

Effect of Pongamia Leaf Medium on Growth of Earthworm (*Eudrilus eugeniae*)

Jesikha.M and M. Lekeshmanaswamy

PG and research Department of Zoology, Kongunadu Arts and Science College, Coimbatore-29, Tamil Nadu, India

Abstract- The growth of *Eudrilus eugeniae* (Kingberg) in cattle waste and Pongamia leaf waste was studied. The wastes were prepared as separate media for growing worms. The worm's growth in the form of weight has been recorded in every week. The results of both media in total weight were gradually increased. The highest total weight 1,287mg in cow dung medium and followed by Pongamia leaf medium 1,098mg. The maturation of worms also recorded in 8th and 9th week in cow dung and Pongamia leaf media respectively. The growth gain and growth rate were also observed in both media. The waste can be composed by earthworms to form excellent fertilizers but the Pongamia leaf includes some chemical substances that distress the growth and maturation of earthworm *Eudrilus eugeniae*.

Index Terms- Pongamia leaf medium, *Eudrilus eugeniae*, Growth gain, Maturation.

I. INTRODUCTION

The processing of organic waste into organic fertilizers via vermicomposting has been used to address the issues of environment pollution. In recent years, the use of earthworms in waste degradation has spurred interest in processing large quantities of waste materials. Although, animal dung and agriculture wastes are recognized as a suitable earthworm culture media, but other organic waste material from industries have also proved successful. Several earthworm species e.g. *Eisenia fetida*, *Eisenia andrei*, *Eudrilus eugeniae*, *Perionyx excavatus* have been identified as potential candidates for managing organic waste resources (Edwards, 1998). However, in tropical and sub-tropical conditions earthworm: *E.eugeniae* appeared as the best vermicomposting species (Viljoen and Reinecke, 1992). In order to utilize this species successfully for outdoor vermicomposting of different animal wastes, its survival, growth and fecundity in different wastes should be known.

The biology of composting earthworms has been investigated in terms of their certain growth, reproduction parameters of earthworms. According to Edward 1998, the type, quality and quantity of the organic wastes were very important to determine the rates of growth of earthworms. In general, for large-scale vermiculture practices the knowledge of biological requirements of candidate species must be pre-determined and their optimum requirements concerning nutritional factors might be an active field of research in earthworm biotechnology (Butt, 1997). But influence of culture material on their growth parameters is less considered (Suthar, 2007b).

In this paper, the Pongamia leaf waste used as raw material in composting (laboratory-based culture) and its effects on

different growth parameters of earthworm *Eudrilus eugeniae* were discussed.

II. MATERIALS AND METHODS

In this study, wastes such as Pongamia leaf (L) and cow dung (C) were utilized for composting and its effects on different growth parameters of earthworm *Eudrilus eugeniae* were studied.

Wastes were dried, powdered and amended with soil in 3:1 ratio for culture media. The culture media were maintained with moisture by sprinkling water in proper intervals. The two sets of culture media were maintained with four replicates within a controlled environment. The media were kept about two weeks and introduced with new baby worms. Growth performances of *Eudrilus eugeniae* in two media were studied in the form of total growth, weight gain and growth rate.

The total weight of earthworms in all media was calculated in every week for 10 weeks experiment duration.

The growth rate is the growth of a single worm in a day (mg/worm/day). The weight gains and growth rate for specific periods were calculated by the method of Parthasarathi, 2007.

III. RESULTS AND DISCUSSION

There was a gradual and continuous increase in total weight on the weekly growth of the cultured earthworms from both cow dung and Pongamia leaf media (Fig.1). Throughout the experiment period, earthworms cultured in the cow dung (C) substrate had the highest final weekly weight of 1,287mg/worm and in Pongamia leaf medium (P) about 1,098mg/worm. Reinecke *et al.*, (1992) reported, continuous growth and maximum weight up to 21 weeks at 25° C. *Eudrilus eugeniae* increased in total biomass much more rapidly than *E.fetida*, a species which grows relatively well in most organic wastes. Suthar (2007b) studied the earthworm *E.eugeniae* growth performance in kitchen waste and the worm reached 0.982mg at 9th week. In straw medium, the weight was 0.813mg and 0.762mg in farmyard manure.

The weight gain of both media was increased continuously (fig.2). The weight gain of *E.eugeniae* in C medium was decreased in the 8th week and 9th week in P medium. The worm weight was increased in both of the media after that fluctuation. The weight reduction because of that time was the earthworm attained the matured stage. So it utilized the energy for mating and other reproduction purpose. In cow dung medium the worms are matured at 8th week itself. In Pongamia medium the worms are matured at 9th week, so after it has been reduced because of reproduction purpose. The shortest time from producing cocoons to sexual maturity for *E.eugeniae* was 7-8th week (Dominguez *et*

al., 2001). The time from hatching to sexual maturity was 47 ± 3 days, which agree with the results of Reineck *et al.*, (1992) who reported that is a shorter than the 7-8 weeks quoted for *E.fetida* and the 51 days reported for *E.eugeniae*. It is very much less than the 29-42 weeks quoted for the soil-dwelling species *Allolobophora chlorotica*, 10-24 months for *Millsonia anomata* and 12-24 months for *Bimastos zeteki*.

The growth rate of worms also continuously increased up to 8th and 9th week in cow dung medium and Pongamia medium respectively and after that the growth rate decreased (fig. 3). This fluctuation was because of the energy utilized by reproduction purpose. The worm increased in weight and again decreased because of the energy was utilized by cocoon formation as well as in that time the worm laying eggs.

Growth rates were superior in cow dung medium compare than on control and leaf medium. Final mean biomass was also greater in worms which grown in cow dung medium (Bhatia, 2000). Growth rates of *M.posthuma* were lower in comparison to the *Eisenia fetida* fed on wet activated sludge (14mg/worm/day). According to Fayolle (Fayolle *et al.*, 1997) among the different variables necessary for earthworm production, it seems that the type of food is most important.

The growth of earthworms in plant derived materials could be retarded due to presence of some chemical substances e.g. polyphenols (Suthar, 2007a). Comparatively, in the present study the earthworm showed least biological potential on leaf residues, and it could be due to presence of some polyphenols and related substances. Besides to high concentrations of nutrient in plant origin wastes, some secondary metabolites are also important, which directly or indirectly influence the composting potential as well as growth patterns of earthworm species during vermicomposting practices. It concludes that the feeding material mainly consists of crop residues, the concentration of polyphenols and related compounds were more important for controlling earthworm activities.

REFERENCES

- [1] S. Bhatia. Sonu, Earthworm and Sustainable Agriculture: Study of the Role of Earthworm in Production of Wheat Crop. Ph.D Thesis Awarded by University of Rajasthan, Jaipur, India, 2000.
- [2] K. R. Butt, Reproduction and growth of the earthworm *Allolobophora chlorotica* (Savigny, 1826) in controlled environments. *Pedobiologia* 41, 1997, 369-374.
- [3] J. Dominguez, A. Clive, Edwards and John Ashby, The biology and population dynamics of *Eudrilus eugeniae* (Kinberg) (Oligochaeta) in cattle waste solids, *Pedobiologia* 45, 2001, 341-353
- [4] C. A. Edwards, C.A., The use of earthworms in the breakdown and management of organic wastes. In: Edwards, C.A. (ed.): *Earthworm Ecology*. St. Lucie Press, Boca Raton, 1998, pp. 327-351.
- [5] L. Fayolle, H. Mitchell, H. Cluzeau and D. Stawiec, Influence of temperature and food source on the life cycle of the earthworm *Dendrobaena veneta* (Oligochaeta). *Soil Biology and Biochemistry* 29, 1997, 747-750.
- [6] K. Parthasarathi, Life cycle of *Lampito mauritii* (Kinberg) in comparison with *Eudrilus eugeniae* (Kinberg) cultured on different substrates, *Journal of Environmental Biology*, 28(4), 2007, 803-812.
- [7] A. J. Reinecke, S. J. Viljoen and R. J. Saayman, The suitability of *Eudrilus eugeniae*, *Perionyx excavatus* and *Eisenia fetida* (Oligochaeta) for vermicomposting in Southern Africa in terms of their temperature requirements. *Soil Biology and Biochemistry*, 24, 1992, 1295-1307.
- [8] S. Suthar, Vermicomposting potential of *Perionyx sansibaricus* (Perrier) in different waste materials. *Biores. Technol*, 98 (6), 2007a, 1231-1237.
- [9] S. Suthar, Influence of different food sources on growth and reproduction performance of composting epigeics: *Eudrilus eugeniae*, *Perionyx excavatus* and *Perionyx sansibaricus*. *Applied ecology and Environmental Research*, 5(2). 2007b, 79-92.
- [10] S. A. Viljoen and A. J. Reinecke, The temperature requirement of the epigeic earthworm species *Eudrilus eugeniae* (Oligochaeta) - A laboratory study. *Soil Biology and Biochemistry*, 24, 1992, 1345-1350.

AUTHORS

First Author – Jesikha.M, PG and research Department of Zoology, Kongunadu Arts and Science College, Coimbatore-29, Tamil Nadu, India, Email: Khajesi@yahoo.co.in

Second Author – M. Lekeshmanaswamy, PG and research Department of Zoology, Kongunadu Arts and Science College, Coimbatore-29, Tamil Nadu, India, Email: Khajesi@yahoo.co.in

FIGURES

Fig 1: Total weight of earthworm in two different media

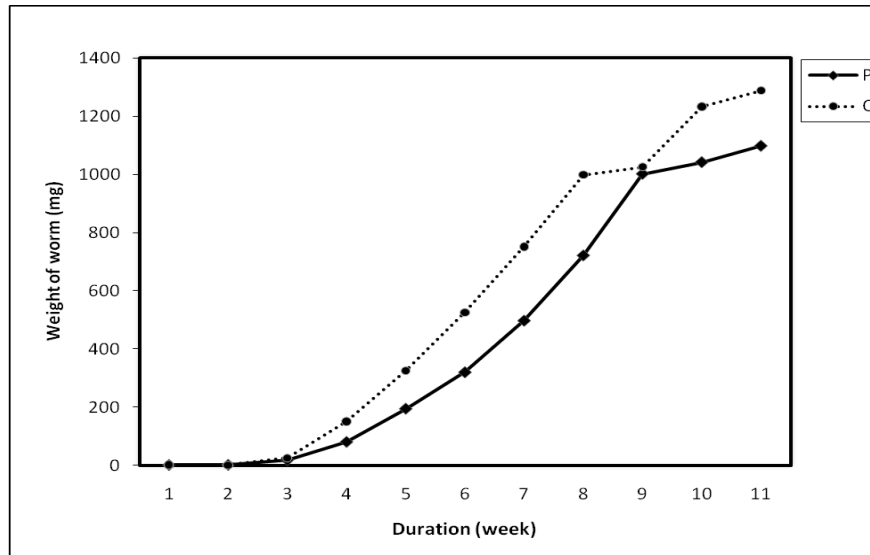


Fig 2: Weight gain of earthworm in two different media

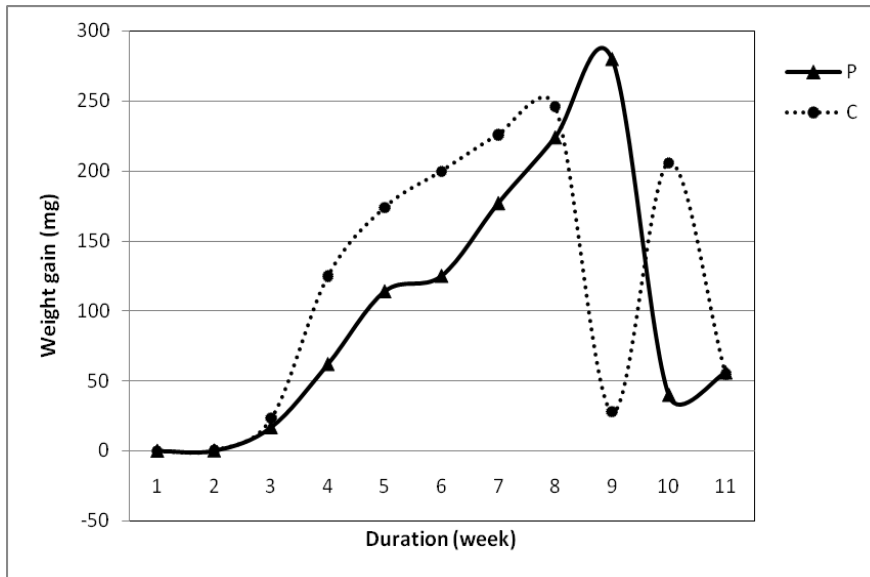


Fig 3: Growth rate of earthworm in two different media

