

Influence of Vermicompost Technology on Solubility of Eppawala Rock Phosphate

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Introduction

This study was conducted to determine the influence of vermicompost technology on solubility of ERP. Earthworms play a major role in vermicomposting. The most common type of earthworms used for vermicomposting is brandling worms (*Eisenia foetida*). Food is ingested through the mouth into a stomach (crop), which retains food and has the ability to expand. From there, food goes into the gizzard where sand and muscular contractions churn the food and increase the surface area. From there, food enters the intestine which has the ability to absorb food, then food exits through the anus. This final product consists of low power organic acids, like Malate, Oxalate, Citrate, etc. This low power organic acid helps to increase the solubility of ERP. ERP is currently mined for use as a fertilizer for perennial crops such as tea, rubber and coconut. This gives considerable value to the country because Phosphate deposits are non-renewable and dwindling resources in the world like fossil fuel. Also this is very economically important natural resource in Sri Lanka. Current production is 25 000 metric tonnes per year while reserves are 40 million metric tonnes. This saves nearly Rs 20 billion annually spent for importing fertilizer. This is important for providing the Phosphorus (P) fertilizer requirement, because P plays an important role in many physiological and bio chemical functions that are important to plants and animals. Major problem can be seen in ERP is the less solubility. The core bodies at Eppawala contain 42% P₂O₅ and citric acid solubility of different components varies from 4 to 6%. The parent rocks are mainly made up of calcite, dolomite and apatite, with lesser amounts of ilmenite, magnetite, pyrite, forsterite, phlogopite, enstatite, magnesite, diopside, tremolite and spinel. The Eppawala rocks are characterized by low silica (0.41%), high phosphorous (10.58%) and high strontium content (Gunawardena, 2003). Therefore in this study, an experiment was made to increase the availability of P by using vermicomposting.

Methodology

This experiment was carried out at the vermicomposting unit of the Coconut Research Institute, in the Low country Intermediate Zone of North Western province of Sri Lanka from May 2011 to August 2011. The area is characterized by bi-modal pattern of rainfall with an annual mean precipitation of >1400 mm, approximately 65% of the annual rainfall is received from April to August (South west monsoon).

Fresh *Gliricidia sepium*, *Panicum maximum* (Guinea Grass) leaves and fresh cow dung was selected and plant species were chopped into small pieces and mixed with fresh cattle manure separately. The proportion of cattle manure and plant residues were 1:1. The mixture was added to black plastic pots. Small holes were made in the pots for removal of excess water, although it should not facilitate the entrance for worms to move the environment.

After adding the mixture, 50 worms from selected species (*Eisenia foetida*) and 200ml of water was added into each plastic pots and those were kept in the shade condition. The weights of 50 worms were measured before introducing to the pots. The mixture was kept for eight weeks to decompose the materials. Once a week mixtures were removed from the pots and mixed well to facilitate aeration. After mixing, 150 ml of water was added into each pot.

Data analysis of the above experiments were conducted using an Analysis of Variance (ANOVA) and the significance of the differences between means were tested using Least Significant Differences (LSD) at $P=0.05$.

Results and Discussion

The treatments were T1 (control), T2 (earthworms), T3 (earthworms + 100 g), T4 (earthworms + 200 g), T5 (without earthworms + 100 g), T6 (without earthworms + 200 g). Temperature, pH, Total Nitrogen, Available Phosphorus and Total Potassium of compost were measured in all treatments.

The temperature of each treatment was increased up to 29°C to 30°C in 3rd week and thereafter temperature was gradually decreased up to 28°C to 27°C due to the reduction of microbial and earthworm respiration. It confirms that the decomposing process was reached to the maturity level. But in this study pH was towards to alkaline condition, due to the effect of earthworm activities and ERP. In this experiment each treatment had the different amount of N% in the final vermicompost, that results indicated the addition of ERP had minimal effect on the conversion or enhancement of Total N. According to results T4, T3 and T2 recorded higher Available P% level. When confirming the results in this experiment relatively high amount of Available P% was found in the treatment having 200 g ERP (T4) compared to the treatment having 100 g ERP (T3). Therefore, vermicomposting can be utilized to increase the solubility of Eppawala Rock Phosphate while increasing the available phosphorus in the end product. During composting period Total K content was increased in all the treatments. The carbon content was rapidly increased along with the composting period.

Conclusion

Vermicomposting can be utilized to increase the solubility of ERP while increasing the Available P% in final product. When increasing the level of ERP it will lead to increase the available phosphorus level. In addition Total K% and Organic Carbon content improve in all treatments. Also pH towards to alkaline condition and decomposition of materials completes within 45 days.

References

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