



The Use of Local Waste in Traditional Compost Fertilizers

Fitri Anugrah Sari

¹Department of Agricultural Cultivation, Faculty of Agriculture, Hasanuddin University, Indonesia

*Corresponding Author: Fitri Anugrah Sari

Email: fanugrahsari@gmail.com



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Abstract

Elephant grass, dung, straw, and Gamal leaves, all of which are readily accessible in Makassar City, have not been extensively used by the local populace despite their abundance. These wastes may be processed into organic fertilizers that can be used to boost the economic worth of the trash by developing simple and suitable technologies. The material to be composted is mixed together with the promi, which is then composted. It takes just 6 weeks for the organic fertilizer to be entirely created, as seen by the final compost, which is odorless, dark brown, and water-insoluble, and contains N = 1.4 percent, P = 1.7 percent, and K = 1.8 percent, with a C/N ratio of 18.9 percent.

Introduction

Compost is a kind of organic fertilizer created by humans from the decomposition of the remnants of living organisms (Inckel et al., 2005). It is used to fertilize crops (plants and animals). Compost not only gives nutrients to the soil, but it also helps to preserve the soil's ability to function properly, allowing plants to thrive. Fertilization with the use of compost has the additional goal of creating soil conditions that enable plants to develop as efficiently as possible. If the soil conditions are excellent, it also means that plants can readily absorb food via their strong roots; on the other hand, if the growth is poor, the addition of compost to fertilizer will provide better results on its own. Plant nutrition may be provided by compost, which is a chemical-free alternative to chemical fertilizers. However, compost is believed to be deficient in nutrients when compared to chemical fertilizers. Compost as a nutrient provider may be able to replace the role of chemical fertilizers, even though the amount of compost applied is greater than the amount of chemical fertilizer applied. This is true even though the amount of compost applied is greater than that of chemical fertilizer applied, as an equivalent to the amount of chemical fertilizer applied.

Composting is a biological process in which organic matter decomposes, notably by bacteria that utilize organic matter as a source of energy, resulting in the decomposition of organic matter (Jurado et al., 2015). This procedure include creating a well-balanced combination of materials, supplying enough water, managing aeration, and adding composting activators to the compost pile. In nature, the composting process happens over a lengthy period of time and at a snail's pace. Numerous composting systems have been created in order to accelerate the composting process. Composting with low, medium, and high technology are all possible. On a fundamental level, the development of composting technology is based on the breakdown of organic waste that happens naturally in the environment. The decomposition process has been improved in such a manner that composting may be completed in less time and with more efficiency. Composting technology is becoming more significant, particularly in the context of addressing the issue of organic waste, which includes the problem of trash in urban areas, industrial organic waste, as well as waste from agricultural and plantation operations. Composting trash may be done aerobically or anaerobically, with or without the use of a

composting activator, and the technique is quite varied (Indasah, 2018). Aerobic composting is the most extensively used method because it is simple and inexpensive to implement, and it does not need process management that is too complicated to implement. Using oxygen, microorganisms in the substance itself decompose the material, which results in a more environmentally friendly product. Anaerobic composting, on the other hand, makes use of microorganisms that do not need oxygen to breakdown organic materials. The final outcome of this composting process is a substance that is required for the benefit of agricultural lands in Indonesia in order to enhance the chemical, physical, and biological aspects of the soil in order to increase crop production. In addition to being used to strengthen the structure of critical land, compost produced from composting waste can also be used in agricultural land, plantation soil, as a cover material for waste in landfills, post-mining coastal reclamation, and as a plant medium, all of which can help to reduce the use of chemical fertilizers. Agricultural industrial waste, forage waste, municipal trash, liquid sludge, and animal manure are all examples of composting raw materials since they all include carbon and nitrogen, such as animal manure and forage waste (Jalili et al., 2019). Materials often utilized as raw materials for composting may be found in the following list of popular sources.

PROMI is an abbreviation for Promoting Microbes. Because promi includes microbial actives that have been shown to encourage plant growth, it was given this name. Promi's active components are made up of three kinds of microorganisms: *Aspergillus* sp., *Trichoderma harzianum* DT 38, *Trichoderma harzianum* DT 39, and weathering microbes. *Aspergillus* sp., *Trichoderma harzianum* DT 38, *Trichoderma harzianum* DT 39, and weathering microbes. *Aspergillus* sp. has the capacity to dissolve phosphate from sources that are not easily dissolved. The mushroom *Trichoderma harzianum* DT 38 has the capacity to accelerate the development of plants. This strain of *Trichoderma harzianum* DT 39 functions as a biological agent for the treatment of soil-borne illnesses, particularly those caused by fungus. Furthermore, weathering microorganisms, as the name implies, are involved in the weathering of raw organic materials. Promi may also be used to infuse active microorganisms into compost or other organic fertilizers to improve their performance. Organic fertilizers are often available in granular form, while enriched compost is typically available in bulk form. Promi may also be administered directly to plants, which is another option.

Promi is very cost-effective when compared to other activators. The promi dosage is only 0.5 kg per ton of material or for every 1 m³ of material, which is quite little. In addition, the price is comparable with that of other activators. Composting with Promi does not need turning over and, in the case of particular materials, does not necessitate the shredding of waste. Because there is just one application, it may be more cost-effective. Reversal is only required if there are issues with the composting process, such as a shortage of water, dryness, or a failure of the temperature to raise enough. In addition to being able to boost yields, dissolve bound P in the soil, and manage plant diseases

Methods

This practicum was carried out at Hasanuddin University's Experimental Farm (Ex-Farm) Agriculture in Tamalanrea District, Makassar City, as part of the university's agricultural research program. Sickle/machete, two huge buckets, hoe and shovel, and a large bag 1 are the tools that will be utilized in this practicum. Rice straw/elephant grass (at least 5 kg), gamal leaves (at least 5 kg), organic market trash (at least 5 kg), manure animal (chicken) (at least 2 sacks), and promi are the items that were employed. In this practicum, the working processes involve preparing equipment and supplies, cutting up rice straw, gamal leaves, and organic market trash, and completing the practicum. After cutting, combine it with animal waste,

combine promi with water, pour activator, and cover with a sack. Allow it to stand for 10 days before using

Results and Discussion

Table 1. Compost observation data

Observation Week	Observation Parameter				
	Temperature	Moisture	Aroma	Color	Depreciation
I	30-32°C	75%	Very Smelly	Fresh-Chocolate	25
II	28-30°C	70%	Very Smelly	Brown	5
WE	25-27°C	50%	No Smell	Dark blackish brown	0

Source: *Primary data after processing*

We watched the compost in the sixth week, and based on our observations, the compost that we created failed owing to the fact that we did not turn the compost, that we did not make enough observations, and that the compost became moist due to the rain factor.

Although the colour of the material changes from its original hue to brown throughout the composting process, it eventually turns blackish brown after the process has been running for 6 weeks. Organic market waste retains its original colour until it is composted to ripeness, or until it has reached the sixth week, while rice straw, elephant grass, and gamal leaves that have been composted are blackish brown in colour. There is no associated with the composting of rice straw, elephant grass, and gamal leaves during the composting process. Meanwhile, organic market trash and animal dung generate a strong owing to the anaerobic decomposition process that occurs in the first to second week of decomposition due to the high-water content of the organic waste and animal dung. Table 1 presents the observational data on the temperature of the compost throughout the composting process, which was collected during the composting process. It is expected that the temperature of the compost would rise to 32 degrees Celsius within the first week.

Factors affecting compost

Depending on the composting procedure, the effective C/N ratio might vary from 30:1 to 40:1. Microbes employ C molecules as an energy source and N as a building block in the production of proteins. Microbes acquire enough C for energy and enough N for protein synthesis when the C/N ratio is between 30 and 40. If the C/N ratio is too high, microorganisms will be unable to synthesize proteins, resulting in a delayed breakdown process.

In general, when the C/N ratio is too high, composting becomes problematic, particularly when the primary material contains a large proportion of wood (saw wood residue, twigs, bagasse, etc.). A particular treatment is required to lower the carbon/nitrogen ratio, such as the addition of cellulosic microbes or the addition of animal dung, since animal manure has a high concentration of nitrogen molecules.

Microbial activity is concentrated between the surface region and the surrounding air. Increasing the interaction between bacteria and the substance will result in a quicker degradation process as the surface area of the material increases. The amount of space between materials is also determined by the particle size (porosity). It is possible to enhance the surface area of a substance by decreasing the particle size of the material.

When there is adequate oxygen (aerobic conditions), composting may begin quickly. Warm air escapes from the compost heap and colder air enters the compost heap as the temperature rises, causing natural aeration to occur. The porosity and water content of the material affect the amount of aeration that occurs (moisture). If aeration is prevented, an anaerobic process will take place, which will result in the production of an unpleasant stench. It is possible to promote aeration in the compost heap by stirring it or flowing air through it.

The amount of space between the particles in a compost heap is known as porosity. The porosity of a material is determined by dividing the volume of the cavity by the overall volume of the material. Water and air will be pumped into the cavities to fill them. The composting process will be aided by the presence of oxygen in the air. If the cavity becomes saturated with water, the oxygen supply will be reduced, and the composting process will be slowed or stopped altogether.

Humidity has a significant impact on the process of microbial metabolism and has an indirect impact on the availability of oxygen to the organism. Organisms may benefit from organic matter if the organic material is readily soluble in water, as is the case with most organic materials. The optimal humidity range for microbial metabolism is 40-60 percent relative humidity. Microbial activity will diminish if the humidity is lower than 40%, and it will be even lower at 15% humidity and lower at 10% humidity.

Microbial activity generates heat, which is used to heat the environment (Marchand et al., 2012). There is a clear correlation between an increase in temperature and an increase in oxygen use. The higher the temperature, the greater the amount of oxygen used and the quicker the breakdown process occurs. In a compost heap, the temperature may rise dramatically in a short period of time. Temperatures ranging from 30 to 60 degrees Celsius suggest a high level of composting activity. When temperatures above 60 degrees Celsius, some bacteria are killed and only thermophilic microorganisms are left alive. High temperatures will also destroy plant pathogenic bacteria and weed seeds, as well as the plants themselves.

The composting process may take place in a broad variety of pH conditions. The pH varies from 6.5 to 7.5, which is optimal for the composting process. Generally speaking, the pH of manure varies from 6.8 to 7.4. The composting process will produce changes in organic matter as well as the pH of the item being composted itself. A reduction in pH (acidification) will be caused, for example, by the process of releasing acid, either momentarily or locally, while the creation of ammonia from nitrogen-containing molecules will cause pH to rise (acidification) during the early stages of composting. The pH of mature compost is generally near to neutral, if not exactly neutral.

The amount of P and K present in the compost is also crucial in the composting process, and it is often found in compost from animals. During the composting process, bacteria will break down and use these nutrients for energy.

Some organic materials may include chemicals that are toxic to microorganisms, making them unfit for human consumption. Heavy metals such as magnesium, copper, zinc, nickel, and chromium are just a few of the elements that come into this group. During the composting process, heavy metals will get immobilized and will not be released. Consequently, it may put the composting process at risk and may even be a contributing reason to the composting process failing.

The composting process takes a certain amount of time depending on the qualities of the material being composted, the composting technique employed, and whether or not a

composting activator is added to the mixture. Natural composting will take place from a few weeks to two years, depending on how thoroughly the compost has been cooked.

Soil structure is improved by composting because it increases the organic matter content of the soil, which also enhances the soil's capacity to hold soil water (Šimanský et al., 2016). Compost will stimulate soil microbial activity that is helpful to plants, which will result in increased plant growth. This microbial activity aids in the absorption of nutrients from the soil by plants. It is also recognized that soil microbial activity may assist plants in dealing with sickness. Plants fed with compost also have a higher quality than plants fertilized with chemical fertilizers, with harvests that are more resistant to storage, heavier, fresher, and tastier than crops fertilized with chemical fertilizers.

Compost provides a wide range of advantages in a variety of contexts. Economic Aspects: Reduces expenses associated with trash transportation and disposal; reduces the amount and quantity of garbage; and has a greater selling value than the original material (see below). In terms of the environment, this means reducing air pollution generated by garbage burning as well as the emission of methane gas from decaying organic waste caused by methanogenic bacteria in landfills; it also means reducing the requirement for land to store waste. Increase soil fertility; improve soil structure and features; increase the water absorption capacity of the soil; increases soil microbial activity; improve yield quality are some of the benefits for land and plants (taste, nutritional value, and harvest amount).

Conclusion

A compost pile is a pile of organic waste that has weathered as a result of interactions between microorganisms that live and work in it. The advantages of compost may be considered from the perspectives of economics, the environment, and the soil or plants. Temperature, humidity, acidity, and the kind of materials utilized all have an impact on how long composting takes. Composting is a biological process that may be used to handle organic waste materials such as plant debris, food waste, and paper. Composting is also known as the decomposition of organic waste. If possible, it is advised that you avoid using hard materials such as tree trunks or mature plant seeds. You should also avoid using animal corpses and items that have been polluted with chemical chemicals while preparing compost. Maintain a temperature of around 30°C. Maintain a moisture content of around 50% in the compost.

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