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EFFECT OF VERMIWASH OF DIFFERENT VERMICOMPOSTS ON THE KHARIF CROPS

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Abstract

Use of vermiwash extracted from vermicomposts of different combination of animal agro and kitchen wastes, is one of the effective liquid biofertilizer for growth and productivity of crops. The present study assesses that it has caused significant effect on the growth and productivity of paddy (*Oryza sativa*), maize (*Zea mays*) and millet (*Penisetum typhoides*) crops. The 10mg/m^2 of vermiwash buffalo dung with straw shows significant growth (89.2±2.7cm) and 30mg/m^2 concentration of similar combination shows highly significant growth in paddy crops(102.6±2.3cm) after 75 days. The 10mg/m^{2}concentration of combination horse dung with gram bran caused significant growth (85.2±4.3cm) 50days while at the same time 30mg/m^{2}concentration of combination of straw with buffalo dung and horse dung caused highly significant growth in maize crops. The combinations of buffalo dung with gram bran and with straw; and combination of horse dung with gram bran and with straw have significant growth in millet crops. All the concentrations of different combinations of animal agro and kitchen wastes have significant early start in flowering and enhance the productivity of crops.

Keywords: Wastes, Eisenia foetida, Vermicompost, Vermiwash, Kharif crops, Growth and Productivity

Introduction

Rice is starch-rich chief food source of world. It is also used for making alcoholic beverages, and as a source of starch and rice flour. Rice starch has wide industrial potential in cosmetic industry as thickener in calico printing, in the finish of textiles and for making dextrins glucose and adhesive. Rice flour is used as confectionary, ice-creams, pudding and pastry. Perl millet a staple food grain in many parts of India, especially in Gujarat and Rajasthan. Its nutritive value is comparable to that of rice and wheat. Grains are ground in to flour for making breads. It is also used for porridge or eaten after perching. Maize is an important cereal crop of the world. In term of area under cultivation and production, its ranks only next to wheat and rice. Corn is extensive used as food forage feed for livestock and as a raw material for many industrial products. The grains are nutritious with high percentage of easily digestible carbohydrates, fats and proteins [26].

Vermiwash is liquid manure, extracted of vermicomposts riches with more number of earthworms. Its foliar spray significantly increases the growth and productivity of crop

[25, 32]. Bucker field et al [6, 7] has reported that it is coelomic fluid extraction contains several enzyme, plant growth hormones like cytokinins, gibberlines and vitamins along with micro and macro nutrients. It increases the disease resistant power in crop, [18, 30, 33]. Tripathi and Bhardwaj [29] have reported that nitrogen in the form of mucus, nitrogenous excretory substance; growth stimulating hormones and enzyme are present in vermiwash. Karuna et al. [14] studied the stimulatory effect of vermiwash on crinckle red variety of *Andurium andreanum*. Effect of vermiwash on plant growth of black gram reported by Sobha et al., [25] and on tea, coconut and horticultural crops by Weerasinghe et al., [32]. Anand et al., [1] and Suthar et al., [27] have reported that vermiwash caused significant effect on the seed germination and development of hatchling. Rao [20] studied that the vermiwash have yield good result, especially initiating flowering and long lasting inflorescence of *Anthuriums.*

Zaller [34] have studied the effect of vermiwash on the field grown tomato *(Lycopersicon esculentum*) indicated the late blight suppression and improve the fruit quality. The application of vermiwash has been shown to reduced disease caused by necrotrophs as well as biotrophs [31, 11, 5]. It was reported that vermiwash have been shown to depress soil born pathogen and pest ([23, 21, 16]. Grudon, [12] also reported that use of vermiwash is more effective when the presence of water in the soil is very poor. It was demonstrated that after treatment of vermiwash showed similar growth pattern due to addition of auxins, gibberllins and cytokinins in the soil [13, 28]. The aim of present study to observed effect of vermiwash of different combination of animal dung and agro / kitchen wastes on the growth flowrering period and productivity of three Kharif crops paddy, maize and millet.

Materials and methods

Collection of wastes:

Animal wastes (cow, buffalo, sheep, horse, goat dung) were collected from different farm houses of these animals of Gorakhpur city and different agro kitchen wastes were collected from rural areas of Gorakhpur district. Partially decomposed mixture of animal, agro/kitchen wastes were use for enhancement of vermicomposting efficiency. The animal dung and different agro wastes were exposed to sun light for 5 to10 days to removing the various harmful organism and noxious gases, before the preparation of vermibeds.

Collection of earth worm:

Earthworms *Eisenia foetida* an epigeic species were collected from U.P. agro states industrial area, Gorakhnath Goakhpur. The collected earthworms cultured in laboratory conditions.

Experimental setup for vermicomposting:

Vermicomposting was conducted on cemented earth surface. There are 35 vermibeds were formed by combination of different animal, agro/ kitchen wastes in 1:1 ratio. The size of each vermibed is 3m ×1m × 9cm. After formation of vermibeds moisten it and inoculated 2kg of cultured *Eisenia foetida* in each bed. The beds were covered the bed by useless jute pockets and moist the bed daily up to 40 to 50 days for maintaining the moisture content. The weds were manually turned over at each week interval up to 3 weeks. After 45 to 50 days granular tea like vermicompost appear on the upper surface of beds. These vermicomposts were used for extraction of vermiwash.

Extraction of vermiwash:

Vermiwash extracted from vermiwash collecting device. The apparatus made from plastic or metals drum having capacity of 2 liter and a tap at the bottom the drum filled with broken breaks, about 10cm thickened which is followed by sand layer of 2-3cm thickness, lastly filled with vermicompost with heavy population of earthworms. Simultaneously added fresh water in to drum and a container kept below the tap of drum. The watery extract of vermicompost i.e. vermiwash drained out off drum and collected, drop by drop in to the container. The colure of vermiwash ranges from yellowish to black. After 1 to 2 days the process of extraction has been completed. The different concentrations of collected vermiwash were used for foliar spray on crops.

Experimental deign:

There are 6 squires of size 1m² areas used for each concentration of different combinations of vermiwash for each crop of paddy, maize and millet. The seedlings of paddy were planted and seeds of maize and millet directly sowed in each experimental field. After 30 days fresh extracted vermiwash have sprayed over it. Three different concentrations 10, 20 and 30mg/m^2 of each combinations have used for the crops of paddy maize and millet. In this way there were six squires treated with each concentration of each combination remain one is used as control. After 10 days of each treatment measured the growth and observed the flowering period in the crop of each squires and finally measured the productivity in per m² area.

Statistical analysis:

All the reported data are mean ± SE of 6 replicates. The two way analysis of variance (ANOVA) was used to analyze the significant growth, flowering period and productivity between vermiwash of different combination of wastes and their concentration. The test performed to identify that which combination and concentration of vermiwash is significantly effective for growth and productivity of crops [21].

Results

There was significant time and dose dependent effect of vermiwash of animal and agro/kitchen wastes observed on the growth, flowering period and productivity of Kharif crops paddy (*Oryza sativa*), maize (*Zea mays*) and millet (*Pennisetum typhoides*). The significant growth of paddy crops (42.6±3.41 and 41.2 ± 3.5cm) observed at 10mg/m^2 concentration of combination of gram bran with horse dung and buffalo dung, after first spray. The 30mg/m^2concentration of these two combination shows significant value (50.4±4.2 cm and 49.2±2.4 cm) respectively. After third treatment the 30mg/m^2 of these two combinations shows highly significant growth viz. 91.2±3.4 and 102.6±3.2cm respectively (table-1).

In case of maize the significant growth observed in horse dung with straw (42.4±2.7 cm) which is followed by horse dung with gram bran (40.4±3.8 cm) at 10mg/m^2 concentration after first treatment. The combination of horse dung with straw (50.8±3.4 cm) and horse dung with gram bran (48.6±2.8 cm) shows maximum significant by the treatment of 30 mg/m^2 concentration. Finally after the third treatment of vermiwash on maize crop, the combination of horse dung with wheat bran shows significant growth (97.4±3.2 cm) which is followed by combination of buffalo dung with straw (97.7±4.2 cm) (table 2).

The combination of buffalo dung with gram bran shows maximum growth (68.6±4.4 cm) after treatment of 10 mg/m^2 concentration on millet crops, after first spray. The 30 mg/m^2 concentration of similar combination show maximum significant growth i.e. 80.4±3.2 cm at 30 days after sowing however, at 80 days after sowing the highly significant growth observed by spray of 30 mg/m^2 concentration of combination of buffalo dung with straw (128.6±7.2 cm) which is followed by combination of horse dung with gram bran (125.2±7.2 cm) (table-3).

There was significant early starting in flowering period observed after treatment of vermiwash of different concentrations and combinations of agro and kitchen wastes with animal dung. In paddy crops the lowest flowering period observed in combination of buffalo dung with wheat bran (62.3±4.6 days). The combination of horse dung with straw (63.2±2.4 days) and with wheat bran (63.8±2.6 days) were approximately similar the time of flowerination.The combination horse dung with straw shows lowest value (58.2± 2.5 days) of flowering period at 30 mg/m^2 concentration. The combination of horse dung with gram bran (58.7±2.5 days) shows similarity to the combination of horse dung with straw. In maize crop, at 10 mg/ m^2concentration of buffalo dung with gram bran (52.7±4.7 days) and buffalo dung with straw (52.7±5.2 days) shows significant lowest value of flowing period. The combination of horse dung with straw (53.2±2.6 days) and gram bran (53.2±2.8 days) are approximately similar but greater than former two. After treatment at 30 mg/ m^2concentration have lowest values of flowerination in combination buffalo dung with straw (48.0±5.2 days). The combination of horse dung with gram bran (48.4±4.2 days) and buffalo with gram bran (48.7±6.2 days) are approximately similar but comparatively higher than buffalo dung with straw. At 10mg/m^2 concentration the combination of horse dung with gram bran shows lowest value of flowing time

(96.2±4.7 days) and combination of horse dung with straw shows approximately similar flowing period then those of horse dung with gram bran (96.8±3.2 days). At 30mg/m^2 concentration these low combination shows minimum time of flowering period that is (93.4±3.2 days) and (93.3±4.2 days) respectively (table 4).

There was significant dose dependent productivity observed after the treatment of vermiwash of different combination of animal agro kitchen wastes. The significant productivity was observed at 10 mg/m^2 concentration in combination of buffalo dung with (0.755±0.087 kg/m^2) in paddy crops. At 30 mg/m^2 concentration, similar combination shows highly significant productivity that is (0.818±0.046 kg/m^2) and (0.802±0.046 kg/m^2) respectively in case of paddy. The significant productivity in case of Millet crop observed at 10 mg/m^2concentration, in buffalo dung with straw (0.872±0.034 kg/m^2) and horse dung with gram bran (0.834±0.040 kg/m^2).Used 30 mg/m^2concentration of these two combination shows highly significant productivity that are (0.902±0.042 kg/m^2) and (0.898±0.062 kg/m^2) respectively. In case of maize crop the combination of buffalo dung with straw (0.764±0.042 kg/m^2) and horse dung with straw (0.738±0.046 kg/m^2) at 10 mg/m^2 concentration shows significant productivity but 30 mg/m^2 concentration of these two combination have highly significant productivity viz. (0.825±0.062 kg/m^2) and (0.832±0.032 kg/m^2) respectively (table 5).

Discussion

It is evident from the results that the vermiwash of different vermicomposts have time and dose dependent significant effect on the growth, flowerination period and productivity of paddy, maize and millet crops. In a preliminary study Edwards, [9] reported in the microbial activity in vermicomposts could result in production of significant quantity of plant growth regulators such as IAA, gibberellins, cytokinins, by microorganisms. Large amount of humic acid were produced during vermicomposting and these had been reported to have positive effects on plant growth [4, 16, 19]. Vermicomposts had been shown to influence the growth and productivity of a variety of plants, cereals and legumes [8], vegetable [9, 2], Ornamental and flowering plants [9], field crops [15, 7]. Atiyeh et al. [3] have shown that vermicomposts when in bedding media had improved seed germination, enhanced the seedling growth and increased overall plant productivity. They have further shown that the greatest response from the plants could be observed only when the vermicompost was used at 10-40 % of the volume of plant growth medium. Parthasarathi and Rangnathan, [17] have reported that supplementation of N.P.K. with pressmud vermicast had enhanced the growth and yield in black gram (*Vigna mungo*) and groundnut (*Arachis hypogaea*). Vermicompost had enhanced the germination rate in seeds [10, 24]. Atiyeh et al. [4] reported that increases in the rate of germination, growth and yield of tomato plants. Subler et al. [22] demonstrated that improvement in the germination and growth of petunias, merigold, bachelor buttons, poinsettias, bell peppers and tomatoes in response to vermicompost substitution in to bedding plant container media.

Conclusion

From present study, it is clear that vermiwash of different combination of animal, agro and kitchen waste is one of the useful bioproduct for foliar spray on the crops of paddy, maize and millet, which give significant increase in the growth and productivity and early flowering.

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Table-1. Effect of different concentration of vermiwash of different vermicomposts of different combinations of animal, agro and kitchen wastes on the growth (in cm) of paddy (Oryza sativa)

Vermiwash	Days after sowing								
	45			60			75		
	Concentration (mg/m2)								
	10	20	30	10	20	30	10	20	30
Control	20.5±2.4	20.5±2.4	20.5±2.4	38.6±4.7	38.6±4.7	38.6±4.7	56.5±4.2	56.5±4.2	56.5±4.2
Cow									
Dung	28.4±2.6 13.2±1.9	31.6±2.4	36.2±3.2	# 48.2±4.2	52.5±3.7	57.2±3.2	# 66.5±3.7	71.2±3.7	78.4±5.4
Dung + Gram Bran	* 38.7±3.4	41.4±2.7	46.2±2.4 20.6±0.6	*59.6±3.6	64.6±4.7	70.4±3.4	* 78.6±4.5 21.0±.04	83.6±2.6 26.8±1.4	89.6±4.2
Dung + Straw	37.4±4.2	40.5±2.4	45.2±2.7	58.2±3.7	63.4±3.8	69.7±4.0	76.4±3.4	81.2±2.7	87.4±3.2
Dung + Wheat Bran	34.2±3.6	37.8±2.6	43.0±2.5	53.4±6.2	58.2±6.2	64.2±3.6	70.8±4.4	75.3±3.7	83.2±4.6
Dung + Rice Bran	31.4±3.7	34.2±3.2	39.0±3.5	51.2±2.4	56.2±2.8	62.2±2.4	68.2±3.2	73.6±4.7	79.2±2.6
Dung +Vegetable wastes	30.2±3.2	33.0±2.7	38.2±2.7	50.8±3.2	56.0±2.7	62.4±3.4	68.8±4.3	73.6±5.3	79.4±2.6
Dung + Barley Bran	30.2±3.0	33.2±1.4	38.4±3.6	50.2±4.6	55.4±2.8	61.5±2.4	67.5±3.2	72.2±2.8	78.7±6.2
Buffalo									
Dung	# 30.4±4.5	35.4±3.7	40.8±4.8	#50.6±4.7	56.0±2.0	62.2±3.8	#68.2±2.8	73.4±3.8	79.2±6.5
Dung + Gram Bran	*41.2±3.5	44.5±4.3	49.2±2.4	*65.6±2.6	71.2±2.6	77.3±4.2	*83.4±6.2	88.8±2.6	94.2±4.2
Dung + Straw	38.2±4.6	41.3±3.2	45.8±3.7	70.2±2.5	76.2±3.2	82.6±4.6	89.2±4.7	94.6±2.5	102.6±3.2

Dung + Wheat Bran	35.4±3.2	38.7±2.2	43.2±4.2	56.2±2.3	61.3±3.2	67.8±3.4	74.2±3.8	79.4±5.5	85.8±4.5
Dung + Rice Bran	35.8±4.6	39.2±3.2	44.3±4.2	56.4±3.2	61.4±3.8	68.2±3.8	74.2±4.2	79.3±6.2	85.6±3.2
Dung +Vegetable wastes	33.7±3.2	38.2±2.7	43.2±3.2	54.6±4.7	60.2±2.6	66.2±4.7	62.4±3.7	67.6±5.7	73.2±2.6
Dung + Barley Bran	32.2±3.7	35.2±2.6	39.4±2.5	51.4±6.2	56.8±3.7	62.8±5.5	69.2±3.5	74.8±3.8	80.8±3.2
Goat									
Dung	#24.6±4.6	28.5±2.4	33.6±1.6	#44.8±2.8	50.8±2.2	56.4±5.6	#62.4±6.2	67.8±5.6	74.2±4.2
Dung + Gram Bran	*30.6±3.2	34.2±3.2	39.0±2.5	*50.2±4.7	55.6±3.6	62.0±2.4	*68.0±4.7	73.5±5.2	79.2±2.7
Dung + Straw	30.2±4.2	33.4±2.0	38.2±3.2	49.2±3.2	54.6±2.7	61.2±3.4	67.4±3.2	72.8±4.2	79.0±2.5
Dung + Wheat Bran	28.2±3.2	31.4±2.1	36.2±2.7	48.4±3.6	53.0±3.0	59.8±4.2	67.2±2.5	72.6±5.2	78.8±2.7
Dung + Rice Bran	27.5±4.2	30.2±2.2	35.2±3.2	46.8±2.1	51.8±4.2	57.6±3.7	63.8±3.5	69.4±6.2	75.8±6.2
Dung +Vegetable wastes	26.2±3.2	29.4±3.2	34.6±2.4	45.2±3.7	49.4±3.4	55.4±4.2	61.2±2.7	67.5±5.6	73.4±3.2
Dung + Barley Bran	25.2±2.7	28.7±4.2	34.0±2.5	45.0±2.5	49.0±4.2	54.8±2.5	61.0±2.8	67.2±4.2	73.6±4.4
Sheep									
Dung	# 26.7±2.8	30.4±2.5	34.6±4.2	#45.4±3.2	49.8±3.2	56.2±3.2	#62.8±3.2	68.3±2.5	74.8±2.4
Dung + Gram Bran	*34.6±3.2	39.0±2.4	44.8±2.8	*55.2±4.7	60.8±5.5	67.3±5.4	*73.2±2.4	78.8±4.6	85.2±4.2

Dung + Straw	34.0±2.0	37.8±2.7	43.0±3.4	55.3±3.2	61.2±6.2	66.4±3.4	72.4±3.4	68.8±3.8	75.2±3.7
Dung + Wheat Bran	31.2±2.6	34.6±3.2	39.2±3.7	52.0±4.2	57.2±2.3	63.4±2.8	69.8±2.7	75.2±3.2	81.5±4.7
Dung + Rice Bran	30.4±3.4	33.7±2.4	38.4±2.4	50.2±3.2	55.8±3.2	62.6±2.2	68.4±2.0	76.3±4.2	82.4±3.2
Dung +Vegetable wastes	28.4±2.8	32.0±4.6	37.8±2.6	48.6±2.4	52.6±4.2	57.2±3.2	63.8±4.6	68.2±4.3	73.6±3.6
Dung + Barley Bran	27.2±3.2	30.8±3.2	35.6±2.5	47.5±3.2	51.2±3.2	56.4±3.2	62.2±3.2	67.4±3.2	72.8±3.8
Horse									
Dung	# 32.4±2.3	36.8±2.8	41.2±3.2	#53.6±4.2	57.6±4.6	63.2±2.8	#64.4±3.2	74.8±2.6	80.6±4.6
Dung + Gram Bran	*42.6±3.4	47.0±3.2	50.4±4.2	*63.2±2.8	68.2±2.4	73.6±3.8	*80.2±4.2	85.2±3.8	91.2±3.4
Dung + Straw	35.2±3.7	38.6±3.2	41.2±3.6	56.2±2.4	61.0±4.2	66.2±2.5	72.4±4.8	78.2±5.5	84.7±4.6
Dung + Wheat Bran	34.3±2.4	37.5±2.1	40.5±3.1	54.6±2.4	59.9±2.8	64.6±2.7	69.2±3.5	75.3±2.1	81.2±3.3
Dung + Rice Bran	35.7±3.7	39.2±4.2	42.6±3.2	57.0±2.2	62.2±3.2	68.2±3.7	74.4±3.2	79.8±5.6	85.8±3.2
Dung +Vegetable wastes	36.4±4.2	39.6±3.2	43.4±4.3	60.7±2.4	65.2±2.4	70.4±3.8	77.2±2.8	82.3±3.2	87.8±4.6
Dung + Barley Bran	33.8±3.4	36.4±4.6	42.8±3.2	57.2±3.8	62.6±4.2	69.0±2.7	74.8±2.6	81.2±3.2	88.5±2.1

Each value is the mean ± SE of six replicates. 2 way ANOVA: Significant (P<0.05) * within column, # within row.

Table -2. Effect of different concentration of vermiwash of different vermicomposts of different combinations of animal, agro and kitchen wastes on the growth (in cm) of Maize (Zea mays)

Vermiwash	Days after sowing								
	30			40			50		
	Concentration (mg/m2)								
	10	20	30	10	20	30	10	20	30
Control	22.6±2.5	22.6±2.5	22.6±2.5	37.4±3.2	37.4±3.2	37.4±3.2	56.8±4.2	56.8±4.2	56.8±4.2
Cow									
Dung	# 28.6±4.2	31.4±3.7	34.7±2.6	# 45.2±4.6	50.6±4.2	56.2±4.2	# 66.2±2.4	68.2±3.6	77.8±4.3
Dung + Gram Bran	* 36.2±3.7	40.2±3.6	44.6±2.8	* 56.4±2.7	61.6±5.2	68.8±3.8	* 76.4±4.2	81.4±4.2	87.6±3.4
Dung + Straw	34.4±4.8	42.6±6.4	46.2±4.2	57.2±3.6	65.2±3.6	72.6±3.0	78.2±3.6	84.5±3.8	92.8±4.2
Dung + Wheat Bran	35.2±3.6	38.8±3.7	42.2±4.6	54.6±2.6	57.6±5.2	63.8±4.2	73.6±3.2	78.6±4.2	84.6±3.4
Dung + Rice Bran	33.0±2.5	35.2±2.8	39.6±2.8	53.6±6.2	55.4±4.7	51.2±6.2	71.4±4.7	76.6±5.2	82.2±2.4
Dung +Vegetable wastes	31.6±3.6	34.8±4.4	38.2±3.2	44.2±2.6	53.4±2.8	59.0±3.2	68.2±2.6	73.0±3.2	78.9±4.4
Dung + Barley Bran	31.4±2.4	34.2±4.2	37.2±4.2	48.2±3.7	52.6±3.6	58.8±3.8	64.2±2.6	59.4±4.6	74.8±2.6
Buffalo									
Dung	# 30.2±3.6	34.5±4.7	37.8±3.4	# 48.2±2.8	54.8±4.6	62.2±4.3	# 66.2±6.2	71.4±3.8	78.0±2.5
Dung + Gram Bran	* 38.4±4.6	42.6±3.8	45.6±4.2	* 59.2±6.2	55.6±4.2	64.2±6.3	* 78.3±5.6	84.8±4.7	92.6±3.8
Dung + Straw	40.2±3.6	44.2±3.8	47.8±5.3	62.4±4.2	68.8±6.2	75.2±3.2	80.4±3.2	87.2±3.2	95.4±4.6

Dung + Wheat Bran	37.2±5.2	43.6±4.2	46.6±4.2	57.8±3.7	64.2±3.6	71.3±4.3	74.6±4.7	80.4±6.2	86.4±3.2
Dung + Rice Bran	36.2±4.2	40.2±3.2	43.6±2.5	54.2±2.6	60.2±6.2	65.8±3.7	71.2±3.2	77.0±3.8	83.6±4.2
Dung +Vegetable wastes	34.6±3.7	38.8±3.7	42.0±3.0	51.6±3.6	57.2±3.8	63.4±3.8	68.4±3.6	74.4±3.0	80.2±6.2
Dung + Barley Bran	32.4±4.6	36.2±5.5	39.4±3.6	51.0±2.4	57.7±3.5	64.2±2.6	68.2±2.7	74.4±3.6	80.4±3.8
Goat									
Dung	# 26.5±3.6	29.7±3.4	32.0±3.5	# 42.6±3.8	47.2±4.3	53.8±3.7	# 69.8±2.6	64.2±4.2	70.4±3.5
Dung + Gram Bran	* 35.5±2.5	38.6±3.6	41.4±4.7	* 52.4±6.2	57.8±4.2	64.2±4.6	*70.4±2.8	76.4±3.8	82.2±4.6
Dung + Straw	37.4±4.2	40.8±4.2	44.0±3.8	55.2±5.5	63.6±2.6	69.8±4.2	74.6±6.4	81.2±6.2	87.4±3.8
Dung + Wheat Bran	32.4±4.6	35.8±4.7	38.6±4.7	49.8±5.7	55.8±3.5	61.2±3.7	68.3±4.5	73.4±6.3	78.7±5.5
Dung + Rice Bran	33.4±2.4	36.2±6.2	39.4±3.6	45.0±5.2	51.2±2.5	57.4±4.2	65.5±5.5	70.5±3.8	75.8±4.2
Dung +Vegetable wastes	28.6±3.2	32.0±6.4	35.6±3.7	46.8±2.5	53.0±3.0	59.2±3.4	66.4±6.2	71.6±4.2	77.2±4.4
Dung + Barley Bran	28.4±2.7	31.8±3.2	34.8±4.2	45.2±3.5	51.4±2.6	57.4±3.6	65.4±2.6	70.4±3.4	74.3±3.2
Sheep									
Dung	#25.6±3.2	28.2±2.5	31.4±3.2	#39.6±2.7	44.3±2.7	50.2±2.5	# 56.2±2.8	61.2±3.7	67.4±2.4
Dung + Gram Bran	*35.4±4.6	38.6±3.2	41.6±4.2	*50.4±3.7	55.6±3.8	61.2±3.8	*69.4±3.6	74.6±4.2	81.2±4.6

Dung + Straw	36.2±2.4	39.2±4.2	42.8±3.4	52.7±2.7	58.0±4.2	63.8±4.2	72.6±4.2	76.6±4.2	77.8±3.2
Dung + Wheat Bran	30.2±2.6	33.4±3.2	36.2±2.6	45.2±3.6	50.2±3.7	55.2±3.6	60.8±5.2	65.0±4.2	71.2±4.2
Dung + Rice Bran	31.2±3.7	34.5±4.2	37.8±3.7	46.3±2.5	51.6±2.7	56.2±4.2	62.8±4.2	67.2±5.2	73.6±3.2
Dung +Vegetable wastes	27.5±2.5	30.6±3.2	33.6±3.7	42.4±4.7	47.6±2.6	52.2±3.7	61.2±5.5	66.3±4.2	72.4±4.2
Dung + Barley Bran	27.8±3.8	30.9±4.2	34.5±3.8	42.6±2.6	47.2±3.7	52.6±2.4	60.8±4.6	65.2±3.2	72.0±4.6
Horse Dung	#31.8±4.7	35.4±3.2	38.6±2.5	#49.4±3.8	54.6±4.6	61.2±4.2	# 72.6±3.8	76.8±4.2	82.2±3.8
Dung + Gram Bran	*40.4±3.8	44.5±3.6	48.6±2.4	*60.2±3.2	65.4±6.2	72.4±2.4	*81.4±4.2	86.2±6.2	93.2±4.2
Dung + Straw	42.4±2.7	46.8±4.6	50.8±3.4	63.4±4.2	69.2±6.6	76.2±3.7	85.2±4.3	90.2±2.3	97.4±3.2
Dung + Wheat Bran	38.4±3.6	42.6±3.2	47.0±4.2	58.4±5.2	64.2±3.6	70.4±4.6	79.8±3.4	83.2±4.6	90.8±2.4
Dung + Rice Bran	37.2±4.3	41.2±4.2	46.4±3.2	56.8±5.2	60.8±4.2	66.2±3.6	77.2±2.4	81.8±2.4	91.7±4.2
Dung +Vegetable wastes	34.2±3.4	38.6±3.6	42.4±4.6	52.6±3.7	56.4±2.7	62.4±3.4	72.8±4.6	77.2±3.4	85.4±4.4
Dung + Barley Bran	33.2±6.4	37.6±2.4	41.3±4.2	51.4±3.8	55.6±3.2	61.2±6.2	70.2±3.8	74.6±2.4	81.2±3.4

Each value is the mean ± SE of six replicates. 2 way ANOVA: Significant (P<0.05) * within column, # within row.

Table -3. Effect of different concentration of vermiwash of different vermicomposts of different combinations of animal, agro and kitchen wastes on the growth (in cm) of Millet (Pennisetum typhoides).

Vermiwash	Days after sowing								
	20			50			80		
	Concentration (mg/m2)								
	10	20	30	10	20	30	10	20	30
Control	25.6±2.3	25.6±2.3	25.6±2.3	45.4±4.2	45.4±4.2	45.4±4.2	65.8±4.4	65.8±4.4	65.8±4.4
Cow									
Dung	# 46.8±3.8	56.7±3.6	56.7±3.6	# 67.8±6.2	72.6±4.5	78.5±3.8	# 90.2±3.6	96.2±6.7	102.6±4.5
Dung + Gram Bran	* 60.2±4.6	65.6±3.8	71.4±3.5	* 81.2±4.2	86.4±5.7	92.8±4.7	* 104.7±7.6	111.8±7.2	117.8±7.2
Dung + Straw	58.4±4.3	63.8±4.2	69.0±3.0	79.6±4.8	84.2±3.6	90.4±3.7	102.6±4.6	109.6 ±6.8	115.2±4.5
Dung + Wheat Bran	53.8±6.6	58.6±3.5	64.2±3.4	74.8±6.2	74.4±4.8	85.6±4.2	98.4±4.2	106.8 ±4.6	109.6±6.8
Dung + Rice Bran	59.6±4.7	57.2±4.7	62.3±4.5	73.6±6.2	78.6±3.8	84.2±4.5	96.2±3.5	102.4 ±3.6	108.9±3.6
Dung +Vegetable wastes	48.6±4.2	53.7±5.5	68.6±2.5	69.7±4.5	74.8±4.8	80.4±6.2	92.8±5.2	99.4±4.5	105.6±7.2
Dung + Barley Bran	48.2±3.2	53.0±3.8	68.2±3.7	69.8±4.8	74.2±5.7	80.2±3.7	92.6±5.7	98.2±4.8	104.2±3.2
Buffalo									
Dung	# 53.6±4.2	58.4±6.7	64.2±3.2	# 74.8±4.6	80.2±3.2	88.2±6.2	# 97.2±3.4	104.2 ±4.6	110.0±3.2

Dung + Gram Bran	* 68.6±4.4	73.8±4.5	80.4±3.2	* 89.8±6.2	95.2±4.7	104.2 ±3.8	*112.6±7.2	120.4 ±6.2	128.6±7.2
Dung + Straw	66.8±6.3	72.0±3.4	78.0±4.7	87.6±4.5	93.4±4.5	101.4 ±4.7	109.2±6.7	115.6±3.8	121.4±4.7
Dung + Wheat Bran	62.6±6.2	67.3±4.8	73.6±3.8	83.4±3.5	89.6±5.5	97.2±5.5	105.2±4.8	112.6±6.2	118.7±5.5
Dung + Rice Bran	58.4±7.2	63.6±4.6	69.4±4.2	78.8±3.8	84.4±3.4	91.2±6.6	102.0±3.8	108.2±7.2	114.2±3.8
Dung +Vegetable wastes	54.8±6.2	59.2±3.5	65.6±5.2	75.6±3.5	81.2±4.2	88.8±5.2	98.6±6.2	105 ±6.7	111.6±4.2
Dung + Barley Bran	54.6±3.2	59.0±2.6	65.0±3.8	75.4±6.2	81.0±4.7	88.0±3.7	98.2±4.2	105.0 ±6.2	116.0±3.2
Goat									
Dung	#38.8±4.2	42.6±4.6	47.2±3.4	#59.7±4.5	64.2±6.7	68.8±4.7	#81.6±6.2	86.2±3.2	90.4±3.8
Dung + Gram Bran	* 47.2±6.2	51.2±4.2	56.4±4.6	* 68.4±3.8	72.6±4.6	77.8±6.7	* 90.4±4.2	95.6±4.7	100.2±4.6
Dung + Straw	48.2±4.5	52.4±3.6	57.6±4.8	69.7±7.2	74.3±5.5	78.6±5.2	91.6±6.3	96.8±5.5	102.6±6.5
Dung + Wheat Bran	44.2±6.2	48.2±4.8	53.6±4.2	65.6±4.2	70.8±4.2	76.2±3.6	87.6±3.5	92.2±4.6	98.2±5.5
Dung + Rice Bran	43.4±4.2	47.6±3.6	52.8±3.2	64.8±3.6	70.2±3.8	75.0±4.5	86.2±4.6	91.0±3.2	97.5±5.2
Dung +Vegetable wastes	40.2±3.2	44.4±4.2	49.5±4.7	61.6±3.2	67.2±4.7	72.6±6.2	83.4±3.5	88.2±3.8	94.3±6.2
Dung + Barley Bran	39.8±6.2	43.2±2.6	48.6±5.5	60.2±5.6	65.2±3.7	69.2±4.5	82.4±6.2	87.4±4.7	93.6±7.2

Sheep									
Dung	# 35.6±3.6	39.5±3.8	44.6±6.2	# 56.2±4.5	60.8±5.5	64.3±3.7	# 77.8±4.2	81.3±6.2	85.9±6.2
Dung + Gram Bran	* 44.2±4.2	48.2±4.7	52.6±2.5	* 65.2±6.2	69.4±7.2	73.6±4.7	* 86.4±6.2	90.8±4.8	95.6±7.2
Dung + Straw	45.6±2.5	50.2±2.6	54.2±4.8	66.6±4.2	70.4±4.7	74.8±5.5	87.6±4.5	91.8±4.9	97.2±4.2
Dung + Wheat Bran	41.6±3.6	45.8±2.6	50.2±3.2	62.8±3.8	67.2±5.9	72.0±3.4	83.8±5.7	88.0±4.2	92.6±3.8
Dung + Rice Bran	40.2±4.2	44.6±3.8	49.2±4.8	61.2±4.2	66.4±4.7	70.2±2.8	82.6±5.6	86.8±2.6	90.6±4.8
Dung +Vegetable wastes	38.2±4.6	42.6±3.5	47.8±2.5	59.6±4.6	64.0±4.2	68.2±3.8	80.2±6.2	84.4±4.7	89.2±5.2
Dung + Barley Bran	37.4±4.2	41.2±3.7	46.2±3.5	58.4±3.8	62.2±3.5	66.7±3.5	79.2±6.5	83.3±3.2	87.7±4.2
Horse									
Dung	# 55.6±5.5	60.2±3.2	66.2±3.6	# 75.2±6.4	82.6±4.5	89.8±6.3	# 102.4±3.6	108.6±6.2	114.4±8.6
Dung + Gram Bran	* 65.2±3.8	70.6±4.7	77.2±4.7	* 85.8±5.4	92.4±7.2	99.8±5.2	* 112.6±3.2	118.8±7.5	125.2±7.2
Dung + Straw	66.7±4.7	72.4±7.2	80.6±3.0	87.8±3.8	94.6±6.2	102.6 ±4.9	110.2±7.2	116.6±3.4	122.4±4.5
Dung + Wheat Bran	63.6±5.7	68.8±6.2	75.2±3.8	83.6±3.6	90.2±3.8	97.6±5.8	106.6±4.7	112.5±4.7	118.8±3.7
Dung + Rice Bran	62.6±6.3	68.0±3.0	75.0±2.5	82.8±4.5	89.6±4.2	96.2±3.8	104.3±4.5	110.4±3.8	115.8±4.8

Dung +Vegetable wastes	58.2±3.8	63.2±6.2	68.6±3.8	78.2±6.3	84.6±3.5	91.2±6.2	101.4±3.8	107.8±7.2	113.2±7.5
Dung + Barley Bran	57.8±4.7	62.0±2.4	67.2±4.7	77.6±3.2	83.4±5.7	90.0±3.6	100.8±4.7	106.2±3.2	110.6±2.6

Each value is the mean ± SE of six replicates. 2 way ANOVA: Significant (P<0.05) * within column, # within row.

Table -4. Effect of different concentration of vermiwash of different Vermicomposts of combinations of animal, agro and kitchen wastes of Flowering period (days) of Paddy, Maize and Millet.

Vermiwash	Crops								
	Paddy			Maize			Millet		
	Concentration (mg/m2)								
	10	20	30	10	20	30	10	20	30
Control Cow	83.4±4.2	83.4±4.2	83.4±4.2	67.4±4.4	67.4±4.4	67.4±4.4	120.6±4.6	120.6±4.6	120.6±4.6
Dung	* 75.2±4.3	72.4±3.6	71.2±3.6	*62.4±3.2	60.4±2.6	59.0±3.0	*110.4±3.7	108.2±3.2	106.2±3.7
Dung + Gram Bran	69.4±2.7	67.2±3.7	66.2±2.6	56.2±4.6	54.7±2.6	52.3±2.6	105.6±2.7	103.2±2.6	102.4±2.7
Dung + Straw	69.3±4.3	67.4±3.6	66.8±3.8	57.6±3.8	55.2±3.8	53.2±4.7	107.8±3.6	104.2±3.5	103.7±4.7
Dung + Wheat Bran	70.4±2.6	68.2±4.7	67.7±4.2	59.3±2.6	57.3±4.7	55.5±2.5	108.2±5.2	105.6±2.6	104.7±3.2
Dung + Rice Bran	70.6±3.5	68.4±2.3	67.4±4.6	60.3±4.7	58.3±2.6	56.2±3.7	109.2±3.7	106.2±3.2	105.6±4.3

Dung +Vegetable wastes	71.4±5.2	69.2±2.6	68.2±2.5	58.3±5.5	56.8±2.4	54.2±2.6	110.1±2.6	107.0±3.7	105.2±3.2
Dung + Barley Bran	72.3±4.2	70.6±6.2	68.8±2.6	62.5±6.2	60.2±3.2	58.3±4.6	110.2±2.8	107.4±2.7	106.3±3.7
Buffalo									
Dung	*70.4±3.2	68.2±6.2	66.3±4.2	*56.4±2.6	54.5±2.8	52.2±3.7	*104.4 ±3.7	102.2±2.6	100.2±3.7
Dung + Gram Bran	66.2±4.2	64.2±2.4	62.5±3.2	52.4±3.7	50.0±2.0	48.7±.6.2	100.2±4.1	097.2±3.6	095.3±4.6
Dung + Straw	62.3±4.6	65.4±3.2	63.4±3.6	52.7±5.2	50.2±3.7	48.0±5.2	101.2±3.2	098.8±4.6	096.3±2.6
Dung + Wheat Bran	68.2±2.5	66.1±4.3	64.8±2.6	53.3±2.6	51.0±2.7	49.3 ±5.3	100.3±5.2	098.8±3.7	095.3±3.2
Dung + Rice Bran	68.6±3.7	66.6±3.2	64.5±5.2	55.2±2.6	52.0±4.7	50.2±5.1	102.4±7.2	100.4±2.6	098.4±3.6
Dung +Vegetable wastes	69.0±2.8	67.0±6.4	66.3±5.7	53.4±2.5	52.6±2.3	51.3±2.7	103.2±3.2	101.0±4.7	100.2±2.4
Dung + Barley Bran	69.6±2.5	67.8±2.4	65.2±3.4	56.6±2.8	54.0±2.0	52.3±2.8	103.4±3.7	101.6±4.1	100.4±3.2
Goat									
Dung	*86.3±2.5	78.2±5.2	77.8±4.6	*65.2±4.2	63.8±2.4	62.4±2.6	*114.7±7.3	112.4±6.2	110.4±3.5
Dung + Gram Bran	77.3±4.2	75.3±2.4	72.3±2.6	60.2±2.8	58.0±2.3	56.2±2.8	107.6±3.2	105.2±6.2	102.7±2.6
Dung + Straw	79.2±6.2	76.3±4.7	73.8±3.6	60.4±3.7	58.3±2.6	56.3±3.2	107.4±4.7	105.7±5.5	101.6±5.2
Dung + Wheat Bran	78.2±3.8	75.0±3.7	74.2±3.8	63.2±2.7	59.3±4.7	58.2±2.4	109.2±3.6	107.4±3.0	105.4±6.2

Dung + Rice Bran	78.0±2.0	75.2±2.4	76.4±2.8	62.4±7.2	60.8±2.6	58.6±2.8	110.6±3.8	108.4±3.7	106.2±2.8
Dung +Vegetable wastes	79.3±2.8	76.3±3.8	75.7±4.2	65.3±2.6	62.4±3.0	60.4±2.0	112.1±2.6	110.0±4.0	107.3±2.6
Dung + Barley Bran	79.3±3.7	77.3±4.6	76.2±3.8	64.4±4.7	62.3±2.6	60.3±2.3	113.4±3.2	110.6±4.2	106.2±3.6
Sheep									
Dung	*80.4±2.7	78.6±4.2	76.8±3.2	*66.3±4.2	64.2±3.2	62.4±3.2	*115.2±2.6	112.4±4.5	110.4±4.2
Dung + Gram Bran	75.6±2.5	73.6±6.0	71.8±3.6	60.8±3.7	58.2±2.7	56.4±2.4	107.2±3.7	104.6±2.6	102.3±2.6
Dung + Straw	75.5±3.2	73.4±2.8	70.8±4.2	60.0±2.0	58.3±2.6	55.7±4.7	107.6±2.6	104.5±2.5	102.4±2.8
Dung + Wheat Bran	77.6±2.8	75.2±4.7	72.0±2.0	63.5±5.2	60.2±2.6	58.5±2.7	109.4±3.0	106.6±2.8	103.7±2.8
Dung + Rice Bran	77.3±4.7	75.6±3.8	72.6±3.8	62.8±5.8	60.7±3.7	58.3±4.7	111.5±5.2	108.7±2.4	105.3±2.6
Dung +Vegetable wastes	77.3±2.6	76.3±3.6	75.2±3.2	66.0±3.6	63.0±2.6	62.0±6.2	112.0±3.2	110.0±4.7	109. 2±2.6
Dung + Barley Bran	78.3±2.4	77.2±4.2	76.3±4.2	65.6±3.2	63.7±2.8	62.4±3.2	112.6±2.4	110.4±4.2	108.2±3.2
Horse									
Dung	*69.4±3.7	67.6±3.8	66.6±2.4	*57.3±2.4	54.7±7.2	53.7±2.7	*104.7±4.8	102.6±6.2	101.2±4.7
Dung + Gram Bran	62.2±2.8	59.7±2.7	58.2±2.5	53.2±2.6	50.2±6.2	48.4±4.2	096.2±4.7	094.2±6.2	093.2±3.2
Dung + Straw	63.2±2.4	59.3±2.4	50.3±3.8	53.2±2.8	50.8±2.6	49.2±7.2	096.8±3.2	094.6±3.2	093.4±4.2

Dung + Wheat Bran	63.8±2.6	66.8±4.7	60.4±4.3	54.4±4.6	51.6±2.6	50.6±2.0	098.2±4.7	096.2±0.0	094.3±3.7
Dung + Rice Bran	64.7±6.3	62.2±3.7	61.4±2.4	53.8±2.6	51.3±3.8	50.4±2.5	100.4±3.7	098.4±2.4	096.8±4.2
Dung +Vegetable wastes	65.4±7.2	63.6±2.4	61.8±2.5	55.0±2.6	53.6±2.6	52.4±2.5	104.2±2.8	101.9±2.6	099.4±3.6
Dung + Barley Bran	64.3±2.8	62.3±3.8	60.4±7.2	55.7±3.7	53.6±2.4	52.6±3.8	105.2±4.7	101.6±3.2	099.6±2.8

Each value is the mean ± SE of six replicates. 2 way ANOVA: Significant (P<0.05) * within column, # within row.

Table- 5. Effect of different concentration of combinations of different animal, agro and kitchen wastes on the productivity (kg/m2) of paddy, millet maize crops.

Vermiwash	Crops								
	Paddy			Maize			Millet		
	Concentration (mg/m2)								
	10	20	30	10	20	30	10	20	30
Control	0.252 ±0.032	0.252 ±0.032	0.252 ±0.032	0.324 ±0.024	0.324 ±0.024	0.324 ±0.024	0.205 ±0.01	0.205 ±0.01	0.205 ±0.01
Cow Dung	*0.586 ±0.086	0.664 ±0.047	0.696 ±0.032	*0.486 ±0.042	0.512 ±0.031	0.546 ±0.032	** 0.372 ±0.016	0.412 ±0.012	0.446 ±0.024
Dung + Gram Bran	0.692 ±0.082	0.762 ±0.032	0.790 ±0.042	0.690 ±0.032	0.722 ±0.032	0.762 ±0.041	0.624 ±0.025	0.648 ±0.086	0.682 ±0.061

Dung + Straw	0.663 ±0.025	0.732 ±0.062	0.755 ±0.037	0.702 ±0.045	0.735 ±0.041	0.775 ±0.062	0.642 ±0.026	0.667 ±0.056	0.694 ±0.064
Dung + Wheat Bran	0.640 ±0.025	0.702 ±0.024	0.734 ±0.042	0.672 ±0.062	0.702 ±0.044	0.732 ±0.033	0.560 ±0.021	0.508 ±0.052	0.632 ±0.026
Dung + Rice Bran	0.622 ±0.041	0.682 ±0.037	0.713 ±0.043	0.653 ±0.045	0.682 ±0.021	0.708 ±0.048	0.666 ±0.014	0.682 ±0.012	0.722 ±0.042
Dung +Vegetable wastes	0.604 ±0.061	0.678 ±0.048	0.692 ±0.046	0.582 ±0.026	0.624 ±0.041	0.656 ±0.018	0.562 ±0.029	0.581 ±0.082	0.616 ±0.037
Dung + Barley Bran	0.598 ±0.024	0.670 ±0.056	0.692 ±0.032	0.572 ±0.042	0.604 ±0.045	0.640 ±0.026	0.502 ±0.036	0.526 ±0.068	0.550 ±0.034
Buffalo									
Dung	*0.672 ±0.042	0.702 ±0.062	0.730 ±0.042	*0.602 ±0.052	0.638 ±0.012	0.668 ±0.037	** 0.412 ±0.042	0.512 ±0.012	0.536 ±0.042
Dung + Gram Bran	0.735 ±0.082	0.781 ±0.031	0.802 ±0.034	0.825 ±0.034	0.852 ±0.032	0.886 ±0.062	0.678 ±0.032	0.712 ±0.062	0.712 ±0.062
Dung + Straw	0.755 ±0.062	0.790 ±0.024	0.818 ±0.046	0.872 ±0.025	0.887 ±0.041	0.902 ±0.042	0.764 ±0.042	0.784 ±0.023	0.825 ±0.062
Dung + Wheat Bran	0.724 ±0.026	0.762 ±0.038	0.792 ±0.037	0.730 ±0.015	0.752 ±0.042	0.898 ±0.072	0.672 ±0.056	0.704 ±0.041	0.732 ±0.086
Dung + Rice Bran	0.712 ±0.042	0.760 ±0.025	0.782 ±0.042	0.771 ±0.041	0.804 ±0.042	0.842 ±0.062	0.656 ±0.021	0.685 ±0.021	0.720 ±0.045
Dung +Vegetable wastes	0.682 ±0.012	0.752 ±0.027	0.774 ±0.037	0.698 ±0.032	0.724 ±0.016	0.762 ±0.042	0.612 ±0.043	0.642 ±0.045	0.685 ±0.038
Dung + Barley Bran	0.680 ±0.014	0.753 ±0.016	0.784 ±0.042	0.672 ±0.046	0.704 ±0.024	0.741 ±0.037	0.588 ±0.064	0.623 ±0.068	0.672 ±0.042

Goat									
Dung	*0.543 ±0.044	0.625 ±0.026	0.642 ±0.048	*0.402 ±0.021	0.438 ±0.032	0.468 ±0.044	** 0.286 ±0.045	0.318 ±0.017	0.364 ±0.015
Dung + Gram Bran	0.716 ±0.052	0.746 ±0.046	0.770 ±0.069	0.652 ±0.024	0.686 ±0.032	0.702 ±0.036	0.496 ±0.038	0.524 ±0.013	0.546 ±0.062
Dung + Straw	0.701 ±0.062	0.734 ±0.020	0.760 ±0.034	0.635 ±0.032	0.667 ±0.041	0.686 ±0.042	0.523 ±0.042	0.554 ±0.042	0.573 ±0.025
Dung + Wheat Bran	0.631 ±0.043	0.721 ±0.041	0.743 ±0.036	0.572 ±0.057	0.602 ±0.072	0.652 ±0.032	0.462 ±0.032	0.486 ±0.062	0.502 ±0.062
Dung + Rice Bran	0.620 ±0.052	0.714 ±0.021	0.732 ±0.042	0.556 ±0.026	0.582 ±0.014	0.612 ±0.044	0.482 ±0.063	0.512 ±0.050	0.540 ±0.060
Dung +Vegetable wastes	0.582 ±0.024	0.665 ±0.026	0.692 ±0.021	0.531 ±0.024	0.560 ±0.026	0.586 ±0.025	0.392 ±0.057	0.421 ±0.042	0.456 ±0.032
Dung + Barley Bran	0.552 ±0.046	0.634 ±0.041	0.672 ±0.043	0.486 ±0.025	0.514 ±0.042	0.556 ±0.037	0.376 ±0.025	0.408 ±0.042	0.432 ±0.042
Sheep									
Dung	*0.541 ±0.017	0.632 ±0.084	0.654 ±0.027	*0.402 ±0.046	0.425 ±0.049	0.470 ±0.035	** 0.268 ±0.042	0.302 ±0.045	0.320 ±0.072
Dung + Gram Bran	0.668 ±0.025	0.740 ±0.064	0.764 ±0.034	0.642 ±0.052	0.665 ±0.063	0.690 ±0.047	0.486 ±0.032	0.512 ±0.023	0.542 ±0.042
Dung + Straw	0.670 ±0.038	0.752 ±0.012	0.782 ±0.042	0.592 ±0.061	0.625 ±0.014	0.660 ±0.012	0.500 ±0.043	0.523 ±0.041	0.546 ±0.062
Dung + Wheat Bran	0.542 ±0.034	0.721 ±0.012	0.743 ±0.072	0.562 ±0.048	0.602 ±0.024	0.642 ±0.016	0.456 ±0.061	0.488 ±0.042	0.512 ±0.088
Dung + Rice Bran	0.672 ±0.047	0.764 ±0.072	0.792 ±0.063	0.512 ±0.016	0.542 ±0.018	0.582 ±0.050	0.482 ±0.042	0.502 ±0.012	0.542 ±0.057

Dung +Vegetable wastes	0.542 ±0.042	0.643 ±0.061	0.687 ±0.062	0.460 ±0.048	0.502 ±0.026	0.534 ±0.062	0.442 ±0.036	0.476 ±0.031	0.496 ±0.041
Dung + Barley Bran	0.531 ±0.062	0.623 ±0.024	0.664 ±0.083	0.456 ±0.021	0.482 ±0.041	0.526 ±0.042	0.421 ±0.024	0.456 ±0.016	0.486 ±0.024
Horse Dung	*0.623 ±0.042	0.703 ±0.042	0.734 ±0.086	*0.616 ±0.021	0.646 ±0.031	0.662 ±0.046	** 0.486 ±0.037	0.538 ±0.047	0.558 ±0.032
Dung + Gram Bran	0.726 ±0.088	0.784 ±0.026	0.802 ±0.025	0.858 ±0.032	0.873 ±0.045	0.898 ±0.062	0.726 ±0.032	0.778 ±0.012	0.804 ±0.042
Dung + Straw	0.732 ±0.058	0.788 ±0.042	0.802 ±0.026	0.834 ±0.040	0.852 ±0.042	0.882 ±0.072	0.738 ±0.046	0.789 ±0.014	0.832 ±0.032
Dung + Wheat Bran	0.682 ±0.047	0.721 ±0.032	0.742 ±0.046	0.792 ±0.072	0.821 ±0.071	0.843 ±0.076	0.642 ±0.048	0.684 ±0.074	0.724 ±0.044
Dung + Rice Bran	0.698 ±0.038	0.743 ±0.043	0.768 ±0.047	0.742 ±0.040	0.784 ±0.012	0.802 ±0.072	0.672 ±0.048	0.714 ±0.056	0.746 ±0.032
Dung +Vegetable wastes	0.684 ±0.036	0.724 ±0.062	0.746 ±0.057	0.762 ±0.062	0.801 ±0.041	0.826 ±0.034	0.624 ±0.024	0.652 ±0.021	0.684 ±0.043
Dung + Barley Bran	0.672 ±0.046	0.722 ±0.034	0.744 ±0.050	0.674 ±0.024	0.712 ±0.042	0.738 ±0.052	0.586 ±0.045	0.616 ±0.037	0.582 ±0.036

Each value is the mean ± SE of six replicates. 2 way ANOVA: Significant ($P<0.05$) * within column, # within row.