



Development and characterization of hybrid liquid fertilizer from celery and cucumber wastes

Shamsul Bin Zakaria*, Mohammad Sufian Bin Zahari, Siti Zulaikha Binti Hisamudin

Faculty Industrial Sciences & Technology, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Pahang, Malaysia

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ABSTRACT

Agriculture is one of the most important sectors in Malaysia. Since huge amount of vegetable wastes gives negative impacts towards the environment, they can be used to produce hybrid liquid fertilizer to facilitate the growth of the plant. Hybrid liquid fertilizer is a fertilizer that is made from addition of ammonia to fermented liquid from the fermentation of vegetable wastes and brown sugar. The objectives of this study are to produce hybrid liquid fertilizer as a growth booster from fermentation, to characterize the developed hybrid liquid fertilizer, and to analyze the effect of hybrid liquid fertilizer on the growth of mung beans. The hybrid liquid fertilizer obtained was used to analyze the nutrients content by using ICP-MS. pH of the hybrid liquid fertilizers were also tested. The result showed that the pH decreases as days of fermentation increases due to the production of acids. In ICP-MS analysis, potassium content in the samples increases with increasing days of fermentation. The same trend goes for phosphorous except for the hybrid liquid fertilizer of cucumber with 4 g of ammonia. Hybrid liquid fertilizer of celery with 2 g of ammonia at 7 days fermentation showed to be the most suitable to be used for the growth of plant as it produced the best results for the height of mung bean plant, the length of the leaves and the width of the leaves.

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1. Introduction

Agricultural sector is one of the important sectors that has been contributing to Malaysia's economy due to various factors. Mainly, it is due to the fact that Malaysia is a country that is located close to the equator, so Malaysia can maintain its humidity level. The weather is hot and humid throughout the year and the country are unlikely to get affected by natural disasters such as hurricanes or drought. Therefore, the environment in Malaysia is highly favorable to promote the reproduction of the seeds.

Population growth will lead to heightened use of natural resources. The food demands are increasing in growing population countries which also means that more foods might get wasted. Resources used in the production of food ends up being lost and wasted accounts for almost one-fourth of the total global cropland and fertilizer use [1]. About one-third of all fruits and vegetables are estimated to be lost during postharvest (excluding preharvest losses and waste after reaching the consumer) and do not even reach the consumer for consumption. The food waste

has become a concern especially in a landfill since it is able to produce greenhouse gases such as carbon dioxide and methane. The greenhouse gases that are generated causes a loss in soil nutrient value in a landfill and this will add unnecessary cost to the landfill [2]. The smell from the food waste is also a concern as it attracts rodents and insects which might affect the public health.

In order to solve these issues, the vegetable wastes are used to produce hybrid liquid fertilizer by using fermentation process. The advantage of hybrid liquid fertilizer is that it gives convenience in savings and helps to meet the crop needs. This fertilizer can help in boosting the growth of the plant as it can supply the essential nutrients that plants needed for optimum growth [3,4]. Also, fertilizers are also used widely because it is able to improve quality of soil and yield of the plant [5]. The nutrients that are used can be vary (nitrogen, phosphorus, and potassium) to fulfill the needs of the crops. Nitrogen is used to help plant growth and helps to be strong. Meanwhile, phosphorus helps in the development of roots and potassium helps to improve overall plant health. Compared to potassium and phosphorus, nitrogen-based fertilizer has lesser probability to cause clogging during fertigation since according to [6], nearly all nitrogen-based fertilizers are completely water

* Corresponding author.

E-mail address: shamsulzakaria@ump.edu.my (S. Bin Zakaria).