

QUANTITY AND QUALITY OF THE EARTHWORM *LUMBRICUS RUBELLUS* AS RAW FEED VERMICOMPOSTING RESULTS OF BEEF CATTLE FAECES

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ABSTRACT

This research has been conducted in the Laboratory of Microbiology and Animal Waste Management Faculty of Padjadjaran University in Bandung. The purpose of this study was to determine the effect of C / N ratio feces of beef cattle through vermicomposting of quantity and quality of the earthworm *Lumbricus rubellus*. This research is conducted in a laboratory experiment using a complete random design with 3 treatments and 6 times repeated, P1 = C / N ratio 25, P2 = C / N ratio 30 and P3 = C / N ratio 35. To know the effect of treatment, the data obtained were analyzed with a variety of prints and Tukey test. The results showed that treatment be given effect on the quantity (biomass) earthworm *Lumbricus rubellus*, the quantity (biomass) the highest worm *Lumbricus rubellus* obtained in treatment P1 = 337.66 ± 8.89 g, but the treatment given is not have real impact on the quality of earthworms *Lumbricus rubellus* (crude protein content), crude protein content in the earthworm *Lumbricus rubellus* ranged $58.83 \pm 2.04\%$ - $59.17 \pm 2.04\%$

Keywords: C / N ratio, vermicomposting, earthworms (*Lumbricus rubellus*), protein

INTRODUCTION

Bioconversion is a material change from one form into another form involving biological agents. Vermicomposting is the process of organic materials bioconversion including beef cattle feces, a product of earthworm biomass as feed materials and biomass as casting solid organic fertilizer, utilizing organisms activity of earthworms (*Lumbricus rubellus*) and microorganisms. Vermicomposting success is influenced by various factors, the C / N ratio feces of beef cattle (20-40), water content (50-55%), oxygen, temperature (18-29 ° C), pH (6,8-7,2) and content of microorganisms (10^6 / g) and the number of earthworms used. The ratio C / N feces of beef cattle a source of nutrients used by earthworms to grow and develop, it is necessary to the C / N ratio as appropriate.

Source of nutrients will affect the quantity (amount) earthworm biomass and quality (crude protein content of earthworms) are produced. Earthworm biomass increased by 79.5% within 22 days by using the media to grow a cow feces (Waluyo, 1991) The differences increase the body weight of earthworms in vermicomposting period of 2 weeks and 4 weeks is closely related to the media's ability to provide food for earthworms so besides the type and amount of food available will affect large earthworm population, growth rate and fertility of earthworms (Edward and Lofty, 1977). The C / N ratio is the indicator of the availability of nutrients as a medium to grow earthworms. Beef cattle feces has the C / N ratio 18.5, to meet the C / N ratio from 25 to 35 need a material as a source of carbon (C), ie sawdust. The C / N ratio would yield the corresponding earthworm biomass high.

Chemical analysis earthworm contains high nutritional value, with crude fiber 0.2%, fat 9.28%, protein 61.47%, Ca 0.92%, P 1.02% and protein content and amino acid earthworm (*Eisenia foetida*) is a protein composed of 63.43% : 4.16% arginine, 2.85% lysine, 1.22% histidine, 4.81% leucine, 3.04% isoleucine, 3.10% methionine, 0.08 % valine, 2.98% threonine, 2.52% phenylalanine (Waluyo and Hidayat, 1990). According to Catalan (1981) earthworm crude protein from 64 to 72%. According Kangmin (2005) contains an earthworm 70% protein in wet conditions and 10-20% protein in dry conditions, except that earthworms are rich in vitamin A and vitamin B, there are 0.25 mg of vitamin B1 and 2.3 mg of vitamin B2 in 100 g of earthworms.

MATERIALS AND METHODS

Research material used is beef cattle feces, sawdust, earthworms *Lumbricus rubellus*, to analyze the chemical content of crude protein. Observed variables are earthworm biomass (quantity) and crude protein content of earthworms (quality).

The method used in this study is the method in laboratory experiments. The design used is Complete Random Design (RAL) with 3 kinds of treatment that is P1 = C / N ratio 25, P2 = C / N ratio 30, P3 = C / N ratio 35 and repeated 6 times

Vermicomposting procedures and Beef Cattle Faeces and Sawdust:

1. Determination of mixture of beef cattle feces and sawdust by using the following formula:

$$R = \frac{Qf(Cf \times (100 - Mf)) + Qs(Cs \times (100 - Ms))}{Qf(Nf \times (100 - Mf)) + Qs(Ns \times (100 - Ms))}$$

- Description:
- R = C / N ratio materials
 - Qf = weight of the feces of beef cattle (kg)
 - Qs = weight of sawdust (kg)
 - Cf = C content of the feces of beef cattle (%)
 - Cs = C content of the sawdust (%)
 - Nf = N content of feces of beef cattle (%)
 - Ns = N content of sawdust (%)
 - Mf = water content of feces of beef cattle (%)
 - Ms = water content of sawdust (%)

The C / N ratio 25 (1.7 kg of beef cattle feces + 1.3 kg of sawdust), the C / N ratio 30 (1.2 kg of beef cattle feces + 1.8 kg of sawdust), the C / N ratio 35 (0.87 kg of beef cattle feces + 2.13 kg of sawdust)

2. Then the two ingredients until well blended and put into the plastic tub with a size of 25 x 34 x 13 cm for incubation 2 weeks, then added the earthworm *Lumbricus rubellus* age of 1 month of 200 g of each treatment and incubated for 2 weeks
3. After vermicomposting process is finished, done with harvesting earthworms, earthworm biomass weighed (g) generated from each treatment to determine the quantity of earthworms and made a rough analysis of protein content (%) to determine the quality of earthworms

RESULTS AND DISCUSSION

The influence of ratio between C / N of the quantity (biomass) Earthworm *Lumbricus rubellus*

Based on observation and measurement data obtained during the study the average biomass of earthworms *Lumbricus rubellus* is presented on Table 1.

Table 1. Data on average biomass of earthworms *Lumbricus rubellus*.

Treatment	Earthworm biomass (g)
P1	337.66 ± 8.89
P2	332.00 ± 10.12
P3	289.33 ± 9.93

Based on table 1, shows that there are differences in the average biomass of earthworms *Lumbricus rubellus*. P1 treatment produced the highest average, ie 337.66 ± 8.89 g of P2 followed for 332 ± 10.12 g and 289.33 for the lowest P3 ± 9.93 g. To know the size of treatment effect, done various print analysis, based on the results of the print range is known that a real treatment effect ($F_{hit} > F$ table) against the biomass of earthworms *Lumbricus rubellus*, To find the difference between the treatment carried out further tests with Tukey test. (Table 2)

Table 2. Influence Tukey test ratio C / N of the quantity (biomass) Earthworm *Lumbricus rubellus*

Treatment	Average Biomass (g)	0.05 significance
P1	337.66 ± 8.89	a
P2	332.00 ± 10.12	b
P3	289.33 ± 9.93	c

Description: The letters are not just towards the columns indicate significantly different

Based on the Tukey test results, it is known that P1 treatment (337.66 ± 8.89 g) treatment significant with P2 (332 ± 10.12 g), as well as the treatment P3 (289.33 ± 9.93 g). It is expected the C / N 25 ratio is C / N ratio is suitable for the growth of the earthworm *Lumbricus rubellus*, when viewed from mixture composition, the C / N ratio 25 containing more beef cattle feces compared with the C / N ratio 30 and 35, so that the protein is also expected more. Protein is necessary for growing organisms such as the earthworm *Lumbricus rubellus*. This is consistent with the opinion of Catalan (1981) that requires a balance of earthworms in the feed nutrients are consumed, especially the availability of essential nutrients such as proteins, carbohydrates, vitamins and minerals for growth and reproduction. According to Edward and Lofty (1977) states that consume earthworms feed with high protein content will have a weight increase rapidly compared with earthworms consume food with low protein content.

The influence of C / N ratio of Quality (Crude protein content) Earthworm *Lumbricus rubellus*

Based on observation and measurement data obtained during the study average crude protein content of earthworms *Lumbricus rubellus* is presented in table 3

Table 3. Data average crude protein content of earthworms *Lumbricus rubellus*.

Treatment	Crude protein content of the Earthworm (g)
P1	59.17 ± 2.04
P2	59.00 ± 1.55
P3	58.83 ± 2.04

Based on table 3, shows that there is no difference in average yield crude protein content of earthworms *Lumbricus rubellus*. P1 treatment on average produces, ie $59.17 \pm 2.04\%$ followed by P2 and P3 of $59 \pm 1.55\%$ of $58.83 \pm 2.04\%$. To know the size of treatment effect, done various print analysis, based on the results of various prints in mind that no significant treatment effect ($F_{hit} < F$ table) of crude protein content earthworm *Lumbricus rubellus*. It is expected the formation of proteins in the body is affected by consumption of feed material type and age of earthworms, in this study the same type of material that is beef cattle feces and sawdust and the age of earthworms used uniforms, all treatments using earthworm age 1 month, so as not to affect the proteins that form in the body of worms. This is consistent with the opinion Soeparno (1998) which states that the formation of protein in meat is affected by species and age.

CONCLUSION

1. The quantity (biomass) of earthworms *Lumbricus rubellus* highest P1 treatment resulted in the C / N ratio 25 of 337.66 ± 8.89 g.
2. Quality (crude protein content) *Lumbricus rubellus* earthworms produced ranged from $58.83 \pm 2.04\%$ to $59.17 \pm 2.04\%$.

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