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PRODUCTION OF THE TOWARD EARTH IN THE CONDITION EDAPHOCLIMATIQUESS OF ORIENTAL MBUJIMAYI/KASAÏ

Mulangu Kabamba [1], Ndaya Kabula [2]

[1] Professor to the Faculty of the Agronomic Sciences, Department of Zootechny, Unit of research in Hydrobiology, Aquaculture and Biodiversity, Official University of Mbujimayi
[2] Attending the ISTM/Section of Lab-Nutrition

Abstract

A production engineering of the toward earth has been led in the conditions édaphoclimatiques of Mbujimayi to determine the different factors capable to influence the success of this culture in this part of the country.
Several materials have been used of the installation of the test until the harvest of Lombricus. The experimentation on associated land to the direct observation technique constituted the main used method. The following parameters have been analyzed: the temperature, the atmospheric moisture, the humidity of the substrata, the pH and the weight of the toward earth to the harvest.
After survey, the gotten results show us the average values below:

- the temperature 2°C, the atmospheric moisture 7%, pH=8 and the humidity of substratum 3500 more or less 53 to the Block I;
- the temperature 2°C, the atmospheric moisture 7%, pH=8 and the humidity of substratum 3750 more or less 52 in the Block II.

Of what precedes, the results gotten in this survey go in the norms of production of toward earth as described in our discussion with other authors.

Keywords: Toward Earth; Dung; Droppings; Lisier.

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1. Introduction

The food of the house pets must be balanced and answer their maintenance needs, production, growth and reproduction whose earthworms constitute one of the major sources. The use of earthworms as flour in the ration of monogastric is logically foreseeable, permitting to save numerous other sources of proteins intended to the food of the Clogged man thus, (1984); Buch (1991).

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The worm of present earth a considerable interest, in agriculture, he/it improves the quality of soil (fertilizes and alcalinise soil); in raising, he/it provides a proteinic contribution importing to the animals; in agroalimentary industry, he/it can be used in the preparation of the cookies and pancakes rich in proteins for the Clogged man, (1984); Buch (1991).

Being a lot a source less important for the human food in our middle, the toward earth require however for his/her/its culture, some optimal conditions so much in terms of substrata, pH, temperature, humidity that of his/her/its incorporation in the ration.

According to Agbédé and al., (1994), the contents in raw proteins (60-72%) and in lipids (7 to 10%) flours of verse are comparable to those of the fish flours and meat. The toward earth are richer in amino acid essentials, fatty acids to long chains, mineral and vitamins. When one knows that the hens and pigs in raising villager are consumers natural of toward earth, the use of these last as flour in the ration instead fish flours and the other food often imported, would constitute a logically foreseeable option (Clogged, 1984).

This survey has for objectives to cause the culture of toward earth in our middle and to determine different factors influencing their success in the conditions édaphoclimatiques of Mbujimayi, and, to promote the culture of toward earth to use like alternative in the food of poultry in order to avoid the man-animal competition.

Thus, the production of toward earth would permit to the breeder to produce to least cost the proteins for their raisings. To arrive there, we used the experimental method associated to the direct observation technique during 52 days.

2. Middle, Material and Methods

2.1. Middle of Survey

This survey has been achieved in the conditions édaphoclimatiques of Mbujimayi. This city is situated on the tray of the Kasaï on 500 to 1000m slightly hilly altitude, it is limited by the Lubilanji river to the East, to the North by the Muya stream, to the South by the Kanshi stream, to the west, his/her/its limits are conventional and correspond to nearly a straight line on the tray that separates the township of Bipemba, of Tshibombo one of locality of the District of Tshilenge (Kambi, 2001). The city of Mbujimayi is situated in a zone to humid tropical climate, of latitude of 6°10' and of longitude is of 23°27', it presents a yearly average temperature of 25° C and a relative humidity of 77,7%. It is situated on a tray damaged çà and by ravines there due to the lack of evacuation channels and to the bad drainage of waters whose middle altitude is of 740m (Kambi, 2001).

The soil of this city is essentially constituted from 85% of sand and 7 to 15% of clay. It is therefore a sablo-clayey soil to particularly movable structure. The Kasaï-Oriental belongs to the fluvial basin of the Mbujimayi (if one considers the theory of the regionalization elaborated by Buache, 1985).

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2.2. Material

To achieve this work, we used two types of materials to know: the biologic materials and the biologic or technical materials.

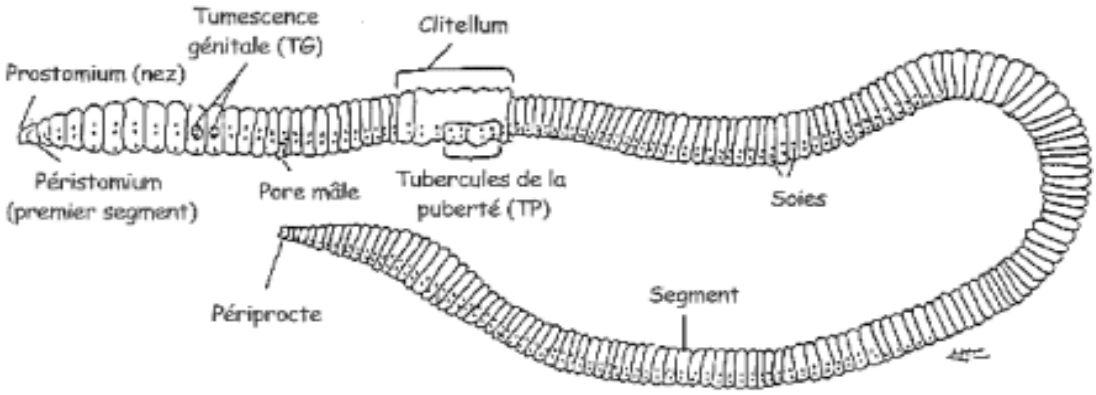
2.2.1. Biologic Material

The main biologic material of this survey is the toward earth épigé: Lumbricus terrestris.Il is of a large size. His/her/its body reaches 10 to 15 cm and a weight of 3,5 to 4,0 g. It is used mainly like decoy for the fishing sporty Buch, 1991.

Generally, the body of the toward earth is ringed, composed of rings. The first segment is called " Prostomium ", the second " Peristomium " and the last " Pygidium " (Sims and Gérard mentioned by Bazri, 2015). Like all terrestrial Oligochèteses, the toward earth don't have eyes, nor distinct head.

At the lombricidés, every segment of the trunk is characterized by the presence of four pairs of silks of variable positions. He/it also carries two nephritic pores. The all gives a very characteristic, wormlike aspect, what encourages their penetration in soil.

However they possess a strong density of sensory cells, the previous region is unraveled more and carry the mouth; whereas the posterior region, sometimes more bulged and slightly flat, carry the Edward anus and al., 1996.



Face 1: Morphology of the toward earth

The earthworms are hermaphrodite, they are provided of male reproductive organs (testes) and female (ovaries) on every individual, but they are incapable of self-fertilization. They reproduce by fertilization crossing. The two verses produce some cocoons then, a capsule having the shape of a lemon and to the approximate measurements of 6 mm of length by 4 mm of width, that contains the impregnated œufs. Usually, the cocoons hatch at the end of 14 to 21 days, when the conditions are favorable, and give one to two toward.

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If the conditions of temperature and humidity are not favorable, the capsules stay intact while waiting for better conditions. The capsules can survive inimical conditions of drought and heat where the verses would not survive. It suits to know that the worm can regenerate the posterior part of his/her/its body that has been sectioned (Buch, 1991).

Among the biologic substances used for this work us have also: the dung dried in the sun during 5 days, then sifted,; the droppings dried in the sun during 5 days, then sifted,; the lisier of pigs dried in the sun during 5 days, sifted then as well as the black earth.

2.2.2. Technical Material

Different tools of which the balance, the tubs, the hygrometer, the gloves, the sifter, the spade, the pen, the notebook, the pH measures, the calculator, the goblet, has also been used on land.

2.3. Method of the Test

The main method used in this work is the experimentation on land associated to the direct observation technique.

To make itself/themselves, 1Kg of earth have been spread to the bottom of every tub, followed of 1Kg of the substratum (Dung, Droppings, Lisier of pigs according to the case), 75g of the toward earth of the type épigé (by treatment) made the object of the inoculation; then 500g of earth acted as cover for every treatment and finally a goblet of 500 ml of water served us to water every treatment in the objective to assure a favorable humidity. Daily we brought 600g of substratum in every tub as food for 75g of toward inoculated earth.

2.3.1. Substrata Used for the Production

A very adequate food for the raising of the verses consists in using some grains ground cereals as the germ of wheat, his/her/its of wheat, ground corn, and flakes of oat (wheat flour); pulverize the grains in powder and sprinkle in layer light to the surface of compost, replace the cover of jute and the lid of screen then (Morin, 1999).

He/it is worth to distribute small quantities of food better frequently (1 or 2 times the week) that a big quantity in only one time, because food tends to agglomerate because of the presence of humidity (Morin ,1999); it is whereas one can mix the powder in the food of the hens.

2.3.2. Method of Treatment of Toward Earth

As the toward earth are the vector agents of the syngamose, he/it is preferable after the harvest, to soak them in a pickle in order to empty twists them (evacuations) in the intestine (Mason and al., 1992).

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2.3.3. Experimental Device

The experimental device consisted of 16 tubs of blue color left in 2 blocks (1 and 2) completely random.

Picture 1: Experimental device of the test in completely random blocks

I Block

T_0 Earth	**T_2 Lisier of pork**	**T_1 Dung**	**T_3 Droppings**
T_3 Droppings	T_1 Dung	T_0 Earth	T_2 Lisier of pork

II Block

T_3 Droppings	**T_1 Dung**	**T_2 Lisier of pork**	**T_0 Earth**
T_2 Lisier of pork	T_0 Earth	T_1 Dung	T_3 Droppings

Face 8: Experimental device

The toward chosen earth are of type épigé (Lumbricus terrestris) collected in the plant matter in decomposition, notably to the surface of soil to our experimental site.

We inoculated 75g of toward earth of the type épigé in every tub toward the cool hours of the evening (18 hour), and we covered 500g of earth in surface. We brought about 500 ml of water during the whole period of the test (52 days).

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Face 9: Inoculation of 75g of the toward earth

2.3.3.1.Studied Parameters

During this survey, the following parameters have been analyzed. It is about of: the temperature, the atmospheric moisture, the humidity of the substrata, the pH and the weight of the toward earth. As the complete biologic cycle of the verse takes about 52 days (Morin, 1999), the period of experimentation lasted 52 days, either 7 weeks and 3 days.

2.3.3.2.Statistical Analyses

The introverted data have been seized and have been dealt with the software Excel 2007 and Ear info version 7.0. The gotten results have been presented under shapes of the pictures including the statistical indications as the arithmetic mean, the coefficient of variation, the variance, the test of Kruskal-Wallis for the comparison of the averages, as well as the percentage (%). The doorstep of significance was of 5%.

3. Presentation of the Results and Discussion

3.1. Results

3.1.1. Assessment of The Physico-Chemical Parameters

Picture 5: Comparative assessment of the physico-chemical parameters in experimental period (blocK1 and blocK2).

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Tableau 5: Evaluation comparative des paramètres physico-chimiques en période expérimentale (bloc1 et bloc2).

Parameters	**Blocks**		**Σ**	$\bar{X}$
	1	**2**		
T°	**24**	**24,5**	**49**	**24,25**
H. At (%)	**74**	**74**	**148**	**74**
H. Substratum (mm)	**43500**	**43750**	**87250**	**43625**
pH	**8**	**8**	**16**	**8**
Variances				**0,4958**

He/it is evident from this picture that a difference didn't have in the variation of the temperature to the 2 block, the average remains equal to 24,25°C. It is some in the same way of the average of the pH as well as the one of the atmospheric moisture that stays respectively 8 and 74%. Statistically, the physico-chemical parameters don't differ between the two blocks [p> 0,05]. ?

3.1.2. Quantity of the toward Produced Earth

Picture 8: Output of toward earth on the 52nd day (blocK1 and blocK2).

Treatment	**Blocks**		**Σ**	$\bar{X}$
	1	2		
T0	342	534	876	438
T1	540	960	1500	750
T2	462	672	1134	567
T3	48	42	96	48
Variances				0,4958

He/it is evident from this picture that the middle results gotten at the time of the production of the toward earth for the 2 blocks in 52 days present themselves as follows: the most elevated mean of production is gotten in the T1 (750g), followed from T2 (567g), (438g) for the T0 and in last position the T3 (48g). Statistically, there is not a difference between the two blocks in term of output [p> 0,05].

3.1.3. Quantity in G of the Flour of Verse

Picture 11: Output of flour of toward earth (blocK1 and blocK2).

Treatment	**Blocks**		**Σ**	$\bar{X}$
	1	**2**		
T0	**26**	**40**	**66**	**33**
T1	**41**	**75**	**116**	**58**
T2	**35**	**51**	**86**	**43**
T3	**2**	**2**	**4**	**2**

This picture shows that the best production by block is the one of the block 2 with respectively 75g (T1), 51g (T2), 40g (T0) and in last position the T3. The most elevated average is the one of

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T1 (58g), followed from T2 (43g). The control treatment records 33g of flour produced on average and the T3 comes in last position with 2g.

The analyses of laboratory revealed that the content in protein in 100g powder of toward earth is of 43%; as two types of bacteria have been observed in microscopy to know the cockles positive GRAM (Staphylococci) and the bacilli negative GRAM (Escherichia coli); no toxic substance has been found. From where the necessity to treat the verses before their use in food for bétails.

3.2. Discussion

He/it is evident from the present survey that the dung is the best of substrata for the culture of toward earth with 41g flour for the bloc1 and 75g for the bloc2 after culture of 75g of verse; consistent of lisier of pigs with 35g for the bloc1 and 51 for the bloc2.

According to Gruenefeld (1992); Fraser (1999); Christophe (2016) and Glenn (2014) the water composition (80 to 90% deau) and nourishing (NPK) of the cow dung constitute the elements favorable to the development of verse. This affirmation could really justify the best results gotten in this work with the dung of cow.

According to the dictionary small Robert (2009), the lisier is an agricultural affluent, mixture of evacuations of raising animals (urines, excrement) and of water, in which dominates the liquid element. He/it is characterized by the main nourishing elements (N, P, K) responsible of life of toward earth in the substrata. According to Edward (1988); Darwin (1881), the animals reject in their excrements between 65 and 75% of the ingested nourishing elements. All these observations could justify the results gotten in this survey with regard to the dung and the lisier of pork used like substrata.

For what concerns the physico-chemical parameters, we got in this work the following results: The average temperature 24 °C, the average of the atmospheric moisture 74%, the average of pH = 8, and the one of the humidity of the substratum is of 43500mm ± 53 to the block 1; to the bloc2, the temperature was of 24,5 °C, the atmospheric moisture of 74%, the average of the pH = 8 and the humidity of the substratum 43750 ± 52.

According to some authors, the humidity and the temperature of soil are the main climatic factors influencing the growth and the reproduction of the verses. Even though food is abundant, heat and humidity are necessary sufficiently for their development (www.srhgx.be, 2017); Fosgate and al., (1972). The conditions ideal for the verses are a temperature between 16 and 26 Celsius degrees, a rate of humidity of 75 to 85% with a pH of 6,5 to 8 as well as the organic matter to eat (manure, dead plants…). A too low rate of humidity stops them from breathing and to move (www.bio-vers.com, 2017); Edward (1998); Hand and al., (1988); these observations confirm the results gotten in this survey.

According to Morin (1999); Edward (1988) and Lavelle and al., (1994), the speed of assimilation of the substratum, the growth and the reproduction of the earthworms are influenced by the temperature. So that a worm becomes adult, 25°C are necessary about 20 days, and 40 or even 100 days when the temperature decreases to 15 or 10 °C. Pursues the author, the temperature ideal for

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the multiplication of the verses is understood therefore between 15 and 25°C. Below 5°C or above 30°C of the important mortalities or the massive migrations can occur.

These same authors didn't fail to signal that, water constitutes 75 to 90% of the weight of the earthworms. They have a big faculty nevertheless to survive in conditions of unfavorable humidity. The verses épigés, used for the lombricompostage, resists as cocoons. He/it is to note that periods prolonged of drought drag a reduction marked of the number of individuals and a slow recolonisation of the substratum.

The fertility is also greatly influenced by the rate of humidity. The excessive humidity limiting the ventilation of the substratum is also a factor limiting the activity of the verses. The results gotten in this survey go in the interval of the securities of the temperatures proposed by these authors and it could justify our results.

The verses can survive in a beach of active pH of 5 9 Edward, (1998); Lee KE (1983). most experts estimate that the verses prefer a pH of 7 or slightly more elevated. Researchers of Nova Scotia discovered that the beach of pH=7,5 and 8,0 were the best MeKada and al., (1979); Mitchell (1997). in general, the pH of the litters of verse tends to lower with time. If food is rather alkali, it has a regulating effect that stretches toward a neutral or slightly alkali pH. On the other hand, a source of food or an acidic litter (coffee grounds, moss of peat) can make really lower the pH of the beds below 7, it can cause a problem of development of parasites as the acariens. One can make carry up the pH by the addition of calcium carbonate. In the rare cases where one has need to make lower it, one can introduce an acidic litter material as the moss of peat (Ndegwa and al., 2001). These affirmations could justify the results gotten in this survey.

In our survey, the analyses made to the laboratory raised that the content in proteins in 100g the powder of toward earth is of 43%; two types of bacteria have been observed in microscopy to know the cockles positive GRAM and the bacilli negative GRAM; no toxic substance has been found. Ndekwa and al., (2001); Parmelee and al., (1998) didn't miss to show that in 100g flour of earthworms, there are 44,7% of proteins. The verses are richer in essential amino acids, in fatty acids to long chains, in minerals and in Riggle vitamins and al., (1994); Sabine (1983).

4. Conclusion

This survey on the test of the production of toward earth to basis of dung, droppings, lisier in the conditions édaphoclimatiques of Mbujimayi had for goal to cause the culture of toward earth in our middle while determining the different roles and practices of toward earth, their content in protein, their degree of toxicity and the factors influencing their culture. After survey, he/it comes out again that the worm of earth improves the structure of soil, fertilize and alcalinise this last, provides a proteinic contribution to various animals of raising, enter in the composition of cookies and pancakes rich in proteins and already clear soups by the man elsewhere. The content in proteins in 100g powder of toward earth is of 43%; no toxic substance has been found in the flour of verse; the physico-chemical parameters (the temperature, the pH, the substratum (food) and the humidity) are the factors limiting the production of these beings.

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Taken into consideration what precedes, we recommend to the breeder to produce the toward earth to basis of dung like better substratum in order to find a source of less expensive proteins for raising.

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*Corresponding author.
E-mail address: andremulangu@ yahoo.fr