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Wayan Suparta, PhD
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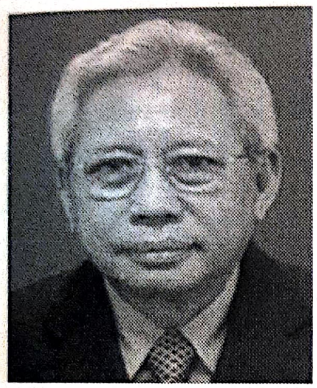

As Professor at the Universitas Pembangunan Jaya, with daily activities in lecturing, doing research, as well as water resources development planning, I really praise the Nova Science Publishers for publishing selected papers from "2020 International Conference on Urban Sustainability, Environment, and Engineering (CUSME 2020)". Hence, this publication would be useful for professionals, reseachers, scholar, policymakers, and NGO. I believe that currently, many professionals would like to give more attention on development of sustainable urban. In addition, this publication could be used as reference for City authorities to make appropriate policy choices to protect the provision of equitable housing, health, and transportation services.

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Urban Development and Lifestyle are trend issues for the cities around the world. Learning from experiences is the most effective way to support the cities to be sustainable developed. This book offers the knowledge sharing among countries which covers variety of cities' issues. It also provides the great lessons for researchers, officers and policy makers on coping with several urban problems.

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Chapter 28

THE ROLE OF GUANO PHOSPHATE IN IMPROVING THE QUALITY OF COMPOST FROM HOUSEHOLD AND MUSHROOM MEDIA WASTE IN SUPPORTING THE ZERO WASTE CONCEPT

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ABSTRACT

Waste is a material that is not useful and has no value, which is produced every day by every household, then the amount is abundant, thus polluting the environment, causing distrubed health (being a source of disease), and disturbing the beauty of the scenery. Therefore, waste management needs to be carried out with the principle of disposing as well as utilizing it. The 3R principle is an approach in managing waste from its source with the concept of zero waste. Making compost from organic household waste is a management effort that supports the concept of zero waste. The process of composting organic household waste naturally takes a long time to decompose, and the compost produced has low quality, so it needs efforts to speed up the decomposition process and improve the quality of compost by adding organic enrichment materials, namely mushroom growing media waste and Guano Phosphate. The method used in this study is a mixture of household organic waste material and mushroom growing media waste with a weight ratio of 1:1, added Guano Phosphate: 0%, 5%, and 10% of the compost raw materials. Measurement of the quality of organic fertilizers uses a comparative method to the quality standards of solid organic fertilizers based on Permentan No 70/ Permentan/SR.140/10/2011. The parameters measured and observed include nutrient contents, namely C-Organic, N-Total, P_2O_5, K_2O, C/N, pH, color, structure and scent. The results obtained in this study are the quality of compost which has physical properties of dark brown, crumb, odorless, and chemical properties of C-Organic, N, P_2O5, K_2O, C/N, and the pH becomes better.

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Keywords: Guano Phosphate, household waste, mushroom growing media waste, zero waste

INTRODUCTION

Getting better level of economic welfare increases public awareness of a better and healthier quality of life. The improvement in people's welfare is reflected in the improvement in the quality of lifestyle, among others concerning dietary habit, fashion styles, housing styles, and so on. One of the challenges faced is how to improve the welfare of life while maintaining the quality of a clean and healthy environment.

In life, humans are inseparable from the problem of garbage; the more the population increases, the more amount of waste is generated. Waste is a material that is not useful and has no value, which is produced every day by every household, so that the amount is abundant. Household waste that is produced every day is around 2.5 liters/person per day or 0.5 kg/person per day. Such conditions if not managed properly and correctly will cause problems i.e., a pile of garbage both at the 'TPS' and at the 'TPA' which pollutes the environment, disturbs health (becomes a source of disease), and disturbs the beauty of the scenery. Therefore, it is necessary to manage waste with the principle of disposing and utilizing it at the same time, which means managing waste while getting economic benefits from the management. The 3R principle is an approach in managing waste from its source with the concept of zero waste. The first principle is to reduce landfill at the source (reduce), reuse material so that it does not become garbage (reuse), and recycle material that is no longer useful to other materials that are more useful (recycle). Making compost from organic household waste is a management effort that supports the concept of zero waste. The initial stage in composting is to sort organic waste and inorganic waste, furthermore, organic waste is composted while inorganic waste is sold to collectors or made into handicrafts, so as to reduce the volume of waste at landfills.

The composting process, naturally, will take a relatively long time, which is about 2–3 months or even 6–12 months, so it is necessary to add another organic material which serves to accelerate the decomposition process and improve the quality of the compost produced. In this study, the basic material for compost used is household waste and mushroom growing media waste which are local resources in the study area, and addition of Guano Phosphate which plays a role as a bioactivator to speed up the decomposition process while increasing the content of compost nutrients, especially Phosphorus nutrients. Guano Phosphate is an ingredient that comes from a pile of sea bird droppings or bat droppings containing not more than 6% Nitrogen (N), around 25% Phosphorus (P), and around 20% Calcium (Ca). In addition, Guano also contains Potassium (K), Magnesium (Mg), and Sulfur (S) [1]. Mushroom growing media waste plays a role in improving the physical quality of compost and in increasing nutrients. Mushroom growing media waste contains nutrients of N 0.6%, P 0.9%, and K 0.2% [2].

Compost is an organic fertilizer that has a role in increasing soil fertility, either physical, chemical, or biological soil properties. Compost as an organic fertilizer, if applied to

agricultural land for crop cultivation, can increase soil productivity and produce healthy and nutritious plants.

The public is increasingly aware of the meaning of health, so they are very concerned about the quality and nutritional content of food products consumed. Society wants agricultural commodities that are environmentally friendly.

METHODS

Materials and Research Tools

The materials used are organic household waste originating from Temporary Waste Disposal Sites (TPS) and mushroom growing media waste obtained from Pandowoharjo Village, Sleman District, Sleman Regency, clean water, bio-activator of cattle rumen, dolomite, molasses, and chemicals for the analysis of compost products. Equipment used: compost filters, scales, sprayers, buckets, shovels, tarpaulins, plastics, and equipment for compost product analysis.

Research Methods

The method used in this study is mixing 200 kg organic household waste and 200 kg mushroom growing media, then adding Guano Phosphate to several measurements: 0%, 5%, and 10% of the raw materials for compost.

Measurement of the quality of organic fertilizer is the method of comparing with the "quality standard" of solid organic fertilizer based on Permentan No. 70/ Permentan/SR.140/10/2011. The parameters of chemical properties of compost measured include the nutrient contents of C-Organic, N-Total, P_2O_5, K_2O, C/N, and pH. The physical properties of compost observed include color, structure, and scent. Measurement of compost quantitative data is C-organic with the Walkley & Black method, P_2O_5 with the wet destruction method measured using a spectrophotometer, K_2O with the wet destruction method measured with a Flamephotometer, Total N with the Kjeldahl method, and pH using a pH meter.

Research Steps

The research was carried out in two stages, namely the stage of making compost from organic household waste mixed with mushroom media waste and the stage of organic fertilizer analysis.

Composting

In the early stage of composting organic household waste and mushroom media waste, cow rumen bioactivator is made.

Composting organic household waste: collecting organic waste from "Amarta" BumDes TPS and mushroom media waste from "jejamuran" mushroom house. The amount of organic household waste and mushroom media composted is 200 kg each (1:1 ratio), then it is completely mixed evenly. In layer 1, a mixture of compost raw materials is spread on the surface of an area of 200 cm × 200 cm and thickness of 20 cm. Then, on the surface of the compost, dolomite (2.5% by weight of raw material) and Guano Phosphate according to the treatment are evenly distributed and watered a bioctivator solution (cow's rumen:molasses:water = 1:1:10), then stir homogeneouly. In layer 2, a mixture of compost raw materials is stacked on layer 1 as thick as 20 cm, then given the same treatment as layer 1 and so on, layer by layer until the compost raw materials run out. Cover with a tarp, so that the fermentation process runs optimally. Once a week for 4 weeks, stir until homogeneous so that the temperature drops; if humidity is reduced during the fermentation process, it is doused with a bioactivator solution and covered again with a tarp. Composting is stopped when the compost looks mature with the parameters: dark brown color, crumb structure, odorless, around 30°C compost temperature, and neutral pH.

Compost Analysis

Compost chemical properties which were analyzed included C-Organic, N-Total, P_2O_5, K_2O, C/N, and pH. Analysis of the chemical properties of compost was carried out at the Laboratory of Land Resources at the Faculty of Agriculture, UPN Veteran Yogyakarta.

Data Analysis

To find out the results of research on the quality and quantity of an organic fertilizer, the analysis used is qualitative description and quantitative analysis. Qualitative data analysis was carried out by comparing with the standards on the 'quality standard' of organic fertilizer in Permentan No. 70/Permentan/SR.140/10/ 2011. Quantitative data measurements include C-organic with the Walkley & Black method, P_2O_5 with the wet destruction method measured using a spectrophotometer, K_2O with the wet destruction method measured with a Flamephotometer, and total N with the Kjeldahl method, and pH using a pH meter.

Results and Discussion

The results of the analysis of the chemical properties of compost from a mixture of organic household waste and mushroom media waste with the addition of Guano Phosphate are presented in Table 1.

Based on the research results, it can be seen that compost from a mixture of organic household waste and mushroom media waste with the addition of Guano Phosphate is feasible and safe to use as an organic fertilizer because its nutrient content is in accordance with the quality standard of organic fertilizer based on Permentan No. 70/Permentan/SR.140/10/2011 (Table 1). Nutrient content produced from the compost with the addition of 10% Guano Phosphate has the best nutrient content, but it still needs to improve the quality in making organic fertilizer because the nutrient content still has a low value.

The results of the analysis of the chemical properties of compost with the addition of Guano Phosphate in this study showed that the addition of Guano Phosphate resulted in the increased nutrient content, especially C-organic, total N, P_2O_5, K_2O, and also slightly increased pH. This is in accordance with the opinion of [3] which shows that Guano releases nutrients of N, P, K needed by plants, so that the application of guano fertilizer can increase the availability of N, P, K nutrients in the planting medium. In [1] it is also explained that applying guano fertilizer can increase soil pH, soil CEC, and available N, P, K levels.

Guano fertilizer can improve soil fertility because guano fertilizer contains 7-17% N, 8-15% P, and 1.5-2.5% K [3]. Nutrients, especially N, P, and K, are very important in plant growth because N is needed by plants to support their vegetative growth. Furthermore, P stimulates root growth and flowering, while K mainly plays a role in strengthening plant tissue, especially plant stems. Although compost from a mixture of organic household waste and mushroom media waste with the addition of Guano Phosphate generally has an increased nutrient content, but the nutrient content of nitrogen and potassium is still low in value, so it needs to be improved again because nitrogen has the main function as a chlorophyll material, protein, and amino acids, so that it plays a role in increasing the width of the leaves, while K (Potassium) functions as an enzyme formation and plays a role in the process of cell division and extension, as well as, regulates the distribution of photosynthesis resulting in increased leaf width in plants [4].

The addition of baglog waste can also improve the quality of compost produced because baglog waste contains nutrients needed by plants and can improve soil nutrient contents. The composition of the waste has a nutritional content of 0.7% P, 0.2% K, total N 0.6%, and C-organic 49.00%, so it is beneficial to increase soil fertility [5].

An organic fertilizer is very beneficial for soil fertility, increases agricultural production both in quality and quantity, is able to reduce environmental pollution, and increases land productivity in a sustainable manner. The use of organic fertilizer in the long run can increase land productivity and prevent land degradation. Organic fertilizer or soil organic matter is the main source of soil nitrogen. Organic fertilizer added to the soil will undergo several phases of overhauling by soil microorganisms to become topsoil or soil organic matter. Organic matter also acts as a source of energy and food for soil microbes, so that the microbial activity can be increased in the supply of plant nutrients [6]. Sources of organic material can be compost, green manure, manure, straw crop residues, stover, corn cobs, sugarcane bagasse, coconut coir, livestock waste, industrial waste using agricultural materials, and household waste [7].

Table 1. Results of analysis of the chemical properties of compost with the addition of Guano Phosphate

Chemical properties	Quality standards for organic fertilizers *)	Measures of guano phosphate		
		0%	5%	10%
C organic (%)	At minimum 15	17.96	28.55	19.41
N total (%)	At minimum 4	0.69	1.36	0.89
P_2O_5 (%)		3.26	4.8	5.84
K_2O (%)		2.21	2.21	2.79
C/n	15 – 25	26.0	20.99	21.81
Ph	4 – 9	8.1	8.3	8.4

*) Permentan No 70/Permentan/SR.140/10/2011

Table 2. Number of *Moringa oleifera* cuttings at various levels of composting at observations 3 and 5 weeks after planting

Compost fertilizer levels	3 weeks after planting	5 weeks after planting
1%	0.00 q	0.33 p
2%	0.28 p	0.83 p
3%	0.11 pq	1.05 p
4%	0.11 pq	1.00 p
5%	0.06 q	0.61 p

Note: The mean followed by the same letter in the same column shows no significant difference in Duncan's test of 5%.

The compost with the addition of Guano Phosphate produced has been applied to the planting of *Moringa oleifera* cuttings with levels of 1%, 2%, 3%, 4%, and 5%. The effects of compost application for each level on the number of shoots that grow on moringa cuttings are presented in Table 2.

From Table 2, it can be seen that at the beginning of growth up to the 3rd week after planting, the provision of compost with level of 1%, 2%, 3%, 4%, and 5% produces number of shoots that are significantly different. Giving compost at level 2% produces the highest number of shoots, but it is not significantly different from levels 3% and 4%. In the 5th week after planting, the number of shoots that grow increased, but did not show any significant difference at each level.

Compost base material used in this study has a relatively low nutrient content, so it is necessary to add enrichment material, namely Guano Phosphate which is high in nutrients, especially Phosphorus nutrients and which can simultaneously function as a bioactivator to accelerate composting, as well as utilizing raw materials from organic waste in the form of mushroom growing media as a source of nutrients N, P, K, and therefore, increasing the contents of compost produced nutrients. According to Subandrio et al., household organic waste has a C/N ratio which is quite low, with an average of 17.82 [8]. To start composting with ideal conditions (C/N ratio 30:1), it is necessary to add additional ingredients that have a large C content such as sawdust (C/N ratio 450:1) which also acts as a bulking agent [9]. During the decomposition process, organic acids will be produced which cause acidic pH, so

it needs the addition of dolomite which aims to neutralize the pH and increase the macro nutrients of Ca and Mg. The addition of bioactivators and molasses serves as a source of energy for microbes, so that microbial activity increases and accelerates the process of decomposition and mineralization, so it quickly produces nutrients. Gaur states that in the composting process there will be decomposition of organic matter by microbial activity, i.e., microbes will take water, oxygen, and nutrients from organic matter which then the organic material will decompose and release CO_2 and O_2 [10].

The decomposition process will take place immediately after the raw materials are mixed. Oxygen and easily degraded compounds contained in compost will soon be utilized by mesophilic microbes. The temperature will increase faster. Microbes that are active in this condition are thermophilic microbes, which are active at high temperatures. At this time, the decomposition process of organic material is very active. Microbes in compost use oxygen and will break down organic matters into CO_2, water vapor, and heat. After some material decomposes, the temperature will gradually decrease, and compost maturation will occur. In Musyafa [11] states that the drop in temperature occurs because the compost base material in the form of litter rich in carbon becomes a source of energy and food for microbes, so that energy runs out and O_2 gradually decreases, so the temperature will go down too.

The produced organic fertilizer has crumb structure, odorless, and brown in color. This is in accordance with Sutanto [12] who states that the characteristics of mature compost, namely the crumb structure, is a medium that is not recognized by its basic ingredients. The best color is blackish brown, and the aerobic decomposition process is shown to change color to black. Odor is one indicator of determining that the complete composting process. The observations obtained that during the composting process, odor changes occur every week. Starting from the very pungent odor, quite pungent, less pungent, until it does not smell at the end of composting. Changes in odor are caused by the fermentation process that occurs during composting. Besides, it is caused by the ammonia odor resulting from the cellulose breakdown. The composting process can take place aerobic and anaerobic. In the aerobic fermentation process, CO_2, water, and heat will be produced. In this study, the manufacture of organic fertilizer from a mixture of organic household waste and mushroom media waste with the addition of Guano Phosphate within 35 days showed the results that were in line with expectations. Nutrients obtained increase according to the quality standard of organic fertilizer.

Compost is a man-made organic fertilizer from the process of decomposition of the remnants of waste. The use of compost as a source of plant nutrition is a chemical-free program although compost is classified as nutrient-poor when compared to chemical fertilizers, but the composting materials are quite abundant, then the potential of compost as a nutrient provider might be able to replace the position of chemical fertilizers [13]. The addition of baglog waste and Guano Phosphate improve the quality of compost, therefore, the organic fertilizer produced is safe and suitable for use, and is applied to plant growth.

CONCLUSION

Compost quality from a mixture of organic household waste and mushroom media waste with the addition of Guano Phosphate has physical properties of dark brown, crumb, odorless and chemical properties, namely the contents of C-Organic, N, P_2O_5, K_2O, C/N, and the pH becomes better, according to the quality standards of organic fertilizers based on Permentan No. 70/Permentan/SR.140/10/2011.

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REFERENCES

[1] Suwarno & Idris, K. (2007). Potential and Possibility of Direct Use of Guano as Fertilizer in Indonesia. *Jurnal Ilmu Tanah Dan Lingkungan*, 9(1), 37–43.

[2] Rahmah L. N., Styaningtyas A. N., & Hidayat N. (2016). Compost Characteristic from Oyster Mushroom Baglog's Waste. *Jurnal Industrial*, 4 (1), 1–9.

[3] Syofiani, R. & Oktabriana, G. (2017). Guano fertilizer application in enhancing nutrient N, P, K, and plant growth of soybean on growing media gold mine tailings. *Proceedings of the 2017 National Seminar on Sustainable Agriculture and Herbal Plants in Indonesia*, Faculty of Agriculture, Universitas Muhammadiyah Jakarta, 98–103

[4] Dikdik, T. (2014). *Main Function of Hara N.* Media Petani.

[5] Sulaiman, D. (2011). *Effect of Compost Made from Waste of White Oyster Mushrooms (Pleurotus ostreatus Jacquin) Baglog on the Physical Properties of Soil and the Growth of Yellow Passion Fruit Seedling (Passiflora edulis var. Flavicarpa Degner).* Institut Pertanian Bogor, Bogor, Indonesia. accessed through repository.ipb.ac.id/jspui/bitstream/123456789/53343/1/A11dsu.pdf.

[6] Simanungkalit. (2006). *Organic and Biological Fertilizers.* Center for Research and Development of Agricultural Land Resources, Bogor, Indonesia.

[7] Suriadikarta, Didi A., & Simanungkalit, R. D. M. (2006). *Organic Fertilizer and Biofertilizer.* Center for Research and Development of Agricultural Land Resources. Bogor, Indonesia, page 2. ISBN 978-979- 9474-57-5.

[8] Subandriyo, Anggoro, D. & Hadiyanto. (2012). Optimization of Household Organic Waste Composting Using a Combination of Em4 and Mol Activators Against the C/N Ratio. *Jurnal Ilmu Lingkungan*, 10(2), 70–75.

[9] Djuarnani, N., Kristian, & Setiawan, B. S. (2005). *Fast Ways to Make Compost,* Agromedia Pustaka, Jakarta.

[10] Gaur, A. C. (1980). Manual of Composting. In Hees, P. R. (ed), *Compost Technology Improving Soil Vertility through Organic Recycling* (FAO/UNDP Regional Project RAS/75/004), Project Field Doucument No 13, Food and Agriculture Organization of the United Nation.

[11] Musyafa. (2005). The roles of soil macrofauna on litter decomposition of Acacia mangium Willd. *Biodiversitas,* 6(1), 63–65.

[12] Sutanto, R. (2002). *Organic Agriculture: Towards Alternative and Sustainable Agriculture*. Yogyakarta: Kanisius.

[13] Santi, K. (2006). Effect of compost fertilizer on tomato growth. *Jurnal Ilmiah Progressif,* 3(9), 42.

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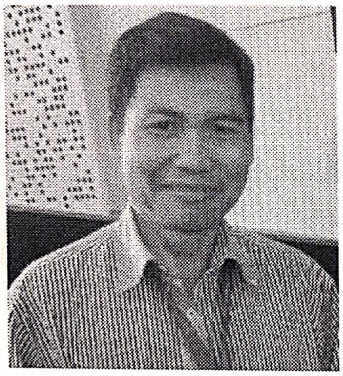

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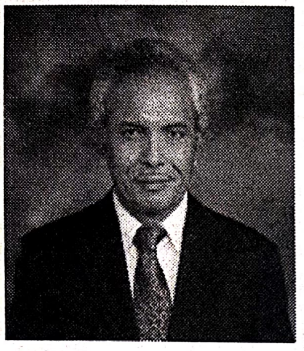

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As Professor at the Universitas Pembangunan Jaya, with daily activities in lecturing, doing research, as well as water resources development planning, I really praise Nova Science Publishers for publishing selected papers from "2020 International Conference on Urban Sustainability, Environment, and Engineering (CUSME 2020)". This publication would be useful for professionals, reseachers, scholar, policymakers, and NGO. I believe that currently, many professionals would like to give more attention to the development of sustainable urban. In addition, this publication could be used as a reference for city authorities to make appropriate policy choices to protect the provision of equitable housing, health, and transportation services.

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