A STUDY ON VERMICOMPOSTING OF ORGANIC WASTE AT SANSKRITHI SCHOOL OF ENGINEERING PUTTAPARTHI

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Abstract : An Managing of solid waste has become one of the major difficulties that we are facing today. Vermicomposting is the improved selection to tackle with this problem. Vermicomposting is the process of conversion of organic wastes by earthworms to valued humus like material which is used as a natural soil. Vermicomposting is environment friendly and cost-effective method for solid waste management. Vermicompost is much healthier than chemical fertilizer because it is not related with any kind of risk. Earthworms are possibly important creatures that can transform garbage into gold. Eisenia foetida is the maximum frequently used species of earthworms for vermicomposting. Vermicomposting is a mesophilic process and should be preserved up to 32°C with the moisture content of 60-80%. Vegetable wastes from market and homes are basis of environmental pollution, global climatic changes and human health hazards. Disposal methods and management are not suitable. Earlier, the study was taken up. In laboratory scale 6 plastic bin were taken for vermicomposting Vegetable waste was mixed with shredded paper, soil sand mixture and after pre-decomposition for 20 days, 40 earthworms were released. This culture were maintained and preserved for next 70 days and then observations made on, pH and NPK value of the medium were recorded and recorded and tested heavy metals in composted material. Six different ratios were maintained to achieve exact result. Different results were found in different ratios of mixture. Normally cow dung slurry (50%) is sprinkled for balancing proper moisture condition in the vermicomposting mixture medium. The best results were found in 5:1:2 ratio mixture of vegetable waste, shredded paper and soil san. Analysis of vermicomposting discovered maximum nitrogen is 1.1% potassium is 0.91 % and phosphorus is about 1.19% content in this composted mixture. Thus, vermicomposting is determined that vegetable waste can be converted into high quality vermicompost in an environment friendly manner.

Keywords **– 1.Vermicomposting, 2.Vegetable waste, 3.Shredded paper, 4.Eisenia foetida.**

I. INTRODUCTION

Municipal solid waste (MSW) refers to the materials rejected in the urban areas for which municipalities are usually accountable for collection, transport and final disposal. MSW includes domestic refuse, institutional wastes, street sweepings, marketable wastes, as well as construction and demolition debris. Solid wastes (domestic refuse and garbage, street sweepings, construction debris, sanitation residues etc.) in an environmentally companionable manner adopting principles of economy, aesthetics, energy and preservation. The density of SW in India is very high (3500- 660 kg/ cubic m.). The metal content is less than 2%. The average calorific value of urban solid waste is low (1900 kcal/ kg). The per capita generation of solid waste in Indian cities ranges from 0.25 to 0.45 kg/day. Vermicomposting technology is one of the best options available for the treatment of organics-rich solid wastes. The term vermicomposting is coined from the Latin word 'Vermis' meaning to the 'worms'. Vermicomposting refers to composting or natural conversion of biodegradable garbage into high quality manure with the help of earthworms. Earthworms play a key role in soil biology; they serve as versatile natural bioreactors to harness energy and destroy soil pathogens. The worms do so by feeding voraciously on all biodegradable refuse such as leaves, paper (nonaromatic), kitchen waste, vegetable refuse etc. The Eisenia foetida is the most widely recognized kind of fertilizing the soil worm. It can prepare a lot of organic matter and, under perfect conditions, can devour bolster relative to its body weight every day. It additionally duplicates quickly, and is exceptionally tolerant against variety in developing conditions.

II. MATERIAL AND METHODLOGY

i) Materials : The plastic container chosen for vermicomposting with a 20kg capacity. 6 plastic bins are taken for this work to maintain the ratio of the material. The holes are provided at the bottom of the bin so the extra water can be drain off. To check the best medium for culture with 6 ratios are maintained for this work. The size of the bin is, height 45cm, top width 40cm and bottom width 30cm. The material required for vermicomposting such as vegetable waste, fruit wastes are collected. The waste is collected from the KCDC site where the waste is coming for windrows composting from Bangalore city. Shredded paper and soil sand used. Eisenia Foetida earthworms are used and collected from Bio-centre Bannerugatta road Bangalore.

ii) Methodology :

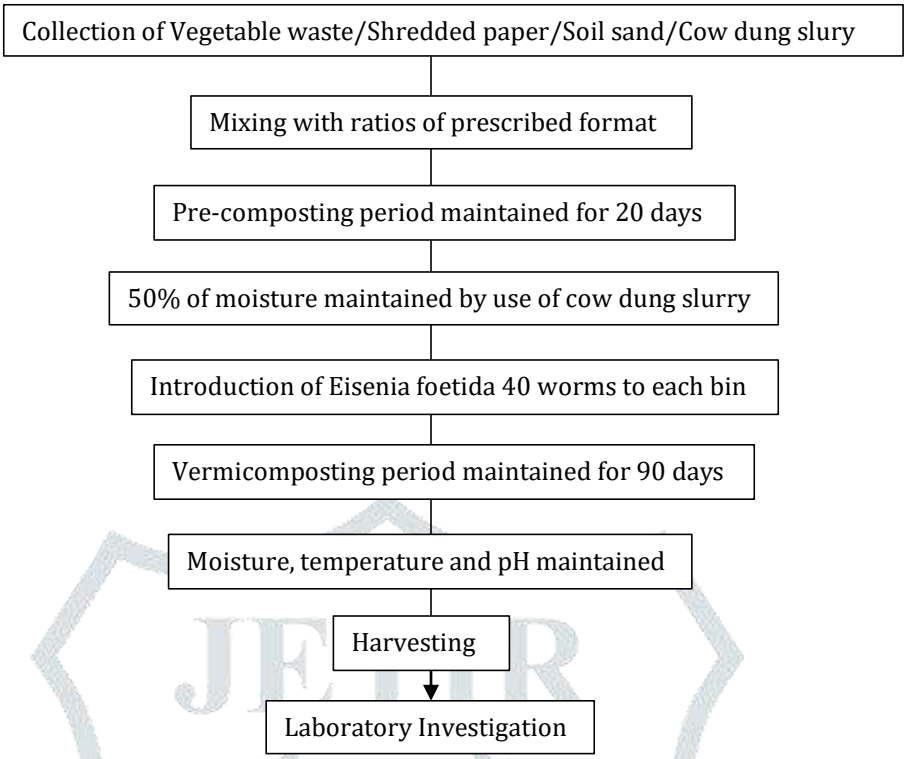

Fig -1: Procedure of Vermicomposting Process

a. **Pre-Composting:** The waste mixtures were kept up in Theban for 10 days without addition of water. The fluid leachate from vegetable waste could easily be consumed by sand-soil and shredded paper. The substance of the bin were turned up-side down so that the entire blend got consistently soaked and afterward 500 ml of dung slurry (50%) was sprinkled on surface to quicken aerobic microorganisms intervened degradation process. The pre-deterioration period was proceeded for next 10 Days.
b. **Introduction of Worm:** Earth worms belong to Eudrilus Foetida family generally known as night crewels are introduced in to the vermicomposting bin. 30 earthworms are introducing to each **vermicomposting** bin. Once the worm is introduced to the bin temperature and moisture content maintained properly.
c. **Operation and Maintenance:** Once the earthworm is introduced to earthworm is introduced to the bin, the composting period maintained for next 70 days during this period proper moisture content and temperature were maintained. In Vermicomposting, temperatures are kept by and large kept underneath 30ºC. Most worm species utilized as a part of vermicomposting require direct temperatures from (1029ºC). While resistances and inclinations vary from species to species, temperature prerequisites are for the most part comparative. When all is said in done worms endure cool and damp conditions far superior than they can hot and dry.
d. **Chemical analysis:** In the continuous process procedure study, the bin was filled up vegetable market waste, shredded paper and soil constituents and use of Eisenia Foetida. The parameter of the soil studied were pH, N, P, K.
e. **Vermicomposting Batches**

Batches	Organic Material	Organic ratio
Batch-1	Vegetable waste : Shredded paper : Soil sand (VW : SP : Soil sand)	1 : 1 : 2
Batch-2	(VW : SP : Soil sand)	2 : 1 : 2
Batch-3	(VW : SP : Soil sand)	3 : 1 : 2
Batch-4	(VW : SP : Soil sand)	4 : 1 : 2
Batch-5	(VW : SP : Soil sand)	5 : 1 : 2
Batch-6	(VW : SP : Soil sand)	6 : 1 : 2

Table – 1: Vermicomposting batches

III) RESULTS AND DISCUSSIONS

i) **pH:** Compost microorganisms function best with neutral to acidic conditions, with the pH's in the range of 5.5 to 8. During the preliminary stages of decomposition, organic acids are formed. The acidic conditions are constructive for growth of fungi and collapse of lignin and cellulose. As composting takings, the organic acids developed neutralized, and mature compost generally has a pH between 6 and 8. The pH of solid waste constitutions was checked after

composting period 90 days. The pH raised in the 1st three Batches and started decreasing optimum which is achieved in 5: 1:2. The near-neutral pH of vermicompost may be qualified by the excretion of NH4 + ions that decrease the pool of H+ ions and the movement of calciferous glands in earthworms comprising carbonic anhydrase that catalyze the fixation of CO2 as CaCO3, thereby averting the fall in pH

Batches	B1	B2	B3	B4	B5	B6
Vermicompost	9.01	8.57	8.23	7.67	7.06	8.23
Normal compost	8.3					
Standard Values	6.5-7.5					

Table – 2: pH values

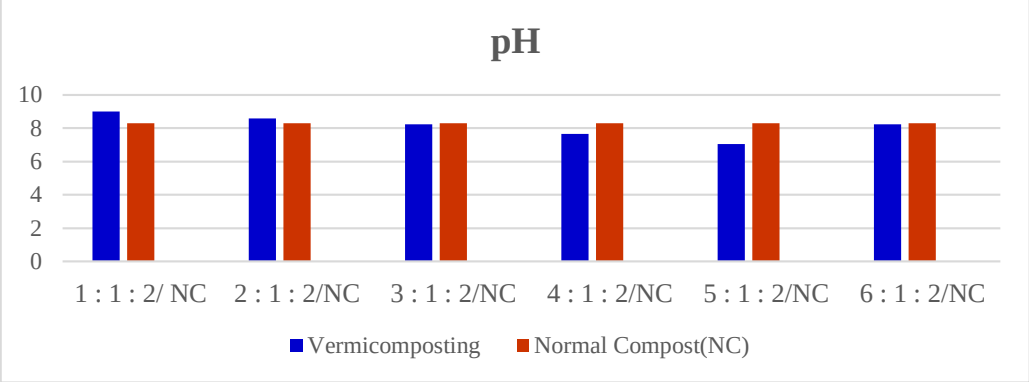

Chart -1: Graph Showing the variation in pH level different cultural media

ii) **Total Nitrogen (N):** The Total Nitrogen show in the vermicompost is depending on the nitrogen content of waste utilized. The Total Nitrogen is increase around 12% to 16% because of the reusing of Nitrogen waste used. The TN in the graph indicates increment amid each interval. The involvement of nitrogen additionally relies on upon number of worm and type of earthworm utilized as a part of compost. The increasing trend of N in the vermicompost of the species of earthworms in the present study substantiated, N availability was more during vermicomposting in the mixture with higher amount of compost.

Batches	B1	B2	B3	B4	B5	B6
Vermicompost	0.41	0.44	0.56	0.59	1.1	0.69
Normal compost	1.2					
Standard Values	1%					

Table – 3: Nitrogen values

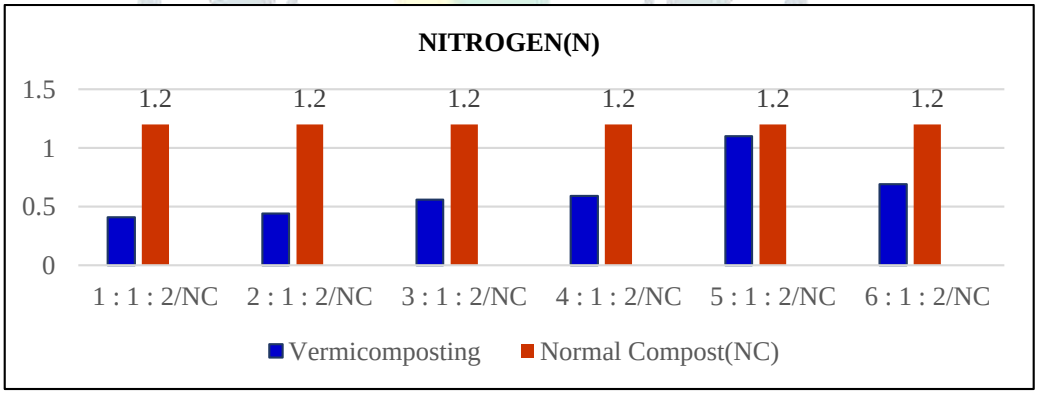

Chart -2: Graph Showing the variation in Nitrogen level different cultural media

iii) **Total Phosphorous (P):** The Total Phosphorus in the chart indicates increment during each interval. The section of organic residue through the gut of earthworm, brings about phosphorous changed over to shapes, which are accessible to plants. The enhanced P level in vermicompost advises phosphorous mineralization during the process. speedy mineralization of P in earthworm actions of organic wastes.

Batches	B1	B2	B3	B4	B5	B6
Vermicompost	0.14	0.18	0.26	0.35	1.25	0.67
Normal compost	1.17					
Standard Values	1%					

Table -4: Phosphorous values

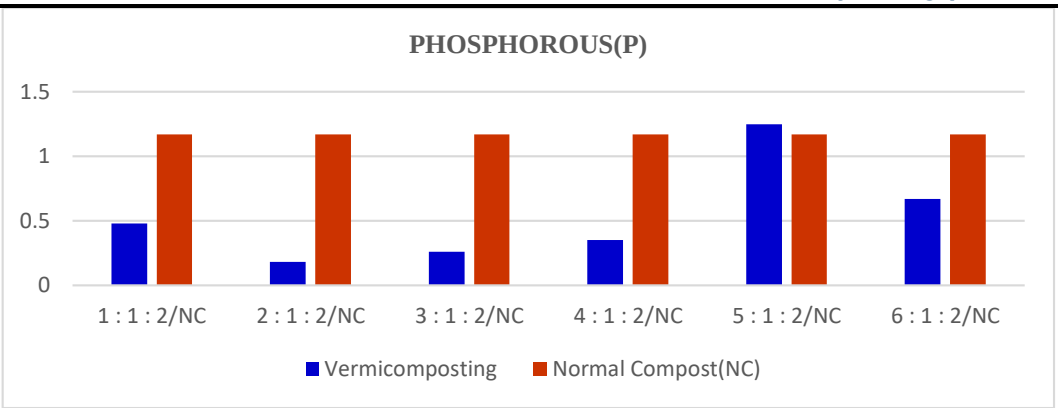

Chart -3: Graph Showing the variation in Phosphorous level different cultural media

iv) **Total Potassium (K):** The concentration of Total Potassium in the vermicomposting fertilizer is as appeared in chart. The measure of potassium is increments gradually which is additionally depend on upon the measure of organic waste utilized. The increasing of substance of total Potassium demonstrates that the treating the soil is occurring in well request.

a. Potassium is essential for vegetables. Knobs on vegetable roots are loaded with microscopic organisms that fix, or convert, nitrogen into a frame that is usable by the plant. At the point when legumes are developed on low-potassium soils, the bacteria can't settle as much nitrogen for the plant.

b. Potassium is imperative for disease resistance and influences the taste and color of products of the so

Batches	B1	B2	B3	B4	B5	B6
Vermicompost	0.1	0.26	0,29	0.4	0.89	0.77
Normal compost	0.76					
Standard Values	1%					

Table – 5: Potassium values

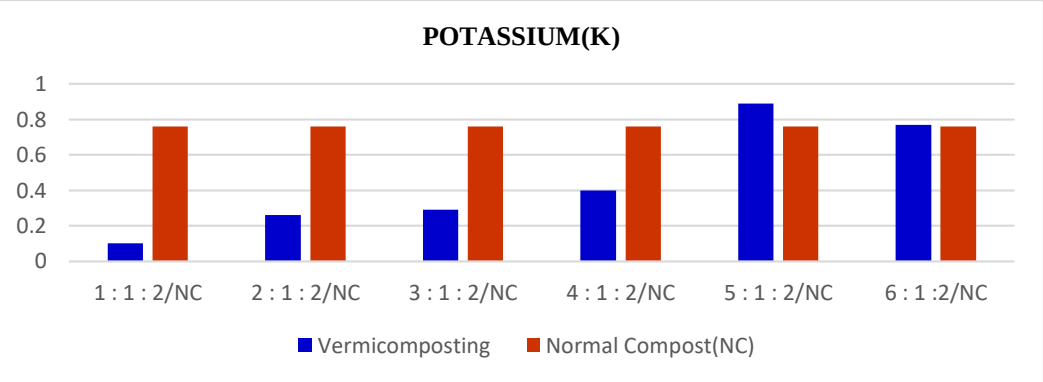

Chart -4: Graph Showing the variation in Potassium level different cultural media.

IV) CONCLUSIONS

1. The current study clearly specified that biodegradable portion of urban wastes can be utilized as resource when it converted into vermicompost comprising high contents of nutrients – N, P, K, compared to that of the substrates, i.e., MSW as well as the sole compost.
2. The nutrient rich vermicompost can be appropriate in enhancing productivity and soil richness for sustainable agriculture development.
3. The vermicompost controlled higher nutrient resources as the composting procedure progressed, and that produced by Eisenia foetida contained higher.
4. In present project work, Eisenia foetida is the most commonly species of earthworms are placed in all bins and different type of solid waste are placed in Batch1, batch2, batch3, bach4, batch5 and batch 6 respectively. The study demonstrations that the good quality of bio compost was obtained from batch 5. Hence Eisenia foetida earthworm primarily appropriate for vegetable waste.
5. The important characteristics such as N, P, and K, Ratio exhibited the increasing order in all the composting bin. But more in batch 5 as compare to batch1, batch2, batch3, batch4, and batch 6.
6. It encourages environmental sustainability by converting a waste to a usable product that improves our environment.
7. In the present work analysis main parameters like N, P, K, Ph exhibited, the Eisenia foetida is supportive in improving the soil quality.
8. Vermicomposting is actual process for decrease of solid waste and eco-friendly process. It harvests high quality composting material which are improved compared to other commercial fertilizer in the market.

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