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Vermicomposting of Human Faecal Matter And Impact of Vermicompost on The Shoot Length of Dahlia Plant.

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ABSTRACT: *In India, nearly 70 % human population belonging and living in the rural areas.In these areas, most of the persons excretes, faecal matter in open areas during early in the morning and evening hours.Dumping, fling, and excretion of faecal matter , in open areas such as in several cropping fields, grasslands, orchards, meadows, river side, lake side, and even near the buildings or houses by human beings, especially, belonging to rural areas and creating a serious problem since the time immemorial till now. Present paper describes the transformation of human faecal matter (HFM) through the agency of earthworms and impact of prepared vermicompost on the shoot length of Dahlia plant.The results were discussed in the light of physico-chemical parameters (PCPs) of the medium ,growth and development of worms and data available.*
Keywords*: Biomass ,Dahlia plant, Eisenia fetida, Human Faecal Matter, Shoot length & Vermicompost,.*

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I. INTRODUCTION

Generation of huge amount of different types of solid waste , nearly, 7000 million metric tons/year by Indian cities and rural areas (Misra,2007) from various domestic, agricultural and industrial activities has created not only the economic problems but contamination of environment too. Burning of wastes also causes atmospheric pollution (Samar *et al.*,1999) and harms beneficial soil organisms (Kumar and Goh, 2002). Detailed informations about the quality of vermicompost prepared from different types of domestic wastes are very limited.Human Faecal Matter (HFM) is one of the major domestic waste in India.In western part of India (especially, Uttar Pradesh),villagers are using temporary washrooms/latrines (sundas latrines) till now and most of the peoples excretes faecal matter in the open areas.Although, our Prime Minister, Shri Narendra Modi motivating to villagers through Nirmal Bharat Abhiyan, thereby villagers are slowly-slowly aware and this problem is also slowly-slowly decreasing. Soil is generally considered fertile when it has good physical structure, balanced nutrients and sufficient biotic activity (Mader *et al.*,2002).Vermicompost improves the physical, chemical and biological properties of the soil (Kale, 1998).There is a good evidence that vermicompost promotes growth of the plants (Lalitha *et al.*,2000; and Rajkhowa *et al.*,2000). Keeping this in mind, in the present studies , an attempt was made for the transformation of HFM with cattle dung into vermicompost , using the worm, *Eisenia fetida* and impact of transformed vermicompost on the shoot length of *Dahlia* plant.

II. MATERIALS AND METHODS

The Human Faecal Matter (released from temporary latrines, sundas latrines and latrine tanks) including ash of cattle dung, was collected from temporary waste dumping areas of village, Kajarbojhi, Barkhera, Pilibhit (U.P.), India. Collection , transportation or processing of Human Faecal Matter (HFM) is to found very difficult because nobody was ready to do this dirtifull and changefull job and therefore, the present research work was carried out at the corresponding author's home place *i.e.* Village-Kajarbojhi, during the rainy season, 2016.The HFM was mixed with cattle dung in three combinations of 1:3, 1:1 and 3:1 . Four kg of each combination was kept in rectangular plastic tubs (size 44x18x14 cm), under laboratory conditions in the tin

shaded rooms, in replica of five. After pre-decomposition period of 20 days, 20 g immature worms of the genus, *E.fetida* (Savigny) were inoculated into each experimental tubs. Moisture of each tub was maintained by sprinkling 250 ml of water alternatively and wearing gloves in the hands, keeling of different experimental waste media was done once a week. The experiment was conducted till the transformation of HFM with cattle dung into vermicompost .The physico-chemical parameters (PCPs) of different combinations were analysed before and after the completion of the experiment as per the techniques , described by Saxena (1994).

III. RESULTS AND DISCUSSION

3.1.Alterations in physico-chemical parameters (PCPs):

It may be noted that the level of % moisture content (% MC) was decreased during the processing of waste by the worms, *E.fetida*.This decrement in % MC was 1.08 times in 1:3, 1.12 times in 1:1 and 1.20 times in 3:1 experimental media than that of their initial values. It may be interesting to note that the BD was reduced after processing of HFM and dung combination by the worms in all the three experimental media (Table-1). % Water olding capacity (% WHC), that plays a significant role in plant growth, was lowered by 1.04 times in 1:3, 1.05 times in 1:1 and 1.05 times in 3:1 of experimental combinations. Earthworms are very sensitive to pH of the medium too. It may be seen that pH was lowered by 1.03 times in 1:3 and 3:1 and maximum *i.e.* 1.06 times in 1:1 experimental media than that of their initial values. % Organic matter (%OM) was lowered by 1.26 times in 1:3 , 1.42 times in 1:1 and 1.40 times in 3:1 experimental media. Prakash (2011) has reported that worm-castings plays a significant role in decreasing pH, BD, % MC and by increasing the level of % WHC, % N and % OM of the habitat, in general.

3.2. Changes in worm's number, biomass and rate of cocoon production in experimental media

Quality of food affects the growth and development of the worms. It may be seen that the total number of earthworms was recorded the maximum in HFM and dung combination of 1:3 experimental media and the minimum in 3:1. Although the total number of worms was noticed higher in all the there experimental media than that of their initial values.This increment in their number was 4.21 times in 1:3, 2.82 times in 1:1 and 1.09 times only in 3:1 experimental media. Interestingly, cocoon production and biomass of earthworms were also recorded more in 1:3 experimental media than that of 1:1 and 3:1 (Fig.1 and Table-2).These results indicated that worms lowered the BD ,% WHC ,% MC % OM and pH of the experimental waste media, during the process of vermicomposting.Although, Singh and Gangwar (2005) ,while working on potentiality of the earthworms, *Esenia fetida* in the transformation of dung of different animals and reported that the maximum growth in their number and body weight was seen in goat pellets and the minimum in elephant's dung while rate of cocoon production more in cow dung medium and less in dung of elephant.

3.3.Impact of transformed vermicompost on the shoot length of *Dahlia* plant:

Impact of vermicompost was evaluated by measuring the shoot length of *Dahlia* plants after every 10 days of time, alternatively till the completion of the experiment (completed within the 60 days of time) .After 10 days of seed germination, the shoot length was measured 4.12 cm in 1:3, 3.01 cm in 1:1 , 2.42 cm in 3:1 in experimental media and only 1.10 cm in control media . In addition, After 60 days of time, shoot length were measured 6.29 times, 6.90 times, 6.48 times and 7.29 times, respectively, more in 1:3, 1:1 and 3:1 and control media than that of 10 days of interval.It may be seen that the medium having vermicompost and soil in the ratio of 1:3 showed better and good results on the growth of the plants than that of 1:1 and 3:1 combinations (vermicompost + soil) and control (soil only) media, because the maximum shoot length was noticed in 1:3 experimental media than that of other two experimental media. Shoot length measure 25.93 cm in 1:3 experimental media and it was 1.36 times, 1.70 times and 3.74 times, respectively, lower in 1:1 , 3:1 and control media.Singh and Gangwar (2005) have reported that 1:1 ratio of soil + vermicompost is the best suited medium for speedy growth of the shoot length of *Hibiscus esculenta* (Lady's finger).Ghosh *et al*.(1999) observed that integration of vermicompost with inorganic fertilizers tended to increase the yield of crops *viz.*, potato, rape seed, mulberry and marigold over other traditional composts.The application of vermicompost rendered better performance in respect of all round growth of mulberry plants in the lateritic soil of south West Bengal (Chakraborty *et al* .,2008). Castings (vermicompost) of earthworms are good fertilizer additive for agricultural crops (Kumar, 2004).

IV. CONCLUSION

It may be concluded that during the present time there is a huge demond of vermicompost in every state of the country and therefore, researchers emphasizing to sustainable organic farming systems thereby central and state government, both provides fund for those peoples or farmers who are going to do vermicomposting for degradation of different kinds of wastes through various species of earthworms.This technique also offers more scope for employment generation and extra income even at village level. Hence,

burning or fling and dumping of wastes including HFM should be now stopped and vermicomposting could be started in every state for sustainable agriculture and environment too.

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Table-1: Showing initial and final PCPs (Physico-chemical parameters) of different experimental media.

Initial PCPs			Parameters	Final PCPs		
1:3	1:1	3:1		1:3	1:1	3:1
41.08 ± 1.08	43.52 ± 0.92	49.32 ± 0.63	%MC	38.03 ±0.98	38.62 ± 1.19	40.89 ± 1.02
0.84 ± 0.09	0.93 ± 0.11	0.97 ± 0.08	BD (g/cm^3)	0.82 ± 0.15	0.91 ± 0.13	0.93 ± 0.07
48.12 ± 1.01	46.35 ± 0.79	44.97 ± 1.10	%WHC	45.96 ± 0.87	43.80 ± 1.12	42.67 ± 0.94
7.98 ± 0.12	8.69 ± 0.09	9.08 ± 0.29	pH	7.68 ± 0.23	8.13 ± 0.18	8.77 ± 0.25
09.09 ± 0.34	12.97 ± 0.40	14.28 ± 0.11	%OM	7.21 ± 0.09	09.09 ± 0.21	10.15 ± 0.23

Table-2: Showing initial and final number of *E.fetida* after vermicomposting of HFM in different experimental media.

Initial number of worms	Experimental media	Final number of worms			
		Clitellates	Non-clitellates	Juveniles	Cocoons
48.92 ± 0.65	1:3	48.21 ± 0.42	59.31 ± 0.18	98.78 ± 0.42	39.01 ± 0.11
46.92 ± 0.58	1:1	32.09 ± 0.09	45.96 ± 0.13	54.34 ± 0.20	28.73 ± 0.17
47.09 ± 0.38	3:1	11.37 ± 0.09	30.60 ± 0.15	09.82 ± 0.05	06.25 ± 0.08

Table-3: Showing impact of transformed vermicompost of HFM on the shoot length of *Dahlia* plant.

Different experimental media	Duration (in days)					
	10	20	30	40	50	60
1:3	4.12 ± 0.09	8.17 ± 0.05	11.92 ± 0.04	15.19 ± 0.05	20.27 ± 1.01	25.93 ± 0.19
1:1	3.01 ± 0.05	6.92 ± 0.06	8.09 ± 0.03	11.08 ± 0.03	16.34 ± 0.07	20.78 ± 0.06
3:1	2.42 ± 0.08	4.31 ± 0.08	5.98 ± 0.05	7.97 ± 0.06	12.39 ± 0.09	15.69 ± 0.04
Soil	1.10 ± 0.09	2.16 ± 0.03	3.91 ± 0.09	5.07 ± 0.08	6.99 ± 0.03	8.02 ± 0.03

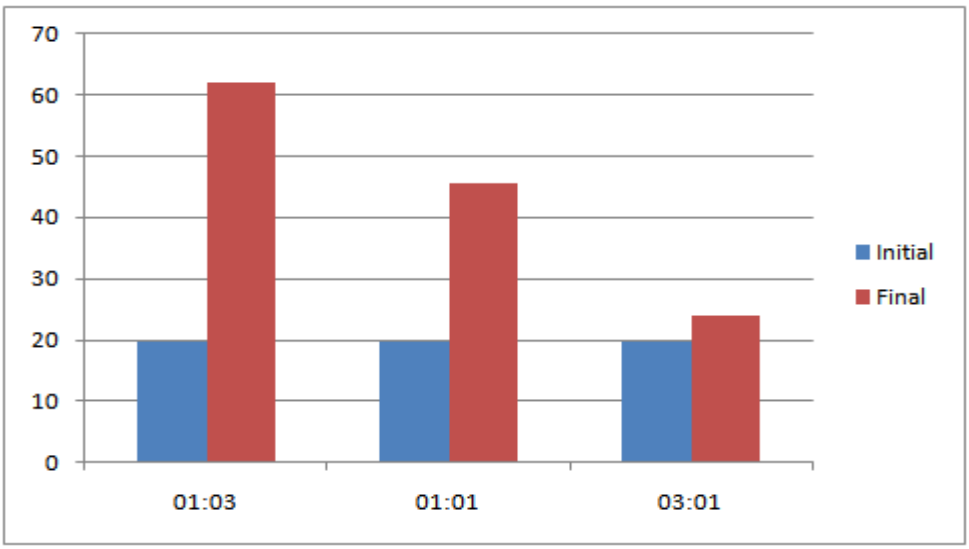

Fig-1: Showing initial and final biomass of *E.fetida* (in gm) after the transformation of HFM into vermicompost in different experimental media.

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