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Making of Bokashi Fertilizer from Rice Straw (*Oryza sativa* L.)by Using the Activator Effective Microorganisms (EM4)

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Abstract:- Agricultural waste in the form of rice straw is a potential local raw material that can be processed into organic fertilizer and bokashi. At harvest time, this rice waste is very abundant and has not been utilized optimally. The use of straw in relation to providing nutrients and soil organic matter is remodeling it into compost. EM4 activator is a material that contains several microorganisms and helps speed up the compostingprocess.

The purpose of this study was to utilize rice straw waste with EM4 activator, to measure the physical properties of the bokashi fertilizer, temperature, color, smell, texture, pH, and length of time to make bokashi. This research was conducted in the area of the State Agricultural Polytechnic Production Laboratory of Samarinda. This research was conducted for 3 months starting from October 20 to December 20, 2017, including preparation, making bokashi, data collection andreporting.

The results of the research on making bokashi fertilizer from rice straw (*Oryza sativa* L.) using activator EM4 can be seen that the observation of bokashi fertilizer was carried out until the 21st day and it looks ripe with observations of temperature 28 C °, pH 7, brown color. blackish andodorless.

Keywords:*-Bokashi Fertilizer, Rice Straw and Activator EM-4.*

I. INTRODUCTION

Fertilizer is the key to soil fertility because it contains one or more elements to replace the elements that have been used up by plants. Fertilizing means adding nutrients to the soil (root fertilizer) and plants (foliar fertilizer).

Organic fertilizer is fertilizer derived from the weathering of organic materials in the form of plant remains, human and animal fossils, animal waste, and organic rocks formed from piles of animal waste for hundreds of years. Organic fertilizers also come from industrial waste, such as slaughterhouse waste, industrial essential oil waste, or industrial wastewater that has been processed, so that it no longer contains toxic materials (AgroMedia Editorial, 2007).

Bokashi can fertilize the soil through its influence on soil physical, chemical and biological properties. Physically, bokashi can loosen the soil so that the root space will increase, chemically bokashi can raise soil pH, so that the availability of nutrients becomes easier for plant roots. Biologically, bokashi can increase the population of fermented and synthetic microorganisms so that disease growth and pest attacks can be suppressed. Bokashi also functions as a biological control tool in suppressing plant diseases, namely byinhibiting disease growth through natural processes by increasing competitive activity and antibiotics in the inoculum (Wididana, 1998).

Agricultural waste in the form of rice straw is a potential local raw material that can be processed into organic fertilizer and compost. At harvest time, the rice straw waste is very abundant and has not been utilized optimally. The use of straw in relation to providing nutrients and soil organic matter is remodeling it into compost (Nurbain and Bachrian, 2011).

Effective Microorganisms (EM4) are materials that contain several microorganisms which are very useful in the composting process. The microorganisms contained in EM4 consist of Lumbricus (lactic acid bacteria) and a few Photosynthetic bacteria, Actinomycetes, Streptomyces, sp and yeast. Effective Microorganisms (EM4) can increase the fermentation of waste and organic waste, increase the availability of nutrients for plants, and reduce the activity of insects, pests and pathogenic microorganisms (Dharmono, 2007).

The purpose of this study was to utilize rice straw with EM4 activator, to measure the physical properties of the bokashi fertilizer, temperature, color, smell, texture, pH, and length of time to make bokashi.

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II. RESEARCHMETHODS

A. *Place andTime*

The research was conducted at the Samarinda State Agricultural Polytechnic Production Laboratory for 2 months from October 2019 to December 2019 including preparation, preparation and preparation of reports.

B. *Tools andMaterials*

The tools used in this study consisted of a chopper, gembor, scale, thermometer, tarpaulin, pH meter, stationery, buckets and cameras.

The materials used in this study were 100 kg of rice straw, 120 ml of liquid brown sugar, 10 l of water, 20 kg of bran and 120 ml of EM-4.

C. *ResearchProcedures*

1. Preparation of EM4 activatorsolution

a. Prepare tools and materials, namely, a bucket, 2 kg of brown sugar, 10 l of water, andEM-4.
b. How to make an EM4 activatorsolution

1) Brown sugar and water are melted by heating on thestove
2) After the brown sugar is liquid, measure the brown sugar as much as 120ml
3) Then add 10 l of water in thebucket
4) After that, measure out 120 ml of EM-4solution
5) Put the measured brown sugar and EM-4 into a bucket filled with 10 l of water, and stir until blended
6) Close the bucket and let stand for 1week
7) The solution is ready to use when the solution is dark brown and smells like tape (Muhammad,2017).

2. Making bokashifertilizer

a. First, prepare 100 kg of ricestraw.
b. Prepare the tools and materialsused.
c. Doing the chopping of rice straw using a chopping machine, after the rice straw is chopped, put the bran as much as 20 kg and stir until evenly, then do the watering with the EM-4 activator which has been fermented until evenly or lebab, namely by holding it with a formed and solid hand.
d. After mixing and watering, cover the bokashi fertilizer tightly with a tarp. Then every day the bokashi fertilizer is reversed (Muhammad,2017)

D. *Observations*

Observations are made by:

1. Observation of the temperature of thebokashi

The temperature observation of the bokashi was done by sticking a thermometer into the bokashi fertilizer, and the measurement was carried out every day at 4:30 pm.

2. Observation of the color of thebokashi

The color change of the bokashi was observed by observing the color change of the bokashi fertilizer, and the observation was carried out every day at 4:30 in the afternoon by observing the color change.

3. Observation of the smell ofbokashi

Observation of the smell of bokashi is carried out by taking a bunch of bokashi and kissing it, the observation is carried out every day at 4:30 pm until the fertilizer is odorless.

4. Observe the texture of thebokashi

Observing the texture of the bokashi was done by squeezing it by hand, the observation was done every day at 4:30 pm.

5. Observation of the data on pH and humidity of thebokashi

Observation of pH and humidity data was carried out by stabbing the pH in the bokashi fertilizer, and measurements were made every day at 4:30pm.

III. RESULTS ANDDISCUSSION

A. Results

The results of observing the physical properties of temperature, smell, color, texture and pH in making bokashi fertilizer from rice straw plants using Effective microo fertilizer. rganisms 4.

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Table 1. Observation results of the physical properties of bokashi

Days to	Temperature ºC	Color	Odor	Texture	pH
1	35	Yellow	Smells	Rough	5,3
2	38	Yellow	Smells	Rough	5,3
3	40	Yellowish	Smells	Rough	5,4
4	43	Yellowish	Smells	Rough	5,4
5	47	Yellowish	Smells	Rough	5,4
6	51	Yellowish	Smells	Rough	5,6
7	55	Yellowish	Smells	Rough	5,7
8	58	Yellowish	Smells	Kinda Crumb	5,7
9	52	Yellowish	Smells	Kinda Crumb	5,9
10	49	Copper Yellow	Smells	Kinda Crumb	6,1
11	47	Copper Yellow	Less Smell	Kinda Crumb	6,1
12	47	Reddish yellow	Less Smell	Kinda Crumb	6,1
13	41	Reddish yellow	Less Smell	Kinda Crumb	6,3
14	40	Reddish yellow	Less Smell	Kinda Crumb	6,3
15	38	Reddish yellow	Less Smell	Kinda Crumb	6,6
16	38	Reddish yellow	Less Smell	Kinda Crumb	6,8
17	34	Reddish yellow	Less Smell	Kinda Crumb	6,8
18	31	Yellow Brown	Less Smell	Kinda Crumb	7
19	28	Blackish brown	Less Smell	Crumb	7
20	28	Blackish brown	Less Smell	Crumb	7
21	28	Blackish brown	Less Smell	Crumb	7

B. Discussion

Bokashi is an organic fertilizer that is fermented by a number of microorganisms in a warm, wet and airy environment, and the end result is humus. According to SNI 19- 7030-2004, the criteria for good bokashi fertilizer are blackish brown, crumb textured, and smells like soil Anang (2010).

In accordance with the opinion of Anang (2010), that the physical signs of a ripe bokashi are dark (blackish brown), crumbly in texture and no longer visible, whereas according to Mulyadi (2008) opinion, ripe compost is marked by a dark color. , no foul odor, crumb structure and no flies.

1. **Physical Properties ofBokashi**

In the process of using a decomposer effective microorganisms 4, it took 21 days for the formation process of bokashi. The addition of activator effective microorganisms 4 makes the rate of the decomposition process faster because inthebioactivator there are microorganisms or decomposer bacteria whose job is to decompose the Bokashi material. In accordance with Indriani's opinion (2012), if the bulk contains decomposer microorganisms, the rate of reduction in the thickness of the bokashi is faster because a lot of the material is broken down so that it reduces the thickness of the bokashi and a more advanced strategy is to utilize organisms that can speed up the bindingprocess.

a. **Temperature**

The initial temperature of etching 35ºC. During the bending process, there is an increase in temperature at the beginning, which is oxidizing and then decreases or stabilizes close to the initial temperature of the bokashi. The highest temperature of 58ºC occurred on the 8th day of the bending process, because the decomposition process had occurred, so the temperature of the fertilizer increased. After that the temperature starts to decrease until the end of the bending process. The temperature of the rice straw bokashi was stable again for 19 days. To maintain the temperature stability of the bokashi, stir it everyday.

According to Salundik and Simamora (2008), the temperature factor greatly influences the composting process because it relates to the types of microorganisms involved. The optimum temperature for composting is 40-60 ° C with a maximum temperature of 70 ° C. If the composting temperature reaches 40° C, the activity of mesophyll microorganisms will be replaced by thermophile microorganisms. If the temperature is 60 ° C, the fungi will stop working and the process of renovation will be continued by actinomycetes and strains of spore forming bacteria (spore forming bacteria).

According to Isro (2008), the temperature of the ripe compost is close to the initial composting temperature. The compost temperature is still high, meaning the composting is still active and the compost is not mature enough.

b. **Smell**

The smell changes at the beginning of composting on the first day starting from the smell of moist leaves litter until the 2nd day, and on the 3rd day there is a change in the smell until the 10th day it still smells, on the 11th day to the 18th day it smells less , and on the 19th day, until the 21st day the fertilizer had no smell anymore. According to Isro (2008), ripe compost does not emit a pungent aroma, but produces a weak aroma such as the smell of soil or forest humus. If the bokashi smells bad it means that the quality of the bokashi is not good, while the bokashi that smells of earth indicates that the bokashi is of good quality and is completely ripe. According to the opinion of Djuarnani et al. (2006), the characteristic of ripe bokashi is the loss of foulodor.

c. **Texture**

The texture on the first day is still rough until the 7th day, the 8th day to the 18th day there has been a change in the texture, which is a bit crumbly, and on the 19th to the 21st day, the texture of the fertilizer is crumbly. During the composting process of the bokashi, the texture of the bokashi gradually changes, namely to become slightly clumpy, clumpy, very clumpy (muddy with water) until at the end of the composting process it becomes clumpy (crumbly or easily crushed). According to the opinion of Djuarnani et al (2006), the finished bokashi has a crumbly texture like soil.

According to Murbandono (2007), mature compost will experience shrinkage. This is caused by the destruction of the material that was hard to become textured like soil, when squeezed it will crumble so that there is shrinkage and shrinkage can also be caused by the lost substances and evaporating into the air.

d. **Color**

To get ripe bokashi, it takes 21 days, ripe bokashi is marked with a color change on the first day of yellow bokashi to the 2nd day, and on the 3rd to 9th day there is a change in color, namely the bokashi becomes yellowish. On the 10th and 11th day, the bokashi changes color again, namely to copper yellow, and on the 12th to the 15th day, there is a color change, which becomes reddish yellow, on the 16th to the 15th day. 18 to brownish yellow color, and by day 19 to day 21 the color of the bokashi has turned blackishbrown.

According to Haq (2014), ripe compost has a blackish brown color because the ripe compost has the same physical properties as soil and humus which are blackish brown and crumbly.

e. **pH**

The initial pH value of composting was 5.3 to day 2, day 3 increased to 5.4 to day 5 and on day 6 to 5.6 on day 7 the pH increased to 5.7 to on the 8th day, and on the 9th day the pH rose to 5.9. On the 10th day to the 12th day the pH increased to 6.1 and on the 13th day the pH increased to 6.3 until the 14th day. The15thdaythepHincreasedto6.6onthe16thdayand17thepHincreasedto6.8 until the 18th day the pH increased to 7 until the 21st day. According to Djuarnani et al, (2005), the increase in the organic pH value is due to the activity of microorganisms in the decomposer that provide OH ion input so that it shows increased freedom which further increases the organic pH value. Composting that runs for days affects changes in pH in organic matter. The initial pH of organic fertilizersstartstobeslightlyacidicduetotheformationofsimple organicacids,then the pH increases with further incubation due to protein breakdown and the release of ammonia.

IV. CONCLUSIONS ANDSUGGESTIONS

A. Conclusion

1. Observations on the physical properties of ripe rice straw bokashi with a temperature of 28 ° C, pH 7, blackish brown, crumb texture, andodorless.
2. This bokashi has finished on the 21stday.

B. Suggestions

Further research is needed, analysis of nutrients or applying them to plants, and also can replace the activator material with other activator materials.

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