MANAGEMENT OF AGRICULTURAL SOLID WASTE THROUGH VERMICOMPOST, NADEP COMPOST AND PIT COMPOST METHOD

Balbhim L . Chavan*

Mangesh. M. Vedpathak*

Bhimashankar R Pirgonde**

Abstract:

Disposal of organic wastes from different sources like domestic, agriculture and industries create environmental hazards and economical problems. The present study was undertaken to convert agricultural solid waste into value added manures by various methods including vermicomposting, NADEP aerobic method and pit method of composting. The agricultural solid waste was used for preparation of different organic composts. The prepared compost was characterized and subjected to chemical analysis. The nutrients including nitrogen (N), phosphorus (P), potassium (K), organic carbon (OC)and moisture were estimated after mature stage of end product of various organic compost. The NPK contents were 1.10%, 1.60% and 0.98% in vermicompost0.66%, 0.79% and 1.15% NADEP compost and 0.90%, 0.83% and 0.65% in pit compost respectively. The vermicompost produced by *E. fetida* possessed higher nutrient contents as compared to NADEP compost and pit composting method. Among the three composting method,vermicomposting of agricultural solid waste with dung exhibited better fertilizers quality compared to the NADEP and pit method of composting.

Keywords: *Vermicompost, NADEP compost, Pit compost, Maturity, agricultural solid waste.*

* Department of Environmental Science,School of Earth Sciences,Solapur University, Solapur-413 255 (MAH, India)

** Sangmeshwar College, Solapur

Introduction

Solid waste can be converted to a potential plant nutrient enriched resource and it can be utilized for maintaining fertility of land [1]. Composting means it is biological process in which recycling of organic matter take place. It is suitable and best technique for the management of solid waste. We can find out appropriate composting method with the use of agricultural solid waste and cow dung. Processing of organic solid waste material through controlled bio-oxidation processes, such as composting, reduces the environmental risk by converting the waste into a safer and stable product suitable for application to soil [2]. NADEP method is a simple method to process and operate which is nuisance free, environmental friendly and socially acceptable as the end product has good fertilizer value [3]**.** In vermicomposting process of degradation of organic solid waste by earthworms takes place in presence of moisture content and air. The organic solid waste matter can be degraded with help of different commercial species of earthworms. The earthworms consume the organic matter. This degradation activity result in formation of soil fertilizer by dropping of earthworms. The biodegradable wastes should be used for preparing compost by adding to it. B. L Chavan., M. M. Vedpathak and B. R. Pirgonde studied (2015) effect of organic and inorganic fertilizers on Cluster bean (*Cyamopsis tetragonolobus).* Vermicompost which can be prepared from agricultural solid materials can be recommended for better growth and yield of Cluster bean (*Cyamopsis tetragonolobus*) in agricultural practices as compared to NADEP and pit organic fertilizers treatments. The resulting vermicompost has been shown to have several positive impacts on plant growth and health [4].

Materials and methods:

Composting was carried out by three methods as vermicompost, NADEP method (aerobic composting) and pit method using agricultural solid wastes.

Methods of Compost Preparation:

Vermicomposting- In this paper VC was prepared by bed methods using agricultural solid waste. This method was easy topractice on field. Made a bed of size was 6x4x2 feet. It made under a sheded open from all sides. Decomposable organic wastes such as cattle dung and chopped dried agricultural solid materials were used as for vermicomposting processes. A cattle dung slurry was applied as layer on the base followed by putting 2 inch thick organic waste. Then 9 inch thick feeding material (cow dung/biodegradable chopped dried agricultural solid

materials) was kept for earthworms in the ratio of raw cow dung: organic waste = 1:5. A layer of 15-20cm of chopped dried agricultural solid materials kept as bedding material at the bottom of the bed. The number of beds can be increased as per raw material availability and requirement. The earthwormsspecies *Eisenia Fetide*should be introduced on the upper layer of bed. Apply about 2.4kg of earthworms on surface area of the compost bed. Beds was kept moist by sprinkling of water (daily). Gunny bags were used to maintaining required moisture and for better performance of the earthworms. Bed should be turned once after 30 days for maintaining aeration and for proper decomposition. VC was harvested after 60 days, and then it was subjected to chemical analysis. Compost gets ready in 60dayswhen raw material is completely decomposed it appears black and granular. The final product was rich in nutrients and beneficial to growth promoting substances. Prepared compost was rich in a source of nutrients. It was easily available nutrient from the complex material to the plant. It plays very important role in plant growth and nutrition [5].

Bed of vermicompost

NADEP method of composting:

Preparation of NADEP compost- In this method the aerobic biodegradation of organic agricultural solid waste was achieved. The microorganisms which are present in soil degrade the solid waste in presence of moisture and sufficient air, hence it is aerobic biodegradation. This model of composting of solid waste was rectangular in shape. The bricks one upon another by creating a gap between two layers of bricks was arranged. Repeat this arrangement of bricks in layers till the height such increase by 1m.At bottom of this model place granular stones sand and pieces of bricks. This bottom was 5 cm in length. Placed the layer of soil having 5 cm width over this method. The layer of chopped agricultural solid material of about 10 cm was placed over soil layer. Over this layer, placed layer of dung about 2-3cm on solid waste layer. Repeat this

procedure of layering with organic matter followed by soil 2-3 times. The last and upper most layer was soil which was width 4cm. Then water was sprinkled over this model. The gap between the bricks arrangement help for better aeration. After 50 to 60 days compost was ready for use. It was source a large amount of nutrients for crop.

Construction details:

Size	Length =2m Breath=1.5m, Depth=1m
Number of bricks	500 Nos. (Apr)
Total number of gaps	150 (Apr)
Area of each gap	9 cm x 9 cm (Apr)
Cement	250 kg (5 bag)
Sand	1 m^3

Construction of NADEP method of compost

Pit composting: This method include making compost in pit that have been dug in the ground. A pit size was 1.5 m wide, 50cm deep and 1 m length was arranged. Agricultural solid waste about 20-30cm was kept at base of pit. This layer was covered by dung about 5-10cm. The layer of soil was added over this layer. These layers were repeated until the heap reaches 1 to 1.5m high [5].

Physico- chemical analysis of various compost: Matured compost samples were collected from each different compost unit about 1 kg and kept in the polythene bag. Each sample bags was labelled and sealed air tightly. The chemical properties analysis of different compost was conducted in laboratory of 'Department of Environmental science, Solapur University, Solapur'.The chemical analysis of different matured organic compost was done for organic carbon (OC), moisture, nitrogen (N), phosphate (P), potassium (K) and pH.pH was determined using digital PH meter. Moisture content was estimated by the difference between the initial and final weight (w1 –w2) of soil as mg of moisture/g soil. Organic carbon was estimated by modified Walkey and Black rapid titration procedure[6].The nitrogen N was estimated micro-

kjeldaah method [7]. Phosphate (P) was determine by spectrometric method [8]. Potassium (K) was estimated by flame photometric technique.

Result and discussion

The quality of nutrients in compost depends upon the source of the raw material. There was difference in the quality of fertilizer produced by vermicompost, NADEP compost and pit composting. The NPK values were more in vermicompost as compare to NADEP and pit composting.The NPK contents were 1.10%, 1.60% and 0.98% in vermicompost 0.66%, 0.79% and 1.15% in NADEP compost and 0.90%, 0.83% and 0.65% in pit compost respectively. The nitrogen content was depends upon initial initial nitrogen content in the waste and extent of its decomposition [9**, 10]**. The decrease in pH is important factor in nitrogen retention [11]. The nitrogen content increased in vermicompost as result of loss of organic carbon. The loss of organic carbon and increase in N with time of degradation was more in vermicompost. The result indicate that P and K content was high in vermicomposting than NADEP and pit composting. The level of moisture was more in vermicompost and then followed by pit and NADEP compost.The measurement of pH show that there was loss of weight and pH of decomposing matter with period of decomposition. The pH value was high in NADEP compost while it decreases in vermicompost and pit composting. It was due to high rate of mineralization process of nitrogen and phosphorous in to nitrates and orthophosphates [12].

Table.1 Nutrient status of various compost.

SR. NO	PARAMETERS	NUTRIENT STATUS OF VERMICOMPOST	NUTRIENT STATUS OF NADEP COMPOST	NUTRIENT STATUS OF PIT COMPOST
1	pH	6.9	7.2	6.8
2	Moisture (%)	30.70	16.90	19.40
3	Organic Carbon (%)	11.50	10.10	16.56
4	N (%)	1.10	0.66	0.90
5	P (%)	1.60	0.79	0.83
6	K (%)	0.98	1.15	0.65

All values are expressed in % except pH.

Conclusion

It is concluded that quality of vermicompost better than NADEP and pit composting prepared from agricultural solid waste. The vermicompost using *E. fetide* possessed significantly higher concentrations of the nutrients followed by NADEP and pit composting.

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