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Quality Vermicompost (Content N, P, K) from Beef Cattle Waste Treatment through Integrated

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ABSTRACT: This study aims to determine the effect of C/N ratio from feces of beef cattle and hay on the vermicomposting to quality vermicompost (content of N, P, K) through integrated processing. This study was conducted using Completely Randomized Design (CRD). Treatments were three treatment T1 = C/N ratio 20, T2 = C/N ratio 25, T3 = C/N ratio 30, with each 6 repetitions. Initial decomposition process conducted for 1weeks, vermicomposting process carried out for 2 weeks. Data were analyzed using analysis of variance and to determine the effect of treatments performed Duncan test. The results showed that: the C / N ratio significantly affect the content of N and P in vermicompost, and give effect non significant to K in vermicompost. The C/N ratio 20 produces the best quality vermicompost(N = 3.18%; P = 1.17% and K = 0.85%)

Keywords: beef cattle feces, rice straw, the C/N ratio, vermicompost

INTRODUCTION

Beef cattle are usually fattening cattle, which will produce primary products such as meat and produce waste which is waste products of metabolism such as feces and urine, but it also is residual feed in the form of rice straw. Faeces produced from beef per cow per day some 5-10% of body weight cattle. Fattening beef cattle will result in waste concentrated in one place, it will be a source of contamination, for it is necessary to manage the waste produced from beef cattle fattening.

Beef cattle waste management can be done in various ways, including processing can be done by way of vermicomposting. This processing is the process of decomposition of organic waste that utilizes the activity of earthworms and microorganisms (bacteria and fungi) (Catalan, 1981). There are several factors that must be considered in vermicomposting including C/N ratio substrate to be described, the content of microorganisms, moisture content, pH, temperature, oxygen, density of population. This study used the difference in C/N ratio as a treatment. Vermicomposting will produce vermicompost which can be used as organic fertilizer. Degradation process will run if conditions are good substrates in accordance with the conditions required by earthworms and microorganisms as decomposers of the substrate, and this will affect the quality vermicompost produced. Vermicompost quality indicators include Nitrogen (N), phosphorus (P_2O_5) and potassium (K_2O).

Nitrogen (N) in vermicompost derived from the overhaul of organic material rich in N an dexcretion mixed with soil microbes in the digestive system of earthworms (Lee, 1985); According to Stofella and Kahn (2001) states that when earthworms digest organic materials decrease the amount of carbon in the substrate, while the amount ofnitrogenis onlya slight change.

The content of phosphorus (P_2O_5) in vermicompost is in line with the number N of the vermicompost. According to Kahn (2001) stated that during vermicomposting lasts microorganisms whose role will issue a phosphatase enzyme that spurs organic P mineralization. The greater

Nitrogen phosphorus contained in the multiplication of microorganisms that remodel will increase, so that the phosphorus content in vermicompost will also increase.

Potassium is nota mineral directly in the formation of organic matter, potassium plays a role only helps the formation of proteins and carbohydrates. Microorganisms utilizing potassiumin the substrate as a catalyst, bacterial activity will greatly affect potassium content. Potassium tied up and kept in a cell by bacteria and fungi, if decomposed back then potassium will be available again (Kahn, 2001).

According to SNI: 19-7030-2004 minimum standards of quality compost containing nitrogen (N) 0.40%, Phosphor (P_2O_5) 0.10% and Potassium (K_2O) 0.2%

MATERIAL AND METHODS

The research materials used were beef cattle feces, rice straw, chemicals to analyze the content of nitrogen (N), phosphorus (P_2O_5) and potassium (K_2O).

The method used in this study is the experimental method in the laboratory. This research is completely randomized design (CRD) with three kinds of treatment, i.e T1=C/N ratio 20, T2=C/N ratio 25 and T3=C/N ratio of 30 and repeated 6 times. Variables measured are Nitrogen (N), phosphorus (P_2O_5) and potassium (K_2O), invermicompost. To determine the effect of treatment, the data were analyzed with ANOVA and Duncan test.

Procedures of Vermicomposting In Beef Cattle Feces and Rice straw:

1. Determination of faecal beef mixture and rice straw according to treatment (C/N ratio 20, C/N ratio 25, and C/N ratio 30) as the substrate material
2. Then the two ingredients were thoroughly mixed and incubated for 1 week (initial degradation)
3. After the initial degradation process is complete, the substrate incubated for 24 hours, for the preparation of vermicomposting
4. Preparation of earthworms (Lumbricusrubellus), weighed according to the needs that have been established
5. Then the earthworm (Lumbricusrubellus) put in the stocking on a substrate which has been prepared, and incubated for two weeks (vermicomposting)
6. After vermicomposting was completed, an analysis on Nitrogen (N), phosphorus (P2O5) and Potassium (K2O) invermicompost was conducted.

RESULTS AND DISCUSSION

The average contents of total N, P_2O_5 and K_2O vermicompost on a variety of treatments was shown in Table1.

Table1. The content of total N, P_2O_5 and K_2O vermicompost at Various Treatment C/N ratio

Treatment	Content (%)		
	N	P^2O^5	K^2O
T1	3.18a	1.1a	0.85a
T2	2.84b	0.83b	0.9a
T3	2.58c	0.6c	1.0a

Description: T1=C/N ratio 20; T2=C/N ratio 25; T3=C/N ratio 30

The same letter indicates no significant difference (P>0.05)

In Table 1 it appears that the total N content of vermicompost ranging from 2.58 to 3.18%, P_2O_5 content ranged from 0.6 to 1.1%, and K_2O content ranged from 0.85 to 1.0% average of the total N content, and P_2O_5, in each treatment showed significant differences ($P < 0.05$), and K_2O contents in each treatment did not show significant differences.

N content in the substrate T1 (C / N ratio 20) is higher than T3 (C / N ratio 30), the result vermicomposting N content in vermicompost at T1 (C / N ratio 20) was also higher, it is alleged that vermicomposting is determined by the quality of the initial substrate and the activity of microorganisms and earthworms (Lumbricusrubellus) as decomposer. This is in line with (Lee, 1985) which states that the content of nitrogen (N) in vermicompost derived from the overhaul of organic material rich in N and excretion mixed with soil microbes in the digestive system of an earthworm. Strengthened also by Stofella and Kahn (2001) which states that when earthworms digest organic material decline in the number of carbon in the substrate, while the amount of nitrogen is only a slight change.

The content of P_2O_5 in treatment (T1) C / N ratio 20 was significantly higher compared to treatment T2 C / N ratio 25 and T3 C / N ratio 30. This is presumably because the content (P_2O_5) in vermicompost related to N content in the substrate. The greater the nitrogen content, the multiplication of microorganisms that remodel phosphorus will increase, so that the phosphorus content in vermicompost also increased. The content of phosphorus in the substrate will be used by the majority of microorganisms to build cell. Overhaul of organic matter and phosphorus assimilation process occurs because of the phosphatase enzyme produced by most microorganisms. This condition is in line with Kahn (2001) which states that during vermicomposting lasts microorganisms that act will issue a phosphatase enzyme that spurs organic P mineralization. The more nitrogen contained in the multiplication of phosphorus by microorganisms that remodel will increase, resulting in the increase of phosphorus content in vermicompost.

The content of K_2O in vermicompost at T1 (C / N ratio 20) = 0.85%; T2 (C / N ratio 25) 0.9% and T3 (C / Nratio 30) 1.0%, did not show significant differences in each treatment. Potassium content in vermicompost derived from the content of potassium in the substrate, although the potassium content of each treatment is different, but the presence of potassium in the vermicompost did not show significant differences, it is suspected due to potassium in the substrate utilized by microorganisms in the metabolism of growth will then affect the activity of microorganisms in degrading organic material. This is in line with Kahn (2001) which states that the mineral potassium is not directly in the formation of organic matter, potassium plays a role only helps the formation of proteins and carbohydrates. Potassium utilizing microorganisms in the substrate as a catalyst, bacterial activity will greatly affect the increase in the potassium content. Potassium tied up and kept in a cell by bacteria and fungi, if decomposed back then potassium will be available again. Research, quality vermicompost (vermicompost total N content ranged from 2.58 to 3.18%, P_2O_5 content ranged from 0.6 to 1.1%, and K_2O content ranged from 0.85 to 1.0%, according to the Indonesian standards (SNI), a quality compost should be minimal containing nitrogen (N) 0.40%, Phosphor (P_2O_5) 0.10% and Potassium(K_2O) 0.2%.

CONCLUSION

The C/N ratio 20 produces the best quality vermicompost (N = 3.18%; P_2O_5 = 1.17% and K_2O = 0.85%)

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