



QUANTIFICATION OF CELLULOLYTIC BACTERIAL POPULATION IN TWO DIFFERENT ANIMAL WASTES AND PROBIOTIC ADDED VERMICOMPOSTS

N.Parimala Gandhi, Shanthi S., Alwin Rajan D., ¹Ramesh T., ¹Jayanthi J. and Ragunathan M.G*.

Department of Advanced Zoology and Biotechnology, Guru Nanak College, Chennai, Tamil Nadu, India.

¹Gill Research Institute, Guru Nanak College, Chennai, Tamil Nadu, India.

***Author for Correspondence: Ragunathan M. G.**

Department of Advanced Zoology and Biotechnology, Guru Nanak College, Chennai, Tamil Nadu, India.

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ABSTRACT

In this study the animal wastes (wild cow and buffalo) composted with leaf litter of *Ficus bengalensis*. The probiotic was used at two concentrations (10% and 20 %) to enhance the composting process. For each waste, viz., wild type cow and buffalo were inoculated with 1 kg uniformed size earthworms (*Eudrilus eugeniae*) per 1000 g of waste. The microbial enumeration conducted at regular interval for a period of 60 days. The total cellulolytic bacterial loads were screened at regular interval under identical laboratory conditions during the composting process. Cellulolytic bacterial count was found to be high in the vermicompost processed with the wastes of wild type cow followed by buffalo.

KEYWORDS: Vermicompost; *Eudrilus eugeniae*; probiotic; bacteria.

INTRODUCTION

Organic farming works in harmony with nature rather than against it. This involves using techniques to achieve good crop yields without harming the natural environment or the people who live and work in it.

Compost is organic matter (plant and animal residues) which has been rotted down by the action of bacteria and other organisms, over a period of time. Materials such as leaves, fruit skins and animal manures can be used to make compost. It is cheap, easy to make and is a very effective material that can be added to the soil, to improve soil and crop quality (Nighawan and Kanwar, 1952). Compost has many advantages over chemical fertilizers. Chemical fertilizers provide nutrients for plants but do not improve soil structure but compost feeds nutrients to soil and improves soil structure, its beneficial effects are long lasting. (Baralet al., 2012).

Cellulose is a crystalline polymer of D-glucose residues connected with β -1,4 glucosidic linkages, being the primary structural material of plant cell wall. It is the most abundant carbohydrate in nature. Microorganisms including bacteria, fungi and actinomycetes are able to carry out bioconversion of cellulose during composting. (Sahaet al., 2006). Cellulolytic and lignolytic strains of microbes not only enhance the rate of vermicomposting but also results into nutritionally better vermicompost with greater enzymatic activities. (Anonymous, (2009).

This work was designed to study the cellulolytic bacterial aspect of vermicompost produced using *Eudrilus eugeniae* from *Ficus bengalensis* leaf litter added with Red Sindhi-cow and Ellichpuri-buffalo wastes in the presence of selected concentration of a commercially available probiotic.

MATERIALS AND METHODS

Collection and Processing of Leaf Litter

The leaf litter of *Ficus bengalensis* were collected and cut into small pieces and taken for vermicomposting.

Collection of Animal Wastes

Animal wastes such as Cow (Red Sindhi Variety) dung and Buffalo (Ellichpuri Variety) dung were collected in fresh polythene bags and brought to the composting site.

Experimental Set Up

800 g of each of the animal waste was taken in plastic trough and 8 kg of processed leaf litter waste was added to it. This mixture was mixed well with the required amount of water. In each plastic trough 1kg uniform sized *Eudrilus eugeniae* (Kinberg, 1867) earthworms were added and turned well for uniform distribution. Duplicates (replica 1 and 2) were maintained for each experimentation. This set up was kept under shadow condition for 60 days. The physical parameters such as pH, temperature and moisture content were monitored with utmost care.

Studying the Effect of Probiotics in Vermicomposting with Different Wastes

To study the effect of probiotics in vermicomposting – commercially available EM (Effective Microorganisms) solution was used. The EM should be activated prior to use as per manufacturer (Maple Org Tech, India (P) Ltd) guidelines. The effectiveness of EM in the vermicomposting was checked at 10%, 20% and 30% concentrations. EM was added at 10%, 20% and 30% in cow dung and buffalo dung added vermicomposts. The four different combination taken for analysis were: CDV-I (combination of leaf litter, cow dung, earth worms and EM); BDV-I (combination of leaf litter, buffalo dung, earth worms and EM); CDV-II (combination of leaf litter, cow dung and earth worms); and BDV-II (combination of leaf litter, buffalo dung and earth worms).

Cellulolytic Bacterial Population Analysis

Cellulolytic bacterial population was assessed at different periods. On initial (0), 15th, 30th and 60th days, the samples were collected for bacterial enumeration from replica-1 and replica-2. Sterile nutrient agar plate

was used as control. Analysis was carried out based on the work of Cappuccino (1992). The bacterial enumeration results are presented in Table 1.

RESULTS

The cellulolytic bacterial population in the different vermicompost combinations was checked at 0, 15, 30 and 60 days interval during the composting process.

The CDV-I and BDV-I composts showed higher cellulolytic bacterial populations than CDV-II compost; at the same time CDV-I showed higher cellulolytic bacterial populations when compared to BDV-I. The cellulolytic bacterial load was found to be declining at 30th and 60th days in CDV-I and BDV-I composts with 20% and 30% concentration of EM, respectively. But the CDV-I and BDV-I composts with 30% EM at 60th day did not shows any colonies. The reduction in the bacterial population may be due to the secretion of antibacterial substances produced by microbes like actinomycetes present in the probiotic (EM) solution (Viswanathan, 2008; Vijayaet al., 2008).

Table1: Total cellulolytic bacterial population in vermicomposting at different periods.

Days	EM Concentration (%)	Cellulolytic Bacterial Count (CFU/ml)				
		CDV-I	BDV-I	CDV-II	BDV-II	Control
0	10	7×10^{-3}	6×10^{-3}	6×10^{-3}	4×10^{-3}	-
	20	9×10^{-3}	8×10^{-3}			
	30	11×10^{-3}	11×10^{-3}			
15	10	14×10^{-3}	10×10^{-3}	8×10^{-3}	6×10^{-3}	-
	20	12×10^{-3}	11×10^{-3}			
	30	9×10^{-3}	5×10^{-3}			
30	10	16×10^{-3}	11×10^{-3}	11×10^{-3}	9×10^{-3}	-
	20	9×10^{-3}	7×10^{-3}			
	30	5×10^{-3}	3×10^{-3}			
60	10	19×10^{-3}	13×10^{-3}	13×10^{-3}	9×10^{-3}	-
	20	7×10^{-3}	5×10^{-3}			
	30	-	-			

Each value presented in this table is Mean value obtained from 6 individual observations of the replica 1 and 2.

DISCUSSION

Among the treatments, highest cellulolytic bacterial population was recorded in the CDV-I vermicompost processed with cow dung waste and 10% EM solution, so this probiotic concentration may be considered as the best one as it will enhance the maximum growth of cellulolytic bacteria in vermicompost.

The result suggests that the bacterial load is rich in the vermicompost processed with waste from Red Sindhi-cow than Ellichpuri-buffalo in the presence of 10% probiotic solution. The findings may help the organic agriculturists to adopt the vermitechology in efficient way.

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