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ASSESSMENT OF VERMICOMPOST BIOFERTILIZER PRODUCED BY THE EARTHWORM E-EUGENIAE ON VEGETATIVE GROWTH OF SEEDLINGS

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ABSTRACT:

Decomposition of organic waste was enhanced when passed through the earthworm gut releasing more quantities of available forms of plant nutrients in vermicompost than compost. Since mineralization process depends on worm activity. It is always more during monsoon > winter > summer. Majority of agricultural organic wastes have almost similar amount of nutrient constituents. Compost or vermicompost has no influence on the germination and further vegetative growth of seedlings up to 10 days. Later vegetative growth of seedlings up to 20 days was notably influenced only in soils amended with 20% (1.5) compost or vermicompost.

Biomass, length of root, shoot, leaf and member of leaves and branched in seedling grown in Vermicompost were always more than those in compost.

Keywords: E-eugeniae, Vermicompost, Biomass, length of root, length of shoot, number of leaves, number of branches, maximum length of leaf.

Introduction

Earthworms are important in the breakdown of organic matter and the release of nutrients that it contains (Darwin. 1881). In recent years, it has been understood clearly that few species of earthworms are specialized to live in decaying organic matter and degrade it into fine particulate materials high in available nutrients with considerable potential additives.

Earthworms are known to select organic and mineral components that they ingest. As a result, their excreted cast often has much higher contents of soil organic matter and nutrients than the surrounding soil(Lee, 1985). This is probably ue to a preferential ingestion of plant residues (Piearce, 1978, Ferriere, 1980, Kanyonyo, 1984) and clay minerals. Barois and Patroh (1994) demonstrated that the tropical peregrine species, *Pontoscolex corethrurus,* was able to select large organic debris and small mineral particles depending on soil type. Vermicasts can be produced from almost all kinds of organic wastes with suitable pre-conditioning and controlled processing. These biofertilizers are known to support plant growth and can also be used as structural additives for infertile soil to provide nutrients (Edwards, 1982, 1983a). Earthworm cast has been reported (Shrikande and Pathak, 1984) to contain more organic matter content that in ant and termite mounds. Joshi and Kelkar (1952) have reported Higer electrical conductivity in casts which denoted the increase in level of soluble salts than in surrounding soil. Some of the microbes associated with the cast remove the obnoxious odor from the decomposing materials (Watanable et al, 1982). Application of worm cast to fields has been reported to improve the physic-chemical properties of the soil (Kale et al, 1992). On using vermicompost as a source of organic carbon, increased uptake of nutrients with the increased symbiotic microbial association has been shown by Kale et al. (1987, 1992) in cereals and ornamental plants.

The nutrient content of vermicompost differ greatly depending on the parent material from which it is derived. However, Buchanan et al. (1988) suggested that most vermicompost's had higher levels of available nutrients than wastes from which they were formed. Edwards (1988) reported that samples of vermicomposts had relatively high levels of available nitrogen. Bano et al. (1987b) have reported that NPK content of worm cast obtained from *Eudrilus eugeniae* can replace compost and to some extent costly chemical fertilizers.

Darwin (1881) stated "Earthworms prepare the ground in an excellent manner for the growth of fibrous rooted plant and for seedlings of all kinds" Literature reveals that when earthworms are available in soil they always promote plant growth (Wollny, 1890; Hopp and Slater, 1948, 1949; Waters, 1951, Atlavinyte et al. 1968, Springest and Syres, 1979; Edwards and Lofty, 1980) Rhee van (1965) reported many fold increase production of grass, wheat and clever in the presence of earthworms. Similarly, an increase in crop growth (Ponomareva, 1952), growth of maize (Spain et al, 1992) and ornamental plants (Kale et al. 1982) has also been reported.

The beneficial effects of earthworms on plant growth may be due to several reasons apart from the presence of macronutrients and micronutrients in vermicasts and in their secretions in considerable quantities. There are reports that certain metabolites produced by earthworm may be responsible for stimulating plant growth (Gavrilov, 1962, Nielson, 1965). It is believed that earthworms release certain vitamins and similar substances into the soil which may be the B-group vitamins. (Gavrilov, 1963), or some provitamin-D (Zrazhevskii, 1957) or free amino acids (Dibash and Ganti, 1964). several experiments (Reinecke and Visser, 1980, Edwards and Burrows, 1988) have provided that worm cast can promote lush growth of plants. This may be due to the presence of plant growth promoters like cytokins and auxins in casts (Krishnamoorthy and Vajranabhaiah, 1986)

Vermicomposts produced by the activities of *E-eugeniae* in varied manure amended different agricultural organic wastes during different seasons were analyzed for the plant nutrient status. In nature large quantities of a very few residual organic wastes are available in individual form for producing vermicompost in their pure form. Therefore, for potential utility purpose. Vermicompost produced out of them were mixed randomly and such mixed vermicompost was used for their assessment as biofertilizer on vegetative growth of seedlings of most common food crops grown in this semiarid region of Karnataka.

Materials and Methods:

Vermicomposts produced from out of different organic wastes during different seasons were mixed thoroughly and used to assess its influence on the growth of seedlings. Good quality seeds of redgram, black gram, green gram and jowar (common food crops of this region). Having 80 -90% germination were brought from seed farm centers duly recognized by the Ministry of Agriculture (Government of India). To assess the plant nutrient status, vermicompost was mixed with black cotton (BC) soil in the ratio of 1: 5, 1: 10. Similar ratios of compost (without worm) mixed BC soil served as controls for worm activity. BC soil alone served as control for compost and vermicompost amended soils. Seedling culture pots were prepared by filling polythene bags of 1750 cm^3 volume and 75.0 cm^2 surface area. These pots were placed in green house to allow sunlight and avoid the leaching effect of rain water. A day later they were wetted with water, five seeds were planted each at a distance of 10 cm apart and 1 – 1.5 cm depth in controls as well as experimental pots. To maintain capillary water in seedling pots, water was sprinkled on every alternate day to the 20^{th} day. Observations were made for time taken for seedling germination up to 10 days. To avoid congestion and for maintain sufficient space between growing seedling. On 10^{th} day three out of five seedling were removed and observations continued up to 20 days. On the 20^{th} day, biomass; length of stem, root and leaves, number of leaves and branches of each seedling were recorded.

Chemical analysis:

Chemical analyses for varying components of compost (without earthworm) and vermicompost (with earthworm) were made by the methods. Described by authors mentioned below.

Constituents	Method followed	Author (s)
pH	pH-meter	Sorenson,, 1909
Electrical conductivity (EC)	Electrical conductivity meter	Trivedi and Goel, 1986
% Organic carbon (% OC)	Acid digestion	Walkley and Black, 1934
Available nitrogen (N)	Alkaline potassium permanganate	Subbaiah and Asija, 1956
Available phosphorous (P)	Colorimetertic molybdenum – blue	Jackson, 1958
Available Potassium (K)	Flame Photometry	Mehlich, 1956
Available calcium (Ca)	Flame Photmetry	Mehlich, 19956
Available Magnesium (Mg)	Calorimetric Titan Yellow	Cornfield and Pollard, 1750
Available Sulfur (S)	Turbidimetric	Trivedi and Goel, 1986
Available Copper (Cu)	Atomic absorption Spectrophoto	Christian and Feldman, 1934

Results and Discussions

Table 1, 2 and 3 indicate the chemical composition of ten agricultural organic wastes in respect of pH, EC, %OC, N, P, L, Ca, Mg and Cu during monsoon, winter and summer seasons respectively. The suffix letters a, b and c in tables 1, 2 and 3 depict chemical compositions of parent waste formulations, composts (decomposed humus matter without worms) and vermicomposts (decomposed humus matter) produced by *E.eugeniae*. All the chemical parameters, excect % OC, analysed with respect of each organic waste formulation revealed that during each season there was an increasing tendency of the nutrient elements from vermicomposts > composts > parent waste formulations.

Among seasons also, the chemical composition of each organic waste was more in monsoon than in winter and summer seasons in composts as well as vermicomposts. It was interesting to note that of all the elements analysed, % OC in all the organic wastes during monsoon, winter and summer seasons revealed declining trend from parent materials through composts to Vermicomposts; while all other nutrients revealed increasing trend from parent materials through composts to vermicomposts. During all seasons EC, P and Cu were in more amount in composts as well as vermicomposts produced from Other parent wastes. Of the different waste forumulations, Mg and S was found more in Wht formulation and Ca was found more in Rcs formulation.

Mineralization of organic wastes accelerate during the passage of wastes through the gut of earthworms releasing greater quantities of plant available nutrients. The quality of vermicompost depends on the release of constituents in available form from the parental wastes by potential censurability of worms and also the activity of associated saprophytic microbes. Conventional composting of dung in nature will be very slow and may requires minimum of 8 – 10 months, but worm can hasten up the degradation of organic complex molecules into available mineral nutrients in as short as 2 -3 months period. Similar observation for E.eugeniae has been reported by Bano et al. (1987 b).

Vermicomposts when compared with composts revealed increased levels of hydrogen ion concentration, electrical conductivity, available forms of nitrogen, phosphorus, potassium, sulphur, calcium and magnesium and decreased level of total organic carbon. Increased presence of plant nutrients in worm worked wastes was attributed to the enhances mineralization of wastes and incorporation of excretory products of worms into the vermicompost. The decreased quantity of organic carbon in vermicompost than in compost may be due to utilization of this element for building up body mass of worms and /or release of carbon in the form of CO_2 to the environment during decomposition process. Lee (1985) has reported higher level of pH in earthworm cast than that in soil from which they were derived. This increase in pH was attributed to the release if ammonia and calcium carbonate into the earthworm gut. Similar increase of pH due to earthworm activity was noticed by Baker et al. (1995b). Higher electrical conductivity in casts due to increases quantity of soluble salts has also been reported by Joshi and Kelkar (1952). Many researchers have also shown the increased amount of nitrogen (Joshi and Kelkar, 1952; Needham, 1957; Syers et al. 1979; Krishnamoorthy and Vajranabhaiah, 1986; Sheu, 1987, Cristensen, 1988; Lavelle et al., 1992), phosphorous (Sharpley and Syers, 1976, 1977) and potassium (Krishnamoorthy and Vajranabhaiah, 1986) in worm casts. In casts of *P. excavates.* Krishnamoorthy (1990) reported similar increase in pH and rich amount of nitrogen, phosphorus, potassium, sodium, calcium and magnesium. Hence vermicomposts produced from agricultural organic wastes by *E. eugeniae* have all major components that are essential to call them as biofertilizer (Bano et al. 1987b) and can replace the use of inorganic fertilizer to a certain extent to improve the soil fertility and sustainability of agricultural practice.

Assessment experiments with compost and vermicompost revealed that there was increased biomass, length of root, stem and leaves and number of leaves and branches of seedlings in experimental sets (vermicompost amended soil) than control sets (compost amended soil) and soil (Table 4) Deep coloration of seedlings was noticed in experimental sets than in compost and soil sets. The observed parameters in both vermicompost and compost sets were more in seedlings grown on 1:5 ratio (7; 4.8 times) than on 1:10 (3.2 ; 1.5 times) and 1:15 (2 ; 1.3 times) rations than in soil. Collier (1978) reported that plants grown in (E. fetida) vermicompost weighed four times more than those in soil. Enhances biomass of seedlings grown in 1:5 ratio indicated the presence of more available nutrients for plant growth than in 1:10 and 1:15 rations. Higher the available nutrients more was the seedlings growth. Germination of seeds of red gram, black gram, green gram and jowar, in all pots took 48, 24, 24 and 40 hours respectively revealing that for germination moisture was a governing factor than the nutrient content of the cultural medium. In contrast to this, Edwards (1998) reported the emergence of tomatoes, cabbage and radish seedlings tended to be as good and usually better, in vermicompost that in commercial plant growth media and much better than in composted animal wastes with no earthworms.

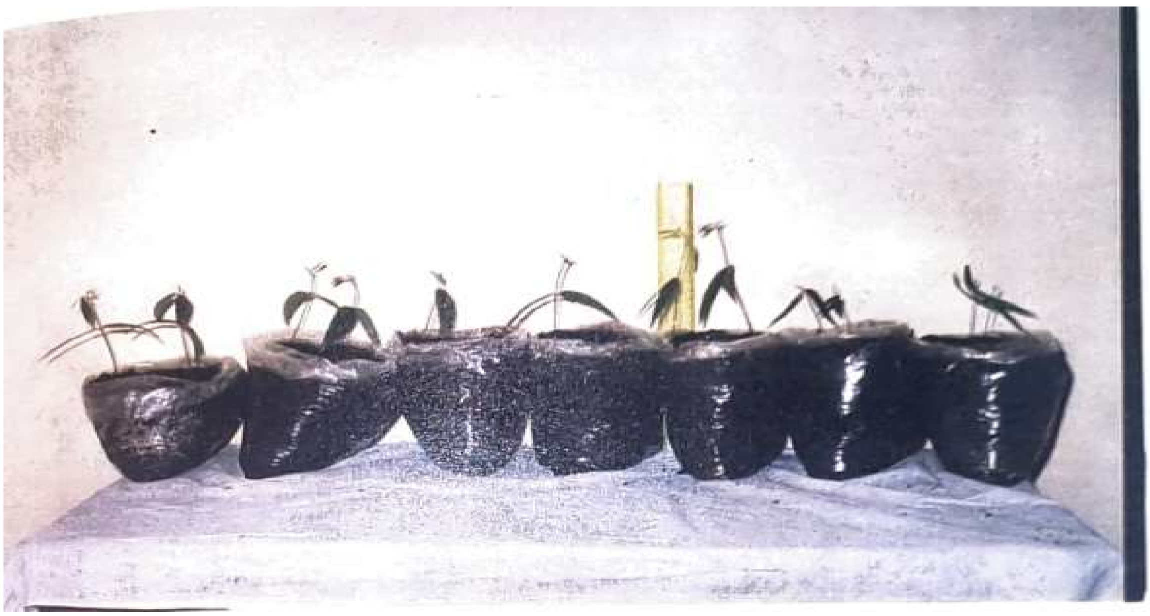

Fig. 1 Ten days aged seedlings of red gram grown in soil and compost & vermicompost of 1:5, 1: 10 and 1: 15 formulations.

Fig. 2 Ten days aged seedlings of black gram grown in soil and compost & vermicompost of 1:5, 1: 10 and 1 : 15 formulations.

Fig. 3 Ten days aged seedlings of green gram grown in soil and compost & vermicompost of 1:5, 1: 10 and 1: 15 formulations.

Fig. 4 Ten days aged seedlings of jowar grown in soil and compost & vermicompost of 1:5, 1 : 10 and 1 : 15 formulations.

Table 1a. Chemical composition of the parent raw organic waste before inoculation of worms in monsoon season.

Sl.No.	Wastes	pH	EC(mhos)	%OC	% N	% P	% K	%S	%Ca	%Mg	Cu μg/g
1	Rdp	7.50	$2.2x10^2$	29.95	0.683	0.10	0.99	0.115	1.01	0.210	1.12
2	Blp	7.70	$3.90x10^2$	30.48	0.719	0.09	0.95	0.148	1.14	0.200	1.72
3	Ggp	7.75	$3.85x10^2$	31.50	0.831	0.25	0.86	0.149	1.32	0.180	4.36
4	Jwr	7.65	$4.10x10^2$	36.48	0.668	0.42	0.76	0.115	1.28	0.085	3.92
5	Rcs	7.55	$3.25x10^2$	29.00	0.820	0.40	0.82	0.118	1.32	0.066	2.95
6	Wht	7.60	$4.35x10^2$	29.68	0.834	0.18	0.90	0.202	1.21	0.056	4.44
7	Bng	7.40	$2.90x10^2$	30.61	0.838	0.29	0.68	0.171	1.23	0.085	2.72
8	Grs	7.65	$2.90x10^2$	35.01	0.738	0.10	0.83	0.140	1.05	0.190	2.68

9	Prt	7.85	$4.30x10^2$	31.02	0.920	0.50	0.92	0.168	1.21	1.80	6.48
10	Gen	7.80	$3.00x10^2$	33.54	0.800	0.21	0.89	0.170	1.33	0.098	4.56

Table 1b. Chemical composition of the composts (without worm) produced after three months in monsoon season

Sl.No.	Wastes	pH	EC(mhos)	%OC	% N	% P	% K	%S	%Ca	%Mg	Cu µg/g
1	Rdp	7.85	$4.65x10^2$	26.30	1.048	0.21	1.39	0.125	1.31	0.280	3.16
2	Blp	8.95	$4.500x10^2$	24.68	1.028	0.26	1.41	0.156	1.41	0.300	3.08
3	Ggp	8.00	$4.00x10^2$	26.40	1.061	0.38	1.56	0.151	1.53	0.240	9.76
4	Jwr	7.90	$5.10x10^2$	29.10	1.054	0.61	1.66	0.211	1.56	0.130	8.24
5	Rcs	7.85	$4.40x10^2$	23.16	1.134	0.62	1.53	0.121	1.62	0.180	6.6
6	Wht	7.90	$5.10x10^2$	23.20	1.061	0.35	1.30	0.213	1.50	0.091	9.88
7	Bng	7.75	$3.25x10^2$	25.10	1.160	0.42	1.99	0.180	1.53	0.116	8.32
8	Grs	7.85	$3.20x10^2$	28.21	1.011	0.29	1.32	0.154	1.38	0.250	4.88
9	Prt	8.05	$6.25x10^2$	26.48	1.020	0.65	1.46	0.176	1.46	0.230	18.4
10	Gen	8.05	$4.60x10^2$	26.80	1.000	0.37	1.44	0.182	1.55	0.180	13.16

Table 1c. Chemical composition of the vermicomposts (with worm) produced after three months in monsoon season

Sl.No.	Wastes	pH	EC(mhos)	%OC	% N	% P	% K	%S	%Ca	%Mg	Cu µg/g
1	Rdp	8.0	$5.86x10^2$	21.36	1.60	0.53	2.81	0.225	2.98	0.380	8.25
2	Blp	8.2	$5.68x10^2$	19.21	1.82	0.5	2.65	0.269	2.88	0.360	12.84
3	Ggp	8.25	$5.41x10^2$	19.68	1.96	0.76	2.76	0.195	2.86	0.320	13.16
4	Jwr	8.30	$6.10x10^2$	21.4	1.98	0.75	2.89	0.241	2.75	0.230	12.88
5	Rcs	8.2	$5.43x10^2$	17.11	1.8	0.7	265	0.19	2.56	0.260	13.7

					9	6		2			6
6	Wht	8.3	$5.81x10^2$	17.38	1.93	0.62	2.86	0.254	2.71	0.120	16.4
7	Bng	8.1	$4.4x10^2$	22.51	1.98	0.57	2.73	0.243	2.65	0.260	11.52
8	Grs	8.15	$4.4x10^2$	22.67	1.95	0.44	2.69	0.253	3.05	0.310	7.48
9	Prt	8.45	$7.45x10^2$	20.26	1.79	0.81	2.88	0.191	2.99	0.320	24.6
10	Gen	8.5	$5.7x10^2$	17.99	1.85	0.58	2.91	0.261	3.02	0.300	21.6

Table 2a. Chemical composition of the parent raw organic wastes before inoculation of worms in winter season.

Sl.No.	Wastes	pH	EC(mhos)	%OC	% N	% P	% K	%S	%Ca	%Mg	Cu µg/g
1	Rdp	7.45	$2.16x10^2$	31.02	0.640	0.08	0.89	0.107	1.00	0.210	2.72
2	Blp	7.70	$3.85x10^2$	29.68	0.618	0.10	0.85	0.140	1.09	0.200	2.08
3	Ggp	7.65	$3.70x10^2$	33.00	0.935	0.20	0.81	0.142	1.28	0.190	3.84
4	Jwr	7.70	$4.05x10^2$	34.76	0.580	0.43	0.68	0.140	1.25	0.192	4.92
5	Rcs	7.50	$3.15x10^2$	30.21	0.770	0.37	0.86	0110	1.21	0.067	1.24
6	Wht	7.45	$4.35x10^2$	31.30	0.783	0.16	0.85	0.199	1.18	0.060	4.08
7	Bng	7.45	$2.70x10^2$	29.40	0.850	0.25	0.72	1.170	1.26	0.093	1.84
8	Grs	7.75	$2.80x10^2$	36.06	0.670	0.08	0.90	0.136	1.01	0.160	3.36
9	Prt	7.80	$4.20x10^2$	33.00	0.849	0.45	0.85	0.168	1.17	0.170	5.56
10	Gen	7.70	$2.95x10^2$	34.98	0.780	0.18	0.83	0.173	1.29	0.088	2.56

Table 2b. **Chemical composition of the composts (without worms) produced after three months in winter season.**

Sl.No.	Wastes	pH	EC(mhos)	%OC	% N	% P	%K	%S	%Ca	%Mg	Cu µg/g
1	Rdp	7.75	4.50x10^2	28.31	1.001	0.18	1.29	0.118	1.28	0.250	2.92
2	Blp	7.90	4.20x10^2	27.12	0.920	0.21	1.30	0.152	1.38	0.280	2.56
3	Ggp	7.90	4.05x10^2	28.13	0.990	0.32	1.43	0.146	1.49	0.210	7.88
4	Jwr	7.85	5.00x10^2	31.10	0.885	0.57	1.55	0.203	1.51	0.100	6.56
5	Rcs	7.75	4.20x10^2	26.56	0.910	0.59	1.38	0.115	1.56	0.180	5.16
6	Wht	7.80	5.00x10^2	26.17	0.844	0.29	1.05	0.211	1.47	0.095	7.56
7	Bng	7.65	3.10x10^2	27.28	1.031	0.37	1.22	0.180	1.39	0.111	6.52
8	Grs	7.85	3.00x10^2	31.10	0.921	0.25	1.18	0.153	1.32	0.222	4.0
9	Prt	7.95	6.00x10^2	27.89	1.025	0.59	1.23	0.174	1.34	0.210	15.24
10	Gen	7.90	4.50x10^2	29.00	1.038	0.32	1.31	0.179	1.40	0.170	11.12

Table 2c. **Chemical composition of the vermicomposts (with worms) produced after three months in winter season.**

Sl.No.	Wastes	pH	EC(mhos)	%OC	% N	% P	%K	%S	%Ca	%Mg	Cu µg/g
1	Rdp	7.85	5.85x10^2	24.13	1.43	0.50	2.61	0.22	2.77	0.35	7.24
2	Blp	8.10	5.5x10^2	23.18	1.63	0.48	2.43	0.26	2.67	0.33	12.0
3	Ggp	8.15	5.31x10^2	23.75	1.89	0.70	2.52	0.18	2.69	0.301	11.84
4	Jwr	8.20	5.95x10^2	26.87	1.63	0.67	2.65	0.23	2.69	0.21	11.52
5	Rcs	8.15	5.10x10^2	23.15	1.44	0.69	2.46	0.19	2.31	0.191	11.92
6	Wht	8.20	5.65x10^2	22.55	1.32	0.55	2.68	0.24	2.45	0.11	15.12
7	Bng	8.00	4.31x10^2	24.10	1.71	0.49	2.59	0.23	2.39	0.243	9.72

8	Grs	8.00	$4.32x10^{2}$	26.53	1.61	0.38	2.58	0.24	2.89	0.29	5.72
9	Prt	8.15	$7.38x10^{2}$	23.99	1.43	0.72	2.68	0.18	2.81	0.28	21.84
10	Gen	8.25	$5.6x10^{2}$	24.00	1.68	0.49	2.74	0.24	2.92	0.27	18.72

Table 3a. **Chemical composition of the parent raw organic wastes before inoculation of worms in summer season**

Sl.No.	Wastes	pH	EC(mhos)	%OC	% N	% P	%K	%S	%Ca	%Mg	Cu µg/g
1	Rdp	7.50	$2.10x10^{2}$	30.53	0.635	0.09	0.90	0.110	0.99	0.190	1.72
2	Blp	7.65	$3.85x10^{2}$	30.55	0.678	0.09	0.83	0.135	1.06	0.210	1.2
3	Ggp	7.60	$3.65x10^{2}$	32.86	0.910	0.23	0.86	0.139	1.25	0.200	3.36
4	Jwr	7.70	$4.00x10^{2}$	34.55	0.596	0.43	0.71	0.186	1.23	0.089	4.5
5	Rcs	7.50	$3.20x10^{2}$	30.55	0.786	0.39	0.90	0.105	1.21	0.068	1.48
6	Wht	7.50	$4.20x10^{2}$	30.48	0.790	0.17	0.88	0.200	1.23	0.059	3.96
7	Bng	7.35	$2.95x10^{2}$	30.50	0.800	0.28	0.70	0.170	1.24	0.088	2.04
8	Grs	7.70	$2.85x10^{2}$	35.15	0.675	0.09	0.87	0.139	1.14	0.180	2.88
9	Prt	7.75	$4.20x10^{2}$	32.25	0.890	0.46	0.9	0.165	1.23	0.200	4.92
10	Gen	7.65	$3.05x10^{2}$	33.00	0.788	0.19	0.80	0.171	1.30	0.094	2.4

Table 3b. **Chemical composition of the composts (without worms) produced after three months in summer season.**

Sl.No.	Wastes	pH	EC(mhos)	%OC	% N	% P	% K	%S	%Ca	%Mg	Cu µg/g
1	Rdp	7.60	$4.2x10^{2}$	29.48	0.986	0.15	1.01	0.110	1.26	0.220	2.64
2	Blp	7.75	$4.00x10^{2}$	28.76	0.865	0.17	1.21	0.150	1.35	0.210	21.2
3	Ggp	7.80	$3.80x10^{2}$	30.52	0.846	0.29	1.28	0.142	1.40	0.222	6.24
4	Jwr	7.7	$4.15x10^{2}$	32.30	0.85	0.5	1.4	0.19	1.41	0.110	4.52

		5			4	1	0	5			
5	Rcs	7.65	$3.75x10^2$	28.62	0.817	0.54	1.28	0.112	1.45	0.170	3.92
6	Wht	7.70	$4.45x10^2$	28.23	0.822	0.25	1.00	0.209	1.38	0.086	5.68
7	Bng	7.50	$2.98x10^2$	29.00	0.912	0.33	1.12	0.173	1.33	0.106	4.88
8	Grs	7.80	$2.76x10^2$	32.05	0.836	0.23	1.06	0.146	1.25	0.200	3.44
9	Prt	7.80	$5.20x10^2$	29.96	0.928	0.54	1.00	0.168	1.30	0.190	12.16
10	Gen	7.70	$3.68x10^2$	31.76	0.946	0.27	1.09	0.176	1.35	0.170	10.24

Table 3c. Chemical composition of the vermicomposts (with worms) produced after three months in winter season.

Sl.No.	Wastes	pH	EC(mhos)	%OC	%N	%P	%K	%S	%Ca	%Mg	Cu µg/g
1	Rdp	7.75	$4.98x10^2$	26.86	1.09	0.48	2.53	0.16	2.54	0.34	6.8
2	Blp	8.0	$4.2x10^2$	25.52	1.08	0.46	2.36	0.17	2.41	0.31	10.52
3	Ggp	8.05	$4.33x10^2$	26.98	0.99	0.67	2.46	0.16	2.48	0.29	10.84
4	Jwr	8.10	$5.21x10^2$	27.80	1.12	0.64	2.50	0.20	2.40	0.20	9.56
5	Rcs	8.00	$4.58x10^2$	24.54	1.03	0.65	2.39	0.17	2.03	0.18	10.12
6	Wht	8.10	$4.59x10^2$	25.33	1.07	0.52	2.52	0.21	2.11	0.10	13.36
7	Bng	7.85	$4.05x10^2$	26.56	1.21	0.47	2.43	0.21	2.08	0.21	9.36
8	Grs	7.90	$3.92x10^2$	28.45	1.09	0.36	2.34	0.23	2.63	0.27	4.04
9	Prt	8.05	$6.57x10^2$	26.46	1.13	0.68	2.54	0.17	2.58	0.26	20.12
10	Gen	8.15	$5.12x10^2$	27.86	1.26	0.46	2.67	0.23	264	0.24	16.04

Table 4 Influence of compost and vermicompost amended soils on the growth of seedlings of food crops

Seedlings	Soil	Compost and Soil			Vermicompost and soil			Ratios								
	S	1:5 C1	1:10 C2	A:15 C3	1:5 V1	1:10 V2	1:15 V3	S:C1	S:C2	S:C3	S:V1	S:V2	S:V3	C1:V1	C2:V2	C3:V3
Jowar																
Biomass	0.442	2.140	0.679	0.557	3.512	1.41	0.901	4.8	1.5	1.3	7.94	3.19	2.03	1.64	2.07	1.58
No. of leaves	4	6	5	4	7	5.0	5	1.5	1.2	1	1.75	1.25	1.25	1.16	1	1.25
Max. Length of leas (cm)	18.5	30	21	21	35	32.5	25	1.4	1	1.1	1.89	1.75	1.35	1.16	1.54	1.19
Shoot length	27	42.5	27.5	27	44.2	40	33	1.6	1	1	1.63	1.48	1.22	1.04	1.45	1.22
Root length (cm)	11.5	13	12.5	11.5	15	14	11.9	1.1	1.1	1	1.3	1.21	1.03	1.15	1.12	1.03
No. of branches	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Black gram																
Biomass	0.731	1.004	0.910	0.846	1.194	1.110	1.02	1.4	1.2	1.2	1.63	1.51	1.39	1.189	1.21	1.2
No. of leaves	4	6	6	5	8	8	7	1.5	1.5	1.2	2	2	1.75	1.33	1.33	1.4
Max. Length of leas (cm)	5.2	6.5	6	5.7	7.2	6.4	6	1.2	1.1	1.1	1.38	1.23	1.15	1.1	1.06	1.05
Shoot length	9	11	10	9.7	12	10	10	1.2	1.1	1.1	1.33	1.11	1.11	1.09	1	1.03
Root	6	10	8.	8.	11	9.	8.	1.	1.	1.	1.	1.	1.	1.0	1.1	1.0

length (cm)		.5	5	4	.5	7	5	7	4	4	91	61	41	9	4	1
No. of branches	1	2	2	2	2	2	2	1	1	2	1	1	1	1	1	1
Greengram																
Biomass	0.684	1.317	1.130	1.093	1.692	1.365	1.25	1.9	1.6	1.6	2.47	1.65	1.59	1.28	1.2	1.14
No. of leaves	4	8	7	5	8	7	6	2	1.4	1.2	2	1.75	1.5	1	1	1.2
Max. Length of leas (cm)	5	6.6	6.2	5	7.2	6.7	6.3	1.3	1.2	1	1.44	1.34	1.26	1.09	1.08	1.26
Shoot length	9	12	11.5	10	12.6	11.5	10	1.3	1.3	1.1	1.4	1.27	1.11	1.05	1	1
Root length (cm)	5	6.5	5.5	5	8	6.5	6	1.3	1.1	1	1.6	1.3	1.2	1.23	1.18	1.2
No. of branches	2	2	2	1	2	2	2	1	1	0.5	1	1	1	1	1	2
Redgram																
Biomass	0.473	0.827	0.708	0.686	1.827	1.161	1.028	1.7	1.5	1.4	3.86	2.45	2.17	2.2	1.63	1.49
No. of leaves	5	8	8	7	12	11	8	1.6	1.6	1.4	2.4	2.2	1.6	1.5	1.37	1.14
Max. Length of leas (cm)	6	7.2	7	6	11.8	7	6.5	1.2	1.2	1	1.3	1.16	1.08	1.08	1	1.08
Shoot length	10.5	15.4	14	12	18	15	13	1.5	1.3	1.1	1.71	1.42	1.23	1.16	1.07	1.08
Root length (cm)	5	9.8	9.5	5.2	11.5	9.8	6	2	1.9	1	2.3	1.96	1.2	1.17	1.03	1.15

No. of branches	2	3	3	2	4	3	3	1.5	1.5	1	2	1.5	1.5	1.33	1	1.5

rowth of seedlings of redgram (Fig. 1), blackgram (Fig. 2), grrengram (Fig. 3) and jowar (Fig. 4) in soil beds as well as in 1: 5, 1: 10 and 1 : 15 formulations of compost and vermicompost did not reveal notable difference at 10 days. Thereafter the difference in growth of seedlings in different rations of compost and vermicompost and of soil was noticed. Higher growth (biomass) of seedlings in experimental sets than in control sets may be due to the presence of more available nutrients; especially the available nitrogen (Edwards, 1988) required for the synthesis of structural proteins used in building up the body of seedlings. Handreck (1986) opined that many vermicomposts may not have sufficient nitrogen to supply all the needs of the plants, while Edwards et al. (1985) reported that most organic wastes have excess amounts of nutrients and usually only a small portion is lost during rapid vermicomposting. Lush growth of all seedlings may also be due to the presence of growth regulator substance (Tomati et al, 1990; Krishnamoorthy and Vajranabhaiah; 1986) in the vermicompost. Increase in the rates of uptake of nutrientrs in cereal and ornamental plants on using vermicompost as a source of organic manure was noticed (Kale et al., 1987, 1992). Vermicompost obtained by the activity of *E.eugeniae* on agricultural organic wastes had value added biofertility activity as it had more available plant nutrients.

From the foregone discussion it can be concluded that the decomposition of organic wastes will be enhanced when passed through the earthworm gut releasing more quantities of available forms of plant nutrients in vermicompost than in compost. Since mineralization process depends on worm activity, it is always more during monsoon > winter > summer. Majority of agricultural organic wastes have almost similar amount of nutrient constituents. Compost or vermicompos has no influence on the germination and further vegetative growth of seedling upto 10 days. Later vegetative growth of seedling upto 20 days is notably influenced only in soils amended with 20% (1 : 5) compost (4.8 times more than in soil) or vermicompost (7.9 times more than in soil). Biomass length of root, shootm leaf and number of leaves and branched in seedlings grown in vermicompost sere always more than those in compost.

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