

## Studies on multiplication rate of different species of earthworms under laboratory conditions

A.P. BIRADAR\*, P. K. SINGH<sup>1</sup> AND R. A. BALIKAI

Department of Entomology, University of Agricultural Sciences, Regional Agricultural Research Station, BIJAPUR (KARNATAKA), INDIA

### ABSTRACT

The experiment was conducted at the Department of Agricultural Entomology, Regional Agricultural Research Station, Bijapur. Different earthworm species required for the study were obtained from different sources. The feed culture was prepared by using organic wastes (*viz.*, dried leaves, sunflower stalks, and green leafy matter and dung. Organic waste and dung were mixed in the proportion of 10:1 and were arranged in a brick wall (aboveground) pit of size 10 x 1 x 0.33 m (LxWxH) in layer wise. The results on multiplication rate of different species of non-clitellate earthworms under laboratory conditions revealed that, at 45 days after release of earthworms, significantly higher number of non-clitellate earthworms (33.33) were recorded with *Eudrilus eugeniae* (Kinberg) over the other species in the study which was followed by *Perionyx excavatus* (E.Perr) (23.02). Similar trend was observed at 60 and 90 days after release also. Number of clitellate earthworms at 45 days after release with *E. eugeniae* was significantly higher (27.33) and was superior over all other species in the study. At 60 and 90 days after release also, *E. eugeniae* found superior over the other species. Lowest number of non clitellate and clitellate earthworms were recorded with the *Polypheritima elongata* (Mich.). In conclusion, at 45, 60 and 90 days after release, *E. eugeniae* found significantly superior by reducing highest number of non clitellate and clitellate worms.

**Key words :** Earthworm species, Multiplication, Vermicompost

### INTRODUCTION

Earthworms constitute a major portion of the soil fauna biomass. The activity of earthworms in soil is known to influence various physical, chemical and biological properties. This activity is associated with increased enzyme activities and microbial population in the worm casts compared to non-injected soil (Lee, 1985).

Different species of earthworms contribute in different degrees to the mixing of organic and inorganic components of soil. The earthworms move large amounts of soil from the deeper strata up to the surface. The amount moved in this way ranges from 2 to 250 tons per hectare per annum, which is equivalent to bringing a layer of soil between one mm to five cm thick to surface every year creating a stone free layer on the surface of soil. Earthworms also affect soil structure through their burrowing activities for better aeration and infiltration. Earthworms generally prefer soils with near neutral pH values and the absence of worms in acid soils, which leads to the accumulation of thick mat of slow decaying organic matter as the surface characteristic feature of soils (Wood, 1995).

Screening of naturally available efficient earthworm species is a pre-requisite for commercial vermiculture

development. The selection criteria exercised for commercial exploitation of vermiculture should generally include, abundant occurrence of species in a natural habitat that is rich in organic matter, adaptability to fluctuating environmental stress conditions, high growth rate and conversion ratio, short developmental period, low incubation period, high fecundity and high metabolic demand, assimilability, production efficiency. Hence, an attempt was made to know the multiplication rate of different species for efficient utilization in vermicomposting.

### MATERIALS AND METHODS

The present studies were conducted at the Department of Agricultural Entomology, Regional Agricultural Research Station, Bijapur. Bijapur It is situated in the northern dry zone (Region II and Zone-3) of Karnataka at 15° 49' North latitude, 75° 43' East longitude and altitude of 573 m above the mean sea level. The rainfall is confined to the monsoon period from June to November with occasional showers in pre monsoon months of April and May with an average rainfall of 594.3 mm per annum. The mean maximum and minimum temperatures are 33.6° and 18.2°C, respectively. The relative humidity values are uniformly high during the monsoon months from July to September (RH<sub>1</sub> & RH<sub>2</sub>)

HINDAGRI-HORTICULTURAL SOCIETY

\* Author for correspondence.

<sup>1</sup> Department of Agril. Zoology & Entomology, R.B.S. College, Bichpuri, AGARA (U.P.) INDIA

than March to May.

### Collection of different earthworm species

Various species required for the study were collected from different sources. The *E. eugeniae*, *Eisenia foetida* (Savigny) and *P. excavatus* were collected from vermiculture unit, Department of Agricultural Entomology, Regional Agricultural Research station, Bijapur, University of Agricultural Sciences, Dharwad(Karnataka).Where as, local earthworms species viz., *Lampito mauritii* , *Pentosclex corethurus* and *P. elongata* were collected from vermiculture unit situated in Main Research Station, university of Agricultural Sciences, Dharwad campus.

### Maintenance of the earthworms

Food material required for experimentation as well as for the maintenance of earthworm species was prepared by using organic wastes (viz., dried leaves, sunflower stalks, and green leafy matte and dung. Organic waste and dung were mixed in the proportion of 10:1 and were arranged in a brick wall (above ground) pit of size 10 x1x0.33m (LxWxH) in layer wise. Each layer was alterenated with dung layer. The pit was closed with a thin layer of soil (1 cm) and covered with 6-12” mulch layer. The pit was watered sufficiently and regularly to enhance the decomposition process. After 45 days, the decomposed organic matter was thoroughly mixed, collected and stored in the laboratory for further use. About 25 kg of decomposed organic matter was taken and put in trough of size 60x45x30 cm. Organic matter

data were subjected to suitable statistical analysis.

## RESULTS AND DISCUSSION

At 45 days after release of earthworms, multiplication rate of different species of non-clitellate earthworms under laboratory conditions revealed that, significantly higher number of non-clitellate earthworms were recorded with *E. eugeniae* (33.33) over the other species in the study. The next best species was *P. excavatus* (23.02) which was at par with *E. foetida* (18.36) but was significantly superior over the other species like *L. mauritii* (14.01), *P. elongata* (13.00) and *P. corethrus* (12.01) in production of non clitellate worms. (Table 1).

At 60 days after release of earthworms, significantly higher number of non-clitellate earthworms of 39.33 were recorded with the species *E. eugeniae* over the entire species the next best species in this respect was *P. corethrus* (24.00) and was at par with the *E. foetida* (19.66), *L. mauritii* (16.6). The number of non-clitellate earthworms produced by *Polypheritima elongata* (14.66) and *Perionyx excavatus* (14.62) did not differed significantly.

At 90 days after release also the species *E. eugeniae* remained significantly superior over the other species, which recorded 46.66 non-clitellate earthworms followed by *E. foetida* (30.00). These findings are in conformity with the findings of Abbot (1994) and Barley (1959).

With respect to number of clitellate of earthworms at 45 days after release, the species *E. eugeniae*

Table 1 : Multiplication rate of different species of non-clitellate earthworms under laboratory conditions

S. No.	Treatments	No. of earthworms released/ 60x45x30 cm sized trough	Number of non clitellate earthworms / 25x25x20cm		
			45 DAR	60 DAR	90 DAR
1	<i>Eudrilus eugeniae</i>	25	33.33	39.33	46.66
2	<i>Eisenia foetida</i>	25	18.36	19.66	30.00
3	<i>Perionyx excavatus</i>	25	23.02	14.62	22.33
4	<i>Lampito mauritii</i>	25	14.01	16.66	21.00
5	<i>Pentosclex corethrus</i>	25	12.00	24.00	14.33
6	<i>Polypheritima elongata</i>	25	13.00	14.66	20.00
	S.Em (±)	-	2.41	2.13	3.12
	C.D. at 1%	-	7.21	6.42	9.33
	C.V.(%)	-	3.41	5.46	5.92

\* DAR= Days after release

was sufficiently wetted and twenty-five adult earthworms were released. Such four replications were maintained. Sampling was made at 90 days after release of earthworms and observations were recorded on number of cocoons, number of juveniles/earthworms. Later the

recorded the significantly higher (27.33) clitellate of earthworms over all other species and was at par with *E. foetida* (22.20). These Species *P. excavatus* recorded the clitellate earthworms of 20.20 followed by *L. mauritii* (19.0) and both were significantly superior over *P.*

Table 2 : Multiplication rate of different species of clitellate earthworms under laboratory conditions

S. No	Treatments	No. of earthworms released/ 60x45x30 cm sized trough	Number of clitellate earthworms/ 25x25x20cm		
			45 DAR	60 DAR	90 DAR
1	<i>Eudrilus eugeniae</i>	25	27.33	30.30	39.00
2	<i>Eisenia foetida</i>	25	26.00	26.33	29.33
3	<i>Perionyx excavatus</i>	25	20.20	20.33	17.33
4	<i>Lampito mauritii</i>	25	19.00	13.00	16.33
5	<i>Pentosclex corethrurus</i>	25	22.20	17.00	14.66
6	<i>Polypheritima elongata</i>	25	14.00	16.21	16.21
	S.Em (±)	-	1.62	1.73	2.71
	C.D. at 1%	-	5.01	5.41	7.13
	C.V.(%)	-	9.43	8.23	6.64

\* DAR= Days after release

Table 3 : Vermicompost yield as influenced by different species of earthworms

S. No	Treatments	No. of earthworms released/ 60x45x30 cm sized trough	Vermicompost yield (kg) per 25 Kg feed material
1	<i>Eudrilus .eugeniae</i>	25	23.63
2	<i>Eisenia. foetida</i>	25	20.23
3	<i>Perionyx excavatus</i>	25	17.66
4	<i>Lampito mauritii</i>	25	12.82
5	<i>Pentosclex corethrurus</i>	25	14.64
6	<i>Polypheritima elongata</i>	25	12.82
	S.Em (±)	-	1.01
	C.D. at 1%	-	2.96
	C.V.(%)	-	4.76

*elongata* (14.0) (Table 2).

At 60 and 90 days after release also the species *E. eugeniae* was found significantly superior over the other species with respect to production of higher number of non-clitellate earthworms (39.33 and 46.66 respectively). As per the clitellate of earthworms is concerned similar trend was followed here also, *E. eugeniae* species were found significantly superior. The results were in conformity with the results obtained by the Stannard and Kelly (1977) and Chan *et al.* (1988).

Significantly highest vermicompost yield of 23.63 kg/ 25 kg feed material was recorded with the species, *E. eugeniae* as compared to other species in the study. However, this was followed by *Eisenia foetida* which recorded the vermicompost yield of 20.23/kg/25 kg feed material (Table 3).

In conclusion, by evaluating different species at 45, 60 and 90 days after release the species, *E. eugeniae* was significantly superior over all the species of the earthworms in the study.

## REFERENCES

- Abbott, L. (1994).** Distribution of the native earthworm fauna of Australia: a continent wide perspective. *Aust. J. Soil Res.*, **32** : 17-26.
- Barley, K.P. (1959).** The influence of earthworms on the soil fertility earthworm populations found in agriculture land near Adelaide. *Aust J. soil Res.*, **10**:171-78.
- Chan, K.Y., Bellotti, W.D. and Roberts, W.P. (1988).** Changes in surface soil properties of vertisols under dry land cropping in a semi-arid environment. *Aust J. soil Res.*, **26** : 509-18.
- Lee, K.E. (1985).** Earthworms and their ecology and their relation with soil and land use, Academic Press, Sydney, pp.188-194.
- Stannard, M.E. and Kelly, J.D. (1977).** The irrigation potential of the Lower Namoi valley, Water Resources commission, Sydney, Australia.
- Wood, M. (1995).** Soil formation and development. *Environmental Soil Biology*. Blackie Acad. Professional, pp 66-94, Cambridge, UK.

Received : August, 2006; Accepted : January, 2007