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Effect of Different Combinations of Animal Dung and Agro/ Kitchen Wastes on Growth and Development of Earthworm *Eisenia Foetida*

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Abstract: The effect of various animal agro and kitchen wastes on the growth and development of an epigeic earthworm *Eisenia foetida* was studied under identical laboratory condition. There was observed significant growth and development of earthworm among different combination of animal agro and kitchen wastes. Maximum number of earthworm was observed in dung with gram bran even when they were counted after one night. Highest significant growth was observed in gram bran with cattle dung. The maximum significant gain in weight and length attained in combination of gram bran with buffalo dung and highest number of *Eisenia foetida* were observed in combination of gram bran with horse dung.

Key words: *Eisenia foetida*, wastes, growth, development,

INTRODUCTION

Abundant uses of chemical fertilizer have change the physicochemical texture of soil, resulting it become unfertile soil and reduced productivity (Gupta, 2005). Animal agro and kitchen wastes are serious problem for society due to its odour problem and necessary to its management. The vermicomposting is the best way of waste management by use of earthworm (Sabine, 1978; Hertenstien, 1981; Chan and Griffith, 1988; Reinecke *et al*., 1992; Ndegewa and Thompsom, 2001; Shweta and Kiran, 2004). The *Eisenia foetida* is the most suitable species for vermicomposting due to there short life cycle with reproduction and regeneration rate it can tolerate with wide range of temperature and humidity (Hertentien *et al*.,1979; Ismail, 1995). The growth and development of earthworm *Eisenia foetida* population is very necessary for more conversion of waste because huge amount of wastes manage through more population of earthworm in to rich nutrient manure (Garg and Kaushik, 2005). The aim of present work was to access the growth and development of *Eisenia foetida* in different combination of animal, agro and kitchen wastes.

MATERIALS AND METHODS

Collection and Culturing of the Earthworm:

Adult earthworm *Eisenia foetida*, were randomly picked from several stock culture maintained in the vermiculture research center, Department of Zoology, D. D. U. Gorakhpur University, Gorakhpur, U. P.

Collection of Cattle Wastes:

The fresh waste of different animal viz. cow, buffalo, horse, sheep and goat were collected from different animal farms located in Gorakhpur city. The animal dung was used after 10 days of collection because pre-composting is very essential to avoid the death of the worms.

Collection of Agro and Kitchen Waste:

The organic wastes (agro and kitchen) used as substrate were collected from the garbage and different parts of villages, situated under the Gorakhpur region. All the samples were kept at normal room temperature for biological and visual analysis.

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Experimental Design:

Measurement of growth (length, weight and number) of *Eisenia foetida* was conducted on cemented surface of the floor. 2kg of combination (ratio 1:1) was put on 30 cm × 30cm ×10cm areas at cool and elevated places on the floor. Animal dung measured as control. The combinations turn over manually every n24 hr for 10 days in order to eliminate the volatile substances. After 10 days 20 adult individuals of equal size (3.8cm) *Eisenia foetida* were introduced in to the each bed. The moisture content was maintained during experimental period between 40-60 percent. After 60 days the total number of earthworm and their length and weight were counted from each bed. Each experiment was replicated at 6 times.

Statistical Analysis:

Data have been expressed as mean ± SE of 6 replicates. Student's t-test was applied to compare the significant ($P<0.05$) between different cattle dung and different combination of cattle dung with agro and kitchen wastes (Sokal and Rohlf, 1973).

RESULTS AND DISCUSSION

The different combination of cattle dung, agro and kitchen wastes caused a significant growth in the *Eisenia foetida*. There was significant increase in number, weight and length of earthworm in different combination of cattle dung with agro/kitchen wastes with respect to cattle dung only. The average weight gain 1131.50 mg/animal and length 8.65 cm/animal were observed in the *Eisenia foetida* inoculated in bed of buffalo dung with gram bran. Highest increase in number of earthworm after 60 days of inoculation was observed in bed of horse dung + gram bran (121) with respect to 20 inoculated earthworms in the beginning. However, the number of earthworms in horse dung was 66. Two way ANOVA applied in between the different combination of dung and agro/ kitchen wastes demonstrated that there is a significant variation in between number and weight of the column of different combination; Whereas in case of length the significant variation was observed only in rows i.e. single dung combination with different agro/ kitchen wastes and effective in increasing the length of earthworms (Table1).

Table1: Effect of different animal dung and its combinations with agro / kitchen waste on the growth and development of earthworm *Eisenia foetida*.

Wastes	Number	Weight	Length
Cow Dung	54.50±0.83	789.83±40.4	5.07±0.00
Dung+ Gram Bran	111.17±0.98*	979.3384.52*	6.98±0.01*
Dung+ Straw	101.00±0.89*	889.66±8.80*	6.96±0.08*
Dung +Wheat Bran	81.17±0.68*	866.50±38.03*	5.90±0.10
Dung +Rice Bran	80.67±0.93*	850.17±25.84*	5.53±0.12
Dung + Vegetable Wastes	61.33±0.82	803.17±37.91*	5.26±0.12
Dung + Barley Bran	106.00±0.89*	935.67±66.58*	5.91±0.12
Buffalo Dung	66.70±0.89	746.83±34.46	5.25±0.10
Dung +Gram Bran	105.83±0.89*	1131.50±33.63*	8.65±0.31*
Dung + Straw	98.67±0.81*	961.33±39.47*	7.30±0.16
Dung + Wheat Bran	90.83±0.85*	921.61±39.25*	6.98±0.15
Dung + Rice Bran	81.67±0.82*	782.82±26.36*	6.80±0.00
Dung + Vegetable Wastes	67.00±0.00	728.50±39.29	6.42±0.33
Dung + Barley Bran	108.00±0.89*	1046.83±30.56*	7.45±0.54
Goat Dung	35.33±0.81	747.67±36.06	5.10±0.40
Dung + Gram Bran	82.00±0.00*	921.33±27.67*	6.81±0.07
Dung + Straw	76.00±0.89*	844.33±24.45*	6.78±0.15
Dung + Wheat Bran	67.17±0.99*	824.17±14.10*	6.05±0.23
Dung + Rice Bran	56.00±0.89*	819.33±25.53*	5.83±0.16
Dung + Vegetable Wastes	43.50±0.83*	775.67±32.50*	5.20±0.14
Dung + Barley Bran	70.67±0.81*	874.83±32.96*	6.47±0.27
Sheep Dung	31.00±0.63	783.67±19.67	5.00±0.28
Dung + Gram Bran	70.17±0.41*	914.17±16.16*	6.27±0.19
Dung + Straw	60.67±0.81*	861.33±33.16*	5.88±0.20
Dung + Wheat Bran	51.16±0.98*	846.00±22.72*	5.98±0.10
Dung+ Rice Bran	45.17±0.09*	842.50±32.76*	5.78±0.14
Dung + Vegetable Wastes	42.50±0.86*	792.80±26.01	4.48±0.27
Dung + Barley Bran	68.00±0.00*	877.02±10.86*	6.20±0.10
Horse Dung	66.00±0.00	869.17±60.19	6.03±0.21
Dung + Gram Bran	121.00±0.89*	1065.00±53.00*	7.50±0.10
Dung + Straw	104.50±0.86*	1141.67±14.12*	7.86±0.41
Dung + Wheat Bran	91.00±0.89*	1010.83±37.41*	7.48±0.40
Dung + Rice Bran	83.50±0.87*	976.67±17.00*	7.02±0.52
Dung + Vegetable Wastes	75.67±0.81	914.28±33.68*	7.02±0.37
Dung + Barley Bran	111.33±0.57*	1046.00±47.15*	7.53±0.28

Each value is mean± SD of 6 replicates.
*Significant ($P< 0.05$, t test) between treated and control group.
Number counted in 30.0×30.0×10.0 cm area of vermicomposting bed.

Discussion:

The attainment of more body weight by the worms in buffalo wastes was due to the fact that time taken to achieve the maximum biomass was longer for buffalo wastes than cow wastes in case of earthworm by *Perionyx excavatus,* (Chudhari and Bhattacharjee, 2002) but our experimentation period was not much longer for attainment of body weight and length by worms and we got significant result may be due to the combination of agro and kitchen wastes with animal dung's. Neuhauser *et al*. (1980) reported that the weight gain by *Eisenia foetida* was dependant on population density and food type. Feeds that provides earthworms with sufficient amount of easily metabolizable organic matter and non- assimilated carbohydrate, favor growth and reproduction of earthworms (Edwards *et al*., 1988) and our experiment followed this observation due to the enhanced microbial activity due to the presence of different combinations of animal, agro and kitchen wastes. Suthar,(2007) already worked on the influence of different food sources on growth and reproduction performance of composting epigeic: *Eudrilus eugeniae, P. excavatus and P. sansbaricus.* Microbial activity is regarded as the indicator of the advancement of the composting process (Diaz - Burgos *et al.* 1992). The maximum increase in the number of earthworm in combination of horse + gram bran due to the biochemical quality of feed, which is an important factor in determining the time taken to reach sexual maturity and onset of reproduction (Edwards, *et al*., 1998). Although the doubling rate in term of number was greater in case of horse dung + gram bran and than in similar combination of buffalo and cow dung. The increase in population of worms in buffalo dung was may be due to addition of various agro and kitchen wastes. The increased population might also be attributed to the C: N ratio decreased due to the increasing of microbial activity in waste (Nedgwa and Thompson, 2000).

***Conclusion*:**

The observation, indicate that the combination of agro and kitchen wastes, with cattle dung shows significant growth and development of *Eisenia foetida.* The combination of agro and kitchen wastes with dung provides an environment for better growth and development of *Eisenia foetida*. The growth and reproduction of Eisenia foetida were highest when allowed to feed on buffalo dung with gram bran and horse dung with gram bran. Thus the combination of gram bran with horse and buffalo dung is suitable for better growth and development of earthworm *Eisenia foetida*.

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