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STUDY OF PRODUCTION AND VIABILITY COCOON OF *PONTOSCOLEX CORETHRURUS* FR.MULL AT VARIOUS CONCENTRATIONS OF CARBARYL INSECTICIDES

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Abstract *:*

Research about Study Cocoon Production and Cocoon Viability earthworm Pontoscolex corethrurus Fr. Mull to variaty concentration insecticide carbaryl was hel on July to September 2019. at Animal Physiology Laboratorium, Biology Department, Faculty of Mathematics and Science, Sriwijaya University, Indralaya, Ogan Ilir, South Sumatera. The purpose of this research is to learn the cocoon production and cocoon viability to variaty concentration insecticide carbaryl. Contribution of this research gives the information to farmer about the effect of insecticide carbaryl to non-target animal, especially to land worm Phontoscolex corethrurus Fr. Mull. This research used Completely Randomized Design with 6 treatments and 5 times replication . Treatment that was given to sample are the insecticide carbaryl with concentration of 0 % (control); 0.1% ; 0.2 % ; 0.3 % ; 0.4 % ; 0.5 %. Data analysis was using Varians Analysis. If there was real difference then data analysis continued with The Duncan Test on level of confidence of 95%. The results of this research show us that several concentration of insecticide carbaryl have the real effect to the average cocoon production and cocoon viability earthworm Pontoscolex corethrurus Fr.Mull.. The lowest average of cocoon production on earthworm Pontoscolex corethrurus Fr.Mull is on concentration of 0.5 % (0.62 ± 0.06 cocoon/invidual/week) and the highest average of cocoon production on earthworm Pontoscolex corethrurus Fr. Mull is on concentration of 0% (control) (3.62 ± 0.02 cocoon/individual / week) The lowest average of cocoon viability on earthworm Pontoscolex corethrurus Fr.Mull is on concentration of 0.5 % (18.85 ± 1.19 %)and the highest average of cocoon viability on earthworm Pontoscolex Fr.Mull is on concentration of 0% (98.65 ± 2.15 %).

Keywords: carbaryl, cocoon production, cocoon viability , Pontoscolex corethrurus Fr.Mull.

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1. Introduction

One of the many soil biota populations found on agricultural land and plantations that has a beneficial role in soil ecosystems (the process of decomposition and mineralization) is the population of *Pontoscolex corethrurus* Fr.Mull. Earthworm populations of *P. corethrurus* in the soil are strongly influenced by the physiology of these earthworms. The physiology of *P. corethrurus* earthworms is closely related to the environmental conditions of the existence of *P. corethrurus* earthworms. These environments are physical, chemical, biotic and feed conditions which can together affect the population of *P. corethrurus* earthworms. Ecological factors that affect the population of *P. corethrurus* earthworms include acidity (pH), temperature, aeration and CO2, organic matter, type and availability of feed, as well as insecticide residues found on the surface and in the soil.

P. coretthrurus plays the role of breaking down soil particles and digesting them while at the same time remodel the organic matter contained in the soil; increase soil aeration, soil porosity, soil drainage and increase the activity of microflora in the stomach for humification. *P. corethrurus* also has an important role in various ecosys-

tem functions such as the formation of faecal organic matter earthworms can increase soil fertility and are very important organisms in terms of maintaining the biological, chemical and physical character of soil ecosystems [1] The use of insecticides in many agricultural sectors found in farmers who cultivate their gardens or agricultural land. Chemical insecticides or synthetic insecticides are still considered effective for eradicating plant pests.

Insecticides used by farmers are also available in various types, depending on the intended use. The most commonly used and most widely used insecticides are carbamate insecticides, one of which is carboxyl insecticide with the brand name Sevin. Carbaril insecticides are often used by farmers, because the killing power is more effective but the toxic power in humans is not high. The solubility and biodegradability of carboxyl insecticides will affect the life of non-target or non-target organisms, water quality, soil and air quality. Karbaril insecticide is used by spraying to kill crops, but the residue or residue of carbaryl insecticide on the surface of the ground can affect non-target organisms or non-target (soil animals), one of which is earthworm *Pontoscolex corethrurus* Fr.Mull. Carbaryl insecticide accumulation in earthworm *P corethrurus* in the earth is important to know because of earthworms.

P. corethrurus can act as an insecticide redistribution, so that it can influence the chain of insecticide transfer to higher levels of organisms [3]. Giving one of the insecticides from carbamate group is carbofuran insecticide on the earthworm Eisenia foetida, giving an influence on the production of cocoon and viability of the earthworm cocoon of Eisenia foetida. [4] Likewise, the administration of insecticides from carbamate groups, namely carbaril insecticides to the morphology of earthworms *Pontoscolex corethrurus* Fr.Mull gives effect to the morphology of *Pontoscolex corethrurus*Fr.Mull [5] Giving Karbaril insecticides by spraying on leaves of palawija corethrurus by farmers will cause an effect on the morphology of *Pontoscolex corethrurus* Fr.Mull [5]. The importance of the process and role of earthworm physiology for the sustainability of ecosystems, especially organisms in the soil, it is necessary to carry out studies of cocoon production and viability of *Pontoscolex corethrurus*Fr.Mull earthworms at various concentrations of carboxyl insecticides.

2. Materials and Methods

Experiment of *P. corethrurus* Cocoon Production at Various Concentrations of Carbaryl Insecticide

This experiment was carried out according to a Completely Randomized Design, with 6 treatments and 5 repetitions each. The treatments were various concentrations of carboxyl insecticide, which was the same as the treatment at the rate of consumption and efficiency of assimilation. In this experiment 30 plastic pots were used (d = 20 cm, t = 15 cm). Each plastic pot is filled with the original biotope soil as much as ¾ the volume of the plastic pot is 750 grams. Groundwater content in plastic pots ranged from 30-40%, then each plastic pot was added 4 individual *P. earthorrurus* adult earthworms. Adult earthworms with a body weight of 1.70 -2.0 g, clitellum length of 0.4 - 0.6 cm and aged 12-16 weeks. Feed in the form of 100 mg of cow's feces is mixed with a determined concentration of carboxyl insecticide, and stirred. until homogeneous, then placed on the surface of the soil in a plastic pot. which already contains 4 individual earthworm *P. corethrurus*. The plastic pot is covered with black plastic on it [5]. Cocoon produced at each treatment, sorted and observed every two weeks interval by hand sorting method [6]. Cocoon sorting is done by spilling the soil in a pot on top of black plastic, the feed mixed with carboxyl insecticide has been separated before, then the soil is reversed, the cocoon found is taken up and counted. cocoon production trials carried out for 4 months.

Observation of the Earthability of *Pontoscolex corethrurus* Fr.Mull Cocoon at Various Concentrations of Carbaryl Insecticide

The cocoon produced by *Pontoscolex corethrurus*Fr.Mull earthworm from each treatment of carboxyl insecticide concentration was placed in a petri dish (d = 9 cm) that had been dialed with filter paper given sufficient distilled water, then the petri animal was covered with a lid. The cocoon placed on each petri dish was counted, and labeled the petri dish based on the treatment of carboxyl insecticide concentration. Every day the cocoon is seen until the cocoon hatches into juveniles (young worms). The viability of *P.corethrurus* earthworm cocoon was calculated using the formula:

$$\text{Cocoon viability} = \frac{\text{The number of cocoons hatched}}{\text{Total number of cocoons}} \times 100\%$$

Research design

This study used a Completely Randomized Design (CRD), with the treatment of carboxyl insecticide mixed with cow feces as feed for *P. corethrurus* Fr.Mull earthworms. Carbaryl insecticide with a concentration of 0%; 0.1%; 0.2%; 0, 3%; 0.4% and 0.5%. Each treatment was carried out 5 replications. The treatment, referring to the design carried out by researchers [8], is:

Ao = 0% carboxyl insecticide + 100 mg of cow feces
A1 = 0.1% carboxyl insecticide + 100 mg of cow feces
A2 = 0.2% carboxyl insecticide + 100 mg of cow feces
A3 = 0.3% insecticide carbaril + 100 mg cattle feces
A4 = 0.4% carboxyl insecticide + 100 mg of cow feces

A5 = 0.5% carbaryl insecticide + 100 mg of cow feces

.Observation Parameters

The parameters observed in this study were the production of cocoon and viability of the earthworm *Pontoscolecx corethrurus* Fr.Mull.

Data Presentation

Data is presented in tabular form for each observation parameter.

Data analysis

Data obtained from observations were carried out in the Variance Analysis. If there is a real difference then continue with the Duncan New Multiple Range Test (DNMRT) at the α = 5% level.

3. Results and Discussion

Experiment of *P. corethrurus* Cocoon Production at Various Concentrations of Carbaryl Insecticide

The average number of cocoon earthworms of *P. corethrurus* at various concentrations of carboxyl insecticides is listed in Table 1.

Table 1. Average number of P corethrurus cocoons at various concentrations of carboxyl insecticides

No.	Carbaryl Insecticide Concentration (%)	Average number of cocoons (cocoon / individual / week)
1.	0	3,62 ± 0.02 a
2.	0,1	2,12 ± 0.05 b
3.	0,2	1,68 ± 0.03 c
4.	0,3	1,25 ± 0,01 d
5.	0,4	0,93 ± 0.04 e
6.	0,5	0,62 ± 0,06 f

Note: Numbers followed by the same lowercase letters in the column show no significant difference at α = 0.05

In Table 1, the highest average number of cocoons in the treatment of carboxyl concentrations of 0% (control) was 3.62 ± 0.02 cocoons/individual/week, while the lowest average number of *P. corethrurus* in the treatment of carboxyl insecticide concentrations 0.5% ie 0.62 ± 0.06 cocoon/individual/week. The higher the concentration of carbaryl insecticide given to *P. corethrurus*, the lower the amount of cocoon produced by *P. corethrurus*.

The reduced amount of cocoon produced by *P. corethrurus* earthworms, because the carbaryl insecticide contains 1- naphthyl methylcarbamat compounds that can damage the central nervous system, thus affecting the reproductive system. The intensive use of carboxyl insecticides can leave residues, contamination, and poison the environment thereby reducing the population of various non-target animals. The mechanism of action of toxicity can cause the inactivity of the enzyme cholinestrase. This enzyme breaks the neurotransmitter acetylcholine at synapses. Enzyme inhibitory complexes are further decomposed, leaving the enzymes bombarded. Carbamate is a reversible inhibitor of collinerase, because active enzymes can be regenerated from enzyme inhibiting complexes. compound 1- naphthyl methylcarbamate. The reproduction of *P. corethrurus* is strongly influenced by the quality and quantity of feed given. In the form of cattle feces feed mixed with carboxyl insecticide, the quality of the feed will affect the palatability of *P. corethrurus*, which will not affect the amount of cocoon produced. so the earthworm's body weight decreases. This has similar results with different compounds in other researchers, that the decamethrin compound found in synthetic pyrethroid insecticides greatly influences the hormone for growth and production of *P. corethrurus* earthworm cocoon [9]

Based on observations of earthworm cocoon conducted for 20 weeks at various concentrations of carbaric insecticide showed different numbers of cocoons. The highest average number of cocoons in the treatment of carboxyl insecticide concentration of 0% (control) was 72 cocoons, while the lowest average number of cocoons was seen in the treatment of 0.5% karbaril insecticide concentration, namely 13 cocoons. The low number of cocoon produced by *P. corethrurus* earthworms, due to the limited energy possessed by *P. corethrurus* earthworms caused by soil media as feed that has been contaminated by carbaril insecticide The treatment of carboxyl insecticide concentration of 0% is significantly different from the treatment of carboxyl insecticide concentration of 0.1% ; 0.2% and 0.3% were significantly different from carboxyl insecticide concentrations of 0.4% and significantly different from carboxyl insecticide concentrations of 0.5%.

Adult earthworm *P. corethrurus*, more energy in the body is used for cocoon production. Production of *P. corethrurus* earthworm cocoon began to decrease, because its energy was partly used for the process of body tissue growth by *P. corethrurus* earthworm. The production of *P. corethrurus* earthworm cocoon was influenced by temperature and soil water content. Changes in temperature affect the activity of *P. corethrurus* earthworms, including metabolism, growth, reproduction and cocoon production. So it can be said that the earthworm *Pontoscolex corethrurus* Fr.Mull during cocoon production uses more energy in its body and is out of balance with the energy that enters its body [10, 11].

Production of *P. corethrurus* earthworm cocoon decreased due to carboxyl insecticides containing the chemical 1-Napthyl N-methyl-carbamate can affect the central nervous system and peripherals so that disrupting the endocrine system causes damage to the reproductive system, thereby affecting the production of *P. corethrurus*

earthworm cocoon [12]

Carbaryl insecticide belongs to the carbamate insecticide group, inhibits the activity of the enzyme acetylcholinestrase in the somatic and peripheral autonomic nervous system, causing it to affect the sense of taste and smell of earthworms, so that *P. corethrurus* earthworms consume less feed in the form of cow feces mixed with carbohydrate insecticide concentrations [13] . Other researchers also said the growth and production of cocoon was strongly influenced by the quality and quantity of Fr.Mull earthworm *Pontoscolex corethrurus*feed [14].

Observation of Viability of *P. corethrurus* Earthworm Cocoon after Given Various Concentrations of Carbaryl Insecticide

The percentage of the number of hatched cocoons produced by *P. corethrurus* earthworms after being treated with various carboxyl insecticide concentrations, are listed in Table 2

Table 2. Average Cocoon Viability of *P. corethrurus* at Various Concentrations of Carbaryl Insecticides

No.	Carbaryl Insecticide Concentration (%)	Average cocoon viabiltas (%)
1.	0	98,65 ± 2,15 a
2.	0,1	62,57 ± 1,53 b
3.	0,2	54,43 ± 1,75 c
4.	0,3	40,17 ± 1,58 d
5.	0,4	32,10 ± 1,40 e
6.	0,5	18,85 ± 1,19 f

Note: Numbers followed by the same lowercase letters in the column show no significant difference at α = 0.05

Giving carbaryl with different concentrations on the viability *P.corethrurus* earthworm cocoons, are listed in Table 2. Viability earthworm cocoons highest *P.corethrurus* on providing insecticide karbarill 0% ie 98.65 ± 2.15% and the viability of earthworm cocoons *P.corethrurus* the lowest was given 0.5% insecticide which was 18.85 ± 1.19%. Decreased percentage of viability of *P. corethrurus* earthworm cocoon because the resulting cocoon was contaminated with carbaryl insecticide containing carbamate compound, so there was cocoon that did not hatch and did not produce juveniles (young worms) [12]

The results of this study indicate the limited tolerance of *P. corethrurus* to the administration of carbaryl insecticides, because not every cocoon can produce juveniles, except in the treatment with 0% carbaryl concentration almost every cocoon can produce one individual juvenile earthworm P corethrurus. The amount of juvenile produced in each medium is determined by the number of cocoons capable of hatching and the conditions of the media that support the life of Pontoscolex corethrurus.

4. Conclusion

From the results and discussion above, it can be concluded as follows:

1. Cocoon production and viability of P. corthrurus Fr.Mull earthworm cocoon are strongly influenced by carboxyl insecticide concentration.
2. The higher concentration of carboxyl insecticide administered on *P. corethrurus* earthworms causes the lower number of cocoons and the viability of *P. corethrurus* earthworms to be produced.

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