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Effect of the concentrate "Rumifos" on the mass and the degree of reproduction of rain worms

L. Beshkenadze[a], N. Zazashvili[b], M. Gogaladze[a*], N. Klarjeishvili[a], M. Chikaidze[b], O. Lomtadze[a]

[a*]Ivane Javakhishvili Tbilisi State University, P.Melikishvili Institute of Physical and Organic Chemistry, 31A, Politkovskaia str., Tbilisi, 0186 Georgia

[b]Biorational Technologies Research Center (BrTRC), 8, Iumashevi Str., Tbilisi, 0151, Georgia

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ABSTRACT

The article deals with study of effect of a new, innovative, plant product concentrate of local origin "Rumifos" on the mass and the degree of reproduction of the rain worms and, establishes its efficient and optimal doses. The maximal (Max.), nominal (Nom.) and minimal (Min.) doses in milliliters of the plant substance of the concentrate "Rumifos" to be added to the substrate of the trial group are calculated.

Weighting and counting the cocons were conducted in three stages, on 21st, 31st and 41st days after beginning the experiment. Average change of masses by grams and percent in the control and trial groups and average number of cocoons in pieces and percent, were studied in each stage, while. An average change of the mass of trial groups in comparison with the control one during the total period of the experiment and an average degree of increase of the reproduction of cocons, as well as the efficient and optimal doses of the concentrate "Rumifos" were established also. It is found that when balancing the substrates of the rain worms trial in comparison with the control group, no significant changes take place. As to the degree of reproduction of the cocons, on the first stage, this indicator in comparison with the degree of reproduction of the control group cocons (100%), it varies within 1411.0–1633.67% ranges, while the optimal and efficient dose of the plant concentrate "Rumifos" is 0.31ml., calculated for 600g substrate. Thus, balancing the rain worms substrate by "Rumifos", has a positive effect on the mass growth of the worms and increases considerably the degree of reproduction of the cocons, that, as we suppose, is preconditioned by diversity of various biologically active chemical class compounds existing in the composition of the concentrate "Rumifos". The obtained results will have importance for that direction of vermiculivation, where the protein mass of the rain worms is used for balancing the combined feed for farm animals and poultry, as a vitamin-protein, high quality concentrative additive.

Keywords: Vermiculture, Rain worm, Cocon, Concentrate, Rumifos, Substrate.

*Corresponding author: Maia Gogaladze, E-mail address: gogaladzemaia@yandex.com>

Introduction

Improvement of the ecological state of the environment and the health of population is a global problem of nowadays. This problem is as actual for the contemporary world as never [1-12]. To resolve them, production of the ecologically friendly agricultural products is of an essentially important, where the use of bio-humus - the ecologically clean, natural, biologically active organic fertilizer received by processing the organic waste (wastes of the farm animal manure and various plants waste) instead of the chemical fertilizers, herbicides and pesticides, would play a decisive role, were the rain worms have a central role. So, bio-humus is an unique microbiological mineral fertilizer received from the worms. It is approved that the humates contained in the bio-humus, are not toxic,

cancerogenic and mutagenic. The most important difference between the bio-humus and the simple organic fertilizer is that bio-humus contains a large quantity of of the water soluble necessary elements-nitrogen, phosphorus, potassium. The microelements are also transiting into the movable form. Content of the water soluble fractions in the bio-humus is too high. On the other hand, the protein mass of the rain worms is a high-quality vitamin-protein concentrative addition for balancing the combined food of the farm animals and poultry, that, in its turn, is a guarantee of production of the agricultural bioproducts: bio-meat, bio-milk, bio-egg. For this purpose, one of the obstructing factors is its expensiveness. That is why, study of impact of various factors on increase of the protein mass and the degree of reproduction of the rain worms seems to be very important.

As earlier as in the ancient Egypt period, the farmers considered the warms as a precondition of future harvest and, used successfully the river Nile sludge processed by the rain worms. To receive the agricultural cultures, the old Egyptians worshiped the rain worms, since considered them the sacred animal and, restricted their export from the country. Aristotle named them the "earth intestines and, it is true: while passing the earth and the plant waste through their intestines, the worms make the soil rich. They are the unique representatives of the alive nature. All the species of the rain worms differ from each other by their body structure, place and rule of living. However, together with the distinguished features, all the species have the following common features:

- They do not die since they never become ill;
- They are not carriers of human, animal, bird, fish diseases;
- They do not need expensive foods, because they process the organic waste;
- They do not need light and ventilation;
- They can stay in a building that has no windows;
- They do need big energy consumption. A necessary temperature in a building is 18-240C;
- They need the food just once in 2-3 days. They process during a day the bio-humus equal to their body weight.

Today, nobody makes it questionable that the rain worms can play an important role in resolving the food product-related worldwide problem and ensure a sustainable and ecologically balanced development of the agriculture. The rain worms are the source of growth of stimulators of proteins, vitamins, and other biologically active substances not only for the plants but for the animals as well. There are more than 40 proteins just in the celomic fluid of the rain worms, which demonstrate number of the biological effects: cytolytic, proteolytic, hemoglutterial, anti-tumor, mitogenic antibacterial, antioxidative, immunogenic effects, etc. The researchers pay attention also on the giant molecule of hemoglobin, neuropepdide, growth factors. By a set of the biologically active components, exclusivity of the effects of some species, and their availability, the rain worms have no equal analogues in the world [13-17]. Together with a variety of these properties, a rapid growth of biomass of the rain worms and a high degree of reproduction, not pretentious attitude to the food composition and the feeding conditions and a high percentage content of the protein in the organism, as well as high proficiency and ecologically friendly nature–all this determine (ensure) a possibility of a massive industrial production of the rain worms and necessity of use of this hew bio-resource for receiving the high-quality vitamin-protein containing food addition in the fields of poultry, livestock and fishery, that enables us to move to the production of organic meat, egg, and milk [18-23]. For studying the effect of the concentrate "Rumifos" on the mass and degree of reproduction of the rain worms, a new specie of the rain worm "Georgian New" was selected, which is produced in the bio-farm of the company "Macro-Prim LLC." by a breeder Guram Gejadze [24].

Computational Method

On the basis of the sources of literature available to us, we could not find other researches similar to the one conducted by us. Therefore, we have implemented the study using our own methodology, where we used the method of weighting for determining the alive mass of the worms and the method of counting for determining a quantity of cocons. The object of research is: Rain worm, substrate, cocons and concentrate "Rumifos".

In the coursed of the experiment we have studied:

- The dynamics of change of the rain worms mass; Weighing was conducted in three stages-on 21st, 31st and 41st days after beginning the experiment (average change of the mass in

grams, in each stage and each group);
- Quantity of the cocoons produced by the rain worms. Average number of cocoons in the same time ranges;
- Change of the mass in comparison with the control group and number of the cocons by percent, in each stage;
- Average quantity of total masses and cocons in percent, for all three stages during the total period of experiment;
- Efficient and optimal doses of the testing sample of the concentrate "Rumifos" for the substrate of the rain worms.

Results and Analysis

Joint researches targeted at studying the effect of various additives on the protein mass and the degree of reproduction of the rain worms are continued by participation of the Iv. Javakhishvili Tbilisi State University, Laboratory for the Agricultural Chemistry Problems at Petre Melikishvili Institute of Physical and Organic Chemistry, and Bio-rational Technologies Research Center ("BrTRC") with involving the effect of the concentrate "Rumifos" on the mass and the degree of reproduction of the rain worms. The product - concentrate "Rumifos" is the intellectual property of the company "Lark LLC.", the trade mark and the technology of receipt are protected (an unique technology of receipt of the product is developed on the base of the Bio-rational Technologies Research Center). The concentrate "Rumifos" is received through extraction of the endemic raw grain crops spread in the mountainous areas of Georgia. The biologically active substances contained in the concentrate are the total of the compounds of various chemical classes [ferments, co-ferments, amino-acids, poly-phenolic substances, flavonoids, phyto-biotics) [25, 26].

Its positive effect on the intestinal tract of the cattle (restoration of a natural microflora of intestines), and high rate of food consumption are established.Besides, its stimulating effect on the immune system and metabolic processes in the animals, on growth of their live mass, preservation of steadiness, etc., are studied [27].

Based on the important sciebntific sources, the derivatives of imadizole and pyrazole, which are identified in the "Rumifos" presumably have the anti-tumor properties [28-30].

The purpose of our work was to balance the substrate by the concentrate "Rumifos" and establish its effect on the changes and degree of reproduction of the protein mass of rain worms. We calculated the defined quantities (200-200g.) of the dry substrate for both the control and trial groups, and 3-3 doses of defined quantity of the "Rumifos" for adding to the substrate of the trial groups (Max=0.62ml.; Nom=0.31ml.; Min=0.16ml.), in milliliters.

In the course of the experiments on the rain worms, our goal was a. To determine changes of the protein mass and the degree of reproduction in the works, caused by effect of the "Rumifos" being added to the substrate; b. To define the efficient and optimal doses of "Rumifos". For this purpose, we have conducted test for four groups, each with three repetitions: in all three repetitions, the substrate of the control group was soaked by an ordinary water, the I trial group–with a water solution of maximal (0.62ml.) doze of "Rumifos", II trial group - with a water solution of nominal (0.31ml.) doze of "Rumifos", and the III trial group–with a water solution of minimal (0.16ml.) doze of "Rumifos". For repetitions in each group, we selected 5-5 worms of comparably equal masses. The first weighting and counting of the cocoons were conducted on the 21sty day after beginning the experiment, while the second and the third procedures were conducted on the 31st and 41st days., respectively. In cases of all three weighting, we calculated average change of the mass in each group, mass changes by, Average and total number of cocons by percent. After the end of the experiment, average masses and average number of cocoons were counted in percent, for all stages and for the control group and 3 trial groups (Table).

Table. Results of The Test on the Rain Worms

Groups (Dose, ml)	Container #	Stages of testing																									
		initial stage			I							II						III						Result	
		Number of worms	Mass (g)	Mass (average)	Mass (g)	Mass (average)	Mass change, (g)	Mass change (%)	Number of coconuts	Number of coconuts (average)	Number of coconuts (%)	Mass (g)	Mass (average)	Mass change, (g)	Mass change (%)	Number of coconuts	Number of coconuts (average)	Number of coconuts (%)	Mass (g)	Mass (average)	Mass change, (g)	Mass change (%)	Number of coconuts	Number of coconuts (average)	Number of coconuts (%)	Mass change, (%)	Number of coconuts (%)
Control. (0)	1	5	1.22	1.27	3,05	2.99	1.72	100	1	1	100	3.25	3.20	0.21	12.02	4	3.33	333.0	3.31	3.25	0.05	2.91	2	1.67	167.0	38.31	200
	2		1.40		3.03				2			3.15				6			3.25				3				
	3		1.18		2.89				0			3.19				0			3.18				0				
Max. (0.62)	4	5	1.40	1.18	3.85	3.40	2.22	129.65	3	3.67	367.0	3.24	3.23	1.01	-10.06	21	21.33	2133.0	3.22	3.20	2.19	- 0.52	17	17.33	1733.0	39.69	1411.0
	5		1.12		3.21				4			3.25				21			3.24				18				
	6		1.01		3.15				4			3.01				22			3.15				17				
Norm. (0.31)	7	5	1.22	1.23	3.29	3.23	1.99	116.09	8	6.67	667.0	3.45	3.34	0.11	6.39	21	21.67	2167.0	3.34	3.27	-0.07	-3.89	20	20.67	2067.0	39.53	1633.67
	8		1.19		3.15				6			3.25				22			3.22				21				
	9		1.28		3.24				6			3.31				22			3.25				21				
Min.	10	5	1.18	1.22	3.79	3.41	2.19	127.32	6	6.33	633.0	3.80	3.52	0.11	6.39	21	20.67	2067.0	3.82	3.50	-0.02	-1.16	21	20.33	2033.0	44.18	1577.67
	11		1.34		3.15				7			3.40				21			3.35				20				

As the Table shows, at the beginning of the experiment, a maximal growth of the mass by 1.72g. (100%) is observed in the control group on the first stage, while on th second and the third stages, a rate of mass growth is reduced and makes 0.2g. (12.02%) and 0.05g. (2.9%), respectively. In parallel to such mass change in the control group, an average number of the cocoons on the second stage is at first increased from 1 (10%) to 3.33 (333.0%) while afterwards on the third stage is reduced to 1.67 (167%).

In the I trial group where "Rumifos" was added with the maximal dose (0.62ml.), on the first stage an increase of the mass by 129.65% in comparison to the control group was observed, while on the second and the third stages the masses were reduced by 10.06% and 0.52%, respectively. As to the degree of reproduction of the cocons, in comparison to the control group, their number on the first stage was increased by 367.0%, on the second stage – by 2133.0%, and on the third stage – by 1733.0%.

In the II trial group where the nominal dose (0.31ml.) of "Rumifos" was added the mass increase rate on the first stage was by 116.09%, on the second stage – by 3.34%, while on the third stage the mass reduction was reported by 3.89%. In parallel to such changes of masses, a degree of reproduction of the cocons on the first stage was increased by 667.0%, on the second stage–by 2167.0%, and on the third stage –by 2067.0%.

In the II trial group with adding the minimal doze (0.16ml.) of the "Rumifos", changes of masses of the worms are of a following nature: On the first stage, the mass is increased by 127.32%, on the second stage–by 6.39%, while on the third stage the mass is reduced by 1.16%. A degree of reproduction of the cocons se in the same trial group is increased by 633.0% on the first stage, by 2067.0% on the second stage, and by 2033.0% on the third stage.

During the whole period of the experiment, (in total for all three stages) an average mass increase is reported and, in the control group it is equal to 38.31%, in the I trial group – 38.69%, in the II trial group – 39.53%, and in the III trial group – 44.18%. as to the total change of the cocoons reproduction degree, it has the following nature: In the control group – 200%, in the I trial group 1411.0%m in the II trial group – 1633.67%, and in the III trial group – 1577.67%.

Conclusion

Based on the analysis of the obtained results of the experiment, we can conclude the following: In the whole period of the experimental process, the mass change of the rain worms is characterized by one and the same nature. Namely, on the first stage, in both the control and trial groups, a maximal increase of masses of the rain worms is reported, while on the second and the third stages, a rate of the mass increase is reduced and, such a reduction is as lower as the degree of reproduction of the cocons is higher.

Increase of the degree of reproduction of the cocons is of the following nature: In all the trial groups in comparison with the control one increase of the degree of reproduction of the cocons is reported and, such the increase reaches at the maximal value on the second stage (2167%), to which a maximal reduction of the masses corresponds (-3.89%).

By total results of all the three stages, we conclude: A total change if the mass for all groups are positive and, reaches at the maximal value in the III trial group (44.18%), while total number of cocoons reaches at the maximum in the II trial group (1633.67%). Based on the obtained results, effective and optimal dose of substrate concentrate "Rumifos" 0.31 ml for 600mg. substate is selected.

Balancing the warms substrate by "Rumifos" has a positive weffect on the mass growth of the warms and increases considerably the degree of reproduction of the cocoons that, as we suppose, is preconditioned by diversity of various biologically active chemical class compounds existing in the composition of the concentrate "Rumifos". The obtained results will have importance for that direction of vermiculivation, where the protein mass of the rain worms is used for balancing the combined feed for farm animals and poultry, as a vitamin-protein, high quality concentrative additive.

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