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BIOCONVERSION OF VERMICOMPOSTED WEED PLANTS WASTE USING *EUDRILUS EUGENIAE* KINBERG FOR PROMOTING THE GROWTH OF BRINJAL (*SOLANUM MELONGENA*)

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ABSTRACT

Present study deals with the bioconversion of vermicomposted weed plants waste using *Eudrilus eugeniae* Kinberg for promoting the growth of Brinjal (*Solanum melongena*) preparation of weed plants waste vermicompost and its physico chemical parameters were analyzed, enumeration of microorganisms bacteria, fungi and actinomyces from vermicompost, preparation of vermiwash and vermicompost extract and its physico chemical parameters were analyzed, growth parameters and biochemical characteristics also studied of Brinjal. The weed plants waste vermicompost was studied the physico chemical parameters like pH, temperature, electrical conductivity, organic carbon, total nitrogen, total phosphorous, total potassium and C:N (ratio) were studied. The number of colony forming unit of the vermicompost of Bacteria, Fungi and Actinomyces. After preparation of vermicompost, vermiwash and vermicompost extract was prepared using after 45 days worked healthy earthworm. The Physico chemical parameters of vermiwash and vermicompost extract also studied. The growth parameters like seed germination, shoot length, root length, total fresh weight, total dry weight, leaf area index and vigour index were studied and biochemical characteristics such as chlorophyll a and b, total chlorophyll, carotenoide and anthocyanin were estimated. Based on the results growth parameters and biochemical characteristics were higher in Brinjal treatments 5 and 6 using various concentration of vermicompost, vermiwash and vermicompost extract.

INTRODUCTION

Agriculture plays a major role in Indian economy most of Indian population reside in rural areas and are directly or indirectly dependent on agriculture. Weeds are plants that grow on the cultivation of maize whose presence can reduce the production of corn. Weeds that grow in the cultivation of maize derived from the seeds of weeds in the soil. Certain weed species is a competitor of the corn crop in getting water, nutrients, and light. Level of competition between crops and weeds depends on four factors, namely stages of plant growth, weed density, water stress and nutrient levels, as well as weed species. *Parthenium hysterophorus*, *Cassia tora, Ipomoea carnea Jacq.* etc. are the major invaded weeds. Biomass of the weed is reported to have higher nutrient contents, which adds humus to soil on decomposition and degradation (Saravanane *et al.,* 2008). Several methods have been developed to convert agricultural wastes into organic manure to replace inorganic fertilizers. But recently, interest has been shown in the development of eco friendly novel processes, which are based upon the utilization of biological systems (Hemalatha, 2013). In India, about 320 million tones of agricultural waste are generated annually of which weeds and vegetable wastes are in major proportion (Shrivastava and Singh, 2013). Organic composting is an ancient agricultural manure producing technique, from last century vermiculture for producing a better manure or compost called vermicompost developed by agriculturist is now being expanded a new branch in agriculture, termed as organic Farming (Ndegwa and Thompson, 2001; Amir and Fouzia, 2011). During vermicomposting the nutrients are released and converted into soluble and available forms that is providing nutrients such as available N, soluble K, exchangeable Ca, Mg, P and microelements such as Fe, Mo, Zn, and Cu which can easily taken up by plants (Edwards 1988; Bansal and Kapoor 2000; Gunadi *et al*. 2002). This work related to the preparation of predecompost with vermicompost, preparation of vermiwash and vermicompost extract, physico chemical parameters of

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vermicompost, vermiwash, and vermicompost extract, enumeration of microorganisms (bacteria, fungi and actinomyces), growth parameters and biochemical characteristics of brinjal (*Solanum melongena*) is totally wanting. Hence the present study was carried out.

MATERIALS AND METHODS

Weed plants are collected and cut into small pieces and dried under shade condition. To this weed plants add cow dung in the ratio of 1:3 (1 kg of weed plants and 3 kg of cow dung). This set up was kept for predecomposition in tank [40 cm height × 55 cm diameter size] for 30 days. Water was regularly sprinkled and the substrate was regularly turned for 30 days, for preparing the vermicompost, the predecomposition was directly mixed with cow dung in 1:2 (1 kg of predecompost and 2 kg of cow dung) ratio on dry weight basis in same tank. The substrates were hold 60-80 percentage of moisture content and kept for 24 hrs stabilization. Seventy number of healthy, clitellate Earth worm *Eudrilus eugeniae* kingberg were introduced in the same tank. After 45th day, the trial tank compost were sieved and collected for weed plants waste vermicompost. The vermicompost extracts were analyzed for various physico chemical parameters such as pH, electric conductivity, total nitrogen, total phosphorous and total potassium using standard procedures (Mane and Raskar Smitha (2012).

The enumeration of microorganisms such as bacteria, fungi and actinomycetes using standard plate count method (Chitrapriya *et al.,* 2013). The vermiwash and vermicompost extract were prepared using standard procedures (Gurav and Pathade 2011). The vermiwash and vermicompost extract were analyzed for various physico chemical parameter such as pH, electrical conductivity, total nitrogen, total phosphorous and total potassium using standard procedures Avinish and Joshi (2010). Pot culture study was carried out for growth parameters were observed and biochemical characteristics were analyzed for 30 days and 60days intervals of pot culture study of Brinjal.

RESULTS AND DISCUSSION

The physico chemical parameters of vermicompost was given Table 1. The weed plants waste vermicompost was studied the physico chemical parameters such as pH was 7.2, temperature was 28^0C, electrical conductivity (ds/m) was $37x10^2$, organic carbon was 45.04 %, total nitrogen was 2.15%, total phosphorous was 2.45%, total potassium was 1.24% and C: N (ratio) was 22.5%. Mane and Raskar Smitha (2012) reported that the physico chemical parameters of vermicompost from agricultural wastes using *Eudrilus eugeniae* kingberg and *Eisenia foetida* such as pH was 8.0, electrical conductivity (ds/m) was $3.44x10^2$, organic carbon was 19.7 %, total nitrogen was 0.95%, total phosphorous was 0.8%, total potassium was 0.8% and C:N ratio was 20.40%. Avnish and Joshi (2010) reported that the physico chemical parameters of vermicompost from some toxic and dangerous weed wastes using *Eisenia foetida*. Gandhi and Sivagama Sundari (2012) studied that the physico chemical parameters of vermicompost from aquatic weed with cow dung using *Eudrilus eugeniae* such as the pH was 6.6, electrical conductivity was $1.76x10^2$, organic carbon was 12.40%, total nitrogen was 0.62%, total phosphorous was 0.50%, total potassium was 0.54% and C: N (ratio) was 20:23. After preparation of vermicompost, microorganisms (bacteria, fungi and actinomyces) were enumerated and it was given Table 2.

Table 1. Physico chemical parameters of weed plants waste vermicompost

S.NO	Parameters	At 45 Days
1	pH	7.2
2	Temperature (^{0}C)	28^0C
3	Electrical conductivity (ds/m)	$37x10^2$
4	Organic Carbon (%)	45.04
5	Total Nitrogen (%)	2.15
6	Total Phosphorous (%)	2.45
7	Total Potassium (%)	1.24
8	C: N (%)	22.5

The number of colony forming unit of the vermicompost of bacteria was 185 x 10^6, fungi was 15 x 10^3 and actinomyces

Table 2. Enumeration of microbial populations of weed plants waste vermicompost

S.NO	Microorganisms	No of Colony forming units (CFU) of Commercial vermicompost	No of Colony forming units (CFU) of Weed plants waste vermicompost
1	Bacteria	$60x10^6$	$185x10^6$
2	Fungi	$9x10^3$	$15x10^3$
3	Actinomyces	$103x10^4$	$207x10^4$

Table 3. Physico chemical parameters of *Eudrilus eugeniae* kingberg vermiwash and vermicompost extract

S.NO	Parameters	Vermiwash	Vermicompost extract
1	pH	7.2	7.4
2	Temperature (^{0}C)	30^0 C	29^0 C
3	Electrical conductivity (ds/m)	$12x10^2$	$10x10^2$
4	Organic Carbon (%)	48.99	48.20
5	Total Nitrogen (%)	2.65	2.38
6	Total Phosphorous (%)	2.15	1.95
7	Total Potassium (%)	2.05	2.12
8	C: N (%)	18.48	22.73

was 207 x 10^4 and compare to the commercial vermicompost, The number of colony forming unit of the commercial vermicompost of bacteria was 60 x 10^6, fungi was 9 x 10^3 and actinomyces was 103 x 10^4. Nagavallmma *et al.,* (2006) reported that the enumeration of microorganisms from organic waste vermicompost such as the number of colony forming unit of bacteria was 54 x 10^6, fungi was 8 x 10^4 and actinomyces was 1 x 10^4.

Table 4. The growth parameters of Brinjal

Growth parameters	T0	T1	T2	T3	T4	T5	T6
Germination efficiency	57	73	77	79	98	97	100
Shoot length	4.9±0.2	4.9±0.2	6.3±0.3	6.2±0.3	6.7±0.4	7.9±0.4	7.2±0.4
Root length	5.3±0.2	6.9±0.4	6.8±0.3	7.0±0.6	7.1±0.7	7.7±0.2	9.2±0.8
Total fresh weight	5.4±0.2	4.3±0.2	5.6±0.2	6. 1±0.3	6.4±0.2	6.6±0.4	6.5±0.2
Total dry weight	1.3±0.2	1.6±0.1	1.7±0.1	1.9±0.1	2.1±0.1	2.2±0.1	2.3±0.1
Vigour index	580	862	990	1036	1106	1160	1172

Table 5. The biochemical characteristics of Brinjal

Biochemical characteristics	T0	T1	T2	T3	T4	T5	T6
Chlorophyll (a)	0.8±0.1	0.6±0.2	0.5±0.1	0.6±0.1	1.1±0.3	1.7±0.5	2.9±0.1
Chlorophyll (b)	0.6±0.1	0.5±0.2	0.6±0.5	1.2±0.3	1.8±0.2	5.5±0.1	2.8±0.1
Total Chlorophyll	1.4±0.3	1.1±0.4	1.1±1.4	1.8±0.2	2.9±0.5	7.2±0.5	5.7±0.1
Carotenoide	4.8±0.7	3.1±0.2	2.9±0.2	3.8±0.6	4.6±1.8	11.4±0.4	14.7±0.3
Anthocyanin	0.05	0.08	0.09	0.10	0.11	0.23	0.24

Vermiwash and vermicompost extract was prepared using after 45 days worked healthy earthworm. The physico chemical parameters of vermiwash and vermicompost extract was given table 3. The pH of the vermiwash was 7.2, temperature was 30^0C, electrical conductivity (ds//m) was $12x10^2$, organic carbon was 48.99 %, total nitrogen was 2.65%, total phosphorous was 2.15%, total potassium was 2.05% and C: N (Ratio) was 18.48% and pH of the vermicompost extract was 7.4, temperature was 29^0C, electrical conductivity (ds//m) was $10x10^2$, organic carbon was 48.20 %, total nitrogen was 2.38%, total phosphorous was 1.95%, total potassium was 2.12% and C: N (Ratio) was 22.73%. Sundararasu and Jeyasankar (2014) reported that the physico chemical parameters of vermiwash such as pH was 8.99, electrical conductivity (ds//m) was 1.02, organic carbon was 0.63 %, total nitrogen was 50.6 (kg ha^{-1}), total phosphorous was 7.13 (kg ha^{-1}) and total potassium was 33 (kg ha^{-1}). Jayanthi and Jayanthi (2013) physico chemical parameters of vermiwash such as total nitrogen was 1.94%, total phosphorous was 3.40% and total potassium was 0.96%.

Vermicompost, vermiwash and vermicompost extract was using various concentrations of pot culture studies. The growth parameters of Brinjal was given Table 4. The germination efficiency of brinjal (*Solanum melongena*) was higher in T_6 (100%) and lower in T_0 (57%), the shoot length was higher in T_5 (7.9 cm) and lower in T_0 (4.9 cm). The root length was higher in T_5 (9.2 cm) and lower in T_0 (5.3 cm), the total fresh weight was higher in T_6 (6.6 g) and lower in T_1 (4.3g), the total dry weight was higher in T_6 (2.3 g) and lower in T_1 (1.3g), the vigour index of the brinjal was higher in T_6 (1712 cm^2) and lower in T_0 (580 cm^2) for 60 days intervals of pot culture study. Mamta *et al.,* (2012) reported that the growth parameters of brinjal (*Solanum melongena*) such as plant height, no of leaves, leaf length and leaf width. Jayanair *et al.,* (2006) also reported the growth parameters of bendi plant using various concentration of agri wastes vermicompost. The biochemical characteristics of Brinjal was given Table 5. During the growth of brinjal (*Solanum melongena*), the biochemical parameters such as chlorophyll a, was higher in T_6 (2.9) and lower in T_2 (0.5), the chlorophyll b was higher in T_5 (5.4) and lower in T_1 (0.4), the total chlorophyll was higher in T_6 (2.9) and lower in T_1 (5.4), the carotenoids was higher in T_6 (14.7) and lower in T_2 (2.9) and anthocyanin was higher in T_6 (0.24) and lower in T_0 (0.05) for 60 days intervals of pot culture study. Kamal *et al.*, (2013) reported that the biochemical characteristics of brinjal (*Solanum melongena*) chlorophyll a (1.2 mg/g), chlorophyll b (1.9 mg/g), carotenoids (11 mg/g), anthocyanin (2.7 mg/g). Mohamad Oma Albasha *et al.,* (2015) also reported the biochemical characteristics of brinjal plant such as chlorophyll a and b, total chlorophyll, carotenoid and anthocyanin were estimated.

Conclusions

The present study was concluded that the earthworm *Eudrilus eugeniae* kingberg is more efficient in bioconversion of weed plants wastes vermicompost, vermiwash and vermicompost extract were using various concentration of pot culture study of Brinjal (60 days) was higher in growth parameters and it is acts as an excellent base for the establishment and multiplication of beneficial and symbiotic microbes. It being a natural means of soil fertility management strategy for sustainable agriculture.

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