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Effect of Types of Bioactivators and Organic Waste on the Quality of Organic Fertilizer

Didi Saidi[1], Tuti Setyaningrum[2], Bagus Muhammad Akbar[3]
[1]Soil Science Study Program. Faculty of Agriculture. UPN "Veteran" Yogyakarta
[2]Agrotechnology Study Program. Faculty of Agriculture. UPN "Veteran" Yogyakarta
[3]Informatics Engineering Study Program. Faculty of Industrial Engineering, UPN "Veteran" Yogyakarta
didi.saidi@upnyk.ac.id; tuti.setyaningrum@upnyk.ac.id; bagusmuhammadakbar@upnyk.ac.id

Abstract— *Organic waste management must aim to improve public health and environmental quality and to make waste a resource of economic value. An effective type of bioactivator is important because the process of decomposition and decomposition of organic waste into organic fertilizer takes a long time, so the right bioactivator is needed. When is the compost ready to be used as fertilizer? so as to increase crop production. reduce environmental pollution and improve public health. This study aims to determine the effect of an effective type of bioactivator in accelerating the decomposition process of organic waste so that the decomposition time is faster and produces quality organic fertilizer according to SNI standards. The research method was carried out in a descriptive manner by looking at the decomposition process of organic waste. on 5 types of organic waste, namely P: Market organic waste. R: Household waste. T: Livestock waste. D: Leaf litter. J: Rice straw. with 3 kinds of bioactivators: 1: Trihoderma Mushroom. 2: Mixed culture (EM4). b. Pure culture (lignolytic). Parameter of organic fertilizer is C-organic. N total. pH. Phosphorus and Potassium. Data analysis used SNI standards according to Minister of Agriculture Regulation No: 70/Permentan/SR.140/10/2011. The results of the study show that the quality of the organic waste used is still below the Indonesian National Standard.*

Keywords— *Bioactivator. decomposition. organic waste. quality. organic fertilizer.*

I. INTRODUCTION

Garbage is the residue of human daily activities and/or natural processes in solid form [1]. Article 2 states that waste consists of: household waste (waste originating from daily household activities, excluding feces and specific waste), household-like waste (waste from commercial areas, industrial areas, social facilities areas, public facilities, other facilities), specific waste (hazardous and toxic waste, disaster-related waste, building rubble, waste that cannot be processed technologically. According to article 4, waste management must aim to improve public health and environmental quality and make waste a resource.

The market is one place that contributes large amounts of waste every day. nationally there are 31.2 million tonnes of waste/year consisting of 10.9 million tonnes not managed. 9.3% food waste. 11.1% plastic waste. West Java has 4.6 tons of waste/year consisting of 1.9 million tons that are not managed. 43.5% food waste and 17.4% plastic waste [2]. In Yogyakarta, 10 percent of the 260 tons of Yogyakarta city waste that was brought to the Piyungan landfill came from 29 people's markets in the city of Yogyakarta. even during long holidays the volume of waste can reach 30 tons per day. The Zero Inorganic Waste Movement with waste sorting and management centered on the Giwangan Market. is expected to reduce the volume of Yogyakarta City waste by up to 7 tons

The process of decomposition of organic waste is slower than the accumulation that continues to grow. To reduce the accumulation of increasingly large organic waste. it is necessary to add bioactivators to accelerate and improve the quality of organic fertilizers. The results of laboratory analysis of liquid compost components from household waste showed that the organic C content was high (23.94%). high organic matter (41.17%). high total nitrogen content (1.61%). low C/N ratio (14.87). Available phosphorus (P2O) is high (14.66%) [3]. The results of research [4] show that liquid organic fertilizer has a neutral pH. Low organic matter content. total nitrogen nutrients. phosphorus available. low available potassium. This is because the anaerobic fermentation process takes longer. so that the availability of elements from waste has not all been decomposed. and the source of compost from household waste is dominated by vegetable waste. Weaknesses in the quality of liquid fertilizer need to be improved to increase crop production. Increasing the quality of organic fertilizers can be done by enriching Hipro fertilizers because Hipro fertilizers contain very complex nutrients and microelements.

Processing livestock waste into organic fertilizer. shows that the quality of solid and liquid organic fertilizers that are fermented/processed is better than that which is not fermented/original. The quality of solid organic fertilizer and liquid organic fertilizer from livestock manure results from laboratory analysis shows that the organic fertilizer produced from cattle manure, both solid and liquid organic fertilizer, has characteristics: alkaline pH (7.25 – 8.5) still meets the standards. organic C content of solid organic fertilizer (18.66 – 21.09 %) exceeds the standard. but liquid organic fertilizer (7.33 – 10.64%) is below standard. total nitrogen content. P2O5 levels. K2O levels of liquid organic fertilizer are below standard [5]. The results of the study [6] show that organic fertilizers from cow manure, both solid and liquid organic fertilizers, have characteristics: alkaline pH (7.9 – 9) still meets the standards. organic C content of solid organic fertilizer (38.27%) exceeds the standard. but liquid organic fertilizer (0.42%) is below standard. total nitrogen content. P2O5 levels. K2O content of liquid organic fertilizer is below standard. but

the potassium content of solid organic fertilizer meets the standard.

Corn (Zea mays L) is a type of food crop with high economic value. because besides being a source of carbohydrates and protein that can be used as an alternative to rice and wheat to support national food security. Indonesia's corn productivity is still low when compared to other countries such as Thailand, which is 9 tons per hectare. Japan 21 tons per hectare. Corn productivity experienced a slight decrease from 30.26 kw/ha to 30.13 kw/ha. This decrease in production was more due to a decrease in harvested area by 39.77 percent, from 6,462 hectares in 2014 to 3,892 hectares in 2015 [7].

Based on statistical data. demand for food/vegetable commodities in Indonesia continues to increase in line with the increasing population of Indonesia. in 2018 there was an increase of 420,998 tons or 19.1% from the previous year's period [7].

The results of organic fertilizer testing on corn plants [5], showed that plant height at 30 days after planting was achieved in solid organic fertilizer treatment (POP plus). but the highest was achieved in ponska fertilizer (NPK) this is because the quality of solid organic fertilizer is better than liquid organic fertilizer. Nitrogen content in high solid organic fertilizer plays a role in plant vegetative growth. According to [9] that liquid compost from Giwangan market waste is in the form of a mixture of vegetable waste. fruit and fish have the best/highest quality as organic fertilizers and the quality decreases in the form of fish waste. vegetable and fruit.

Organic compost mix. manure and Azolla can increase the total nitrogen content of compost. increase the growth of corn plants. the greater the ratio of the amount of manure. the better the quality of the compost. and the better the effect on the growth of corn plants [10].

Soil as a place for plant growth must have quality that is effective and efficient both in terms of physical availability of water or humidity. as well as chemical properties of nutrients or nutrients available to plants. and its biological properties, namely the presence of biological activity in the soil. Regosol soil types are strongly influenced by parent materials, for example volcanic ash from the eruption of Mount Merapi. The results of research [11], the characteristics of Regosol soil are low Nitrogen content (0.15%). The available N content is very low (0.01%). Low CEC (13.57 me%). Low C-organic (0.99 %). Neutral pH (6.75) and sandy texture with sand content (44.96%). The size of the fraction is dominated by sand. so it has a low fertility rate problem. This is due to nutrients and low water availability as a result of the ease with which water and nutrients are leached. water and nutrients cannot be stored in Regosol soil because the soil has a large porosity. To overcome these problems, it is necessary to have technology to improve the quality of compost from household waste so that it can increase physical fertility. Soil chemistry and biology need the addition of organic matter. Giving water once every 3 days and treating organic matter 300 g/pot is the best dose to increase N.P and K [12].

The purpose of this study was to determine the decomposition process of organic waste with several bioactivators on the quality of organic fertilizers with pH parameters. C-Organic and NPK levels in the composting process. Determining the quality of compost from organic waste from market waste. household waste. leaf litter. rice straw waste. livestock waste. Determine the best bioactivator in accelerating the composting process. Determine the quality of compost from organic waste with reference to the Indonesian National Standard (SNI).

II. Research Methodology

The research was carried out in the practice garden/greenhouse of UPN "Veteran" Yogyakarta Condongcatur campus and chemical analysis was carried out in the Soil Biology Laboratory. Soil Chemistry Study Program of Soil Science Faculty of Agriculture UPN "Veteran" Yogyakarta. The research method was carried out in a descriptive manner by looking at the decomposition process of organic waste. on 5 types of organic waste, namely P: Market organic waste. R: Household waste. T: Livestock waste. D: Leaf litter. J: Rice straw. with 3 kinds of bioactivators: 1: Trihoderma Mushroom. 2: Mixed culture (EM4). b. Pure culture (lignolytic). Parameter of organic fertilizer is C-organic. N total. pH. Phosphorus and Potassium. Data analysis uses SNI standards according to Minister of Agriculture Regulation No: 70/Permentan/ SR.140/10/2011.

III. Results and Discussion

The results of the analysis of organic waste before treatment are listed in the Table 1.

TABLE 1. laboratory analysis results of organic waste before treatment

Treatment	pH	C-Organic (%)	N total (%)	P_2O5 (%)	K_2O (%)	Ratio C/N
Market Waste (P)	5.12	40.06	1.15	0.55	0.038	34.83
household waste (R)	4.26	43.48	1.33	0.70	0.028	32.69
Livestock waste (T)	8.93	24.69	0.93	0.63	0.019	15.79
Leaf litter (D)	6.26	37.32	1.8	0.26	0.009	20.73
Rice Straw (J)	8.64	29.82	1.31	0.31	0.016	22.76
SNI: Permentan No 70/SR.140/10 2011	4 - 9	> 15	(N + P + K) > 4			15 - 25

The quality of the organic waste used in the study has the characteristics of pH 4.26 – 8.93 meeting SNI standards, C-organic content of 24.69 – 43.48% meeting SNI standards, Nitrogen + Phosphorus + Potassium levels less than 4% so it does not meet SNI standards, this is because the waste organic has not undergone decomposition and has not undergone a mineralization process so that NPK levels are still low. C-organic content is still high and the C/N ratio is still high.

The results of the study on the effect of various bioactivators on some organic wastes after 1 month of incubation are shown in Tables 2 and 3.

Table 2. Shows that the quality of organic fertilizer from several types of organic waste has characteristics of pH 6.71 – 8.86 meeting SNI standards, C-organic content of 25.96 – 45.01% meeting SNI standards, Nitrogen + Phosphorus +

Potassium content of more than 4% so that it meets SNI standards,

This is because organic waste has undergone decomposition and has undergone a mineralization process so that NPK levels have increased. C-organic content is still high but the C/N ratio is low. The highest quality organic fertilizer was achieved from market organic waste with a total nitrogen content of 7.93 percent.

TABLE 2. Effect of organic waste on fertilizer quality

Treatment	pH	C-Organic (%)	N total (%)	P_2O5 (%)	K_2O (%)	Ratio C/N
Market Waste (P)	8.86	41.23	7.93	0.73	3.22	5.29
household waste (R)	8.49	48.45	4.15	0.89	3.5	13.48
Livestock waste (T)	8.47	25.96	6.99	0.91	3.93	2.32
Leaf litter (D)	6.71	45.01	4.51	0.27	2.45	10.13
Rice Straw (J)	8.83	34.54	6.35	0.35	3.91	6.29
SNI: Permentan No 70/SR.140/10 2011	4-Jan	> 15		> 4		15 – 25

TABLE 3. Effect of bioactivator types on fertilizer quality

Treatment	pH	C-Organic (%)	N total (%)	$P_2O_{5\,(\%)}$	K_2O (%)	Rasio C/N
Trichoderma (1)	8.15	34.12	4.81	0.68	3.31	8.51
EM4 (2)	8.2	38.13	5.86	0.68	3.39	6.92
Lignolytic (3)	8.46	38.87	7.29	0.53	3.51	7.08
SNI: Permentan No 70/SR.140/10 2011	4 – 9	.> 15		> 4		15 – 25

Table 3. The results showed that the quality of organic fertilizer from the influence of several types of bioactivators had characteristics of pH 8.15 – 8.46 meeting SNI standards, C-organic content of 34.12 – 38.87% meeting SNI standards, Nitrogen + Phosphorus + Potassium content of more than 4% so that it met the standards SNI, this is because bioactivators play an important role in the decomposition process and the mineralization process so that the NPK levels increase. C-organic content is still high but the C/N ratio is low. The most effective bioactivator in increasing Nitrogen was lignolytic (7.29%), followed by EM4 (5.86%) and Trichoderma (4.81%). This is because lignolilit is an effective microorganism and plays a role in breaking down lignin which is difficult to decompose, moreover the organic waste is in the form of market waste where most of the lignin content is low.

IV. CONCLUSION

The results showed that the quality of organic fertilizers from several organic wastes (market waste, household waste, livestock waste, leaf waste, and rice straw) met SNI standards according to SNI: Permentan No 70/SR.140/10/2011. The highest quality organic fertilizer was achieved from market organic waste with a total nitrogen content of 7.93 percent.
Trichoderma, EM4 and Lignolytic Mushroom Bioactivators play a role in the decomposition process and mineralization process of organic waste, the quality of the fertilizer produced meets SNI standards. The most effective bioactivator in increasing Nitrogen was lignolytic (7.29%), followed by EM4 (5.86%) and Trichoderma (4.81%).

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