JOURNAL OF PURE AND APPLIED MICROBIOLOGY, October 2010. Vol. 4(2), p. 895-898

Effect of Application of Vermicompost Prepared from Leaf Materials on Growth of *Vigna unguiculata* L. Walp

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(Received: 09 January 2010; accepted: 23 February 2010)

Leaf samples of *Cassia auriculata* and *Leucaena leucocephala* were collected from in and around Gandhigram Rural University, Gandhigram, Dindigul, and Tamilnadu, India. The collected leaf samples were predecomposed for 15 days by sprinkling water and regular turning. Two earthworm species such as *Eudrilus eugeniae* (Kinberg) and *Eisenia fetida* (Savigny) were used for the study. The vermicomposting trial was made with two leaf samples mixed with cowdung in 1:1:2 ratio using two earthworm species separately for Treatment I and Treatment II. The physico-chemical parameters such as pH, electrical conductivity, organic carbon, nitrogen, phosphorous, and potassium were analyzed in different day intervals (0, 15,30,45,60 d). After 60 days the compost was used for 7 day growth studies of *Vigna unguiculata* L.walp. On 45th day Ec (2.00), organic carbon (35.21 percent) and NPK (1.51, 1.03, 0.71 percent) values were high in the treatment with *E.fetida* than in treatment with *E. eugeniae* and in control. The results of plant growth studies on 7th day showed that the germination percentage (100), shoot length (12.71±1.62 cm), root length(2.5±2.87 cm), number of leaves (4.6±1.14), fresh weight of the whole plant(0.86±0.23 g) and dry weight of the whole plant(0.06± 0.02 g) were also significantly enhanced by the compost prepared using *E. fetida.*

Key words: Leaf samples, *Eisenia fetida*, *Eudrilus eugeniae*, vermicompost, plant growth, *Vigna unguiculata* L.walp.

Soil is the life sustaining layer of the earth formed and supported by the activities of numerous organisms of which microbes and earthworms are the most important organisms (Parthasarathi and Ranganathan, 1998). The significant feature of biological activity in soil is the conversion of dead organic matter into inorganic nutrients (Maity and Joy, 1999). Vermicomposting is an eco-friendly, inexpensive technology in which earthworms are used as bioreactors to convert organic materials into valuable compost (Karmegam and Daniel, 2000-a and Manivannan and Daniel 2008). The effect of vermicompost on the growth of a variety of crops including cereals and legumes, vegetables, ornamental plants and flowering plants has bees assessed by many researchers in the green houses and to a lesser degree in field crops (Gajalakshmi and Abbasi 2004-a Karmegam and Daniel 2008-a). Hence the present study is undertaken to find the effect of vermicompost on the growth of cow pea, *Vigna unguiculata* L. Walp.

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MATERIAL AND METHODS

Leaves of *Cassia auriculata* and *Leucauna leucocephala* and cow dung were collected from Gandhigram Rural University campus, Gandhigram, Dindigul (Dt), Tamilnadu, India. The leaves were kept separately in cylindrical cement tanks, covered with wet gunny bags and water was sprinkled every day for a period of fifteen days to bring out initial decomposition of the leaves. The decomposed leaf materials were used for the preparation of vermibed.

The earthworm *E. fetida* Savigny and *E.eugeniae* Kinberg obtained from the mass culture tanks containing cowdung medium medium from the Department of Biology, Gandhigram Rural University were used for composting. The vermibeds were prepared in rectangular plastic troughs of 45cm×35cm 15×cm size. A layer of one kg of pre-decomposed leaf material +cowdung mixture was spread over the troughs. 20 number of *E. eugeniae* and 30 numbers of *E. fetida* separately were introduced in each vermibed . Before introduction the initial weight of the worms were recorded.

The troughs were kept inside a shed to avoid direct sunlight and rain. On alternate days water was sprinkled on the bed to keep the bed moist. The culture beds were regularly observed and the experiment was continued for a period of 60 days. Once in 3 days the materials were turned carefully without causing any damage to earthworms. The physico-chemical parameters like electrical conductivity (E.C.), organic carbon (Wakley and Black method 1947), nitrogen (Microkjeldhal method), phosphorous (colorimetric method) and potassium (flame photometric method) were analysed once in fifteen days for 60 days. After 60 days the vermicompost recovered was used for seven days plant growth studies of *V. unguiculata*. Germination percentage, shoot length, root length, number of leaves produced, fresh weight and dry weight of the whole plants were analysed.

RESULTS AND DISCUSSION

The results of physico-chemical parameters like pH, EC, OC and N,P,K are given in Table 1. The pH showed a slight decrease with the increase in the number of days. The same has been observed in previous studies also (Karmegam and Daniel 2000-c).

The Electrical conductivity was considerably increased in all the treatments. This shows that the soluble salts have increased by the action of earthworms. The earthworms convert the unavailable form of nutrients into available forms and it is also due to the presence of more exchangeable calcium, magnesium and potassium in the worm worked substrates. (Bhatnagar and Palta, 1996 and Daniel and Karmegam, 1999).

The percentage of carbon have decreased in all the treatments because of the action of earthworms. Reduction in organic carbon content was attributed to the release of carbon dioxide during the composting process (Borkar *et al.*, 1991).

The weight loss due to carbon release might have contributed to the increase in NPK contents of the compost (Kiruba, 1996) *V. unguiculata* seeds showed higher percentage of germination efficiency and vigour index in treatment.I (ie) the compost prepared using *E.fetida* than in treatment II (*E. eugeniea* treatment) and in the control. The observation made on the 7 day growth of *V. unguiculata* such as the root length (14.1±1.08 cm), the shoot length (44.1±2.45 cm), no of leaves (10.8±1.43g), fresh weight (3.32±0.40g), and dry weight (2.49±0.84g), showed an increase in Treatment - I, when compared to Treatment II and the control.

The effect of vermicomposts on the growth and production of crops such as rice and legume cropping, rye grass, wheat and barley seeds has been reported by several authors (Daniel *et al.,* 1999). The study shows that application of vermicompost improves seed germination as well as plant growth. Vermicompost is known to carry several microorganisms and some of them are plant growth regulators. Addition of vermicompost in the present study could have enhanced the growth of *V. unguiculata* by such growth promoter, in addition to the manorial value of the vermicompost.

There is scope to mix Biofertilizers such as *Rhizobium* and phosphate solubilizing

Table 1. Physico-chemical characteristics of worm-un-worked and worm-worked composts from 0-60 days

Day	Treatment	EC	pH	C (%)	N (%)	P (%)	K (%)
0	Control	1.42	7.53	45.29	1.30	0.80	0.50
	Treatment I	1.42	7.53	45.28	1.30	0.80	0.50
	Treatment II	1.42	7.53	45.28	1.30	0.80	0.50
15	Control	1.45	7.52	45.01	1.33	0.82	0.50
	Treatment I	1.70	7.42	43.11	1.37	0.87	0.55
	Treatment II	1.60	7.49	44.21	1.35	0.86	0.53
30	Control	1.57	7.45	43.55	1.35	0.85	0.55
	Treatment I	1.90	7.30	38.53	1.45	0.94	0.62
	Treatment II	1.85	7.32	39.71	1.42	0.92	0.61
45	Control	1.48	7.44	40.93	1.37	0.88	0.58
	Treatment I	2.00	7.28	35.21	1.51	1.03	0.71
	Treatment II	1.92	7.31	37.00	1.47	1.00	0.68
60	Control	1.49	7.43	39.23	1.39	1.00	0.59
	Treatment I	1.98	7.27	33.08	1.53	1.08	0.76
	Treatment II	1.95	7.30	35.65	1.49	1.05	0.72

Control-*C.auriculata* + *L. leucocephala* + cowdung
T1 - *C.auriculata* + *L. leucocephala* + cowdung + *E.fetida*
T2 - *C.auriculata* + *L. leucocephala* + cowdung + *E.eugeniea*

Table 2. Seven day plant growth studies of *Vigna unguiculata*

S. No	Treatment	Germination (%)	Shoot length (cm)	Root length (cm)	No. of leaves	Fresh weight (g)	Dry weight (g)
1.	Control	60	04.30±1.35	1.41±1.43	1.3±1.77	0.36±0.35	0.03±0.01
2.	*C.a*+*L.l*+CD+*E.f* (Treatment I)	100	12.71±1.62	2.5±2.87	4.6±1.14	0.86±0.23	0.06±0.02
3.	*C.a*+*L.l*+CD+*E.e* (Treatment II)	100	11.96±0.68	2.3±2.93	4.5±1.16	0.82±0.31	0.05±0.01

C.a - *Cassia auriculata;*
E.f - *Eisenia fetida;*
CD - Cow dung
L.l - *Leucaena leucocephala*
E. e - *Eudrilus eugeniae*

microbes to vermicompost to improve its fertilizing value (Manivannan & Daniel 2007). More detailed studies are needed in the field of earthworm microbial interaction on production of plant growth regulators and other microbes of fertilizer value.

REFERENCES

1. Parathasarathi, K and Ranganathan, L.S., Pressmud vermicomposting casts are hot spots of fungi and bacteria. *Ecol.Envi.* and cons 1998; **4**(3): 81-86.
2. Maity, S.K and Joy, V.C., Soil microorthropod feeding effect on non – nutrient chemical of decomposting leaf litter.*Indian J.Environ and Ecoplan*., 1999; **2**(3): 225-231.
3. Karmegam, N.and Daniel, T., a. Decomposition of leaf litters using the composts earthworm, Eisenia fetida. *Indian J. Environ. And Eco.plan* 2000; **3**(1): 111-116.
4. Manivannan.N and Thilagavathy Daniel., Organic waste recycling using Eudrilus eugeniae. *Environment and Ecology* 2008; **26**(2): 557-559.
5. Gajalakshmi, S.and Abbasi,S.A., A Effect of the application of water hyacinth compost

vermicompost on the growth and flowering of crossandra undulaflolia, and an several vegetables. *Bioresouece Technology*.2004; **85**: 197-199.

6. Karmegam.N. and Thilagavathy Daniel , A Effect of vermicompost and chemical fertilizer on growth and yield of Hyacinth Bean, *Lablab purpureus* (L.) Sweet. Dynamic soil, Dynamic plant 2008; **2**(2): 77-81.
7. Walkley, A., Black, I.A., Chromic acid titration for determination of soil organic matter. *Soil Sci.* 1934; **63**: 251.
8. Karmegam.N. and Thilagavathy Daniel, c. Decomposition of leaf litters using the compost worm Eisenia fetida. *Indian J.environ and Ecoplan.,* 2000; **3**(1): 111-116.
9. Bhatnagar, R. K. and Palta, R.K., Earthworm, Vermiculture and Vermicomposting Kalyani publisher, Ludhiana 1996; 106.
10. Thilagavathy Daniel and Karmegam.N, Bioconversion of selected leaf litters using an African Epigeic Earthworm, Eudrilus eugeniae. *Ecol.Env. & cons.* 1999; **5**(3): 271-275.
11. Borkar, D. K., Dashmaskh,E.B. and BHOYAR, V.K., Manurial value of FYM and compost as influenced by raw materials used methods and period of decomposition. In:Eco-Friendly biocomposting and recycling of sugarcane trash. (Eds) Jothimani, (P., Selseelan, D.A., and Bhaskaran, A., *Indian J. Environ. and Ecoplan* 1991; **6**(2); 399-404.
12. Kiruba. M.C., Recycling of poultry dropping manure . In :Eco- friendly biocomposting and recycling of sugarcane trash. (Eds).Jothimani, (P.,Selseelan,D.A., and Bhaskaran, A. *Indian Jou. Environ. And Ecoplan* 1996; **6**(2); 399-404.
13. Thilagavathy Daniel and Karmegam.N and Alagumalai.K, Vermiculture- approach for sustainable agriculture. *Journal of Extension & Research,* 1999; **1**(2): 16-23.
14. Manivannan. N and Thilagavathy Daniel., Isolation and mass multiplication of Rhizobium sp. For nitrogen enrichment of vermicompost. *J. Pure and Appl. Microbiol.* 2007; **1**(2): 251-254.