Local Microorganism From “Tape” (Fermented Cassava) In Composition and Its Effect on Physical, Chemical And Biological Quality

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Submission date: 19-Feb-2021 02:25PM (UTC+0700)
Submission ID: 1512925551
File name: Indasah_2020_IOP_Conf._Ser.__Earth_Environ._Sci._519_012003.pdf (650.28K)
Word count: 6578
Character count: 34216

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Abstract. The purpose of this study is to identify the potential of microbes, physical, chemical, biological qualities. Local Microorganism Solution (MOL) from *tape* (Fermented Cassava) as composting bio-activator and physical, chemical, biological quality. Compost based on concentration and fermentation time. The design of this study used true experiments with factorial patterns of randomized block designs. The first factor was *tape* (Fermented Cassava) concentration which consisted of 100 grams; 150 gram; and 250 grams. The second factor was the fermentation time consists of 10 days and 20 days. The parameters observed were: biological, physical and chemical quality of local microorganisms and compost. Physical quality included, temperature, color and odor, biological quality which included the total population of bacteria and fungi. Chemical quality included pH, total-N content, total-P, K, C-organic and C / N ratio. Data were analyzed using ANOVA. The results of this study indicated that the microorganism of the mole solution of *tape* (Fermented Cassava) was Saccharomyces sp. as much as 9.6 x 105. The highest total bacterial population in the *tape* (Fermented Cassava) treatment was with a concentration of 250 grams for 20 days, while compost was found in the treatment of 250 grams for 20 days, which is 1x102. The highest degree of acidity in the same mole and compost solution is found in the treatment of 250 grams for 20 days. The results of this study fermentation process occur due to microbial activity, especially bacteria in remodeling the ingredients contained in MOL solution. Changes that occur in the fermentation process include changes in color and odor. For chemical changes showed that the best solution quality for Mol solutions is (N-total 0.99%), (P-0.33 mg kg-1), (K 0.71), (C-organic 7.56), (C / N 12), meanwhile for compost (N-total 0.38%), (P-0.20 mg kg-1), (K 0.208), (C-organic 7.50), (C / N 35).

1 Introduction

Waste is a material that is not useful, not used or material that is wasted as a residue from a process (Moerdjoko S, 2002). Waste is usually in the form of solids or half solids known as wet or dry rubbish. The amount of waste component that can be decomposed is a potential resource as a source of humus, nutrients macro and micro, and as a soil conditioner. Waste can also be a limiting factor due to the content of heavy metals, organic compounds toxic and pathogenic, composting can reduce the influence of toxic organic compounds and pathogens on the environment (Yuwono, 2006). One of the effective handling of organic waste is to process it as organic fertilizer.

Modern technology that has a high dependence on agrochemicals, such as chemical fertilizers, pesticides and other agricultural chemicals is more attractive to farmers than implementing environmentally friendly agriculture (Sutanto, 2002). The tendency for the use of chemical fertilizers cannot continue due to the scarcity of these fertilizer raw materials (Budiasa, 2011). Given the increasingly high price of fertilizers and the large implications for the preservation of ecosystems, the use of artificial fertilizers has begun to be compensated for by the use of cheaper alternative fertilizers and their impact on environmental degradation is much smaller (Yuwono, 2008)

Utilization of organic fertilizer derived from local microorganisms (MOL) is an alternative supply of nutrients in the soil and as a source of microorganisms that can help provide nutrients. Another function is to help the decomposition of organic matter, and as a bio-pesticide, which is why the use of organic fertilizers can reduce the use of inorganic fertilizers (Kusuma. N.W., 2010). The use of MOL in the supply of nutrients is very easy, inexpensive, and efficient because it uses materials that come from the surrounding environment that are often found and generally in the form of waste such as tofu waste, and the manufacturing process is very simple.

Compost comes from the rest of organic material, both from plants, animals, and organic waste that has undergone decomposition or fermentation. Types of plants that are often used for compost include straw, rice husks, separating midribs, weeds, rotten vegetables, corn crop residues, and coconut coir. Meanwhile, materials from livestock that are often used for compost include livestock manure, urine, wasted animal feed, and biogas liquid (Hadisuwito, 2007).

The composting process requires an activator as a decomposer in the process of decomposition of complex organic matter carried out by microorganisms so that it becomes simple organic material which then undergoes mineralization so that it becomes available in the form of minerals that can be absorbed by plants or other organisms. (Viegas, Faria, Santos, Carolino, & Sabino, 1990).

In simple terms, composting is the process of decomposing biologically complex organic matter by a consortium of microorganisms by producing simple and relatively stable organic material that resembles humus in controlled conditions. Composting technology has evolved greatly, from open systems to closed systems using air injection. The reactors used for the composting process are also varied, such as the horizontal reactor, etc., but the basic principles are the same. (Agroecotechnology, Agriculture & Udayana, 2015)

The parameters that influence the composting process are the C / N ratio, moisture content, oxygen concentration, temperature, pH, etc. of the raw material that will be composted. The ratio between Carbon and Nitrogen (the ideal C / N ratio is between 20-40 to 1/30 to 1 which is the best ratio.

Local microorganisms (MOL) are microorganisms that are used as a starter in the manufacture of solid organic fertilizer and liquid fertilizer. The main ingredient of MOL consists of several components, namely carbohydrates, glucose, and sources of microorganisms. The basic ingredients for fermentation of MOL solutions can come from agricultural products, plantations, or household organic waste. Carbohydrates as a source of nutrients for microorganisms can be obtained from organic waste such as rice water, cassava, wheat, elephant grass, and gamal leaves. The source of glucose comes from liquid brown sugar, granulated sugar, and coconut water, and the source of microorganisms comes from rotten fruit fruit, shrimp paste, snails, stale rice, and cow urine. Another advantage of MOL is that it does not require large costs and is very cheap because it uses materials that are easily obtained around us and makes it very easy. (Sahwan, 2010)

(Vegetables, 2015). Local microorganisms (MOL) are one of the decomposers that can be used to decompose and are one of the fast growing decomposers in the current organic farming system. Research on MOL is needed in order to produce scientific work that can be applied as appropriate technology for farmers and to implement organic farming systems to create quality and healthy agricultural products and create sustainable agriculture.

The more microorganisms in the material, the faster the process of decomposition of organic matter or composting. MOL functions as the main ingredient to accelerate the composting of organic material

into compost. The content of bacteria in MOL can be used as a starter making compost, biological fertilizers, and even organic pesticides. The use of organic fertilizer combined with MOL can save the use of chemical fertilizer up to 400 kg per planting season in 1 ha of rice fields. The manufacturing time is relatively short and how to make it is also easy. In addition, MOL is also environmentally friendly (Panudju. T.I, 2011).

Tape (Fermented Cassava) is one of the foods that contain nutrients and / or chemical elements that can be converted into nutrients by the body whose nutritional status can be of poor, poor, good, and more nutrition (Almatsier S, 2006). The tape is obtained from the fermentation process is the oxidation reaction of organic compounds in rice, sticky rice, and yam with yeast tape (saccharomyces cereviciae). The main content of these organic compounds is carbohydrates (starch or polysaccharides). Carbohydrates (glucose) as essential substances needed by the body and vice versa in excess amounts are also not good for body health. The same thing when sugar is fermented into alcohol, which in sufficient amounts can dissolve body fat but in excess is not very good for the body so alcohol is considered toxic or poison. (Maula & K, 2016) Research on reducing sugar levels was carried out in an analysis of glutinous rice tape with varying amounts of saccharomyces cerevisiae and at various fermentation times. The results obtained decrease in reducing sugar levels during fermentation and at one time the maximum levels of fermentation are obtained which are analyzed with the optimum levels obtained on one day of fermentation. Data were analyzed using factorial designs. The results show that the time of fermentation and the amount of yeast added affects the reducing sugar content (Herminingsih, DS., Usreg Sri Handajani, 1998)

2 Research Methods

2.1 Place and time

This research was conducted in May 2017 to August 2017. The research site was at STIKes Surya Mitra Husada Kediri environmental health laboratory, Kediri City regional health laboratory, MIPA Biology laboratory and Soil University Laboratory, Malang.

2.2 Tools and materials

The tools used were plastic bottles, scales, jerry cans, knives, Erlenmeyers, measuring cups, test tubes, pipettes, pH meters, shaker machines, petridish, beaker glass, saucers, Bunsen lamps, stoves, ovens, autoclaves, Kjeldahl pumpkins, digesters and laminar air flow cabinet.

The materials used in this study were *Tape (Fermented Cassava)* or peuyeum, brown sugar, granulated sugar, water, aluminum paper, plastic hose, alcohol, Potato Dextrose Agar (PDA) media, Nutrient Agar (NA) media, physiological saline solution (0.85%), chemicals for analysis of N-total content by the Kjedhal method and P-content analysis available by the Bray 1 method.

2.3 Treatment and Research Design

The research design used was True Experimental. By mixing 1 tbsp *Tape (Fermented Cassava)* with well water 1.5 liter bottled. Then put in brown sugar and white sugar as much as 5 tablespoons. Shake until the solution was mixed. Let stand for 10-20 days. This study used a factorial randomized block design (RBD) that was, *Tape (Fermented Cassava)* concentration which consisted of:

a. K1 (100 grams of tape + 1 L of well water + 100 grams of brown sugar)
b. K2 (150 grams of tape + 1 L of well water + 100 grams of brown sugar)
c. K3 (250 grams of tape + 1 L of well water + 100 grams of brown sugar)

While the second factor was fermentation time which consisted of:

a. F1 (10-day fermentation)
b. F2 (20 days fermentation)

2.4 Observation Parameters

Retrieval of data to be carried out in this study was to determine some of the parameters observed, namely the biological properties of MOL solutions include: the total population of bacteria and fungi

using the pour cup method. The chemical properties of MOL solutions included pH, N, P, K, C, C / N. The physical properties of MOL solutions included the smell and color of MOL.

2.5 MOL quality data was analyzed using:

1) MOL (pH) reaction was determined by extraction method in a ratio of 1: 2.5 and measured with a pH meter electrode.
2) C-Organic was determined based on the Walkley and Black method, measured using a Spectrophotometer.
3) C / N ratio was obtained by comparing between organic C and total N
4) The total Nitrogen element was determined based on the Kjeldah distillation method, with the final stage titration using 0.02 N HCL.
5) The available P and K elements were determined based on the Morgan method

3 Results And Discussion

3.1 Physical characteristics

a. MOL solution

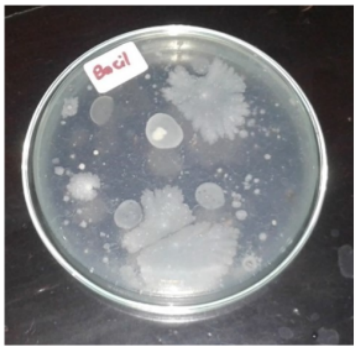
The fermentation process occurs due to microbial activity, especially bacteria in remodeling the ingredients contained in the MOL solution. Type of microorganism Saccharomyces sp. Changes that occur in the fermentation process include changes in color and odor. The average color of MOL solution before fermentation is white, yellow and after fermentation the color of MOL solution turns blackish brown. The smell of MOL before fermentation smells sweet, after fermentation turns into a very sour smell. That is because the ingredients contained in the MOL solution (*Tape (Fermented Cassava)*, brown sugar, and water) have undergone an overhaul that affects the physical results of the MOL solution such as color and odor. (Arief, R.W., 2011) states, microorganisms break down carbohydrate compounds into simple compounds in the form of water, carbon dioxide, alcohol, and organic acids.

b. Compost

Mature compost that is harvested after processing for 10 days to 20 days has no significant change. Physically (texture, color, smell). Appearance of compost using MOL has a smooth and soft texture with black ground warns. From the quad just a different odor the longer the smell does not compost.

3.2. Biological properties

a. MOL solution



The results showed that the quality of compost using bio-activator *Tape (Fermented Cassava)*, with different concentrations showed that the highest total microbial population was found in the 20 day fermentation tape treatment with a concentration of 250 grams with a total of 8 x 102 bacteria.

The results of the total bacterial population MOL solution, tape has increased in the fermentation results, the longer the fermentation of the total bacterial population growth is increasing. Nitrogen source greatly influences the pattern of fermentation, microorganisms will be able to grow quickly in the presence of nitrogen and some require absolute nitrogen (Riadi, 2007).

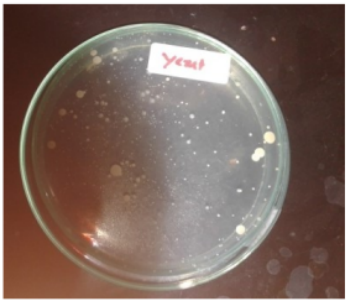
Sample type	Time	
	10 days	20 days
T1 (100 gr)	$6{,}2 \times 10^4$	$3{,}1 \times 10^4$
T2 (150 gr)	$8{,}8 \times 10^4$	$4{,}3 \times 10^4$
T3 (250 gr)	$7{,}3 \times 10^5$	$9{,}6 \times 10^5$

The results of compost quality research using bioactivator *Tape (Fermented Cassava)* with fermentation of 10 days with different concentrations showed the highest total bacterial population results in the treatment of tape with a concentration of 250 grams with a total of 7.3 x 105 bacteria.

The results of compost quality research using bio-activator *Tape (Fermented Cassava)* with fermentation of 20 days with different concentrations showed the highest total bacterial population results in the treatment of tape with a concentration of 250 grams with a total of 9.6 x 105 bacteria.

b. Compost
The results showed that the quality of compost using bio-activator *Tape (Fermented Cassava)*, with different concentrations showed different results.

Bacterial isolation obtained from this study came from **bio-activator *Tape (Fermented Cassava*** and Observation of Morphological Colony Bacteria obtained from this study derived from Bioactivator Tape obtained Saccharomyces sp. as many as 8.7 x 103 isolates



Sample type	Time	
	10 days	20 days
T1 (100 gr)	1×10^2	3×10^2
T2 (150 gr)	1×10^2	5×10^2
T3 (250 gr)	2×10^2	8×10^2

Bacteria Total Population The results showed the effect of concentration and fermentation time showed the results had no significant effect on the total bacterial population quality of MOL solution, seen in the research results showed the highest results of total bacterial population in compost were found in the treatment of 250 grams of fermentation Tape 20 days, 8 x 102 and the lowest is in the treatment of cassava 150 grams of 10-day fermentation that is 1x102. The results of the total bacterial population MOL solution, cassava tape, increased in fermentation results, the longer the fermentation of the total bacterial population growth grew.

According to (Suwastika, A.A.N.G., NN. Doniari., 2012), interactions that occur between living bodies are very diverse. Many interactions occur between various species that affect each other's growth and ability to live. In ecosystems, competition takes place to obtain nutrients, space, oxygen, and other essential substances.

3.3. Chemical properties
a. Acidity (pH)
• Mole Solution

Bacteria have an optimum pH of growth in the range of 6.5-7.5 while yeast or fungus in the range of 4.5-5.5 (Rintis, 2010). The degree of acidity of the product is closely related to the production of organic acids by microbes especially lactic acid which can reduce pH to 5.0 or less. Lactic acid is an acid which is classified as weak and can dissociate by releasing hydrogen ions. The release of hydrogen ions will be able to change the balance of the solution so that the pH is low (Jay, 1992). According to (Aryanta, 2007), with low pH conditions, lactic acid bacteria will dominate growth in the media. (Seni, 2013), states that during the regression phase in acidic conditions, decomposition of organic acids and dissolved nitrogen compounds to form ammonium, carbonic acid, and a small portion of CO2, N2, CH4, and H2 so that the pH will then rise again.

Sample type	TIME	
	10 days	20 days
T1 (100 gr)	7,6	7,1
T2 (150 gr)	7,8	7,1
T3 (250 gr)	7,4	6,9

The results of the pH compost using bio-activator with 10 days fermentation showed that the optimum pH was found in the 250 gram treatment.

The results of compost pH studies using bio-activators with 20 days of fermentation showed that the optimum pH of pH was found in the 250 gram treatment.

Changes in compost pH begin with a slightly acidic pH due to the formation of simple organic acids, then the pH rises on further incubation due to protein degradation and the release of ammonia (Kacang et al., 2012).

The decrease in pH at some time after fermentation is a result of the activity of microorganisms in breaking down organic matter in MOL, which produces H + ions (Iqbal, 2008).

• Compost

The results showed that the concentration and duration of fermentation had no significant effect on the highest compost pH found in the 250 gram fermentation tape treatment of 20 days which was 3.00.

The lowest physical grade results were found on the 250 gram tape treatment on the 10th day which was 5.96. The pH value of MOL decreases until fermentation for 20 days and although it shows a tendency to increase, it is not significantly different from the decrease in pH at the beginning of fermentation due to the activity of microorganisms in breaking down organic matter in MOL

b. Temperature

The increase in temperature has to do with the activity of microorganisms in de-composing organic matter, which produces energy in the form of heat, CO2 and water vapor. The heat produced by the fermentation process is related to the growth curve of microorganisms (Fardiaz, 1992).

• Mole Solution

After reaching the peak, the fermentation temperature begins to decrease, presumably because the activity of microorganisms in breaking down organic matter decreases.

Sample Type	Temperature		
	100 gr	150 gr	250 gr
Tape (Fermented Cassava) (10 days)	27,5	27	28
Tape (Fermented Cassava) (20 days)	28,5	29	29

The results showed that the highest temperature on the 10 day tape was found on the 250 gram tape treatment. As for the 20 day tape, there are 150 and 250 gram tape treatments.

• Compost

Sample Type	Temperature		
	100 gr	150 gr	250 gr
Tape (Fermented Cassava) (10 days)	27,25	29	29
Tape (Fermented Cassava) (20 days)	27,56	29	29,20

The results showed that the highest temperature was found in the treatment of stale rice 250 grams of fermentation in 20 days. The lowest temperature is in the treatment of 100 gram tape

c. N-Total Levels

To nourish and form body cells. The more nitrogen content, the faster the organic material decomposes, because microorganisms that decompose compost material need nitrogen for its development (Huang & Liu, 2014).

• Mole Solution

The low total N-content in each treatment is due to the influence of the process that occurs in the nitrogen cycle. The fermentation process is done semi-anaerobically which causes the nitrification process to not run optimally, while the denitrification process is more dominant. According to (Suwastika, A.A.N.G., NN. Doniari., 2012) there are several factors that affect nitrification, namely oxygen, pH, temperature, and humidity.

Some factors that influence the results of protein breakdown are the nature of the origin of the material itself, the type of microbes that grow during fermentation, fermentation conditions and the length of time of fermentation (F.G, 1980). Nitrogen is an important constituent in protein synthesis. Most of the total nitrogen in water can be bound as organic nitrogen, which is in protein ingredients. In addition to remodeling organic matter into simpler microorganisms, it also uses organic material for its metabolic activities (Dwicaksono, M.R.B., B. Suharto, 2013).

Sample Type	Time	
	10 days	20 days
T1 (100 gr)	0,99	0,97
T2 (150 gr)	0,69	0,46
T3 (250 gr)	0,92	0,68

The results of the total N mole solution using bio-activator with 10 days fermentation showed that the highest total N was found in the 100 gram tape treatment that is 0.99. The lowest total N was found in the 150 gram tape treatment, namely 0.69.

The results of total N mole solution using bioactivator with 20 days fermentation showed that the highest total N was found in the 100 gram tape treatment that is 0.97. The lowest total N was found in the 150 gram tape treatment, which was 0.46.

• Compost

Sample Type	Time	
	10 days	20 days
T1 (100 gr)	0,023	0,022
T2 (150 gr)	0,025	0,029

T3 (250 gr)	0,030	0,038

The results of the total N compost using bio-activator with 20 days fermentation showed that the highest total N was found in the 250 gram tape treatment that is 0.38. The lowest total N was found in the treatment of 100 gram tape which is 0.30.

The value of N which has increased and decreased during the process of making bio-activators is due to nitrogen (N) which is fluctuating. Overall nitrogen levels in each bio-activator have increased. Nitrogen levels are needed by microorganisms to maintain and form cells in the body. The more nitrogen content, the faster the organic material decomposes, because microorganisms that decompose compost need nitrogen for its development (Sriharti and Salim, 2006).

d. P-Total Levels

Mole solution

Decomposition of organic matter results in a variety of organic acids which causes the pH of the MOL solution to fall. According to (Sumarsih, 2003), various organic acids, especially hydroxy acids can bind chelically and form a relatively stable complex with cations Ca2 +, Mg2 +, Fe3 +, and Al3 +, so that P which was originally bound by these cations becomes a dissolved cation.

Sample Type	Time	
	10 days	20 days
TI (100 gr)	0,25	0,33
T2 (150 gr)	0,24	0,24
T3 (250 gr)	0,24	0,28

The results for the P content of mole solution using 10 days fermentation showed that the highest P was in the 100 gr tape concentration treatment.

The results of the study of P mole solution using bio-activator with 20 days fermentation showed that the highest P was found in the treatment concentration of 100 gr.

• Compost

Sample Type	Time	
	10 days	20 days
TI (100 gr)	0,15	0,14
T2 (150 gr)	0,17	0,15
T3 (250 gr)	0,20	0,18

The results for the P content of mole solution using 10 days fermentation showed that the highest P was in the 250 gr tape concentration treatment.

Microorganisms have an important role in the creation of phosphorus. Organic P compounds are converted and generalized into organic compounds. From the nature of the element P as organic matter, this element has a very essential role in soil fertility where the intake of nutrients from organic matter is very helpful in increasing levels of soil nutrients in achieving optimal fertility intensity. This element is very important in the process of photosynthesis and plant chemical physiology. Phosphorus is also needed in cell division, tissue development and plant growth points. (Database, 2006)

e. Levels of K

Potassium binding is derived from the decomposition of organic matter by microorganisms in a compost heap. Compost material which is fresh organic material containing potassium in complex organic forms cannot be utilized directly by plants for its growth. However, with the activity of decomposition by microorganisms, the complex organics can be converted into simple organics that ultimately produce potassium which can be absorbed by plants. Basically, Potassium has an important role in photosynthesis in the formation of proteins and cellulose, in addition to strengthening plant stems which means also to enhance plant resistance (Winarso, 2005).

• Mole solution.

Sample Type	Time	
	10 days	20 days
T1 (100 gr)	0,71	0,70
T2 (150 gr)	0,60	0,67
T3 (250 gr)	0,64	0,68

The results of the K mol research using a 10-day fermentation bio-activator showed that the highest K was in the 100 gram treatment. The results of K mole solution using 20 days fermentation bio-activator showed that the highest K was found at 100 gram treatment.

• Compost

Sample Type	Time	
	10 days	20 days
T1 (100 gr)	0,183	0,104
T2 (150 gr)	0,198	0,198
T3 (250 gr)	0,205	0,208

The results of K compost research using a 10-day fermentation bio-activator showed that the highest K was in the 250 gram treatment.

The results of K compost using 20 days fermentation bio-activator showed that the lowest K was found in the 100 gram treatment.

f. C Organic

• Mole solution

Sample Type	Time	
	10 days	20 days
T1 (100 gr)	5,67	7,56
T2 (150 gr)	5,00	5,92
T3 (250 gr)	6,68	6,70

The results of organic C mole solution using bio-activator with 10 days fermentation showed that the highest organic C was found in the 250 gram treatment.

The results of the study of organic C mol s solution using bio-activator with 20 days fermentation showed that the highest organic C was found in the 100 gram treatment.

• Compost

Sample Type	Time	
	10 days	20 days
T1 (100 gr)	4,32	6,88
T2 (150 gr)	4,94	7,23
T3 (250 gr)	5,50	7,50

The results of compost C research using bio-activator with 10 days fermentation showed that the highest organic C was found in the 250 gram treatment.

The results of compost organic C research using bio-activator with 20 days fermentation showed that the lowest organic C was found in 100 gram treatment.

g. C / N ratio

• Mole Solution

Sample Type	Time	
	10 days	20 days
T1 (100 gr)	7	8
T2 (150 gr)	8	12

T3 (250 gr)	12	10

The results of the C / N Mole Solution using bio-activator with 10 days fermentation showed that the highest C / N was found in the 250 gram treatment.

The results of the C / N Mole Solution using bio-activator with 20 days fermentation showed that the highest C / N was found in the treatment of 150 grams.

• Compost

Sample Type	Time	
	10 days	20 days
T1 (100 gr)	18	31
T2 (150 gr)	19	24
T3 (250 gr)	19	35

The results of the compost C / N study using bioactivator with 20 days fermentation showed that the highest C / N was found in the 250 gram treatment.

The results of compost C / N research using bioactivators with 10 days fermentation showed that the lowest C / N was found in the 100 gram treatment.

In general, if the C / N ratio is too high then the biological activity of microorganisms will be reduced and the pile of waste will rot slowly due to nitrogen (N) limitations. As a result it will take a long time to achieve the process of maturation of the compost (Polprasert, 1989).

4 Conclusion

The interaction of tape concentration and fermentation time has a very significant effect on the parameters of the total bacterial population, pH, N-total, P, K, C and the C / N ratio provided by MOL solution.

1. The best quality of mole solution based on the total bacterial population parameters (9.6 x 105 spk mL-1 MOL) is found in the treatment concentration of 250 grams of tape with 20 days fermentation time.
2. The highest yield of total bacterial population in compost is in the 250 gram fermentation tape treatment of 20 days which is 8 x 102 and the lowest is in the 150 gram fermented cassava tape treatment 10 days that is 1x102
3. The quality of the best mole solution based on pH parameters (6.9), is found in the treatment concentration of 250 grams of tape with 20 days fermentation time.
4. The highest compost pH is found in the treatment of 250 gram fermentation tape 20 days which is 3.00.
5. The quality of the best mole solution based on the N-total parameter (0.99%), is found in the treatment of a concentration of 100 grams of tape with 10 days fermentation time.
6. The results of the total N compost using bioactivator with 20 days fermentation showed that the highest total N was found in the 250 gram tape treatment, 0.38%.
7. The quality of the best mole solution based on the parameter P-available (0.33 mg kg-1), is found in the treatment concentration of 100 grams of tape with 20 days fermentation time.
8. The results for compost P content using 10-day fermentation show that the highest P (0.20) is found in the 250 gr tape concentration treatment.
9. The quality of the best mole solution based on parameter K (0.71) is found in the treatment concentration of 100 grams of tape with 10 days fermentation time.
10. The results of K compost research using a 10-day fermentation bioactivator showed that the highest K (0.208) was found in the 250 gram treatment.
11. The quality of the best mole solution based on the C-organic parameter (7.56) is found in the treatment concentration of 100 grams of tape with 20 days fermentation time.
12. The results of compost C research using bioactivator with 10 days fermentation showed that the highest organic C (7.50) was found in the 250 gram treatment.

13. The best solution quality based on the C / N ratio parameter (12) is found in the treatment concentration of 250 grams of tape with 10 days fermentation time.
14. C / N research results (35) Compost using bioactivators with 20 days fermentation shows that the highest C / N is found in the treatment of 250 grams.

ggestion

Based on the results of this study can be suggested as follows: (1). Initial analysis needs to be done on the basic ingredients of MOL (tape and water), (2). Further research needs to be done on the fermentation time longer than 20 days at a concentration of 100 g, 150 g, and 250 g tape on the quality of MOL solution, (3). Further research needs to be done on the use of MOL as a liquid organic fertilizer, and activator of composting.

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