Test of Physical Quality Compost and PH of Combination of Water Hyacinth (*Eichornia Crassipes Mart. Solm*) and Goat Manure Using Rument Liquid Mol as Activator

A Napoleon*, D P Sulistyani, Bakri
Faculty of Agric. Sriwijaya University, Indralaya Ogan Ilir South Sumatera

*a_napoleon214@yahoo.com

Abstract. This study aims to determine the quality of compost from a combination of water hyacinth (*Eichornia crassipes* Mart Solm) and Goat Manure. The materials used in the research were goat manure, water hyacinth, and bioactivators. This study used a completely randomized design with 5 treatments and 5 replications consisting of treatment P1 = water hyacinth: goat manure (100%: 0%), P2 = water hyacinth: goat manure (75%: 25%), P3 = water hyacinth: goat manure (50%: 50%), P4 = water hyacinth: goat manure (25%: 75%), P5 = water hyacinth: goat manure (0%: 100%). The parameters measured in the study were physical quality (smell, moisture content, temperature, particle size and color) and pH. From the research results obtained showed that the best ratio of water hyacinth and goat manure was 50 % : 50 % in all parameters, both physical properties and pH is in accordance with SNI 19-7030-2004.

1. Introduction
Compost is a medium for improving soil produced through the metabolism of organic substrates, a surface where microbes grow by microbes under controlled conditions [1]. One of the materials that can be used to make compost is water hyacinth (*Eichhornia crassipes* Mart Solm).

Water hyacinth (*Eichornia crassipes*) is a floating water plant that has a fast growth rate, so it is sometimes referred to as a weed plant. Apart from being a weed, water hyacinth (*Eichhornia crassipes* Mart. Solm) is currently increasingly being used as a nutrient supplier as a raw material for compost. Water hyacinth has a high potential to supply nitrogen because it can store up to 3.2% of its dry mass and generally has a carbon to nitrogen ratio (C / N ratio) of around 8 to 15 [2]. The sustainable use of goat manure has a positive effect on soil fertility [3]. According to [4], goat manure has a nutrient content of 0.70% N, 0.40% P2O5, 0.25% K2O, 20-25% C / N, and 31% organic matter.

According to the research of [1] composting a combination of water hyacinth and cow manure using a ratio of 50:50 (equivalent to 2500 g: 2500 g) is the best treatment when compared to other treatments. Based on the research of [5], it is stated that the use of beef rumen fluid to become MOL at a concentration of 2% is the optimal dose to add to raw materials to be composted.

The research objectives as follow 1) knowing the effect of a combination of water hyacinth and goat manure on the physical and chemical properties of compost, 2) Knowing the effect of the addition of MOL of rumen fluid on physical and chemical properties, 3) Knowing the interaction between MOL of rumen fluid on the quality of compost combination of water hyacinth and goat manure, 4) Get recommendations for the use of a combination of water hyacinth compost and goat manure with the addition of the optimum mole of rumen fluid.
2. Research Methodology

This research was conducted from September to November 2020 at the Organic Fertilizer Research Center, Department of Soil and the Laboratory of Chemistry, Biology and Soil Fertility, Faculty of Agriculture, Sriwijaya University. This study used a completely randomized factorial design (RALF) for the treatment of water hyacinth and goat manure.

O1 = Water Hyacinth: Goat Manure (0%: 100%)
O2 = Water Hyacinth: Goat Manure (25%: 75%)
O3 = Water Hyacinth: Goat Manure (50%: 50%)
O4 = Water Hyacinth: Goat Manure (75%: 25%)
O5 = Water Hyacinth: Goat Manure (100%: 0%)

Rumen Mol Fluid Dosage
R1 = 2 mol% of rumen fluid and R2 = 4 mol% of rumen fluid
Repeated 3 times to obtain 30 experimental pots

3. Results and Discussion

3.1. The smell of compost

In the observations of the smell of compost, all treatments have experienced a change in odor from the beginning of the composting process to the end of the composting process. The odor produced by the average treatment in the first and third weeks still smells typical of organic matter, because the material has not been decomposed by microbes, but there are also several treatments which in the third week have experienced a change in the odor. In the fourth to fifth weeks, the composting process has produced an odor due to the activity of microbes that convert organic matter into methane gas, and the compost smells like ammonia. The compost that has been ripe in this study smells like soil, this is in accordance with SNI 19-7030-2004 [6] the smell of ripe compost smells of soil.

3.2. Compost Moisture Content

The important role of moisture is very important for oxygen supply and microbial metabolism. According to [9] research, water content affects the rate of compost decomposition and temperature parameters except for pH and nitrogen levels. Water content affects the rate of compost decomposition and temperature because microorganisms require optimal water content to decompose organic material.

Based on 30 experiments, there were several treatments whose water content exceeded 60% and some were below 50%. The compost that starts to enter the ripening phase is indicated by a decrease in water content. The evaporation of water that becomes gas is due to the activity of microorganisms which causes the water content in the composting process to decrease. Based on the results of the observation of water content, the highest water content was in the treatment of (O4R1) water hyacinth 75% + 25% goat + 2% rumen (56.7%) and the lowest was in the (O5R1) 100% water hyacinth treatment + 2% rumen treatment (47.3 %). And the average compost water content is in accordance with SNI 19-7030-2004.

Figure 1. Graph of changes in compost moisture content every week during composting
3.3. Compost Temperature

According to [7], the optimal compost temperature in the composting process is between 30-50 °C. An important indicator in the composting process is the composting temperature, because the temperature at the time of composting can show the process of microorganisms in breaking down organic matter. Following are the data from the observations of the average compost temperature each week (Figure 1).

Based on the results of temperature observations, the highest temperature was in (O5R2) the 100% water hyacinth treatment + 4% rumen (32%) and the lowest was in (O4R1) the 75% water hyacinth treatment + 25% goat + 2% rumen (30.3%). And the results of the average compost temperature are in accordance with SNI 19-7030-2004, based on SNI 19-7030-2004, the temperature of compost that is ripe has the maximum temperature of groundwater.

3.4. Compost Particle Size

The composting time is influenced by the particle size so that the smaller the raw material size, the composting process will be faster [9]. Material size of about 5-10 cm is suitable for composting in terms of air circulation aspects that may occur. To speed up the weathering process, the leaves, twigs and other organic material are chopped manually by hand or machine.

Based on the results of the observation of particle size, the largest particle size in the treatment of (O1R1) Goats 100% + 2% Rumen (11.7%) and the smallest in the treatment of (O3R1) Water
Hyacinth 50% + 50% Goat + 2% Rumen (8.8%). According to SNI 19-7030-2004, the particle size for mature compost ranges from 0.55-25 mm. Referring to the compost SNI with a maximum particle size of 25 mm, all treatments are in accordance with the SNI.

3.5. Color Compost
Compost color is one parameter that can indicate the level of maturity of a compost. The color of the compost that has been ripe is blackish. The color change from 10GY 2.5 / 1 (blackish green) at the beginning of composting to 10GY 2.5 (black) in the mature compost is due to the decomposition of organic matter by the activity of various microorganisms. The aerobic decomposition process is indicated by the occurrence of a color change to black [10]. Changes that occur in the color of the compost every week starting from green to blackish brown indicate that the compost is ripe. In the first week after the compost, mix it with other ingredients, the color has turned blackish green, and the 5th week the color starts to get darker or blackish, according to SNI 19-7030-2004, the color of the ripe compost is blackish.

3.6 Value of the degree of acidity (pH) of compost
In the composting process, pH has an important role as well, because pH is a critical factor in the growth of microorganisms needed in the composting process. Too high a pH content will cause the nitrogen element in the compost to turn into ammonia (NH3), on the other hand, in an acidic state it will cause some microorganisms to die and also if the pH is too high, oxygen consumption increases and gives bad results for the environment [11].

| No. | Treatment | pH    |
|-----|-----------|-------|
| 1.  | O1R1      | 9.03  |
| 2.  | O1R2      | 8.76  |
| 3.  | O2R1      | 8.78  |
| 4.  | O2R2      | 8.58  |
| 5.  | O3R1      | 8.28  |
| 6.  | O3R2      | 8.65  |
| 7.  | O4R1      | 8.52  |
| 8.  | O4R2      | 8.50  |
| 9.  | O5R1      | 7.66  |
| 10. | O5R2      | 7.64  |

Based on the results of pH observations, the highest pH was in the treatment of (O1R1) Goat 100% + 2% Rumen (9.03%) and the lowest was in (O5R2) the 100% water hyacinth treatment + 4% Rumen treatment (7.64%). According to the ministerial decree 2019, the pH for ripe compost ranges from 4-9.

4. Conclusion
The best combination of water hyacinth and goat manure with the addition of mole of rumen fluid, the best in the composting process is Water Hyacinth 50% + 50% Goat + 2% Rumen, which produces a strong odor, moisture content (53.9%), temperature (31.5ºC), particle size (8.8%), black color and pH (8.28).

References
[1] Seyedbagheri M M 2010 Compost: Production, Quality, and Use in Commercial Agriculture. College of Agricultural and Life Sciences, University of Idaho. Moscow.
[2] Mashavira M, Chitata T, Mhindo R L, Muzemu S, Kapenzi A, Manjeru P 2015 The Effect of Water Hyacinth (Eichhornia crassipes) Compost on
[3] Dinariani, Suwasono Y B, Guritno B, 2014 Kajian Penambahan Pupuk Kandang Kambing dan Kerapatan Tanaman yang Berbeda Pada Pertumbuhan dan Hasil Tanaman Jagung Manis (Zea mays saccharata Sturt) Jurnal Produksi Tanaman 2 (2), 128-136

[4] Djuarnani N, Kristian Setiawan B S 2006 Cara Cepat Membuat Kompos Agromedia Pustaka Jakarta

[5] Yenie E 2008 Kelembaban Bahan dan Suhu Kompos Sebagai Parameter yang Mempengaruhi Proses Pengomposan Pada Unit Pengomposan Rumbai Jurnal Sains dan Teknologi 7(2):58-61

[6] Standar Nasional Indonesia 2004 Spesifikasi Kompos dari Sampah Organik Domestik. SNI 19-7030-2004 Badan Standar Nasional Indonesia Jakarta

[7] Gaur DC 1980 Present Status Of Composting And Agricultural Aspect, In : Hesse, P.R (ed). Improving Soil Fertility Through Recycling, Compost Technology. New Delhi: FAO Of United Nation

[8] Pandya P R , Singh K M, Parnerkar, Tripathi A K, Mehta H H, Rank D N, Kothari R K and Joshi C G 2010 Bacterial diversity in the rumen of Indian Surti buffalo (Bubalus bubalis), assessed by 16S rDNA analysis J. Appl. Genet. 51: 395-402

[9] Suryahadi W G, Piliang., Djuwita L and Widiatutti Y 1996 DNA recombinant technique for producing transgenic rumen microbes in order to improve fiber utilization Indonesia J. Trop. Agric. 7: 5-9

[10] Heriyadi S, Nurachma dan Padang 2004 Kondisi ekosistem rumen domba lokal yang diberi cairan rumen kambing secara In-Vivo Jurnal Ilmu-Ilmu Pertanian Agroland. 11 No.4.

[11] Lamid M, Chuzaemi S, Puspaningsih N, Kusmantono 2006 Inokulasi Bakteri Xilanolitik Asal Rumen Sebagai Upaya Peningkatan Nilai Nutrisi Jerami Padi Jurnal Protein 14(2): 122-128