, totaled 125,1 and 131,5 q/ha as

compared with the control sample, then the surplus yield of potato crop in case of the application of the similar norm of the cattle manure biohumus totaled respectively 93,0 and 122,2 q/ ha.

Such regularity of influence of similar norms of biohumus produced from different substrates was also observed in the sown areas of tomato cultivated in the semi-desert gray soils (Table 4). Table data show that the norm of 6 t/ha of biohumus (produced from industrial waste) as compared with the sample without fertilization, provided 290,4 q/ha or 125,4 % of the surplus yield. The same norm of biohumus, which was produced from horned cattle manure, as compared with the control sample, provided 263,2 q/ha or 113,6 % of increase in tomato harvest or the same norm of biohumus, prepared from industrial waste, provided 27,0 quintal surplus of tomato yield.

This type of surplus yield in both potato and tomato growing fields, probably is due to high nitrogen, phosphorus and potassium levels in the industrial waste (as compared with manure biohumus), which are preserved during the production of biohumus and naturally promote the increase of yield capacity and getting of yield surplus.

The same norms of biohumus produced from different substrates also had some impact on qualitative indexes of agricultural crops (Table 3). Biohumus, produced from industrial waste, contains more available nitrogen than cattle manure biohumus, and mostly promoted the increase in nitrates in potato tubers, about 10 mg/kg, in tomato fruits 15 mg/kg, although, the nitrates content in both potatoes and tomatoes is within the maximum permissible concentrations. At the same time though the use of the same norm of biohumus, prepared from industrial waste, reduced the starch content in the potato tubers by 0,4-0,8 %, however, due to the high yield, more starch per hectare was accumulated in tubers than in case of fertilization with biohumus produced from cattle manure.

Table 1.

The influence of biohumus produced from industrial waste on amount of harvest of the potato crop

N	Samples	Potato yield by repetitions, kg/50sq.m			Potato yield by repetitions, q/ha			Average crop q/ha	Surplus yield		Nitrates
		1	11	111	1	11	111		q/ha	%	
1.	Control sample (without fertilization)	102,4	104,8	99,2	204,8	209,6	198,4	204,3	-	-	105,0
2.	Biohumus 5 t/ha	140,5	142,2	144,2	281,0	284,4	288,4	284,6	80,3	39,3	144,0
3.	Biohumus 7 t/ha	162,4	166,1	165,6	324,8	332,2	331,2	329,4	125,1	61,2	160,0
4.	Biohumus 9 t/ha	170,4	168,8	164,5	340,8	337,6	339,0	335,8	131,5	64,4	185,0
5.	Biohumus 9 t/ha	168,7	169,6	170,5	337,4	339,2	341,0	339,2	134,9	66,0	220,0

Table 2.

The comparative efficiency of industrial waste biohumus and horned cattle manure biohumus in areas under potato crop

N	Samples	Potato yield by repetitions, kg/50sq.m			Potato yield by repetitions, q/ha			Average crop q/ha	Surplus yield				Nitrates
		I	II	III	I	II	III		Compared with the control sample		Compared with each other		
									q/ha	%	q/ha	%	
1.	Control sample (without fertilization)	102,4	104,8	99,2	204,8	209,6	198,4	204,3	-	-	-	-	105
2.	Biohumus 5 t/ha (from industrial waste)	162,4	166,1	165,6	324,8	332,2	331,2	329,4	125,1	61,2	-	-	160
3.	Biohumus 7 t/ha (from manure)	148,4	146,9	150,6	296,8	293,8	301,2	297,3	93,0	45,5	-32,1	-15,7	150
4.	Biohumus 9 t/ha (from industrial waste)	170,4	168,8	164,5	340,8	337,6	339,0	335,8	131,5	64,4	-	-	185
5.	Biohumus 11 t/ha (from manure)	164,0	165,6	160,2	328,0	331,2	320,4	326,5	122,2	59,8	-9,3	-46	175

Table 3.

The influence of the same norms of industrial waste biohumus and cattle manure biohumus on qualitative indexes of potato crop

N	Samples	Average crop q/ha	Content of dry mass, %	Starch content, %	Vitamin C, mg %	Content of nitrates, mg/kg	Yield q/ha	
							Dry matter	Starch
1.	Control sample (without fertilization)	204,3	23,6	15,4	8,2	105,0	48,2	16,8
2.	Biohumus 5 t/ha (from industrial waste)	329,4	26,0	19,2	9,6	160,0	85,6	31,6
3.	Biohumus 7 t/ha (from manure)	297,3	25,4	19,6	9,8	150,0	75,5	58,3
4.	Biohumus 9 t/ha (from industrial waste)	335,8	26,8	18,2	9,2	185,0	90,0	61,1
5.	Biohumus 11 t/ha (from manure)	326,5	26,2	19,0	9,4	175,0	85,5	62,0

Table 4.

The comparative efficiency of industrial waste biohumus and cattle manure biohumus in sown areas of tomato

N	Samples	Tomatoes harvest by terms of maturity, q/ha				Average crop, q/ha	Surplus yield		Marketability against the total harvest	
		5/08	23/08	14/09	10/10		q/ha	%	q/ha	%
1.	Control sample (without fertilization)	43,10	79,6	66,5	41,8	231,6	-	-	207,0	89,4
2.	Biohumus from industrial waste 6 t/ha	87,6	152,0	165,0	120,4	522,0	290,4	125,4	486,5	93,2
3.	Biohumus from (horned cattle) manure 6 t/ha	89,0	143,2	154,0	108,6	494,8	263,2	113,6	459,2	92,8

Summing up the results of one year's field and laboratory studies, we can draw the following conclusions:

1. For the purpose of obtaining environmentally safe products from the fields planted with potato in the lands of river and valley heights it is necessary to fertilize with 7 t/ha norm of biohumus produced from industrial waste, which will provide approximately 330,0 q/ha of high quality potato crop.
2. In the fields of crops sown in drills (potatoes, tomatoes) the similar norm of biohumus (6 or 7 t/ha) produced from industrial waste provides a harvest richer by 12,8 - 15,7 % than the biohumus produced from cattle manure.
3. The results of one-year research on comparative efficiency of biohumus produced from different organic waste on crop quantity and quality can not be satisfactory to present precisely the regularities and findings. Research should be continued for another 2 years.