

## Food Preference of *Eisenia foetida* among Different Combinations of Animal Dung and Agro/Kitchen Wastes

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**Abstract:** Vermicomposting is one of the most important tools in the campaign to recycle agricultural wastes as biofertilizers. In order to attain this objective, vermiculture is one of the most important aspect. This study identifies the most preferred combination of cattle dung and agro wastes for growth of earthworm (*Eisenia foetida*). The behavioral responses of earthworm to different combination were examined. Significant variations in food preference were observed in worm when the cattle dungs were mixed with different agro wastes / kitchen wastes. Dung combination with gram bran mainly emerged as the strongest preferred food for *Eisenia foetida*; followed by dung with straw. Maximum number of worm was observed in dung with gram bran even when they were counted after 24 hours.

**Key words:** Food preference • *Eisenia foetida* • Cattle dung-agro-waste • Kitchen waste

### INTRODUCTION

Vermicomposting is an easy and effective technique for the recycle of the agricultural wastes, city garbage and kitchen wastes materials into biofertilizers. The production of vermicompost involve the rearing of earthworms on cow dung, horse dung, buffalo dung, sheep dung, goat dung, cereals and kitchen wastes etc. [1-6]. The vermicompost is a valuable soil amendment and may replace the chemical fertilizers from agricultural practices. *Eisenia foetida* is most suitable species for vermicomposting due to there short life cycle, high reproduction and regeneration rate. The worms can tolerate a wide range of temperature and humidity variations. It can survive a variety of degradable organic wastes like various combinations of animal, agro and kitchen wastes [7-9]. For this reason, the use of combination of different cattle dung with agro/kitchen wastes has been used as an effective tool for vermicomposting.

Different natural and anthropogenic wastes which have already been converted in to useful compost by different species of earthworms including pig wastes [1, 7]. During the vermicomposting process, the important plant nutrients present in the feed material are converted through microbial action into forms that are much more

soluble and available to plants than those in the parent substrate [3]. Sabine [6] reported that the former product can further be processed in to protein (earthworm meal) or high grade horticulture compost. The vermicast is a valuable soil amendment and may replace the chemical fertilizer to some extent [2]. *Eisenia foetida* (Red wiggler worm) is convenient for vermicomposting due to their short life cycle with high reproduction and regeneration rate and can tolerate wide variations of temperature and humidity and also survive on variety of degradable organic wastes [8, 9].

Reinecke *et al.* [4] studied the *Eudrilus eugeniae* *Perionyx excavatus* and *Eisenia foetida* (Oligochaeta) are suitable earthworm species for vermicomposting. Growth of earthworm (*Eisenia foetida*) is depending on the population density and food rationing [10]. The production of vermicompost involves the rearing of earthworms on wastes like cereals and kitchen wastes etc [5]. Dhawan *et al.* [11] reported that the protein content range from 20.9-25.27% in gram. Straws are almost entirely made of cell walls which are highly lignified structural carbohydrates and of small amounts of structural protein and minerals [12]. The wheat straw was fractioned to pulp (cellulose), lignin and monosaccharide mainly from hemicellulose with yield of approximately 50, 15 and 35%, respectively [13-14].

Consequently, the food preference among combination of animal, agro and kitchen wastes and their effect on the earthworm (*Eisenia foetida*) were conducted so that most suitable combination of wastes be used for efficient vermiculture.

**MATERIALS AND METHODS**

**Collection and Culturing of the 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.

**Collection of Cattle Wastes:** The fresh waste of different mammals 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 worm [15].

**Collection of Agro and Kitchen Waste:** The organic wastes (agro and kitchen) were used as substrate are 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.

**Experimental Design:** Food preference experiment of *Eisenia foetida* was conducted on the cemented floor in departmental animal house. Cattle dung separately and with combinations of different agro and kitchen wastes in ratio of 1:1 were placed in the circumference of the circle at a distance of 26.94 cm (radius 30 cm). Twenty earthworms were kept in center of the circle. Moisture of 40 and 60% was maintained throughout the study. Number of earthworms in different food materials kept on circumference was observed after one hour and after 24 hour. Number of worms in cattle dung was taken as control.

**Statistical Analysis:** Data have been expressed as  $\pm$  SE of 6 replicates. Two-way analysis of variance (ANOVA) was applied between different cattle dung and different combination of cattle dung or agro and kitchen wastes [16].

**RESULTS AND DISCUSSIONS**

Table 1 and 2 give the distribution of *Eisenia foetida* in different dung and combination of dung with agro wastes after one and twenty four hour on the start of the experiment. The combination of goat dung with gram bran receives highest attraction of earthworm (59.17%). Two way ANOVA indicates that there is a significant

Table 1: Per cent food preference of *Eisenia foetida* against combination of different animal and agro/kitchen wastes

Wastes							
Cattle	Dung (Control)	Dung + Vegetable waste	Dung + Wheat Bran	Dung + Rice Bran	Dung+ Gram Bran	Dung + Barley Bran	Dung + Straw
Sheep	7.50 $\pm$ 9.88*	3.33 $\pm$ 6.06 *	15.00 $\pm$ 4.47*	11.67 $\pm$ 4.08*	15.00 $\pm$ 7.75 *	27.50 $\pm$ 7.58*	20.00 $\pm$ 7.07 *
Horse	17.50 $\pm$ 9.88	10.83 $\pm$ 8.01	3.33 $\pm$ 4.08	6.67 $\pm$ 6.06	47.50 $\pm$ 16.35	10.83 $\pm$ 8.01	6.67 $\pm$ 5.17
Goat	14.17 $\pm$ 5.85	5.00 $\pm$ 4.47	3.33 $\pm$ 2.58	0.83 $\pm$ 2.04	59.17 $\pm$ 17.44	6.67 $\pm$ 4.12	10.85 $\pm$ 7.07
Buffalo	23.33 $\pm$ 2.58	9.17 $\pm$ 5.85	5.00 $\pm$ 5.48	3.33 $\pm$ 2.58	30.00 $\pm$ 4.47	14.17 $\pm$ 4.92	15.00 $\pm$ 8.06
Cow	2.50 $\pm$ 4.18	10.00 $\pm$ 5.48	1.67 $\pm$ 2.58	5.00 $\pm$ 6.32	38.33 $\pm$ 16.63	3.33 $\pm$ 2.58	39.17 $\pm$ 13.24

Each value is mean  $\pm$  SE of 6 replicates. 2 way ANOVA: significant(P<0.05) \* within column.

Table 2: Per cent food preference after 24 hours of *Eisenia foetida* against combination of different animal and agro/kitchen wastes

Wastes							
Cattle	Dung (Control)	Dung + Vegetable waste	Dung + Wheat Bran	Dung + Rice Bran	Dung+ Gram Bran	Dung + Barley Bran	Dung + Straw
Sheep	9.17 $\pm$ 4.53*	15.83 $\pm$ 9.17*	14.16 $\pm$ 7.35*	9.17 $\pm$ 3.75*	21.67 $\pm$ 8.56*	10.00 $\pm$ 5.48*	20.00 $\pm$ 8.56*
Horse	14.16 $\pm$ 7.36	6.67 $\pm$ 2.98	17.50 $\pm$ 5.25	8.33 $\pm$ 4.91	26.67 $\pm$ 9.31	16.67 $\pm$ 14.02	10.00 $\pm$ 8.67
Goat	7.50 $\pm$ 6.89	10.00 $\pm$ 5.48	20.83 $\pm$ 7.36	18.33 $\pm$ 8.76	10.00 $\pm$ 7.75	6.67 $\pm$ 4.15	26.67 $\pm$ 16.33
Buffalo	21.67 $\pm$ 6.91	2.50 $\pm$ 2.73	5.83 $\pm$ 4.92	9.83 $\pm$ 7.15	30.83 $\pm$ 2.83	4.17 $\pm$ 4.92	25.70 $\pm$ 3.08
Cow	2.50 $\pm$ 2.74	9.17 $\pm$ 10.20	14.17 $\pm$ 7.61	17.50 $\pm$ 8.80	26.17 $\pm$ 5.85	10.00 $\pm$ 11.10	20.50 $\pm$ 6.89

Each value is mean  $\pm$  SE of 6 replicates. 2 way ANOVA: significant(P<0.05) \* within column.

( $P < 0.05$ ) variation in number of earthworm in dung of different cattle and their combination with agrowastes. There is no significant variation in between the dung of cattle and their combination with agrowastes horse.

Table 2 shows the percents attraction of earthworm after 24 hours by the combination of agro and kitchen wastes with different cattle dung. The highest percent attraction was observed in combination of buffalo dung with gram bran (30.83%). However, number of earthworm in goat dung with gram bran is lowest after 24 hours in comparison to 1 hour observation of different cattle dung with gram bran.

It is evident from the above results that the combination of different animal, agro and kitchen wastes gave significant percent attraction of *Eisenia foetida*. The gram bran has high protein content [11], due to the high protein content and amino acids, the earthworm *Eisenia foetida* prefers more attraction towards the combination gram bran with cattle dungs. The combination of cattle dung with gram bran and straw usually shows highest percent attraction of *Eisenia foetida* even after 24 hour. Straw possesses a good structure, porosity and moisture holding capacity coupled with reasonable quantity of plant nutrients [10]. The straw have high carbohydrate [13, 14], protein and minerals but have low digestibility in the digestive system of cattle [12], due to these properties the *Eisenia foetida* prefer for feeding straw in comparison to others. Combination of agro and kitchen wastes, improved the essential component of food, so that worm *Eisenia foetida* was attracted more than the single dung bed.

### CONCLUSION

It can be concluded from the present study that the combination of agro wastes, gram bran and straw with combination of cattle dung shows significant preferred food preference for *Eisenia foetida*. The highest attractive food combination for *Eisenia foetida* was goat dung with gram bran followed by horse dung with gram bran and cow dung with straw. The variation in the attraction of *Eisenia foetida* towards these combinations may be due to variation in biochemical content present in them.

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