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ORIGINAL ARTICLE

A COMPARATIVE NUTRIENT ANALYSIS OF VERMICOMPOST AND GOAT MANURE BASED ON THE GROWTH OF PLANT GREEN GRAM (*VIGNA RADIATE*)

[1]K. Ilaiayadeepan, [1]K. Durairaj and [2]K.Saravanan

[1]Assistant Professor, PG and Research Department of Zoology
Thiru. Vi. Ka. Govt. Arts college, Thiruvarur -610 003
[2]Assistant Professor, PG and Research Department of Zoology
Govt. Arts college (Autonomous), Kumbakonam -612 002

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ABSTRACT

Vermicomposting is a sustainable technology capable of transforming the agro wastes into fertilizer. Application of vermicompost in the plants reduced the utilization of chemical fertilizer without loss of yield of the plants. It is an important oil seed crop in addition to source of food, feed and nutrient. A substrate was described as location of placing of plant roots. The characteristics of Suitable substrate are ability to provide simultaneously sufficient levels of oxygen and water to the roots adequate storage of water and nutrients for the plant. Desirable growth of plant was appeared with vermicompost application. Vermicomposts contain plant growth- regulating materials, such as plant growth hormones and humic acids. The quality and value of agricultural organic soil amendments are often measured in terms of their contributions on nutrient supplies and soil fertility. Vermicompost are in solid and liquid forms as plant -growth promoter. Compost in green gram also produced plant hormones, mineralize plant available nutrients, fixes nitrogen and providing use full microorganisms that colonize in leaf surfaces.

Keywords: Nutrient analysis, Vermicompost, Goat Manure, *Vigna radiate*

1.INTRODUCTION

An approach towards good soil management with an emphasis on the role of dwellers like earthworm is very important in maintaining balanced ecosystem. The role of earthworms in soil formation and soil fertility is well documented and recognized. The main activity of earthworms involves the ingestion of soil, mixing of different soil components and production of surface and sub surface castings there by converting organic matter into soil humus. Earthworms play an important role in the decomposition of organic matter and soil metabolism through feeding, fragmentation, aeration, turnover and dispersion (Sing. R., 2012). The earthworms are worked as in the recycling of nutrients, soil structure, soil productivity and agriculture, and their application in environment and organic waste management is well understood (Ismail Ansari and Ismail, 2008; Ansari and Sukhraj, 2010).

Earthworms contribute to improvement of soil fertility, plant growth and play a key role in converting organic matter and composting garbage. There are about 3,627 species of terrestrial earthworms in the world (Reynolds 1994).

Stephenson (1923) recorded 63 species of earth worms from Sri Lanka of which 47 were considered as zoo-geographically important to the Asian region. Vermiculture biotechnology promises to user in the '**second green revolution**' by completely replacing the destructive agro-chemicals which did more harm than good to both the farmers and their farmland during the 'first green revolution' of the 1950-60's. Earthworms restore and improve soil fertility and boost crop productivity by the use of their excreta -'wemicast'. They excrete the beneficial soil microbes and secrete polysaccharides, proteins, and other nitrogenous compound in to the soil. Worm activity can increase air-soil volume from 8.30%. Earthwormes have over 600 million years of experience in waste and land management, soil improvement and farm production. (Abduli. M.A., 2013).

Vermicompost has been emerging as an important source in supplementing chemical fertilizer in agriculture in view of sustainable development after Rio Conference, vermicompost is a bio fertilizer enriched with all beneficial soil microbes and also contains all the essential plant nutrients like N, P, K. Vermicompost that is prepared through conventional method has standard values of total

Corresponding author: **K. Durairaj, Assistant Professor, PG and Research Department of Zoology,Thiru. Vi. Ka. Govt. Arts college, Thiruvarur -610 003*

Phosphorous: 0.15% and potassium : 0.27% it is also enriched with various micronutrients such as Fe (4.95 ppm), Zn (6.3 ppm), Mn (2.65 ppm), Cu (4.3 ppm). Further, nutrients in vermicompost are often much higher than traditional garden compost (G. S. Rekha *et al*., 2013).

2.MATRIALS AND METHODS

In the present investigation two types of compost were taken and analysed. These were Goat manure and Vermicompost. The compost samples were collected in ziploc polythene bags and were brought to the laboratory for investigation. The soil aggregates were broken up for grinding with mortar and pestle and the samples were spread for drying. After drying, the samples were passed through 2mm stainless steel or plastic sieve. Approximately 500g compost / soil samples were kept in clean polythene bags with proper labeling for analysis of different chemical parameters like P^H, Electrical Conductivity, Organic Carbon, Phosphorus, Potassium, Iron, Zing, Manganese, Copper, Nitrogen. These experiments were held for one month.

Further investigation was carried in the glass house at 25± 2^0C at 15- 30 days night photoperiod. Each treatment was conducted in triplicate. We took 9- pots and 3 pots were filled with vermicompost (1kg each), 3 pots were filled with goat manure (1kg each), and further 3 pots were filled with garden Soil (control) (1kg each). Five green gram seeds were sown in each pot at the depth of 5 cm. After that seeds were allowed to germinate for 1 week. It was checked regularly and was watered regularly for 1 month and the unwanted weeds were taken out. Water was poured after 2 to 3days, till the green gram plants were grown fully. After that the green gram plants were measured every along with the number of leaves. It was observed that the vermicompost treated plants showed maximum growth and the number leaves as compared to goat manure which further showed much growth than the green gram plants grown in the pots fed with the garden soil (control).

The soil collection is three type of soil. The soil is garden soil (Control), goat manure and vermicompost. The garden soil and goat manure collected in my native place, vermicompost collected from the agricultural institute at Needamangalam (Thiruvaru District). The sample were collected each pot before sowing after harvesting labeled separately. Their physico-chemical properties such as p^H, Electrical conductivity, Nitrogen, Phosphorus, potassium, Copper, Zing, Manganese & Iron were estimated in standard methods and recorded.

3.RESULTS

The results showed that vermicompost has a rich source of nutrient content than goat manure and garden soil (control) (Table 1,2&3).

From the results the pH of vermicompost, goat manure and garden soil (control) was 6.7, 7.4 and 7.5 respectively. The results demonstrate significant increase in electrical conductivity 1.56 Mmho, K^+ 0.27 mg/l, Mg 10 mg Fe^+ 4.95mg, Zn 6.3 mg, Mn 2.65 mg, Cu 4.3mg, in vermin compost, when compared to goat manure, Electrical Conductivity was 1.46 Mmho, K^+ 1.15 mg/l, Fe^+ 5.56 mg, Zn 1.78, Mn 4.9, Cu3.60, Ni 2.56 which further increases when compared to control (Garden soil) as Electrical conductivity was 0 Mmho, K^+ 110 mg/l, Fe^+ 1.51mg, Zn 1.39mg, Mn 4.44mg, Cu 0.13mg, Ni 0 respectively. This indicates that vermicompost has higher nutrient content than pit compost which further shows more nutrient content than Garden soil (control). Due to high nutrient content in vermin compost the green gram plants showed a maximum growth than in pit compost and Garden soil (control).

Table 1 - Nutrient Content of Different Composts (Vermicompost, Goat Manure) and Garden Soil (Control).

Sl. No	Chemical Parameters	Control	Goat Manure	Vermicompost
1	pH	7.5	7.4	6.7
2	EC	-	1.46	1.56
3	OC	81	-	14.23
4	Phosphorus	81.3	0.85	0.15
5	Potassium	110	1.15	0.27
6	Iron	1.51	5.56	4.95
7	Zing	1.39	1.78	6.3
8	Manganese	4.44	4.9	2.65
9	Copper	0.13	3.60	4.3
10	Nitrogen	-	2.56	-

Table 2- The average height of green gram plants, leaves and leaves length

Plants of 4 Weeks		Control	Goat Manure	Vermicompost
Week 1	Average height(in cm)	1.82	1.64	2.15
	Average No of leaves	2	2	2
Week 2	Average height(in cm)	2.65	2.62	3.68
	Average No of leaves	4.7	4.5	5
Week 3	Average height(in cm)	4.95	4.36	7.29
	Average No of leaves	6.4	6.4	8
Week 4	Average height(in cm)	5.78	5.26	8.17
	Average No of leaves	8.43	8.73	11

Table 3: Average length and weight of roots of plants in different trays.

Average of roots	Control	Goat manure	Vermicompost
Average length of roots (cm)	15.53	17.9	18.8
Average weight of roots (fresh weight in gm)	2.55	2.77	6.79
Average weight of roots (dry weight in gm)	0.45	0.56	1.17
Total weight of roots (fresh- dry weight in gm)	2.10	2.21	5.62

The result in the table two demonstrate that the growth of green gram plants grown in vermicompost soil was maximum 8.17 cm height along with number of leaves 11, and the total weight roots 5.62 cm and average length of

roots 18.8 cm as compared to growth of green gram plants grown in goat manure 5.26 cm height along number of leaves 8.73 and the total weight roots 2.21 cm and average length of roots 17.9 cm which was further maximum than the green gram plants grown in garden soil (control) 5.78 cm height along with number of leaves 8.43 and the total weight 2.10 cm and average length of roots 15.53 cm respectively. It was also found that the total weight of roots was higher in the green gram plants grown in vermicompost 5.62 g than goat manure which was 2.21 g and garden soil 2.10 g. Thus it was observed that the vermicompost contains nutrient content to such an extent that enhance the growth of green gram plants at a faster rate in comparison to goat manure and garden soil. Unlike other composts, vermicompost also contains worm mucus which helps prevent nutrients from washing away, holds moisture better and thus helps in increased plant growth.

4.DISCUSSION

Leaf area is an important part of the plant responsible for interception and conversion of solar energy. Total leaf area is the index of rate of photosynthesis which reflects the crop production. The height and total leaf area was recorded in green gram crop in the application of 1kg of vermicompost. The lowest total leaf area was recorded in plants grown in control pots. The same results were observed by Edris A. E, *et al*., 2003 on the effect of organic agriculture practices on the volatile aroma components of some essential oil plants. Improves plant height, number of leaf, weight of roots (fresh & dry) length of roots this also studied Kumar. R et al., 2009 Nutrient uptake and yield of mungbean vigna radiate (L.).

Vermicompositing appears to be the most promising as high value bio fertilizer which not only increases the plant growth and productivity by nutrient supply but also is cost effective and pollution free the same work carried by Mamta *et al*., 2012 Effect of vermicompost on growth of brinjal plant (solanum melongena) under field condition, Mohammad Taghi *et al*., 2013; Effect of nitrogen fertilizer and vermicompost on vegetative growth, yield and NPK uptake by tuber of potato.Use of vermicompost promotes soil aggregation and stabilizes soil structure. This improves the air- water relationship of soil, thus increasing the water retention capacity and encourages extensive development of root system of plants. The mineralization of nutrients is observed to be enhanced, therefore results into boosting up of crop productivity. The vermicomposts have a higher base exchange capacity and more exchangeable calcium, magnesium, potassium than the soil.

5.SUMMARY

The vermicompost was treated with plant of green gram and their growth parameters were observed. Plant height, number of leaves, weight of roots (fresh and dry) and length of roots was greater in the plant treated with vermicompost than the plant treated with goat manure and control (garden soil). Thus it is concluded that vermicompost is more efficient compared to the plant growth using goat manure and control (garden soil). Thus the results indicate that integrated effect of the all the nutrients present in vermicompost results in the increased growth of *vigna radiate* plants in a short period of time. Vermicompost also played a crucial role in improving soil properties, increases crop yield and has a tremendous effect of the growth of *vigna radiate* as compared to goat manure and garden soil (control).

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