RECYCLING WASTES INTO VALUABLE ORGANICA FERTILIZER: VERMICOMPOSTING

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Abstract

Generation of waste is a global problem that required effective management for both animal health as well as environment. There are several ways to reduce the waste but recycling is the best one. By this process not only the problem of pollution is resolved but valuable organic compound is generated which acts as a nutrient for plants. Vermicomposting is the most suitable, cheap and eco-friendly technique by which floral waste can be effectively treated and converted into nutrient rich vermicompost. During the process, floral waste was mixed with cattle dung in different proportions and was subjected to pre-composting. After semi-digestion of organic waste, earthworms were added into the bed and vermicomposting process was carried out. This study revealed that 50:50 proportions of floral waste-cattle dung mixtures is optimum for floral waste management. The growth and activity of the earthworms were also high in that proportion than other proportions.

Keywords:

Vermicomposting, organic waste, earthworm, biomass reduction, floral waste.

Introduction:

Composting is the manipulation of a biological process, decomposition; raw organic materials such as manure,leaves, grass clippings, food wastes, and municipal biosolids are converted to stable soil-like humic substances. Composting is a controlled natural breakdown process that occurs when organic residue comes in contact with soil. Many types of solid waste, such as food, paper, wastewater sludge, and garden wastes, are acquiescent to biodegradation as they possess major amounts of heterogeneous organic substrates, including sugars (as sucrose), fats, proteins, hemicelluloses, celluloses, and lignins (Gray, et al., 1971a; Rhyner, et al., 1995; Eklind, et al., 1997; Ryckeboer, et al., 2003).India's agro sector contributes substantially

towards organic solid waste generation (Singh, et.al., 2003). It is estimated that in India nearly 700 million tons of organic wastes is generated annually including leaves , husk , sawdust , steam bark , flowers etc. which is either burned or land filled (Bhiday,1994).Utilization of this waste material for productivity process is important for both economical and environment reasons. India is a country of religious diversity and religious tolerance. Throughout the history of India, religion has been an important part of the country culture. A vast majority Indian associate themselves with a religion. During worship, devotees offer flowers and other thing to their God and retrieving the blessed. Ujjain is the city of temples, where many famous temples are situated i.e. Shri Mahakaleshwer, Harsidhi mata, Chitaman Ganesh, Kal Bhairav and Chardham. Devotees come from outside as well as from city and offer flowers to God and Goddesses. After offering, flowers and other nirmalyas are thrown as a waste material in open places where it decay by number of organisms through aerobically and anaerobically causing bad smell and pollution thus creating unhealthy atmosphere. Management of anaerobic composting of waste is costly while aerobic composting takes longer time. Vermicomposting appears to be the most suitable cheap, biotechnologically process where earthworms and soil microorganisms cause degradation of waste materials in 45-60 days converting it into valuable manure, rich in plant nutrients.

Material and Method:

Collection of vermicomposting waste: The cattle dung was collected locally from randomly selected cattle houses of municipal territory of the study area, Ujjain. Eudrilus eugeniae and Eisenia foetida equally used in this study were obtained from vermiculture centre of Govt. Madhav Science College, Ujjain (M.P.).The floral wastes used in this experiment was collected from Shri Mahakaleshwer and Iskon temple. Preparations of vermicomposting materials: Collected floral wastes were chopped into small pieces. The chopped wastes were mixed with

cattle dung in following ratio. 1. 100% Floral waste: 0 % Cattle Dung. (2kg Floral waste). 2. 75% Floral waste: 25 % Cattle Dung.(1.5 kg Floral waste + 0.5Kg cattle dung) 3. 50% Floral waste: 50 % Cattle Dung. (1.0 kg Floral waste +1.0Kg cattle dung). 4. 25% Floral waste: 75 % Cattle Dung. (0.5 kg Floral waste +1.5Kg cattle dung). 5. 0% Floral waste: 100 % Cattle Dung. (2.0 Kg cattle dung). Each composition was prepared in two sets. The windrow compost method was used. Bins were sprinkled with distilled water after turning it upside down to maintain high moisture content. Twenty earthworms (E. eugeniae and E .foetida) were added in each composting bins (Singh, et.al.2004). Determination of physical variables of mature vermicompost: There were many tests and checks by which, the various aspects of the vermicomposting process and the mature condition of vermicompost was judged as follows. • Odor: This detection was done simply by smelling (Rodale, 1960). • Heating: It was detected by inserting the hand into the vermicompost at ½ feet depth. • Granule size: During vermicomposting particle size of vermicompost is measured with the help of scale in millimeter (mm). • pH variation: pH of each sample was determined with the help of pH meter according to the method of Rebollido et.al.(2008). • Color: The color of vermicompost was detected by simply looking . • Health of earthworms: This was identifyed by taking the weight of earthworms. During the experiment, 20 numbers of earthworms were added in to composting materials. The size and weight of earthworm was taken initially. It was measured after every 10 days. • Temperature variation: The heating of vermicompost was detected by inserting thermometer vertically in to vermicomposting bins at different depth (Alidadi , 2005; Adegunloye, et. al., 2007). • Bulk Density: It was taken in kilogram during vermicomposting process. The floral waste-cattle dung mixtures were weighed in a 25cm cubical cage to determine the bulk density. We have seen that the bulk density of the waste changes with seasonal variations. Weight of the sample (kg) Bulk Density =---------- Volume of the cubical cage (25 cm3) • Moisture percentage: The 5.0 gm of

vermicompost mixture was weighted and kept at 105°C for 24 hrs. After that, their dry weight was taken. This dry weight was subtracted from initial weight of moist vermicompost. Reduction of weight was measured as moisture percentage (Alidadi, 2005).

Result and Discussion:

Result and Discussion: During the process of vermicomposting ,five different compositions of floral waste-cattle dung mixtures viz. 100% Floral Waste (FW), 75% FW, 50% FW, 25% and 100% CD were taken. Exotic species of earthworms viz. Eisenia foetida and Eudrilus eugeniae were added, when temperature was below 30°C. Characterization of the floral waste- cattle dung mixtures were done before and after a brief period of windrow composting and the obtained result was compared amongst each other. The final stage of vermicompost was determined by Several parameters. Data of the table no.1 shows that at mature condition, vermicompost becomes odorless, its pH and temperature set at constant level, it turn into dark brown color and diameter of granule reduces. The moisture content of initial vermicomposting mixtures was higher which was reduced with maturation. Along with this their biomass was reduced up to 60% of their initial biomass. Results obtained from the study in table no.2 it shows that, 100% floral waste took more days (65 days) and 100% cattle dung required less days (40-43 days) to turn into vermicompost. Moreover in floral vermicomposting process, 100% cattle dung was the best mixture for the growth of earthworms but for conversion of floral waste into compost, 50% proportion was good. In this proportion, floral waste contained cellulosic fiber that present in un-degrade or semi degrade condition which hold water to retain moisture. Moisture is essential for survival of earthworms as well as for microbial activity. Wever et. al., (2001) reported that, moisture content plays an important role in the growth of earthworms. Low moisture content can significantly affect earthworm survivability and reproduction. Moreover, floral waste also contained nitrogen and other carbon source that

boost the growth of microbes, which increases the nutritive and utility value of composting materials. Although, in 100% and 75% floral waste- cattle dung mixture contained more fibers and nutrients than 50% mixture but they were took more time to decompose and also earthworms required semi or complete decomposing materials that was absent or less in both mixture .This result was supported by the work of Ndegwa and Thomson (2000) who found that decreasing C/N ratio increased earthworm biomass production, while increasing C/N ratio produced a more stable end-product. Ndegwa recommended a C/N ratio of 25 for the production of stable vermicompost and a C/N ratio of 10 for the earthworm breeding using bio-solids as a feed substrate.

Table no.1: Measured parameters of vermicompost in all three seasons.

S.No	Parameters Of vermicompost	Initial day (1-10 days)	Intermediate day (11-35 days)	Final day (> 40days)
1.	Odor	Odorness (Dung type)	Less odor	Odorless
2.	Heating	Heated	Less heated	Not heated
3.	Granule size	60 mm	30 mm	2-3 mm
4.	pH variation	More variated	Less variated	Constant
5.	Color	Yellowish brown	Brown	Dark brown
6.	Seed germination	60%	80%	>90%
7.	Health of earthworms	Average	Good	Bad
8.	Temperature variation	More variated	Less variated	Constant
9.	Weight of biomass	10% reduced from initial biomass	40% reduced from initial biomass	55-65% reduced from initial biomass
10.	Moisture percentage (%)	70-80%	65-75%	60-70%

Table no.-2: Days requiredto prepare vermicompost from floral waste- dung mixtures.

Name of Season	100% FW	75%FW	50%FW	25%FW	100%CD
Days	60-65	51-54	42-46	40-43	38-40

(1) (2)

A: 0 day B: After 15 days A: 0 day B: After 15 days

100 % floral waste 75% floral waste + 25% cattle dung

(3) (4)

A: 0 day B: After 15 days A: 0 day B: After 15 days

50 % floral waste + 50% cattle dung 25% floral waste +75 % cattle dung

Conclusion:

After conducting the experiments we can say that the equal proportion of cattle dung and floral wastes mixture is more suitable for vermicomposting than other proportions.

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