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PHYSICO-CHEMICAL ANALYSIS OF TENDU LEAF LITTER VERMICOMPOST PROCESSED BY *EUDRILUS EUGENIAE*.

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ABSTRACT
Beedi industry is one of the most thriving and popular industries in Solapur city that utilizes tendu (*Diospyros melanoxylon*) leaves for rolling tobacco. The waste generated from Beedi industry in the absence of proper scientific method, leads to various environmental hazards. In order to solve this problem of leaf waste disposal in an eco-friendly and economically beneficial manner, the present work has been designed to convert this biomass into biofertilizer using vermicomposting biotechnology and physico chemical parameters are analyzed.

KEY WORDS: Beedi industry, *Diospyros melanoxylon*, Earthworm, Physico-chemical analysis, Tendu leaf, Vermicompost

INTRODUCTION

Solapur city is one of the major cities in western region of Maharashtra state. The Beedi industry is one of the most thriving and popular industries in Solapur city. Urbanization, encroachment of fertile area and booming population are also leading to generation of massive amount of waste. (Sharma *et al*, 2005).The waste generated from Beedi industry is about 12 to 15 thousand tons per annum (Kadam *et al*, 2005) In the absence of proper scientific method, the leaf waste is thrown on the streets and the improper disposal of leaf garbage leads to various environmental hazards. The volume of waste generated is posing great threats to the environment as no proper disposal mechanism is practiced by the workers. Vermicomposting is a simple biotechnological process of composting in which certain species of earthworms are used to enhance the process of waste conversion and produce a better end product. This final product is totally different in nature from the product produced from composting in many ways (Gandhi *et al.,* 1987). In the vermicompositing process the organic raw material is passed through the earthworms and transformed into worm manure, rich in microbial activity and plant growth regulators.

Hence the earthworms are considered as biological machines capable of transforming garbage into gold (Tara Cresent, 2003.) This simple biotechnological process can provide a solution for safe handling of organic biodegradable solid waste as well as the most needed plant nutrients for sustainable productivity (Wani, 2002). In order to solve this problem of leaf waste disposal in an eco-friendly and economically beneficial manner, the present work has been designed to convert this biomass into biofertilizer using vermicomposting biotechnology and physico chemical parameters are analyzed.

MATERIALS AND METHODS

The decomposed tendu leaf litter, and tendu leaf litter vermicomposts are analysed in the laboratory for their physico-chemical properties in triplicate. Moisture was determined by loss on drying method. The vermicompost sample was weighed before putting in the oven at 105 °C for 24 hours and again it is weighed after drying .The difference in the weight gives the moisture content . Ash content was determined by heating moisture free samples in furnace at 550 °C for 4 hours and percentage ash content was measured on dry basis. pH of the sample was recorded by pH meter (Elico) with LI 612 pH analyzer and EC by EC bridge (Elico,CM-183EC-TDS). Ten grams of vermicompost was taken in a clean 100 ml beaker to which 50 ml of distilled water was added. Suspensions were stirred intermittently for 30 min and pH of all the samples was recorded using pH meter. The same suspension after taking pH value was allowed to settle at the bottom for 1 hr and electrical conductivity was measured by using EC Bridge.

RESULTS

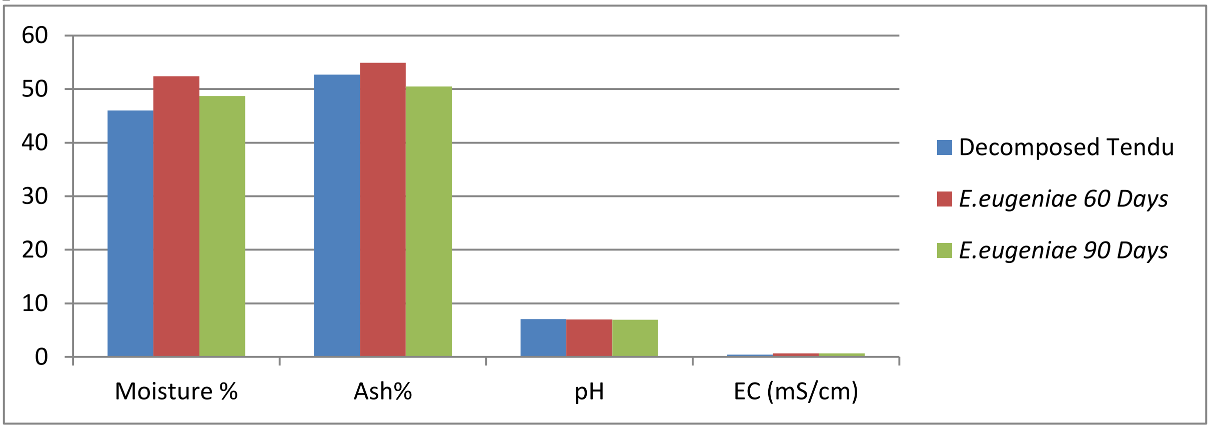
The moisture content in decomposed tendu experimentation acting as a control was 46.02 $\pm$ 5.70. After 60 days of experimentation by using earthworm species *Eudrilus eugeniae* the moisture content was increased to 52.4 $\pm$ 6.00 (Table 1 and Figure 2), Figure 1 showed the Tendu leaf litter waste. The moisture content decreased to 48.70 $\pm$ 5.90 after 90 days. The percentage variation when compared with control was increased and is not significant. The ash content was increased to 54.92 $\pm$ 5.00 after 60 days. After 90 days of experiment when compared with control the ash content was decreased up to 4.10 %. The percentage variation of ash when compared with control after 60 days of experimental was increased to 5.80 %. After 90 days of experiment when compared with control the ash content was decreased up to 8.20 %. pH content was decreased to 7.00 $\pm$ 0.61. The pH content decreased to 6.93 $\pm$ 0.68 after 90 days. The percentage variation when compared with control after 60 days of experiment was decreased up to 5.60 %. After 90 days of experiment when compared with control the pH content was decreased up to 14.00 %. The percentage variation of EC when compared with control after 60 days of experimental was increased up to 59.95% and is significant at P < 0.01. After 90 days of experiment when compared with control the EC content was increased up to 64.20 % and is significant at P < 0.001.

Figure 1. Showed the Tendu leaf litter waste.

Table 1. Physico-Chemical analysis of tendu vermicompost processed by *E. eugeniae* compared with decomposed tendu at various intervals.

Parameters	**Decomposed Tendu**	**Vermicompost**	
		***E.eugeniae* 60 days**	***E.eugeniae* 90 days**
Moisture (%)	46.02 $\pm$ 5.70	52.4 $\pm$ 6.00 (13.86%)	48.7 $\pm$ 5.90 (4.45%)
Ash (%)	52.66$\pm$ 4.91	54.92 $\pm$ 5.00 (4.2%)	50.47 $\pm$5.02 (4.1%)
pH	7.10 $\pm$ 0.80	7.00 $\pm$ 0.61 (5.6 %)	6.93 $\pm$ 0.68 (1.4%)
EC (mS/cm)	0.42 $\pm$ 0.04	0.67$\pm$ 0.07** (59.5 %)	0.69 $\pm$0.06*** (64.2 %)

Figure 2. Physico-Chemical Analysis of Tendu leaf litter Vermicompost processed by *E. eugeniae* at various time periods.



DISCUSSION

Moisture is an important factor for the mobility of water. In order to maintain the plant growth, the soil must contain moisture. The addition of organic matter exerts beneficial effects on the available moisture in soils since it increases the infiltration of water. The nutrients in the soil solution are absorbed easily and utilized by plants at an appropriate pH of the soil solution. In humid regions there is a definite relationship between soil pH and the amount of calcium and magnesium present in exchangeable form. pH 6.5-7.5 is most satisfactory for biological reasons from the viewpoint of availability of nutrients. The increased moisture level in the vermicompost is attributed to the fact that for the enhanced contents of nitrogen, phosphorous, potassium and other secondary micro nutrients. Ash is an important indicative parameter for decomposition and mineralization of the substrate.

In the present study the ash content was observed to be increasing with the increase in the vermicomposting time .In the present study there was a substantial increase in the ash content from the vermicompost, as the organic matter was destroyed and the residue of inorganic salts, the ash remained .The enhancement of ash content may be due to faster and consistent increased microbial activity at the time of vermicomposting. It can also be predicted that increasing ash indicates faster consumption of available ORM (tendu leaf litter) because of increased palatability of waste after initial decomposition (Edwards and Lofty, 1977).It is concluded that higher biomass content indicates larger quantity of ash which results in greater utilization of organic manure for greater production of vermicomposting. For maximum availability of vermicompost end product the moisture content also plays an important role as was observed in the present investigation. This indicates that higher decomposition and mineralization of substrate takes place in the ORM of tendu leaf litter.

In the present investigation the pH content of vermicompost from different experimental groups was variable and was found to be marginally decreased from all durations in both organic raw matters tendu leaf litter and farm waste manure. It is also reported that earthworms are very sensitive to hydrogen ion concentration and distribution and abundance is mainly dependent upon the pH of the surrounding soil. In the present investigation similar type of mechanism might have attributed to maintain the pH towards neutrality in all experimental groups. Venkatesh Eevera (2008) have studied reduction and recovery of nutrients though vermicomposting by using *Eudrilus eugeniae* for a period of 60 days and stated that the pH content of the vermicompost was towards the alkaline side and it was marginally decreased from the initial to the final period of experimentation. This decrease was attributed to the accumulation of certain acids produced during composting and also due to the humification process. In the present investigation the electric conductivity in the entire experimental group was found to be markedly increased from both ORMs, for both the durations of the experiment. The increased level of EC is more prominent from the tendu leaf litter produced vermicompost when compared with control i.e. decomposed tendu. In farm waste vermicompost also the increasing trend was noticed in electrical conductivity. This enhanced electrical conductivity from vermicompost might have hastened the nutrient accumulations which in turn influence the plant growth by making available macro and micro nutrients. Maximum biodegradation of the tendu leaf garbage was obtained by using raised bed method processed by earthworm *Eudrilus eugeniae*. The parameters like pH , temperature and moisture of the bed proved to be an important factor for getting better results.

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