

The Influence of Bioactivator Cattle Feces Against The Length of Composting and C/N Ratio from Three Kind of Organic Material

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Abstract— Research of the influence of bio-activator cattle feces against the length of composting and C/N ratio has been done. The purpose of the research was to (1) learn the gift of cattle feces as a compost bio-activator on some materials to accelerate the composting and C/N ratio (2) Determine the best of bio-activator livestock feces in composting process. Research carried out for 8 weeks from April-June 2013. Making compost is done at home composting Agricultural Polytechnic of Payakumbuh, and chemical analysis in Soil Laboratory Andalas University. This study used a factorial 3 x 4 drawn up according to the full Random Design with three replicates. Research on using straw (A1), azoles (A2) and water hyacinth (A3) as a raw material for compost. The second factor: without feces (B1), cow feces (B2), goat feces (B3), and chicken feces (B4) as bio-activator. The observation parameter consists of a long composting and C/N ratio. The results showed that bio-activator cattle feces can accelerate composting and lowering the ratio C/N compost. The best bio-activator to accelerate composting and lowering the C/N of compost is the cow feces.

Keywords— Bio-activator, cattle feces, length of composting, C/N ratio.

I. INTRODUCTION

Compost is the end result of a fermentation process of organic material that is characterized by a lower C/N ratio than the raw material. References [1] states that any organic material that will be composted has certain characteristics that are useful to support the composting process, especially carbon © and nitrogen (N) content, where C and N levels will determine the biological activity of microorganisms. According to ref [2] an ideal material for composting have C/N ratio about 30–40, because in this ratio, the microorganisms get enough carbon for energy and nitrogen for protein synthesis. If the organic material has a high C/N ratio, the activity of microorganisms will be reduced and the process of decomposition of organic materials will be slow. According to ref [3] a high C/N ratio is indicating that organic matter is immature and still will have the process of decomposition by microorganism.

The decomposition process of organic materials requires certain environmental conditions, especially temperature and humidity factors. Optimal temperature for composting ranged 45-65 0C, this temperature range will ripen compost within 4-6 weeks. The decomposition rate of organic material also depends on the nature of the material to be

composted. The nature of plant material includes plant species, age, and chemical composition of plants. The younger age of the plant, the decomposition process will take over quick. It is caused the water levels are still high, the nitrogen content is high, C/N ratio is small and low lignin content [4].

Plants can absorb nutrients of organic materials results overhaul, if the compost in a mature state of the indicator C/N ratio between 5-20 [5]; [3], and the results [6] the compost is ready used, have C/N ratio equal to the ratio of C/N soil that is 10-12.

Compost plays a role in improving the physical, chemical and biological properties of soil. The physics compost role is to improve the porosity and aeration; power save water and reduce erosion (as mulch). The role of chemical compost (1) provider of macro nutrients (N, P, K, Ca, Mg, and S) and micronutrients (Zn, Zu, CO, Mo, Mn, and Fe), (2) increase the soil CEC and (3) can compounds form complexes with metal ions (Al and Fe) that toxic the plants. The biological role is as a source of energy and food soil organisms so that, it can increase the activity of soil microorganisms. Microorganism makes the nutrients that available in the soil mineralized to become available to plants [7]; [8].

Some organic materials that can be composted in this study include straw, Azoles, and water hyacinth. According to [9] the straw giving 20 t ha⁻¹ equivalent to 112 kg Urea, 203 kg TSP and 162 kg KCL. Similarly [10]; [11] reported that the use of azoles in rice cultivation can reduce the use of Urea at 150 kg ha⁻¹ (50%) with higher rice yields than the use of Urea as recommended. The results of chemical analysis of the water hyacinth plant derived nutrient N 1.46%, P 0.84%, C 13.6%, and improve biological nutrient N plants [11] ; [12].

The purpose of the research were to (1) study the influence of bio-activator cattle feces against the length of composting and C/N ratio of compost and (2) obtain the best type of feces as a bio-activator in composting process.

II. MATERIALS AND METHODS

Research carried out in the home composting of Agricultural Polytechnic of Payakumbuh and Soil Laboratory Andalas University Padang from April to June 2013. The materials composed of straw, azoles, hyacinth, cow feces, goat feces, chicken feces, and chemical analysis materials. The tools that were used are scales, oven, thermometer, equipment – laboratory instruments, basin and a plastic bucket.

This study used 3x4 factorial experiment arranged in completely randomized design with three replications. The first factor is the compost raw material: straw (A1), azoles (A2), water hyacinth (A3). The second factor is the activator in the feces of cattle given: without feces (B1), cattle feces (B2), goat feces (B3), chicken feces (B4).

Each material is cut with the approaching size of azoles, and cattle feces mixed with a ratio of 5: 3 (based on the dry weight of the material) and a total of 100 kg of the mixture. Mixed materials incorporated into the content of the compost bag 50 kg (each 2 bags). Cultivated compost moisture ranged between 40-60%. Reversal of compost is done once a week until the compost is mature for 8 weeks.

The parameters measured were: the length of composting (composting speed) as well as nutrient analysis of C-org and N, so that the C/N ratio got.

III. RESULTS AND DISCUSSION

Provision of cattle feces bio-activator can affect the length of composting. In table 1 are presented the length of composting from bio-activator livestock feces on three types of organic materials used as compost material.

In table 1 shows that the composting of organic material (straw, azoles, and water hyacinth) with a bio-activator cattle feces faster compared with the treatment without bio-activator composting feces. Older cattle feces composting bio-activator ranged from 20-53 days, whereas without bio-activator composting of livestock feces ranged from 40-56 days. Not the addition of compost bio-activator to materials will slow down the composting process. This is due to the fewer number of microbial decomposers those only microbes from the air and the compost material. References [13] states the composting process takes a long time if you do not use the activator. Basically compost materials (straw, azoles, and water hyacinth) are taken from their natural habitat also contains microbes that come from the

environment, but with the addition of animal feces can be assumed to increase the microbial population, so that the composting process is faster.

TABLE I
DURATION OF COMPOSTING WITH THE CATTLE FECES BIO-ACTIVATOR GIVEN OF THREE DIFFERENT TYPES OF ORGANIC MATERIALS

Treatment	Duration of composting (day)
A1B1 (straw without feces)	56
A1B2 (straw + cow feces)	42
A1B3 (straw + goat feces)	50
A1B4 (straw + chicken feces)	50
A2B1 (azoles without feces)	40
A2B2 (azoles + cow feces)	20
A2B3 (azoles + goat feces)	28
A2B4 (azoles + chicken feces)	25
A3B1 (water hyacinth without feces)	56
A3B2 (water hyacinth + cow feces)	40
A3B3 (water hyacinth + goat feces)	53
A3B4 (water hyacinth + chicken feces)	45

Based on the observation against the length of composting are presented in Table 1 shows that the most rapid composting for the three kinds of raw materials of different compost bio-activator that is composting with cow feces, with the length of composting ranged from 20–42 days, followed by composting bio-activator that using chicken feces 25–50 days, and bio-activator goat feces ranged from 28–53 days. More rapid composting with cow feces bio-activator due to the nature of the cow feces are easily biodegradable, so it will be easier for microbes to turn it into nutrients that will serve as a energy source. This is consistent with the results of the study [14] who found that giving cow feces activator significantly affect to the length of composting with the best composting time that is 6 weeks.

Chicken and goat feces tend to be longer to decompose due to the heat, so that microbes can live in feces is assumed only microbes that are resistant to high temperatures. This is consistent with the results of the research [15] which states that microbial decomposers, such as bacteria tend to be a lot of life at the optimum temperature ranging between 55–65oC . Therefore, from the three types of animal feces that used as bio-activator, the best bio-activator to accelerate composting is cow feces.

C/N ratio compost is a key indicator in assessing compost maturity level, the more mature compost; the C/N ratio would be lower. According [15] C/N ratio is the ratio between the percentage of carbon (C) and Nitrogen (N). The principle of composting is for reducing small C / N ratio of organic material to nearly the same as the C/N soil. C/N ratio of three types of compost with different raw materials as a result of the provision of bio-activator cattle feces are presented in Table 2.

Generally, the ratio C/N compost straw, water hyacinth + Azoles bio-activator and feces (Table 2) is lower than without the bio-activator feces, which ranged from 12.69 to 27.09, while the C/N ratio compost bio-activator without feces ranged between 26.61 until 36.51. Bio-activator is a substance containing enzymes humic acids and microbes that could accelerate the composting process. Not result in the addition of bio-activator to the addition of microbes during composting, so the decomposition process becomes

slow and the C/N ratio is high. According [3] C/N ratio is high indicating that organic matter is immature and still will experience the process of decomposition by microorganisms that produce heat.

TABLE II
CONTENT OF ORGANIC C, N, AND C/N RATIO OF CATTLE FECES COMPOST BY PROVIDING THREE DIFFERENT TYPES OF ORGANIC MATERIALS TREATMENT

Treatment	C org	N	C/N Rat
A1B1 (straw without feces)	43,40	1,23	35,28
A1B2 (straw + cow feces)	31,11	1,38	22,54
A1B3 (straw + goat feces)	38,55	1,46	26,40
A1B4 (straw + chicken feces)	38,31	1,42	26,98
A2B1 (azoles without feces)	35,93	1,35	26,61
A2B2 (azoles + cow feces)	19,41	1,53	12,69
A2B3 (azoles + goat feces)	24,67	1,67	14,77
A2B4 (azoles + chicken feces)	22,33	1,68	13,29
A3B1 (w. hyacinth without feces)	47,10	1,29	36,51
A3B2 (w. hyacinth + cow feces)	29,77	1,37	21,73
A3B3 (w. hyacinth + goat feces)	40,36	1,49	27,09
A3B4 (w. hyacinth + chicken feces)	34,35	1,44	23,85

Description: The content of C org and N is very high

The results of chemical analysis of the straw, Azoles, and water hyacinth showed C/N feedstock hay early for 38.63 to 26.74 and 63.00 to Azoles water hyacinth. The addition in composting of livestock feces lower C/N ratio, due to the contribution of nutrients from livestock feces and microorganisms that help decomposition process. In the immature organic matter, microorganisms take N from the organic material, as a result of N is reduced and the C/N ratio is high. Affirmed by [16] that the decomposition of N, P and K in the compost materials can be fast if the comparison between C-organic, N, P, and K in the raw material that decomposes equivalent to 30 : 1 : 1 : 0 : 0,5.

In principle, the addition of compost bio-activator is same of increasing the number of microbial populations into compost. Microbes found in bio-activator will elaborate compost materials into simpler compounds such as lignin, proteins and other compounds. Furthermore, these simple compounds will be parsed again thus releasing elements such as C, N, P and K and these elements are utilized by microbes for their needs. After the decomposition process is complete, the microbes will die and microbial nutrient constituent body will be released. According to [17] at this stage the levels of C/N will be lower because the carbon converted to that CO₂ and evaporate into the air. References [18] stated during the process of composting part of the carbon is released in the form of simple sugars which is taken by microbe, some residual carbon is released into the environment in the form of CO₂, so that the C content of the material is down and makes the C/N ratio is reduced.

In Table 2, compost material that has a high lignin content such as straw, the ratio of C/N lows found in the treatment of cattle feces composting bio-activator that is 22.54 + bio-activator followed by straw goat feces with C/N ratio 26.40 and straw + feces chicken 26.98. Lignin is a structural polymer of vascular stiffness phenyl propane in plants and plant cell wall fiber binds. Furthermore, lignin is degraded by microorganisms into carbon dioxide and water humus, humus serves as a basic ion exchange and is capable of storing and releasing nutrients around the plant [19]. The same phenomenon is also found in the compost feedstock and Azoles water hyacinth. Based on these data, it was

concluded that cow feces is the best bio-activator to lower the C/N ratio of compost. The cow feces are biodegradable because it has a softer structure than the feces of goats and chickens, which can be directly used by the microbes to their needs. In addition, the faster decomposition of compost material, the compost temperature will quickly stabilize so that will be more the live microbes.

Decrease in C/N ratio of compost due bio-activator administration cannot be separated from the fast or slow the composting process takes place. Giving bio-activator can accelerate the composting process, so that the C/N ratio decreased and can meet the criteria of the [19]. In figure 1 it appears that compost bio-activator feces of cattle fed faster decay and has a C/N ratio is lower than that was formed without compost bio-activator. In addition, the three types of material compost bio-activator can be looked that compost with cow feces faster decay and also has a C/N ratio is lower than the goat bio-activator compost and chicken feces. These figures further strengthen that the provision of bio-activator those cattle feces can accelerate the composting process and lower the C/N ratio of compost with the best bio-activator is cow feces [20].

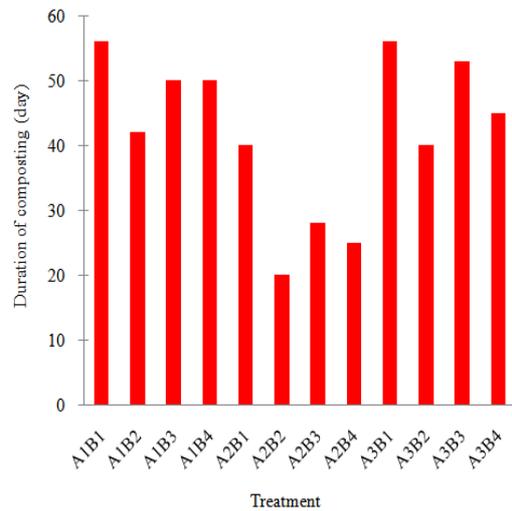


Fig. 1 The length of composting compost bio-activator as a result of giving the feces of cattle on C three different types of organic materials.

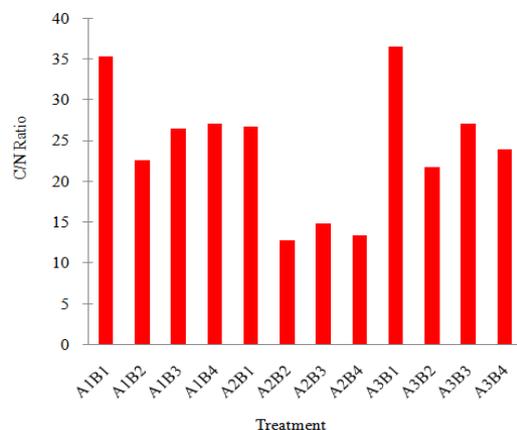


Fig. 2 The ratio C/N compost bio-activator as a result of giving the feces of cattle on three different types of organic materials

IV. CONCLUSIONS

Based on the experimental results it can be concluded that the giving of bio-activator can accelerate the composting of livestock feces and lower C/N ratio. Cow feces as bio-activator give the best results than chicken and goat feces.

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