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RiceCycle EcoFertiliser

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ABSTRACT

This project tackles the critical issues of the food waste and plastic bottles that contribute to significant environmental pollution that can have effects on ecosystems, human health, and the economy. The objective is to recycle and reduce pollution caused by food leftovers such as rice, fruit peels and tea dregs. Simple methods by placing the food waste in biodegradable tea bags and putting it in a recycled plastic bottle containing rice filtering water to boost decomposition and nutrient release, promoting sustainable agricultural practices. The usage of this liquid fertilizer along with chemical fertilizer showed a difference in the plant's height and its stem diameter. Reused plastic bottles serve as fertilizer containers not only reduce plastic pollution but also promote the 3R concepts (reduce, reuse, recycle). Moreover, the materials used in this project can improve soil quality, promotes healthier plant growth, and promotes sustainable planting. It aligns with Sustainable Development Goals (SDGs) to benefit the community through its contribution to a sustainable economy and promote environmental sustainability goals by providing a workable solution to food and plastic waste.

Keywords: rice; food leftovers; plastic bottle; organic fertilizer; Sustainable Development Goals (SDGs).

1. INTRODUCTION

Food and plastic waste are becoming a global issue that cause serious threats to food security and environment concerns. In Malaysia, about 16,688 tonnes of wood waste are generated daily (SWCorp Malaysia, 2019) while globally, one million plastic bottles are bought every minute and end up as waste (The Guardian, 2017).

Chemical fertilisers are commonly used in agriculture but with drawbacks. It can cause soil hardening, pollute air and water, and affect human health and animals (Faiqa and Jilani, 2024). In contrast, organic fertilisers, derived from natural sources like plants or animals are biodegradable and can recycle the nutrients back into the soil (Imwene et al., 2021).

This project focuses on two problems, to reduce food waste (leftover rice, dregs and fruit peels) and plastic wastes and turn them into organic fertilizer (Mandal et al., 2024). The usage of recycled mineral plastic bottles is also being emphasized to be the medium for the fermentation to occur. These solutions offer benefits for both the environment and agricultural sustainability. The innovation in this project is by using tea bags filled with food waste eliminating the process of manual filtering and makes this process user-friendly. Moreover, tea bags can decompose and release nutrients to soil and eventually enrich and promote fertile soil (Dewi et al., 2022).

This project aligns with several United Nations Sustainable Development Goals (SDGs), including creating a better environment and lowering the risks of chemical exposure to human health (SDG 3), reducing waste management and engaging communities in small-scale gardening (SDG 11) and reducing greenhouse gas emissions and soil damage brought on by chemical fertilisers (SDG 13) (United Nations, 2024).

2. METHODOLOGY

2.1 Materials

a. Rice Waste
b. Rice Filter Water
c. Tea Dregs
d. Fruit Peels
e. Container/ Mineral Plastic Bottle
f. Tea Bags
g. Molasses
h. Effective Microbes
i. Spray Head

2.2 Methodology

The procedure begins by preparing Content A, which involves placing tea dregs and fruit peels into a tea bag. Next, Content B was prepared by mixing solutions of molasses, rice wash, and effective microbes. The tea bag containing Content A was then placed into a plastic bottle, followed by pouring Content B into the same bottle. The bottle was closed and stored in a well-ventilated area, allowing the mixtures to ferment for 5-7 days. During this period, the bottle was periodically opened and shaken to promote oxygenation. After a week, the tea bag was removed from the bottle, and the concentrated solution obtained was diluted with water at a 1:10 ratio. This diluted solution was then used as a plant booster, while the leftover Content A was planted in the soil.

3. RESULTS AND DISCUSSION

Based on the title of this research, “RiceCycle EcoFertilizer”, the objective is to utilize the household waste and the process is considered a success depending on the success rate of fermentation. These wastes were placed in the tea bag and inserted into plastic bottles with rice wash water, molasses and effective microbes (MOL). Molasses act as a nutrient provider for the microorganisms and the sources for protein, carbohydrate, vitamins and fiber (Sari et al., 2023) while MOL acts as a starter in the fermentation process consisting of carbohydrate, glucose and microbes. After 7 days, a cloudy white color of liquid fertilizer was obtained with the smell of tape (tapai) which indicates the success of the fermentation process (Dewi et al., 2022). Experiments conducted by Yerizam et al. (2022) indicated the duration of fermentation eventually affects the nitrogen (N), potassium (K) and phosphorus (P) content in the liquid organic fertilizer. In general, the longer time taken for the fermentation process, the higher the contents of N, P and K in the liquid organic fertilizer.

Table 1. Comparison of Different Fertilizers Type on Plant Height and Stem Diameter After 28 Days

Treatment	**Plant height (cm)**	**Stem diameter (cm)**
Control	13.77	7.13
NPK	19.56	8.13
½ NPK + Liquid Organic Fertilizer	22.66	8.33
¾ NPK + Liquid Organic Fertilizer	21.72	8.2

(Syamsiah and Herdiansyah, 2022)

Table 1 showed the impact of using different fertilizers towards the growth of the plant in terms of its height and stem diameter. It indicated that combining chemical fertilizer along with liquid organic fertilizer can maximize the growth of the plants (Syamsiah and Herdiansyah, 2022).

Overall, this study's findings highlight the many advantages of using liquid fertilizer made from fermentation processes in farming. In the future, more investigation is necessary to improve application techniques, evaluate long-term effects on soil health, and investigate approaches for increasing production and uptake of this sustainable agricultural input.

4. CONCLUSION

The project used food waste and plastic to produce liquid fertilizer in recycled plastic bottles. This project not only minimizes waste but also contributes to soil health and agricultural sustainability. Simple methods such as fermentation and decomposition produced organic liquid fertilizer, offering a sustainable alternative to chemical fertilizers. The results and discussions highlight the effectiveness and benefits of using fermented liquid fertilizer in agriculture. From improving soil fertility to reducing environmental pollution and supporting financial resilience in rural areas, the potential impact of this approach is significant. In conclusion, the project aligns with global sustainability goals, addresses multiple environmental and agricultural challenges, and offers a practical solution that can be adopted at both community and industrial scales. Further research and implementation efforts are encouraged to maximize the benefits and promote widespread adoption of this sustainable agricultural practice.

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