

Decomposition of Organic Wastes in Mathura Region Through Vermicomposting

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DOI: 10.29322/IJSRP.9.02.2019.p8689

<http://dx.doi.org/10.29322/IJSRP.9.02.2019.p8689>

Abstract- This paper deals with the management and decomposition of organic wastes by using vermicomposting technology to produce nutrient rich worm cast. Two types of livestock manure in combinations with agro/kitchen wastes were used for culturing the earthworm *Eisenia foetida*. The growth and development of an epigeic earthworm *Eisenia foetida* was studied under identical laboratory conditions. The concentration of total C and total K were higher in cow manure than those of chick manure. Number of earthworms weight and length of *Eisenia foetida* were higher in combination of gram bran with cow dung.

Index Terms- Agro-waste, Animal dung, *Eisenia foetida*, Kitchen waste, Organic wastes, Vermicomposting

I. INTRODUCTION

The Vermicomposting is the best way of waste management and its decomposition by use of earthworm. It is an eco-biotechnological process that transforms energy rich and complex organic substances into stabilized humus like product, vermicompost. This vermicompost can hold more nutrients over a long period without impacting the environment.

Excessive use of chemical fertilizers make the soil infertile and reduce productivity. Animal, agro and kitchen wastes are the serious problems for society. Some epigeu earthworms have appeared as key sources to combat the problems of waste disposal. Proper utilization of these wastes can improve the soil quality as well as environmental quality. The *Eisenia foetida* is the most suitable species for vermicomposting due to its short life cycle and it can tolerate wide range of temperatures and humidity.

The objectives of this study were to compare the quality and quantity of two different types of livestock manure (cow and chick manure) in combination with agro/kitchen wastes by worms, decomposition of these organic wastes and effects of these manures on growth and development of earthworm.

II. MATERIALS AND METHOD

Agro and kitchen wastes were collected locally from randomly selected residential houses and farms of study areas under Mathura region. Fresh animal dung was collected from different animal farms located in Mathura region. The main characteristics of animal wastes are given (Table-1).

Young specimens of *Eisenia foetida* were randomly picked from several stock cultures maintained in the laboratory. The moistures of wastes was adjusted to 60-70% during the study period by spraying adequate quantity of distilled water. The waste combinations were turned over manually every day for 12 days in order to eliminate the volatile substances. All containers were kept in dark at temperature $25 \pm 1^\circ\text{C}$. Animal dung was measured as control^{6,7}. Combinations of wastes were taken in (ratio 1:1). After 12 days, 18 adult individuals of *Eisenia foetida* were introduced into each bed. Length, weight and total number of earthworms were counted from each container after 60 days. All experiments were conducted three times. The pH were determined using whatman no-1 filter paper. Total K was determined by Flame photometer. TKN was determined by microkjeldahl method. Total phosphate was measured by methods of Bears. C:N ratio is used as an index for maturity of organic wastes. Students 't'-test was applied to compare the significance (PL 0.05) between different combinations of dung with agro and kitchen wastes.

III. RESULTS AND DISCUSSION

Table-1 shows the physico-chemical characteristics of animal wastes before use. The pH values of these two animal wastes were in alkaline range (8.9-7.1). The moisture content of the wastes varied between 62% and 20%. The TOC of cow manure was higher than that of chick manure. The C:N ratio of cow manure was 90. EC was 2.2 in cow manure and 0.91 in chick manure.

Table-2 shows the parameters of combination of these two wastes with agro/kitchen waste on the growth and development of earthworm *Eisenia foetida*. Maximum gain in number of earthworm, weight and length of *Eisenia foetida* was observed in gram bran + cow dung. Thus, the combination of gram bran with cow dung is suitable for better growth and development of earthworm *Eisenia foetida*^{1,3,8,11}.

The weight gain by *Eisenia foetida* was dependent on population density and food type^{9,10}. The maximum increase and decomposition in the number of earthworms in combination of cow+ gram bran is due to the biochemical quality of food, which is an important factor in determining the time taken to reach sexual maturity and onset reproduction.

TABLE -1: Initial Physico-Chemical characteristics of two livestock manures

	Cow Dung	Chick Manure
PH(1:10)	8.9	7.1
TOC %	49	19
TKN	0.47	0.20
C:N Ratio	90	70
Moisture Contents(%)	62	20
EC	2.2	0.91
TK%	0.32	0.26
TAP	0.26	0.19

TABLE-2 : Effect of two livestock manures and their combinations with agro/kitchen wastes on the growth and development of Eisenia foetida

Manure	Number	Weight	Length
Cow dung	28.1 ± 0.42	710.10 ± 15.31	4.39 ± 0.21
Dung + gram bran	65.3 ± 0.21	825.20 ± 15.20	6.08 ± 0.15
Dung + wheat bran	45.2 ± 0.88	798.00 ± 22.69	4.12 ± 0.05
Dung + vegetable wastes	35.2 ± 0.71	725.10 ± 21.88	3.02 ± 0.11
Chick manure	10.2 ± 0.33	450.20 ± 13	2.21 ± 0.11
Dung + gram bran	40.1 ± 0.11	528.12 ± 16	5.11 ± 0.12
			4.18 ± 0.08

Dung + wheat bran	32.8 ± 0.26	438.16 ± 20	4.11 ± 0.14
Dung + vegetable wastes	25.1 ± 0.34	428.29 ± 29	

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