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Earthworm Processed Weeds on Plant Growth Attributes

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Abstract

Weed biomass is one of the potential sources of organic matter and nutrients if perfectly utilized. In recent years increased emphasis has been produced globally for integrated use of biofertilizers and organic manures. Weeds are the constraints in successful crop production. Similarly, most of the dicot weeds are also used as medicine, vegetables, feed, and fuel and for compost making. In the (Ipomea carne, Jatropha curcas, Datura inoxia and Calotopis gigantea) and evaluated for their nutrient status of vermicomposts. The result revealed that the nutrient status, maximum plant growth and yield was higher in the nitrogen, potassium, phosphorus (NPK) value for the following vermicomposts Ipomea carnea (2.49,0.8,0.15) Jatropha curcas (1.23,0.1,0.10) Datura inoxia (1.4,0.7,0.3) and Calotropis gigantea (1.7,0.1,0.63) compared with control. Hence, it was terminate that the aforesaid vermicomposts are higher nutrients and higher yielding in Ipomea carnea and Jatropha curcas vermicomposts. Thus, the weeds are not waste, to be approach the formers.

Keywords: Vermicomposts*, Ipomea carnea, Jatropha Curcas, Datura inoxia, Calotropis gigantea,* nutrient level, *solanum melonginea.*

Introduction

Vermicomposting is an uncomplicated biotechnological progress of soil contitionering, in which convinced species of earthworms are used to intensify the practice of waste reclamation and production a superior edge profit. Vermicomposting technology has been solved many problems[1]. Earthworms have been known as farmer's friends for long[2]. Vermicompost technology is converting all biodegradable waste into plant nutrient rich organic manure[3] with the help of composting[4]. An resolve is unravel in vermiculture studies for vermicomposting of various biological waste by waste feeder earthworms into a nutrious organic fertilizer and using them for manufacturing of synthetic-free secure feed, both in capacity and condition without remedy to agro-chemicals. Weeds are not the unwanted plants, but valuable resources[5] and available free of cost, growing without cultivation, irrigation and protecting the soil by giving of a warmer soil cover. A farmer can produce his own vermicompost from the biodegradable waste like weeds, generated in his own farm[6] and need not spend extra money to purchase the raw material of vermicomposts[7]. Potency of *Jatropha, Annona and Parthenium* vermiwash was exposed to inhibit *M. phaseolina*, *Sclerotium rolfsii* and FOC[8]. Economic utilization of these bio-resources through vemicompost production helps in reclaiming of biological waste and reduces the manufacturing cost of the field crops for rural development, by minimizing the use of costly chemical fertilizers. During the process of Vermicomposts, the valuable plant nutritive viz. nitrogen, potassium, phosphorus and calcium present in fodder substances are changed into forms that are much more dissolved and accessible to plants than those in the procreator synthesis[9-11]. Hence, in the present investigation, earthworm processed weeds on plant growth attributes was studied.

Material and Methods

Collection of leaf litters: The leaf litter was collected from in and around agricultural areas of vaigai, Periyakulam Taluk, Theni district. The collected weeds (*Ipomoea carnea, Jatropha curcas, Calotropis gigantea, Datura inoxia)* were dried and authorized to fractional waste for 10-15 days. Then the waste was mixed with cow dung

Collection and culturing of earthworm: The present investigation has been carried out in the laboratory for a period of six months from June 2014-November 2014. The experimental animal (*Perionyx excavatus*) was collected from variuos agricultural fields in and around Periyakulam Taluk, Theni District. The earthworm was carefully collected and transported to the laboratory along with their native soil in a plastic container. The plastic container was provided with small holes can be used for aeration. The earthworms were acclimatized to the laboratory conditions for a period of 15 days before the commencement of the experiment.

Preparation of vermicomposts: Leaf litter, and cow dung was mixed with standard bedding material and introduced into standard plastic tubs occupying about 3kg of the materials. Each pre decomposed substrates were mixed with cow-dung in 3:1 ratio on dry weight basis in separate plastic tub dimension is 51x31x26cm. Vermicomposting was carried out in an environmentally controlled experimental chamber at a temperature of 27°C and the vermin beds were maintained to contain a moisture level of 65-75% by sprinkling water over the surface daily. Each tub containing vermin bed substrate was introduced with 20 adult epigeic species of earthworm. *Perionyx excavatus* were inoculated manually in selected bedding materials in plastic tubs. The culture tubs were placed inside the lab. The upper surface of bedding material was covered with black polythene sheet to avoid threshold of other insects.

Nutrient analysis of weeds vermicomposts: The leaf litter vermicomposts was harvested from vermin bed and dehydrated, using of nutrient analysis. The pH and Electrical conductivity were persistent by the method of Jackson ML[12] in distilled water solution. The decision of organic carbon was carried out as per the procedure of Walkley and Black[13] Nitrogen, Phosphorus, Potassium, Calcium, Carbon and Magnesium were persistent as proclaimed by standard methods as described by Tandon H.Z.[14]. Leaf chlorophyll content was estimated following[15].

Pot culture studies with worm processed leaf litter: Pots with two kg of garden soil were used for pot culture preliminary studies. Common vegetable, plant: *Solanum melongena* was preferred and used to study the effect of vermicomposts on the enhancement of plant growth. The experiment was performed for two months and in triplicates. In the experimental pots different vermicompost was added and control pots were maintained without vermicomposts. In each pot healthy sapling of brinjal was planted. The pots were watered each second day. The extent of plant growth, number of flowers, and number of fruits were studied.

Statistical analysis: ANOVA was performed, using SPSS version 17.0, to assess the contrast in vermicompost making in different treatments and also to compare the mean values of the different chemical criterion of the compost (control) and vermicompost initiate in the various treatments[16] ($P<0.05$).

Results and Discussion

Utilization of vermicompost processed from the herbal plants not only use crop plants as it case valuable microorganisms, that aid the plants to assemble and promote nutrients, but also improve plant growth and prohibits many plant pathogenic microorganisms[17-20]. In the present investigation, a comparative study was made on the effect of worm processed leaf litters, and physicochemical parameters viz. pH, Electrical conductivity, Nitrogen, Potassium, Phosphorus, Calcium, Magnesium, and Organic Carbon were analyzed and tested on plants.

Physicochemical analysis of vermicompost: The high level of electrical conductivity of vermicomposts on the 60th day of processing by *Perionyx excavatus* was noted and compared with control *(Calotropis gigantea 0.3%> Ipomea carnea 0.12% >Datura inoxia 0.22% >Jatropha curcas* 0.33%). The pH of vermicompost was observed to be significantly raised and arrived the maximum on 60th day. The level of pH of vermicomposts was noted in the descending order as follows: *Jatropha curcas> Ipomea carnea> Datura inoxia > Calotropis gigantea* and then compared with control.

Chlorophyll content: Chlorophyll is called as an essential pigment because it converts light energy into chemical energy. This is necessary for various life processes in plants 1.9, 2.1, 1.5, 0.5 mg g^{-1}. The chlorophyll content was higher in *Jatropha curcas* (1.9 mg/g), *Ipomea carnea* (1.9 mg/g), *Datura inoxia* (2.1 mg/g) and *Calotrophis gingantea* (1.5mg/ g) compared with control (0.5 mg/g). These terminations are related to the previous findings[21].

Nutrient analysis of vermicompost: The Total Kjeldhal Nitrogen (TKN) was detected in 60th day of decay progress in the experimental and control bedding but statistically significant difference was reported in vermicomposts ($p\leq0.05$). Compared to the control, the total TKN was higher in *Ipomea carnea* (2.49%) vermicomposts treated by *Perionyx excavatus* and lower in *Calotrophis gingantea* (1.7%), *Datura inoxia* (1.4%), *Jatropha carcus* (1.3%). A substantial rise of total nitrogen in vermicompost obtained from a few burden weeds such as congress grass (*pathenium crasssipes*) and bhang (*cannabis sativa Linn*.) was reported[22] revolutionary ascend in Total Nitrogen was noted in vermicomposting ash[23]. The phosphorus level was noted in vermicomposts of *I.carnea* (0.8%), *D.inoxia* (0.7%), *C.gingantea* (0.1%) and *J.carcus* (0.1%) compared with control. The large amount of Total Phosphorus in experiment investigation than control was found in vermicomposts from environmentally unfriendly weeds[22]. This is in concordance with the statement that when the natural residual proceeded across the gut of earthworms, the unobtainable rise of phosphorus in the natural substance is changed to applicable forms for plants[24].

The level of potassium was analysed and found to be higher in *I.carnea* (16.1ppm), *D.inoxia* (4.6ppm), *J.carcus* (13.4ppm), *C.gingantea* (6.5ppm), and were found to be lesser in control.[25] This is supported by the fact in order that the leacheates gathering throughout vermicomposting method had higher potassium concentration[24]. The carbon level was lesser in *I.carnea* (20%), *J.carcus* (22%), *D.inoxia (38.6%)* and *C.gigantea (15.3%)* when compared with control. The level of total carbon appeared negative correlation with vermicomposts in various precedent findings[26]. This is again supported by a finding that there is a significant reduction in total organic carbon noted in the vermicomposted Parthenium plant than in non vermicomposted parthenium[27]. The magnesium content was found to be higher in vermicomposts from *C.gigantea (*67.3%), *J.carcus* (60.3), *D.inoxia* (52.33%) and *I.carnea* (45.6%) when compared with control. The chloride level was lesser in *J.carcus* (2.03%), *D.inoxia* (0.40%), *C.gingantea* (0.26%), and *I.carnea* (0.16%) compared with control. The calcium content was found to be higher in *J.carcus* (16.6%), *C.gingantea* (28.4%) *I.carnea* (28.6%) and *D.inoxia* (22.36%) compared with control. Two ways anova variation was calculated between the parameters of the nutrient content of the vermicomposts raised from different substrate and the growth and yield of the plant. It was found that very significant difference in the *** (P<0.001). In the nutrient contented of the vermicomposts and their impact on plant growth and yield.

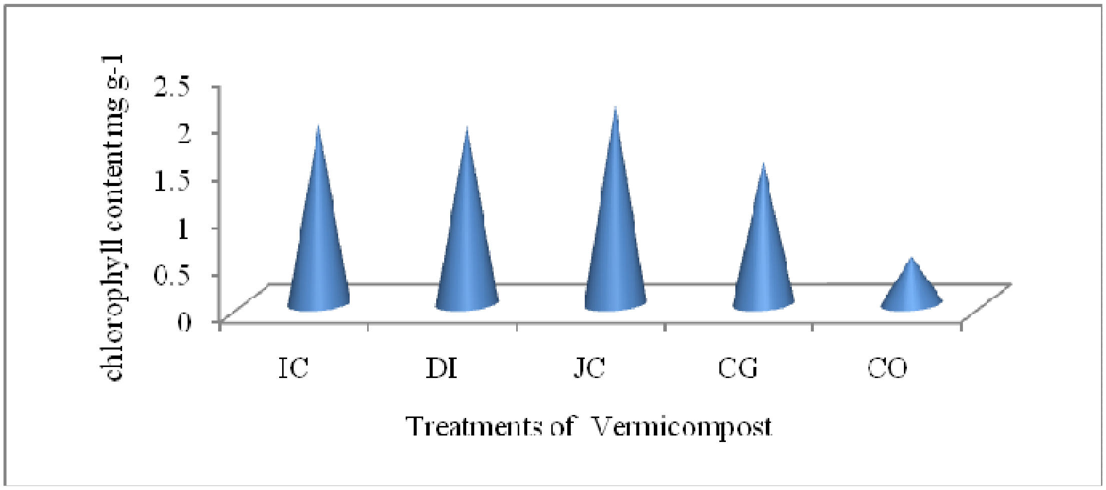

Figure-1
Impact of vermicomposts on chlorophyll content of plants

Table-1
Chemical characterization of different leaf litters of vermicomposts

Vermicomposts	Ec	pH	N%	P%	K ppm	C%	Meg%	Cl%	Ca%
Calotropis	0.3	6.8	1.7	0.1	4.3	15.3	67.3	0.26	128
Datura	0.22	6.8	1.4	0.7	1.9	48.6	52.33	0.46	116.6
Jatropha	0.33	7	1.23	0.1	11.5	22	60.3	2.03	223.6
Ipomea	0.12	6.8	2.49	0.8	14.02	220	45.6	0.16	128
Control	0.02	7	1.3	0.01	6.1	246.6	35.3	3.62	100.6

Figure-2
Impact of vermicomposts on growth and yield attributes of S*olanum melong*ena - Pot culture

Table-2
Impact of vermicomposts in the growth of the plant *(solanum melongena)*

Name of the vermicompost	Egg plant growth (in cm)				Number and weight of fruits	
	15th	30th	45th	60th	Number	Weight in gm
Ipomea carnea	11.6±2.38	15.6±3.14	22.4±5.9	26.8±5.7	3±0.81	22.5±.1.7
Jatropha curcas	8.6±0.62	13.3±0.49	17.0±1.8	20.3±1.9	2.3±0.47	19.4±0.9
Datura	7.3±0.47	9.4±0.7	13.1±1.3	16±1.65	1.6±0.47	14.1±2.5
Calotrophis	5.0±0.04	7.4±0.40	10.6±0.37	13.7±0.9	1.3±0.47	14.1±1.7
Control	4.7±0.49	7.06±0.09	9.7±0.50	13.1±1.08	1.3±0.47	13.0±1.6

The experimental plant (*Solanum melongena*) showed good results of growth in terms of height of the plant, and the number of fruits compared with control (table-2). The heights of the experimental and control plants were recorded on the 30th, 45th and 60th day and the number of fruits were recorded on the 60th day. The flowering persisted in the experiment right from 30th, 45th and 60th day of the experiment.

The fruit was observed from 45th to 60th day in *Ipomea carnea* vermicompost and *Jatropha carcus* and was observed later in *datura* and *calotrophis* vermicomposts but in the control flowering was not observed on 30th to 45th day.

This is in concordance with the work[26] that on application of vermicomposts there was a rise in plant height, numeral of tillers and of leaves in wheat plant than control. A significant variance in plant growth *** ($P<0.001$), number of fruit per plant and weight of the fruit *** ($P<0.001$) was found. In the present investigation maximum weight of the fruit and a number of fruit per plant were recorded in plants treated with vermicomposts raised from *Ipomea carnea* and *Jatropha carcus.* This can be concluded that the worm processed leaf litter of *Ipomea cornea* has showed good result in terms of growth and yield, and was less in *Calotropis* and almost equal to control.

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