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Research Article

An assessment of Vermicomposting technology for disposal of vegetable waste along with industrial effluents

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ABSTRACT

Vermicomposting is one of the potential treatment techniques for organic wastes. An experiment was conducted to prepare vermicompost using partially decomposed Vegetable waste using earthworm species Eudrillus Euginea. The process was carried out with the use of water, diluted Dairy and Distillery effluents in three combinations to provide the necessary moisture for the wastes. The results reveal that the nutrient content and worm population increased in the order of Dairy, Distillery and water. The study confirms that the vermicomposting is an appropriate technique for efficient recycling and disposal of non-toxic solid and liquid wastes.

Keywords: Vegetable waste; Distillery effluent; Dairy effluent; Vermicast

INTRODUCTION

The driving force behind the introduction of vermiculture and other reuse processes for organic wastes is the global recognition of the need to return these wastes to the soil. Vermicomposting offers an ecologically and commercially sustainable alternative to composting or lime stabilization. Much attention is now given in developing countries on the treatment and disposal of industrial wastes[1] due to its growing pollution potential arising out of the rapid industrialization and population growth. Vermicomposting is a low cost technology[2] for the treatment of organic wastes.

The nutrient status of vermicompost was at a higher level than that of compost derived from other methods[3]. The vermicomposting of sewage sludge disposal for the sludge from activated sludge process in Chennai Petrochemical Corporation Ltd, Chennai showed good results of compost[4] rich in micro nutrients, beneficial micro organisms and plant growth promoting substances. In the present study an attempt has been made to convert vegetable waste into compost by adding industrial effluents and a comparative study is made between the vermi-composting process of vegetable waste unmixed and when mixed with industrial effluents, namely Dairy and Distillery effluents.

MATERIALS AND METHODS

The vermi-composting process was carried out by using partially decomposed Vegetable waste with Dairy and Distillery effluents[5] and the experimental results were analyzed. The vegetable waste was collected from a vegetable market in Saibaba Colony, Coimbatore. The raw effluent from the Sakthi Distilleries near Udumalpet was collected for vermicomposting process, and the raw effluent of Dairy industry was collected from the collection tank of Coimbatore District Cooperative Milk Producers Union Limited near Pachapalayam.

Representative samples (vegetable waste) of 10 kg were taken and the percentage distribution of each component by weight is determined. The samples were tested for its physical and chemical characteristics. The earthworm species Eudrillus Euginae[6] was used for the Vermicomposting Process. Three worm bins of laboratory scale were used, each of size (38 cm x 27 cm x 23 cm). These worm bins are open rectangular boxes made of earthen material. The worm bins are provided with wire like holes at bottom for drainage and ventilation.

The vegetable waste was separated from other trash, garbage, rocks and other debris and shredded into smaller size. The distillery and dairy effluents were diluted with water in the ratio of 1:3 (effluent:water). The vegetable waste in respective combinations with water, dairy and distillery effluents was subjected to partial aerobic decomposition in the bins for a period of 27 days and 32 days respectively. All the bins are maintained with controlled parameters of pH, Moisture content and Temperature. Worms around 200 in number are added to the bin by simply scattering at the top. After about 13 to 45 days, finished compost was obtained and the casts are dried and tested for its micro and macro nutrients.

RESULTS AND DISCUSSION

The studies were carried out to three laboratory scale reactors each of 15 kg capacity. The vegetable waste was decomposed in three combinations. Vegetable waste of 3 kg was combined with 10.5 litres each of Water, dairy and distillery effluents in three different reactors. According to (CAPART,)[7] pH should be neutral .The pH values of the partially decomposed vegetable wastes were in the range of 6.8 to 7.4. According to worm women website, the temperature should be 20°C - 30°C. The temperatures were from 24°C - 29°C and the moisture content was between 40%-50% and was well maintained within the limits. The values of Nitrogen, Phosphorus and Potassium show an increase when compared with the initial and decomposed vegetable wastes. This clearly shows that the vermicast can be used as efficient manure. The characteristics of the Vermicast obtained after vermi-composting were analyzed and the results are shown in **Table - 1. Table- 2** shows the Comparison of vermicomposting process of vegetable waste using Water, Distillery and Dairy effluents. The results of the various characteristics of the vermicomposting process of vegetable waste with water, distillery and dairy effluent are shown in **Fig.1, Fig.2 and Fig.3** respectively.

CONCLUSION

Based on the observations and results, the study reveals that Vegetable wastes could be effectively degraded by earthworms along with industrial effluents and the nutrient content of Vermicast show a significant increase in the order of Dairy, Distillery and water. The processing time of this process is between 30 and 40 days only compared with the processing time of around 200 days for traditional composting [8,9]. .Hence this process is an ideal technology for waste minimization as well as an alternative for industrial waste disposal.

Table -1: Vermicast of Vegetable waste using Water, Distillery and Dairy effluents

Parameters	Vermicast (%)		
	Water	Distillery effluent	Dairy effluent
Nitrogen	2.18	2.71	3.06
Phosphorous	1.1	1.2	1.25
Potassium	1.08	1.12	1.15
Calcium	0.38	0.6	5.96
Magnesium	0.19	0.17	2.01
Sulphate	0.012	0.009	0.005
Chloride	4.9	5.1	5.36
Lignin	31	28.16	20.17
Cellulose	2.8	1.92	1.54
Hemicellulose	1.67	1.55	1.32
Carbon	21.8	27.3	27.9
Sodium	0.43	0.52	0.55

Table -2: Vermicomposting process of vegetable waste using Water, Distillery and Dairy effluents

S.No	Parameters	Vermicast (%)		
		Water	Distillery effluent	Dairy effluent
1.	Quantity of waste loaded in kg	3	3	3
2.	Number of earthworms inoculated	200	200	200
3.	Processing Days	17	15	13
4.	Quantity of Vermicast obtained in kg	2.7	2.73	2.75
5.	Number of earthworms after vermicomposting	460	590	620

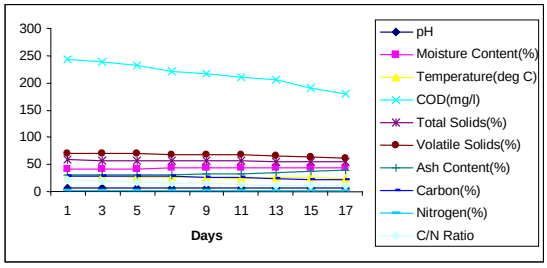

Fig.1: Physicochemical Characteristics of Vermicomposting Process of Vegetable waste with water

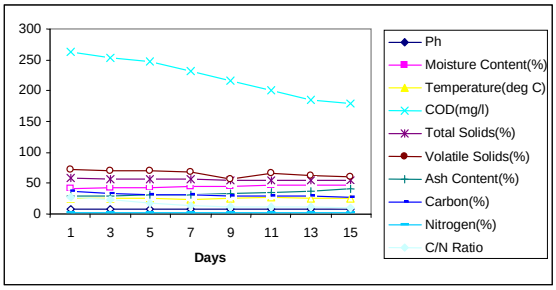

Fig.2: Physicochemical Characteristics of Vermicomposting Process of Vegetable waste with Distillery Effluent

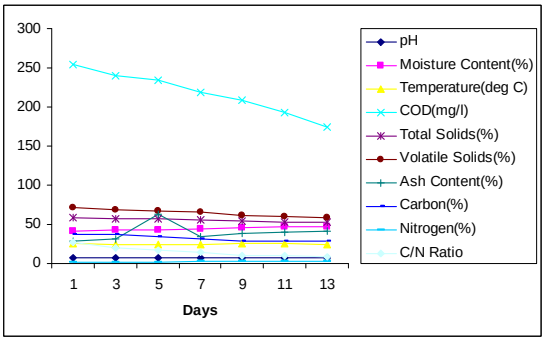

Fig.3: Physicochemical Characteristics of Vermicomposting Process of Vegetable waste with Dairy Effluent

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