Formulation and production of sawdust-based organic fertilizer

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Introduction

About 75% of soils in Malaysia are highly weathered, acidic, and having both low in cation exchange capacity (CEC) and soil organic matter. These properties had caused large nutrients loss due to leaching. Addition of organic from organic waste to this soil may help to restore soil CEC and fertility status for sustainable crop production. The abundant production of sawdust from saw mills and the large production of palm oil mills effluent (POME) could be turned into organic fertilizer. The organic fertilizer produce through the rapid biocatalytic composting technique not only has higher nutrient content from the original material but also has higher pH and humic acid content. These chemical properties had been known to enhance plant root proliferation, and therefore, lead to better plant growth The objective of this study were to develop a rapid composting technique from the sawdust and POME waste materials and also to evaluate the composting product (organic fertilizer) on the growth of leafy vegetable and oil palm seedling grown on weathered acid soil.

Materials and Methods

Two greenhouse experiments were conducted to meet the above objectives. The first experiment was to identify the most rapid composting method. Different types of sawdust and POME ratio were composted with several types of activator (chicken dung extract, effective microbes (EM-4), and rice bran). Temperature were recorded twice daily during the composting . After 35 days of fermentation, pH, and nutrients content were analyzed in the compost material. In the second experiment, five different types of composts derived from several types of agro waste materials (T1; chicken dung: sawdust, T2; POME: sawdust, T3; Chicken dung: paddy husk, T4; POME: Shredded trunk, and T5; controls, standard practice) were evaluated for their effectiveness by observing the growth response of leafy vegetable and oil palm seedlings. For the leafy vegetable, about 5% (w/w) of each compost was mixed with 3 kg of Bungor series soil (Typic paleudult) and sown with bayam seeds. The pots were watered daily at field capacity. After 7 days, thinning was done to two plants per pot. Standard fertilization was applied in each pot. After 28 days the bayam was harvested by sampling the plant top and root weight. The harvested plant biomass was then dried in the oven to obtain plant and root dry weight. For the oil palm seedling experiment, the seed was sown in a 20 kg polybag which was initially mixed with 5% of each type of compost (T1 to T5). The plant seedling was watered daily to field capacity and apply with standard fertilization program as being recommended by the Malaysian Palm Oil Board. The seedlings were allowed to grow until it reaches about 10 months old. The plants were then harvest for plant top and root and placed in an oven to obtain its dry matter content. Each treatment was replicated five times.

Results and Discussion

In the first experiment, the result showed that all types of compost when applied with rice bran (10% w/w)had increased the composts tempeture above 65^0 C, while other only reached about 40^0 C. Many pathogenic microorganisms were killed when the composting temperature hit above 65^0 C, indeed this is one of the advantages of composting. There were no significant different on plant yield either by adding the compost with chicken dung extract or EM-4. This showed that it was not necessary to use imported microbes in conducting rapid biocatylic composting, where chiken dung extract was sufficient as the alternative. In term of POME to sawdust ratio, 1:2 showed better composting then 2:1 as indicated by the higher temperature recorded. In the second experiment, treatment T3 for chicken dung + paddy husk and T4 for POME and shredded trunk, showed relatively high plant top and root dry weight of bayam compared to other treatments. Similarly, the plant top and root dry weight of oil palm seedlings also showed T3 gave the highest value followed by T1 (chicken dung + sawdust). Overall, the result showed the total plant biomass increased by a minimum of 1.3 fold for oil palm seedlings and about 8.2 fold for bayam upon the application of the rapid biocatalytic compost.

Conclusions

The study demonstrated the important of adding an activator such as rice bran a source of food microorganism activity during the composting process. The chicken extract or chicken dung can be an alternative source of composting microbes if one may be unsure about using imported microbes as it need to be approved first by the Department of Agriculture to avoid any pathogenic effect. The study also indicate the beneficial effect of compost appication on both plant and root growth. The large increase in root growth when treated with compost would help to absorb plant nutrients efficiently.

Benefits from the study

The study had shown how agriculture waste material can be transform into high-value organic fertilizer through rapid biocatalytic composting technique. The research had also help KUSOCOM (M) Sdn. Bhd. and DIVERSATECH (M) Sdn. Bhd. to produce their organic compost derived from chicken dung, sawdust, and rice husk. Their organic fertilizers are currently being used in vegetable, fruits and paddy crops.

Patent(s), if applicable:

Not patented

Stage of Commercialization, if applicable:

commercialized under the brand name **JITU.**

Project Publications in Refereed Journals:

Nil

Project Publications in Conference Proceedings

1. Isharuddin, M.I., S.R. Syed Omar, T. Jamal, and J. Shamshuddin. 2000. Establishment of vegetation on carbonaceous shale. Soil Science Conference of Malaysia , April 18-20, 2000. Johor Bahru. p:108-112.

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