Effect on the Ratio of Rice Husks and Palm Oil Mill Effluent (POME) as to be Fertilizer

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Abstract

Palm Oil Mill Effluent (POME), a by-product of palm oil mills is usually produced in a large quantity. In Malaysia, palm oil currently occupies the largest acreage of farmed land. Palm oil sludge, commonly referred to, as palm oil mill effluent (POME) is brown slurry composed of 4-5% solids, mainly organic, 0.5-1% residual oil, and about 95% water. The effluent also contains high concentrations of organic nitrogen. Palm oil mill effluent is a thick brownish liquid that contains high solids, oil and grease, COD and BOD values. Conversion of POME to organic fertilizer can be a sustainable energy for its disposal only when its effects on soil microbial and biochemical properties. Fertilizer is any material of natural or synthetic origin that is applied to soils or plant tissues to supply more or one plant nutrients that is essential to the growth of plants. Rice husks can be used in compost and vermicomposting to obtain a high quality organic fertilizer in a short time. Rice husk contains a high content of silicon and potassium which have great potential for amending soil. The present investigation was aimed to study the effect on the ratio of rice husks and palm oil mill effluent as to be fertilizer. The use of rice husks as an organic fertilizer might play a vital role not only improving soil physical condition but also in improving plant nutrient.

Keywords: fertilizer, palm oil mill effluent, rice husks,

1. Introduction

Rice husk is an agricultural waste and most widely available in many rice producing countries around the world. Approximately, 600 million tons of rice paddy is produced globally each year. On the average of 20% of the rice paddy is husk and about 120 million tons of its annual production (Giddel et al., 2007). Rice hulls or rice husks are the hard protecting that covered the grains of rice. Rice husks are the outermost layer of the paddy grain that is separated from the rice grains during the milling process. Rice husks can be either burnt or dumped as waste in majority of rice producing countries (Kumar et al., 2012). Rice husk contains 75-90% organic matter such as lignin, cellulose and other mineral components such as trace elements, silica and alkalis (Kumar et al., 2012). In order to protect the rice during the growing season, rice hulls can be put to use as building material, fertilizer, insulation material or fuel. Rice husks can be composted but their high lignin content can make it a slow process. Earthworms are used to accelerate the process using vermicomposting techniques and rice husks can be converted to fertilizer in about four months (Longsdon et al., 1994). In this project, rice husks have been used as the raw material.

Palm oil mill effluent or POME is results from the process of oil extraction in generation of liquid waste. (Agamuthu et al., 1995). Palm oil mill effluent contains substantial quantities of solids, suspended solids and total dissolved solids in the range of 18,000 mg L^{-1} and 40,000 mg L^{-1} respectively (Agamuthu et al., 1995). The potential for using POME as an organic fertilizer may offer alternative to the excessive application of chemical fertilizer especially phosphorus (Wu et al., 2008). POME can be used as fertilizer or animal feed substitute due to the non-toxic nature and fertilizing properties in terms of providing sufficient material requirements (Habib et al., 1997). Palm oil mill effluent is a thick brownish liquid that contains high solids, oil and grease, COD and BOD values. The application of raw or digested POME as fertilizer on land was initially thought to be impractical because of the effluent killing vegetation and leading to the blocking of percolation and water logging, thus resulting in anaerobic conditions. Palm oil mill effluent contains high organic load, substantial amounts of plant nutrients and represent a

low cost source of plant nutrients when fermented. The objective of this study is to determine the pH of the rice husk, POME and the mixture of the POME and the rice husk.

2. Methodology

2.1 Palm oil mill effluent (POME)

POME was collected from the company of Kilang Sawit Muar Berhad. It was stored at cool temperature and dark place.

2.2 Sample preparation

Rice husks were collected from Kilang BERNAS, Paya Keladi, Pulau Pinang. The rice husks were weighed about 70 gram and placed in plastic container. POME was added into the container with rice husks in different ratio which are 1:2, 1:4, 1:6, 1:8, 1:10. The pH of POME was determined to be 7.4 while the rice husks was 6.7 prior to mix together. The mixture was placed at the exposed area and covered with black plastic about 28 days. The mixture was blend every 2 days.

2.3 Sample analysis

A test was carried out to determine the pH of the rice husk, POME and the mixture of the POME and the rice husk by using pH meter.

3. Result and discussion

The experiment that is to be conducted for this experiment was to mix the palm oil mill effluent (POME) with rice husks with the ratio that already calculated for this experiment with some retention time which is 21 days. The rice husks were put in 10 samples that had fixed weight. After that, POME were filled in the 5 sample which had different ratio such as 1:2 , 1:4, 1:6, 1:8, 1:10 and every sample were set twice. There was more than one bioreactor being set which is act as control sample consist of mixing of palm oil mill effluent with rice husks. The objective of the experiment were to determine the pH of the mixture that affected by ratio of rice husks and palm oil mill effluent (POME).

The lowest pH value of the mixture is 6.7 which is the ratio of substituent 1:2. This the acidic value. The higher the acidity of the fertilizer, the higher the fertility of the plant and thus will provide healthy fertilizer compared to alkaline according to Ahmad et al. (2006). Fertilizers that contain more alkaline cannot be appropriate to label as a good fertilizer and it cannot provide fertility to the plant (Ahmad et al., 2006). In addition, after 28 days, the rice husks became more compost after it was mixed with POME.

Table 1 The initial pH reading of rice husks and POME

Materials	pH Initial
Rice Husks	7.5
Palm Oil Mill Effluent (POME)	6.8

Table 2 The final pH reading of mixture of rice husks and POME

Ratio of Substituent (Rice husks: POME)	pH Final	
	1	2
1:2	6.7	6.5
1:4	6.7	6.9
1:6	6.9	6.8
1:8	7.3	7.4
1:10	7.6	7.7

Furthermore, the colour change in the mixture can be clearly seen as it becomes brown–black colour after 21 days. A good fertilizer to the plant will compost with darker colour (Lim et al., 2012). The highly composed of mixture can be proved if the colour of the mixture is becoming dark. Furthermore, after a few days, the mixture POME and rice husks becoming more odourless. This is because after the observation that has been made, the mixtures were exposed under the sunlight but covering it with dark canvas to prevent other factor that will affect the result.

All in all, by making a fertilizer from agricultural waste such as rice husks and the reaction with POME will provide a good fertilizer as it requires low cost and the production is safe. In addition, it has no chemical content in the fertilizer and it is also a renewable energy. In the future, the rise husks are suggested to be burnt before being mixture to obtain a good result of fertilizer. Furthermore, the retention time must be longer as (Wu et al., 2009) stated that the first two weeks could be the limiting factor as the nutrients was made for the plant growth. The suitable state of rice husks are supposed to be in ash state because in this state, it has higher specific surface area (Li et al., 2011). Besides that, the mixture or rice husks and POME should be recommended to be placed in an open filed as this to ensure that the mixture will be entirely compost.

4. Conclusion

The present experiment shows that bio-composting of rice husks and POME with the right ratio, can produce good fertilizer. Complete fertilizer is a term used to identify fertilizers that contains Nitrogen, Phosphorus and Potassium. With a right ratio of them, it will be a good fertilizer. Nitrogen is the nutrient needed in largest quantities as a fertilizer. It is because, with Nitrogen, it will produce lush, tender, green leaves (or grass blades), essential for growth of foliage and is easily flushed through the soil. Phosphorus can stimulate the root growth, hastens the maturity of plants, promotes development of flowers, fruits and seeds but excessive phosphorus fertilizer can aggravate iron and zinc deficiencies and increase the soil salt content.

For the potassium, it will gives vigour to tolerate changing weather conditions, helps resists disease but leaches from the soil, not so fast ass nitrogen. In addition, the use of organic matter such as rice husk and in producing bio fertilizer is economical. It also act as the carrier material for nutrient and microorganisms. The potential for using POME as a cheap organic fertilizer may offer an alternative to the excessive application of chemical fertilization especially Phosphorus for which cost is a severe economic constrains.

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