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Research Article

Effect of *Eucalyptus Citriodora* Leaves on the Multiplication of Exotic Earthworm Species *Eisenia Foetida*

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Abstract:

When different ratios of *Eucalyptus* leaves and cow dung were mixed and analyzed for worm multiplication, amongst the three ratios (1:1, 3:1 and 3:2), 3:1 was the most suitable ratio as far as multiplication of worms is concerned. There was no multiplication of worms up to two weeks but the worms started multiplying at a significant rate after two weeks. After eight weeks of inoculation the number of worms went up to 658.33 as compared to 196.33 worms in control in 3:1 ratio. This ratio further provided rapid multiplication of worms i.e., 886.00 worms were observed as compared to 253.00 worms in control after twelve weeks of inoculation. 3:2 ratio i.e. (3 part cow dung + 2 part *Eucalyptus* leaves) stood second with 735.00 worms as compared to 253.00 in control followed by 638.33 worms in 1:1 (1 part cow dung + 1 part *Eucalyptus* leaves) ratio after twelve weeks.

Keywords: Multiplication, Earthworm, cow dung, *Eucalyptus* leaves

1.0 Introduction:

Eucalyptus spp. contains high levels of phenolics and terpenoids which can be toxic. Citronella found in *Eucalyptus* is reported to be mutagenic (Lewis and Elvin-Lewis, 1977). Overdoses of eucalyptus oil in humans cause gastro-intestinal burning, abdominal pain, vomiting and convulsions, depress respiration and central nervous system, and may lead to coma and death. Although *Eucalyptus* is one of the most important medicinal plant yet, eucalyptus forest soil present problems of acidification which result from an accumulation of organic anions complexes with aluminium (Prosser *et al.*, 1993). The increasing soil acidity has brought about secondary changes in the chemistry of soil. Elevated soil acidity may increase soil aluminium availability and toxicity to roots. Many plants are unable to survive with these changing properties and are therefore declining in frequency and amounts. Such acidification can reduce plant yield by increasing the solubility of aluminum and manganese to toxic levels and both factors cause loss of available nutrients and diminution in micro-biota activity. Further, along the roadside eucalyptus litter also poses disposal problems. Present investigation is an attempt to explore the possibilities to utilize eucalyptus leaves

as a feeding substrate for rearing of exotic earthworm *Eisenia foetida*.

2.0 Materials and Methods:

Stock culture of *Eisenia foetida* was taken from Akschat Sansthan, Nandwel, Udaipur. *Eucalyptus citriodora* leaves were collected from nearby areas. Leaves were graded in small pieces and sprinkled with water for softening in plastic buckets for one week. After spreading for two days leaves were mixed with already cooled and semi-decomposed cow dung in three different ratios viz., 1:1 (500 grams cow dung + 500 grams *Eucalyptus* leaves), 3:1 ratio (750 grams cow dung + 250 grams *Eucalyptus* leaves) and 3:2 ratio (600 grams cow dung + 400 grams *Eucalyptus* leaves) while control contained one kilogram cow dung only. Each combination including control replicated three times. After homogenous mixing of cow dung and *Eucalyptus* leaves, they were kept in plastic buckets for vermicomposting. After one week of mixing 50 mature clitellate worms of species *Eisenia foetida* were inoculated in each bucket and the buckets were covered with newspaper as *Eisenia foetida* shows negative response to sunlight. Buckets were made porous at their sides to provide proper

ventilation and drainage of excess water during vermicomposting. Proper temperature (18-25°C) and humidity (60-80 percent) were maintained by sprinkling water at regular intervals. Worms were also protected from predators. Worms were counted at an interval of two weeks. Results were analyzed statistically using CRD ANOVA test.

3.0 Results and Discussion:

When different ratios of *Eucalyptus* leaves and cow dung were mixed and analyzed for worm multiplication, amongst the three ratios (1:1, 3:1 and 3:2), 3:1 was the most suitable ratio as far as multiplication of worms is concerned (Table-1a). There was no multiplication of worms up to two weeks but the worms started multiplying at a significant rate after two weeks. After eight weeks of inoculation the number of worms went up to 658.33 as compared to 196.33 worms in control in 3:1 ratio. This ratio further provided rapid multiplication of worms i.e., 886.00 worms were observed as compared to 253.00 worms in control after twelve weeks of inoculation. 3:2 ratio i.e. (3 part cow dung + 2 part *Eucalyptus* leaves) stood second with 735.00 worms as compared to 253.00 in control followed by 638.33 worms in 1:1 (1 part cow dung + 1 part *Eucalyptus* leaves) ratio after twelve weeks. When the data was put for statistical analysis, the 'F' value was significant for both the parameters i.e. time period and combinations suggesting that *Eucalyptus* leaves mixed in different ratios along with the number of weeks were significant for vermiculture (Table-1b).

Extensive reproduction in different combinations of cow dung and *Eucalyptus* leaves as compared to cow dung alone is not surprising as *E. foetida* being an epigeic worm chiefly feeds on organic materials. Mixture of cow dung and leaves provided conducive environment to the worms to produce favorably. Plant leaves contain chlorophyll which when mixed with cow dung provided recognizable organic material with partially decomposed remains which is favorite food for *E. foetida*. C: N ratio and poly-phenol concentrations are the most important factors determining litter palatability in detritivorous earthworms. As *Eucalyptus* leaves contain poly-phenols and terpenoids, mixture of cow dung and leaves possibly enhanced litter palatability of the worms as compared to cow dung alone and thereby also mating rate enabling close proximity of worms while feeding. Different combinations provided different reproduction which indicated that there should be a proper ratio of cow dung and *Eucalyptus* leaves for maximum reproduction. When preferences vary, obviously it is suggested that physical and chemical properties of the waste materials influence the feeding habit of earthworm. Flavor potentialities and palatable substances exert gustatory effect in earthworm (Kitturmath *et al.*, 2004). Differential reproduction in different combinations may also be due to fluctuating C: N ratio and poly-phenol concentration in parent feeding mixtures. These results were strongly supported by Aira *et al.* (2006). According to them, C: N ratio affects earthworm number. In low C: N ratio substrate, mature earthworms (60 percent) predominate whereas in high C: N ratio substrate mainly juvenile and hatchling earthworms (70 percent) predominate.

Table 1a: Multiplication of worm *E. foetida* in cow dung and *Eucalyptus* leaves.

	B1	B2	B3	B4	Mean
A1	50.000	50.000	50.000	50.000	50.000
A2	50.000	50.000	50.000	50.000	50.000
A3	61.667	76.333	142.000	102.000	95.500
A4	97.333	230.000	511.333	367.000	301.417
A5	196.333	277.667	658.333	540.000	418.083
A6	239.000	519.000	833.667	618.333	552.500
A7	253.000	638.333	886.000	735.000	628.083
Mean	135.333	263.048	447.333	351.762	299.369

Table1b: CRD ANOVA for multiplication of worms in cow dung and *Eucalyptus* leaves.

S.No	SOURCE	DF	SS	MS	F	SE(m)	CD5%	CD1%
1	A	6	4225900	704316	491.200**	10.9	30.97	41.24
2	B	3	1110170	370058	258.083**	8.26	23.41	31.17
3	A×B	18	815361	45297.8	31.591**	21.9	61.94	82.47
4	Error	56	80296.7	1433.87				

CV = 12.649

Table 1c: Percent recovery of vermicompost prepared from cow dung and *Eucalyptus* leaves.

B1	B2	B3	B4
59.67±0.5774	60.83±1.4434	60.83±2.8868	60.00±1.0000

(B1-Control,B2-1:1,B3-3:1,B4-2:3)(A1-A7-Weak-1 to Weak-7)

Further, the experiments also revealed that the rate of multiplication was little bit slow up to 4 weeks in all the ratios i.e. 76.33, 142.00, 102.00 for 1:1, 3:1 and 3:2 respectively as compared to 61.66 in control, but after four weeks the rate of multiplication increased reaching to 230.00, 511.33 and 367.00 as compared to 97.33 after 6 weeks. The trend continued till the end of the observation i.e. up to 12 weeks. Concomitant increase in all the combinations including control may be due to mass emergence of worms from the produced cocoons. These experimental findings are strongly supported by several workers. As suggested by Hendriksen (1990), C: N ratio and particularly poly-phenol concentration are the most important factors determining litter palatability in detritivorous earthworms. Similar properties of incorporated organic waste facilitated massive multiplication of worms after four weeks. Chaudhuri and Bhattacharjee (2002) reported that maximum rate of biomass increase and reproduction was found in the mixtures with straw and bamboo leaf litter. Nagavallemma *et al.* (2004) found that tree leaves and cow dung supported maximum earthworm reproduction and biomass. Massive multiplication (300 times) in 1:1 mixture of cow dung and decaying leaves has also been reported by Jose (2002). Our experimental findings further found support from the work of Dominguez *et al.* (2000). According to them, the quality and amount of food material influences not only the size of earthworm population but also their rate of growth and fecundity.

4.0 Conclusion:

The worms multiplication was in 3:1 ratio that three parts cowdung and one part eucalyptus leaves. Since the worm *Eisenia Foetida* is a good candidate for vermicomposting, high multiplication will definitely help in fast composting, Extensive reproduction in mixture of cow dung and *Eucalyptus* leaves would not only solve the soil acidification problem in *Eucalyptus* soil but also provide a better feeding substrate for commercial worm growers

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