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Process of Making Liquid Organic Fertilizer in Biotechnology Material

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Abstract: Organic fertilizer is a fertilizer made from organic materials such as the decay of plant, animal, and human remains. This study aims to determine the process of making liquid organic fertilizer in biotechnology material. The method of making this liquid organic fertilizer is that household organic waste such as vegetable waste, fruit peels, and others are separated from inorganic waste, then added with EM_4 bio activator. Based on the results of the experiment, an environmentally friendly organic fertilizer can be produced that can be used to increase agricultural production both in terms of quality and quantity, reduce environmental pollution, improve land quality sustainably, increase land productivity and can prevent land degradation.

Keywords: Biotechnology; EM_4; Liquid organic fertilizer

Introduction

Essentially, national education plays a crucial role in developing capabilities and shaping the nation's character and civilization (Gee et al., 2021). A dignified national civilization is oriented toward efforts to enhance the intellectual life of its citizens nation. An intelligent nation is formed through quality education (Fau et al., 2023). Improving the quality of education and developing the learning process are issues that always require attention (Sarbaitinil et al., 2024).

Advances in internet-based information and communication technology have had a significant impact on people's daily lives. Internet technology, which has evolved over time, has transformed the way people access information and communicate, transcending the constraints of space and time. Currently, many learning media are using new innovations and utilizing technology as time goes by. Many print-based learning media are being reduced and shifted to digital-based learning media. Several studies have been conducted to create effective learning media for students in Indonesia and throughout the world. Every development in learning media must be understood by educators so that in the learning process students can achieve the desired learning objectives (Santosa et al., 2023).

In this study, researchers will develop virtual learning media for making liquid organic fertilizer as an effort to provide students with an understanding of how to manage organic waste. Currently, waste is a critical environmental problem faced by Indonesian society. It is undeniable that if waste management is not good, it will result in waste accumulation (Husni et al., 2022).

In response to the ongoing waste problem, it is deemed necessary to prepare individuals with the knowledge and skills to be able to determine attitudes towards current environmental issues, as well as to maintain environmental balance (Leksono et al., 2020). Efforts that can be made to anticipate and overcome environmental problems include improving environmental literacy skills both as individuals and groups, namely by providing an understanding to students so they can utilize organic waste into useful fertilizer (Prasetiyo, 2017).

Organic fertilizer is a fertilizer made from organic materials such as the decaying remains of plants, animals, and humans. Organic fertilizers can be in solid

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or liquid form and are useful for improving the physical, chemical, and biological properties of the soil. Organic fertilizers contain more organic matter than their nutrient content. Sources of organic material can include compost, green manure, manure, agricultural waste (straw, stover, corncobs, sugarcane bagasse, and coconut fiber), livestock waste, industrial waste that uses agricultural materials, and municipal waste (garbage). Making organic fertilizer (POC) from household waste has the potential to increase plant productivity and is an alternative option for reducing household waste production. This waste processing alternative is believed to be a solution for fostering awareness of environmental attitudes and behaviors (Lestari et al., 2021).

Organic fertilizers have enormous benefits, including increasing agricultural production in terms of both quality and quantity, reducing environmental pollution, improving land quality sustainably, increasing land productivity and preventing land degradation, improving the physical, chemical, and biological properties of soil and the environment, acting as a source of energy and food for soil microbes so that they can increase the activity of these microbes in providing plant nutrients (Patanga et al., 2016). Liquid organic fertilizers have advantages over solid organic fertilizers, namely in terms of ease of manufacture, more practical application and faster in overcoming nutrient deficiencies because they can be directly absorbed by plants and soil (Santi, 2008).

Method

Tools

The tools used in this research were a bucket, knife/scissors, pan, stirring stick, bottle, and sieve.

Materials

The materials used in this research were organic kitchen waste such as used vegetable scraps, onion and garlic skins, rotten fruit/fruit peels, used rice, brown sugar, EM_4, and other materials.

Procedure

The procedure for making liquid organic fertilizer is as follows: (a) Dissolve 5 grams of brown sugar in 500 ml of clean water, stir until dissolved on the stove, wait until cool, and pour into a bottle (molasses). (b) Chop all organic ingredients into small pieces and pour them into the prepared bucket. (c) Dissolve 2 bottle caps of molasses and one bottle cap of EM4 in 2 liters of water and pour over the chopped organic ingredients. (d) Close the bucket tightly to prevent air from entering. (e) Open the bucket lid daily for 2 weeks. (f) After 2 weeks, filter the liquid organic fertilizer so that it is ready to use.

Result and Discussion

Fermentation is a chemical process that changes organic substrates through the activity of enzymes produced by microorganisms. The fermentation process requires a starter culture, which is the microbe that will be grown in the substrate. A starter culture is a microbial population in sufficient quantity and physiological condition to be inoculated into a fermentation medium. EM_4 is used for both biological preservation and fermentation starters.

Effective microorganism 4 solution, abbreviated as EM_4, was first discovered by Prof. Dr. Teuro Higa from the University of Ryukyus, Japan. This EM_4 solution contains fermenting microorganisms. The number of fermenting microorganisms in EM_4 is very large, around 80 genera. Of the many microorganisms, there are five main groups contained in EM_4, namely photosynthetic bacteria, lactobacillus sp., Streptomyces sp., yeast, Actinomycetes. Effective microorganisms or EM are a mixed culture of various microorganisms that can be used as an inoculant to increase soil microbial diversity and can improve soil health and quality (Rasmito et al., 2019).

Figure 1. Liquid organic fertilizer fermentation process

Figure 2. Ready-to-use liquid organic fertilizer

Brown sugar is also needed in the production of liquid organic fertilizer. Brown sugar is used as molasses in the production of liquid organic fertilizer. It serves as a food source for microorganisms to grow and facilitate the fermentation process, allowing organic waste to decompose into ready-to-use liquid organic fertilizer (Lisanty et al., 2021).

Conclusion

Based on the results of the experiment, an environmentally friendly organic fertilizer can be produced that can be used to increase agricultural production both in terms of quality and quantity, reduce environmental pollution, improve land quality sustainably, increase land productivity and can prevent land degradation.

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