Investigation on Vermicompost Production of Hyacinth plant and Banana plant Using Cow Dung

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Abstract

Vermicomposting is one of the recycling technologies which will improve the quality of the products. The present study aims to find out the possibility of utilization of hyacinth plant, banana plant and cow dung for vermiculture or for the production of organic fertilizer. Fertilizer is one of the important factor for successful cropping in agriculture. The hyacinth plant, banana plant and cow dung were given to the local earthworms to be vermicompost. In each experiment, brick tank (60x60x30cm) containing soil alone was used as control (T_1), soil and cow dung (T_2),soil and hyacinth plant(T_3),soil and banana plant(T_4),soil, hyacinth plant and banana plant(T_5), soil, hyacinth plant, banana plant and cow dung (T_6) were exposed to fifty local earthworms in each tank. Nutrient values were determined from the compost and compared with that of the control. From these results, it was found that N,P,K values were maximum in compost obtained from soil, hyacinth plant, banana plant with cow dung vermicompost tank. Therefore, Indigenous earthworms were also proved to be promising in the production of good quality vermicompost.

Keywords: Earthworms, Hyacinth plant, Banana plant, Cow dung, N, P, K.

Introduction

Vermicomposting is also called vermiculture or earthworm composting, vermicast, wormcasting, worm humus or worm manure is the end product of the breakdown of organic matters by a species of earthworm. Vermicompost is the product of process of composting utilizing the species of worms found in soil and are adapted to the special conditions in rotting weeds compost and manure piles. Vermicomposting is the process of using worms to make compost by feeding them organic waste. Vermicomposting is an appropriate technique for the disposal of non-toxic solid and liquid organic wastes. It helps in cost effective and efficient recycling of animal wastes (Poultry, horse, piggery excreta and cattle dung), agricultural residues and industrial wastes using low energy (Jamhekar, 1992).

By using vermicompost in agriculture, the crop production will likely to be increased and consequently other good soil improvement can be sought. It has been spread in neighbours Myanmar subjects India, Thailand, Malaysia, Vietnam and Laos since late 1990s. Especially, in India, commercial production of vermicompost has been developed since 2000. Nowadays, it is widely conducted throughout the world and it becomes a part of agriculture. Earthworms are often referred to as farmer's friends. During their feeding, earthworm promote microbial activity greatly which inurn accelerates the breakdown of organic matter and stabilization of soil aggregates. They will not burn when applied directly to even the most delicate plants. They are more water soluble, making their nutrients immediately available as plant food. In addition to increased nutrient levels, worm castings contain millions of microbe which help break down nutrients already present in the soil into plant available forms. Worm castings can be used indoors and outdoors on any and all plants, trees and shrubs (Subler, Edwards and Metzger, 1998). The micro-organisms in the worms gut also produce useful compounds like antibiotics, vitamins, plant growth hormones, etc, all of which are present in its castings (Shinde *et al*, 1992).

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Organic fertilizer is decomposed plant or animal materials to which decomposing activators may have been added to hasten the process of decomposing which no chemical or inorganic fertilizer material has been added to the finished product to affect the nutrient content. Organic fertilizer has two types. These are natural organic fertilizer and synthetic organic fertilizer. Plant nutrients from local resources have two ways, these are green manures and composted livestock manures (Subler, Edwards and Metzger, 1998). Vermicompost can be prepared easily. The essentials are space, cow dung, organic wastes and epigeic phytophagous earthworms. It is a good organic manures as it improve soil quality, water retention, aeration and porosity in soil. Conversely, inorganic fertilizers can deprive the soil of fertility. Vermicompost is an odorless, clean, organic material containing adequate quantities of N, P, K and several micronutrients essential for plant growth, a preferred nutrient source for organic farming. The nutrient content of vermicompost depends on the types of feed stocks and bedding provided for the worms (Geyal, 1993).

Earthworms have an important role in this initial process of the cycling of organic-matters. Earthworms greatly increase amount of mineralized nitrogen that they make available for plant growth. In many parts of the world, earthworms are a major component of the biomass of soil animals. Because of their relatively large size and characteristic feeding behavior certain species have significant impact on soil structure, soil fertility, plant growth and crop yield (Abbot and Parker, 1981).

Vermicompost is one of the recycling technologies which will improve the quality of products. The present study was aimed to convert the hyacinth plant, banana plant and cow dung into value added vermicompost. Thus, vermicompost available from the hyacinth plant, banana plant and cow dung represent easily prepared of nutrients for plants growth.

Materials and Methods

Study site

The present study was conducted in Hlaing River Street (1) of Hlaing Township, Yangon Region, located between latitudes 16° 51' 30" N and logitudes 96° 8' 0" E. The study site is shown in Plate 1.

Study period

The study period was conducted from January, 2016 to January,2017.

Selection of raw materials

The hyacinth plant and banana plant were selected as raw materials and added to cow dung of these raw materials to enhance the formation of vermicompost.

Selection of earthworm

The earthworms were collected from the Hlaing Township area. The earthworms employed in these experiments were *Pheretima posthuma.*

The former is local collected for the purpose of vermicompost production.

Identification

The collected earthworm specimens were identified according to Stephenson, 1923., Bahl, 1936., Gates, 1972., and Edwards and lofty, 1977.

Preparation for vermicompost

The hyacinth plant and banana plant were collected from the Hlaing Township area. The vermin sheds were prepared with using brick tanks (60 x 60 x 30 cm) containing soil alone was used as control (T_1). The second experiments were mainly composed with soil and cow dung(T_2),the third were soil and hyacinth plant (T_3), the fourth were soil and banana plant (T_4),the fifth were soil, hyacinth plant and banana plant(T_5), and the another experiments were soil, hyacinth plant, banana plant and cow dung (T_6) The soil were bedding at the lowest layer and the cow dung were added to the soil layer. And the hyacinth plant were added to these layer. After the hyacinth plant were added to banana plant. the Each soil ,cow dung , hyacinth plant and banana plant layer were composed alternately and were exposed to fifty local earthworms in each brick tank for 60 days. The bedding was kept in moist throughout the experiment by regular watering and the vermicompost produced by the earthworms was harvested for analysis.

Physico-chemical content of vemicompost

The parameters such as p^H, the nutrient such as total nitrogen, phosphorus and potassium were analyzed.

Source: Google Earth (2017)

Plate I. Map Showing the Study Area

Results and Discussion

Content of N, P, K from Soil, Hyacinth plant, Banana plant, Cow dung and another vermicompost

Among these materials, soil, hyacinth plant, banana plant and cow dung (T_6) possessed the highest component of N,P,K value.(Table 1)

Formation of Vermicompost

All the wastes materials used were transformed into vermicompost. However, the rates of ingestion by the earthworm differ from each other.

The nutrient values of vermicompost obtained in this study are presented in Table (1) and Figure (1). The p^H of soil control (T_1) value was 7.5. The p^H of (T_4,T_5,T_6) compost showed significant variation when compared to the other. The overall increase of p^H may be attributed to the decomposition of nitrogenous substrates resulting in the production of ammonia. Ammonia which forms a large proportion of the nitrogenous matter was excreted by earthworms. Casts may cause a temporary rise in soil p^H. . From the results, it was clear that there was a significant increase in the N, P, K content in the vermicompost agree with Lee (1985) who stated that the earthworm casts contain more nitrogen, phosphorous and calcium. Subler, Edwards and Metzger (1998), found that earthworm castings or excrement are for richer in minerals than the soil which earthworms ingest worm castings are rich in nitrogen, calcium, magnesium, potassium and phosphorus as well as many beneficial enzymes and bacteria. Shields, Earl. B (1982) reported that the macro and micronutrient in the vemicompost of semicultural wastes were more and the nutrients are richer in the earthworm casts. Bhawalkar (1991) found that macronutrients N,P,K and micronutrients Ca and Fe were more and found that more N,P,K in the compost than that in the natural soil. The present study support the previous workers. The N, P, K content of the vermicompost prepared from soil, hyacinth plant, banana plant and cow dung has also shown a maximum increase when compared with the compost prepared using individual constituents. The cow dung influenced in the rate of vermicomposition and increased the amount of macronutrients in the vermicompost.

The increased nitrogen may be due to nitrogenous metabolic products of earthworms which are returned to the soil through casts, urine, mucoprotein and earthworms tissue. Hence, it is clear that the mixture of hyacinth plant, banana plant and cow dung is suitable for the production of higher quality vermicompost when compared with the subjecting the same components individually. The use of vermicompost helps to enhance the yield of crops. Vermicompost are providing to replace the chemical fertilizers in producing chemical free crops as well as organic sustainable farming agriculture system.

Table 1. Nutrient values of vermicompost (value are given in percentage)

Treatment	pH	N	P	K
Soil+ Earthworm(T_1)	7.5	1.29	0.430	0.590
Soil+ Cow dung + Earthworm (T_2)	8.0	1.35	0.634	0.832
Soil+ Hyacinth plant + Earthworm (T_3)	8.2	1.31	0.732	0.693
Soil+Banana plant + Earthworm (T_4)	8.5	1.38	0.743	0.735
Soil + Hyacinth plant + Banana plant + Earthworm (T_5)	8.5	1.43	0.812	0.825
Soil+Hyacinth plant+Banana plant+Cowdung+Earthworm(T_6)	8.5	1.49	0.923	0.896

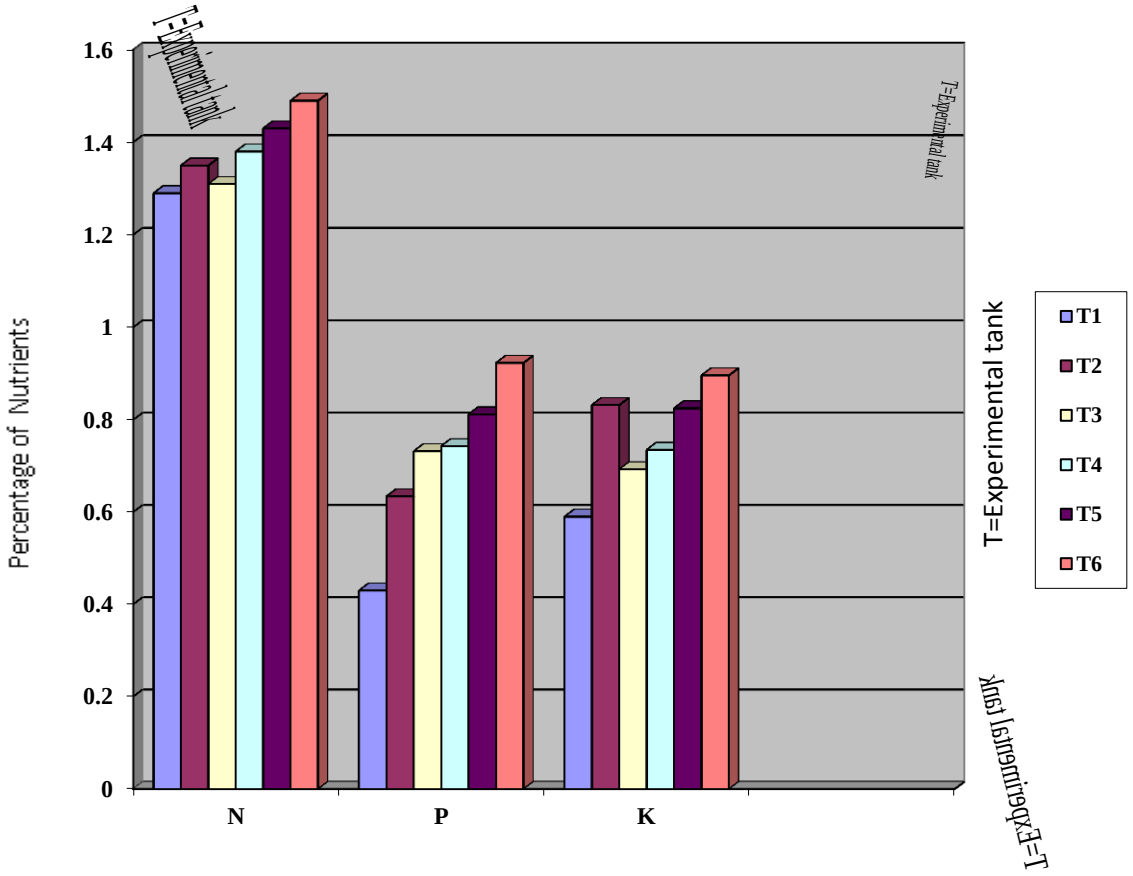

Figure 1. Comparison of the nutrients in the different treatment of vermicompost

Conclusion

The vermiculture and vermicompost production is a simple way with low investments. Therefore, it should be emphasized form small scale farmers to economically large scale holders. Especially, in hilly region, it should be widely used due to the scare of animal manure since it often lack of fertilizer due to erosion .The present study, the organic fertilizer from local resources have two ways, these are hyacinth plant, banana plant manures and composted livestock manures. Vermicompost is enrich the nutrient quality of soil. The use of vermicompost can decrease the use of chemical fertilizer usage in agriculture and also reduce the fertilizer imports.

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