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Effect of leaf litter, vegetable waste, coffee waste, flower waste and may flower waste added vermicompost on weight gain in *Eudrilus eugeniae*

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ABSTRACT

Soil organisms are essential for nutrient cycling and organic matter turn over, thereby functioning as key determinants of soil fertility and nutrient uptake by plants. Rapid urbanization, industrialization, unplanned population growth, misuse and abuse of the environment have led to an increased accumulation of solid waste materials. This, not only reduces available fertile land, but also pollutes air, water and soil. It also causes social, ecological, aesthetic and economic problems having negative impact on human health and quality of life. Due to lack of financial resources more than 90% of solid waste is deposited off on land in an indiscriminate manner posing significant hazards to the environment. The present work aims at studying the growth of worm with the help of various wastes.

Keywords: Vermicomposting, growth, wastes, waste management, Recycling

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INTRODUCTION

A rapid increasing population and high rate of industrialization has increased the problem of solid waste management [2]. The large amount of solid waste and sludge produced by anthropogenic sources is becoming a serious problem [21]. Proper waste management is very crucial and has become the main challenge in many countries [23]. Composted wastes consists of necessary minerals which acts as organic fertilizer to enhance plant growth and improve soil condition [8-14]. Earthworms, the soil macro invertebrates are prominent among soil fauna and regulate the soil processes [7]. Vermicomposting has become an appropriate alternative for the safe hygienic and cost effective disposal of wastes. Earthworm is an eco-biotechnological process that transforms energy rich and complex organic substances into stabilized vermicompost[16]. Recycling of wastes using earthworms has become an important component of sustainable agriculture which has a multidirectional impact in terms of safe disposal of wastes preventing environmental pollution besides yielding nutrient rich material [3]. The environmentally acceptable vermicomposting technology using earthworm can well adopted for converting waste into wealth [15]. The present study aims at using earthworms in the management of leaf litter, vegetable, coffee seed waste, flower waste and May flower waste. Our perusal literature indicates that less work as been done on leaf litter and other variouss waste composting by earthworms, and hence the present study was initiated.

MATERIALS AND METHODS

Eudrilus eugeniae were collected from Santhosh Farms- Pollachi, Coimbatore. Each of the waste was mixed with cow dung. Various wastes such as leaf litter, vegetable waste, coffee seed waste, May flower and flower wastes were cut into small pieces and dried for 5- 6 days. The pre-digestion mixture was prepared by mixing cowdung with

each of the wastes in the ratio of 1:1 (w/w) separately and maintained for 21 days for microbial activity. The pre digestion was carried out using indore method as described by Kale [1].

Growth Studies

For studying the efficiency of vegetable, flower waste, May flower waste and coffee seed waste on growth of *Eudrilus eugeniae* 250 gm of leaf, vegetable waste, may flower waste ,flower waste and coffee seed waste was taken into separate containers and 25 young worms (0.38 ± 0.106 mg) were released into each container. Three duplicates were maintained for each waste. Initial weight was taken before grouping into specific experiments. The worms were weighed at an interval of 10 days up to a period of 90 days. The weight increase was recorded using a monopan balance of 0.001 mg accuracy. The predigestion mixture was not changed during the experimental period. The increase in weight per 10 days was recorded in all the experimental groups. For growth studies 5 healthy worms were selected. They were introduced into plastic tubs containing 500g of predigestion mixture. The experiment was continued for 90 days and increase in weight was recorded. The data obtained was subjected to statistical analysis using‘t’ test [19].

RESULTS AND DISCUSSION

The growth rate of *E. eugeniae* is given in **Table - 1**. The average initial weight of the worm was (0.38 ± 0.106 mg). The growth rate was very slow during first few days and then the growth rate was increased. Alternatively the growth rate increased and decreased throughout the study period. The control worms showed progressive increase in weight of 8.66 ± 0.42 mg over a period of 90 days. The worms showed an increase in weight of 12.61 ± 0.90 mg, 13.58 ± 0.84 mg, 6.56 ± 0.41 mg and 5.3 ± 1.59 mg in vegetable waste, flower waste, May flower waste and coffee seed waste respectively over a period of 90 days.

Our results indicate that the earthworm *E. eugeniae* under normal laboratory conditions revealed a positive growth with a net weight gain of 8.66 ± 0.42 mg over a period of 90 days. In comparison with leaf litter an increase in weight was seen in vegetable and flower waste throughout the study period, while in May flower waste and coffee seed waste, a decreasing trend was seen, perhaps due to the highly dried condition of may flower waste, where the nutrient level might have been reduced nutrient content along with the caffeine might have interfered with the metabolic pathways leading to a decrease in growth. The decrease level in nutrients might have been sufficient enough for the survival of the worms, but might not have favoured weight increase and hence the decrease in growth. Earthworms continue to grow throughout their lives with enlargement of their body segments following emergence from the cocoon [5].

Nutrition is an essential factor that determines the maximum growth of organisms. Quality and quantity of the available feed and various physico chemical parameters have been reported to determine the optimum growth, maturation and reproduction potential [10]. Quality and availability of food determines growth, maturation and cocoon production [22]. Several physiological conditions such as temperature, moisture, oxygen, pH, organic matter and toxic chemicals controls growth and reproduction. Kaushik and Garg [13] have reported that worms fed with cow dung showed the best results in growth. It has reported rapid weight gain up to 45 days in all vermibeds except in biogas sludge in *Allolobophora parva. Eisenia andrei* grown in individual cultures had no food limitation or competition showed maximum growth and reproduction rates in mixtures with straw and pine. Oak leaves and fern mixture along with pig slurry showed low growth rate and reproduction[4].

Low rate of growth was reported during the first few days (1-14 days) and increased from 21-28 days. Highest growth recorded in *Perionyx ceylanensis* was 5.61, 5.33 and 4.93 mg/worm /day at 21-28 days of age in worms cultured singly, in batches of four and eight respectively [11]. Growth rate in *P.excavatus* and *P.sansibaricus* ranged from 3.5 to 8.0 mg/worm/day [20]. A growth rate of 10.6 and 5.5 mg/adult/day was reported for *D.nepalensis* grown singly and in batches in oak litter medium [12]. Pig slurry and pine needle showed a growth rate of 8.83 ± 0.42 mg day^{-1}, while pine bark showed a growth rate of 11.22 ± 0.71 mg day^{-1}. The reason for this variation in growth may be due to the organic matter content and the differing digestibility of each bulking substrate, the amount of water soluble poly phenols in litter is proportional to the rate at which it was consumed and that the litter became much more palatable after a few weeks of weathering. Leaves with high concentrations of condensed tannins are less palatable as they reduce both the availability of soluble protein and polysaccharides and the activity of the digestive enzymes, growth and reproduction has been positively correlated to the volatile solids content of waste and

pre-composting should be kept to a minimum for the vermicomposting system to operate at maximum efficiency [6] in *E. andrei*.

Table-1. Effect of various wastes added Vermicompost on weight gain (mg) in *Eudrilus eugeniae* up to 90 days

Duration of exposure(Days)	Control (leaf litter)	Vegetable waste	Flower waste	May flower waste	Coffee seed waste
10 days	0.29 ± 0.05	0.33 ± 0.10 (+) 29 NS	0.30 ± 0.02 (+) 3.33 NS	0.25 ± 0.08 (-)13.79 *	1.01± 0.58 (+)248.27 NS
20 days	1.47± 0.40	1.77± 0.19 (+)16.94 NS	1.68 ± 0.19 (+)12.5 NS	0.95 ± 0.47 (-) 35.37 **	3.01 ± 1.79 (+)104.76 NS
30 days	2.1 ± 0.12	2.49 ± 0.19 (+) 15.85 *	2.69 ± 0.46 (+) 21.18 NS	2.53 ± 0.41 (+) 20.476 NS	2.51 ± 1.48 (-) 19.524 **
40 days	2.83 ± 0.30	3.92 ± 0.13 (+) 27.81 **	4.42 ± 0.47 (+) 35.97 **	2.66 ± 0.38 (-)6.007 NS	1.23 ± 0.80 (-) 56.537 **
50 days	3.79 ± 0.37	4.6 ± 0.34 (+) 17.61 *	5.84 ± 1.37 (+) 35.10 NS	3.50 ± 0.66 (-)7.652 **	2.31 ± 0.69 (-)39.05 **
60 days	4.84 ± 0.69	5.46 ± 0.36 (+) 11.35 NS	6.96 ± 1.52 (+) 30.45 NS	3.93 ± 0.54 (-)18.802 NS	4.23 ± 1.08 (-)12.603 NS
70 days	5.85 ± 0.31	7.22 ± 0.25 (+) 18.97 **	8.96 ± 1.23 (+) 34.71 *	4.71 ± 0.48 (-)19.487 **	4.26 ± 1.70 (-) 27.179 NS
80 days	7.85 ± 0.20	8.59 ± 0.99 (+) 8.61 NS	10.83 ± 1.73 (+) 27.51 *	5.51 ± 0.24 (-) 29.809 **	4.20 ± 1.53 (-) 46.497 NS
90 days	8.66 ± 0.42	12.61 ± 0.90 (+) 31.32 **	13.58 ± 0.84 (+) 36.22 **	6.56 ± 0.41 (-)24.249 NS	5.3 ± 1.59 (-)45.727 **

Each value represents the mean ±SD of 15 observations.
Data given in brackets represents percent change increase (+) or decrease (-) over the control.
NS – Not significant at 5% and 1% level.
** Significant at 5% level.*
*** Highly significant at 1% level.*

CONCLUSION

This study showed an increased weight in vegetable and flower waste exposed worms when compared to coffee seed and May flower waste exposed worms. Vermicomposting of organic wastes accelerates organic matter stabilization and gives chelating and phytohormonal elements which have a high content of microbial matter and stabilized humic substances. Better waste management is an effort to move towards attaining a sustainable society to serve the future generation from adverse impacts of solid management. Thus, the present study serves to highlight and contributes to a simple but effective process of waste management.

REFERENCES

[1] Bano K, and Kale R. D, *Proc. Nat. Sem. Org. Fmg* .TNAU. Coimbatore, **1992**. 45-46.
[2] Beohar P. A, and Srivasta R. K, *Journal of soil science*., **2011**,1,04-11
[3] Cox D. A, *Journal of plant nutrition*, **1993**, 16, 533-545.
[4] Dominguez J, Edwards C. A, Subler S, *Journal of Biocycle*, **1997**, 4, 57 – 59.
[5] Edwards C. A, and Bohlen P. J, *The Biology and Ecology of Earthworm*, **1996**.
[6] Frederickson J, Butt K. R, Morris R. M, and Daniel C, *Soil Biology and Biochemistry*, **1997**, 29 (3/4): 725 –730
[7] Ismail S. A, *Vermicology., The biology of earthworm*, **1997**, 92
[8] Jakobsen S. T, *Journal of Resources, Conservation and Recycling*, **1995**, 13(1):57-51.
[9] Joshi N. V, and Kelkar B. V, *Indian J.Agric.Sci*. **1951**, 22:189-195.
[10] Karmegam N, and Daniel T, *Journal Exp Zool.*, **2000**, 3(2), 223-226.
[11] Karmegam N, and Daniel T, *Journal of Bioresource technology*, **2009**, 4790-4796.
[12] Kaushal B. R, Kalia S, Bisht S. P. S, *Pedobiologia*, **1995**, 39; 417-422.

[13] Kaushik P, and Garg V. K, *Journal of Bioresource of Technology*, **2003**, 90, 311-316
[14] Lynch D. H, Voroney R. P, and Warman P. R, *Soil biology and Biochemistry*, **2006**, 38(1): 103-114.
[15] Marlin C. J, Rajeshkumar K. T, *Journal of Applied science research*, **2012**, 3(2):1092-1097
[16] Nino A, Rivera A, and Ramirez, *Journal of Experimental Biology*, **2012**, 2(1):199-205
[17] Geetha M, Anjali Y, *Journal of Applied science research*, **2012**, 3(6):3844-3847
[18] Singh A, Sharma S, *Bioresource Technology*, **2008**, 85; 107 – 11.
[19] Steel R. G. D, and Torrie J. H, *Principles and procedures of statistics*, **1960**.
[20] Suthar S, and Singh S, *International Journal of Environment Science and Technology*, **2008**, (1) 99 – 106.
[21] Suthar S, *Journal of Hazardous materials*, **2009**, (163):199-206
[22] Reinecke A.J, and Viljoen S.A, *Journal of Biol Fert Soils*., **1990**, (10): 184-187.
[23] Wagner T, and Arnold P, *Journal of Cleaner Production*, **2008**, 16(4): 410-421.