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UTILIZATION OF VERMICOMPOST OF VEGETABLE WASTE FOR PLANTS GROWTH

ANTONY V SAMROT, VIGNESH V AND VIGNESH MP

Department of Biotechnology, Sathyabama University, Jeppiaar Nagar, Chennai, Tamil Nadu – 600119, India.

ABSTRACT

Vermicomposting is the process of putrefaction of wastes into organic fertilizer by earthworms. Thus obtained ultimate product is enriched with nutrients like carbon, nitrogen and vital minerals. In this study, earthworm - *Eudrilus eugeniae* (African night crawlers) were exploited to degrade the pretreated vegetable wastes. Vegetable wastes were found to be degraded in 60-65 days. Thus acquired vermicompost were used as an organic fertilizer against the plants *Brassica nigra* and *Trigonella foenum-graecum,* influence of vermicompost on plant growth was observed for 20 days. The vermicompost was found to have positive influence on plant growth.

KEYWORDS: ***Eudrilus eugeniae,*** **Plant growth,** ***Brassica nigra*** **and** ***Trigonella foenum- graecum.***

***Corresponding author**

ANTONY V SAMROT
Department of Biotechnology, Sathyabama University, Jeppiaar Nagar, Chennai, Tamil Nadu – 600119, India.

INTRODUCTION

The earthworms have been fortunate to degrade wastes and turn them into a fertilizer which is popularly termed as vermicomposting; thus acquired product is recognized as vermicompost. It is the resourceful technique to renovate the biological wastes (human discarded, kitchen surplus, animal left-over etc.) into a biological fertilizer. Edwards and Burrows [1] reported that vermicompost has an abundant fine structure than outmoded mucks and it is highly saturated with nutrients which are freely available for plants intake. Even vermicompost is rich in both the bacterial components [2] and fungal profusion [3] than the outmoded muck. The optimal temperature for vermicomposting efficiency is 23-25°C with 70-85% moisture. Hypothetically, vermicomposting do not produce odor or stenches if planned appropriately and actions of earthworms can decrease the fermentation procedure which possibly can avoid them from being injured by anaerobic fumes, methane, for instance [4]. Earthworms are used for refining and preserving soil fertility, change of organic waste into a useful fertilizer, for livestock [5] then a bait used for fish [6]. The compost and vermicompost can increase the development of plant species through mycorrhizal colonization, microbial action and also a source of nutrients when it is deputize for instead of soil or while it is supplementary by means of soil [1,7,8,9,10,11,12,13]. In this study, putrefaction of a substrate viz. vegetable waste by earthworm - *Eudrillus eugeniae*, thus acquired vermicompost's end product was intended on different plant for growth.

MATERIALS AND METHODS

Earthworm chosen

Eudrillus eugeniae was obtained from the Government solid waste organization, Perungalathur, Kancheepuram District, Chennai, Tamil Nadu – 601 102, India.

Gathering of waste

Vegetable wastes were collected from vegetable market at around Sholinganallur, Chennai, Tamil Nadu – 600 119, India.

Pretreatment of waste

Vegetable wastes were washed with tap water and dried in direct sunlight for 10-15 days. Thus dried wastes were sliced into small shards to comfort the composting progression. The wastes were assorted with cow dung (dried) (6kg of cow dung/ 6kg of vegetable waste) properly before starting the vermicomposting procedure. Bottom up exchange progression was prepared for first 4-11 days to condense the high temperature (44-50°C) [14] from initial thermophile effects of organic materials despite the fact that decomposing which might injure the earthworms [15] thus the distance of wastes pack were maintained below 25-30cm height [16].

Composting Using E.eugeniae

The vermicomposting bed was prepared in the tank (size of 2*2feet) by layering up of coconut fiber (3.5 cm), small pieces of red brick (5cm), garden soil (2cm) to hold the water and to maintain the moisture, alternative layering of pretreated wastes and dried cow dung was set up in two different tanks and it was sprinkled with water at regular intervals (Fig.1). The earthworms were transferred into the tank one for vermicomposting and another tank was kept as such (without earthworm), which acted as control. Top of the tank was covered with soil or cow dung. 150 earthworms/liter of waste were released into the vermicomposting bed as reported by Chaoui [4]. A tank was also been kept without earthworms for microbial composting and it was taken as untreated in this study.

Mass of E.eugeniae

On preliminary first day around 486 earthworms were been accounted in vegetable treated tank. After the growth period of 45 - 70days the earthworms have been collected and calculated from the treated tanks.

Assortment of vermicompost

Subsequently the precise interval of composting, the tanks were checkered for complete dreadful conditions of wastes by the earthworms to form vermicompost. To gather the vermicompost, the vermicomposting bed was semi dehydrated for 2-4 days for easy isolation from earthworms. The top layer was unglued as fertilizer and the lower portion was separated from the earthworms and the manure.

Exploitation of vermicompost/ compost on plant development

After assemblage of vermicompost, it was applied to the plant species to check their development impact on the plants as follows *Brassica nigra* and *Trigonella foenum-graecum*, these plant seeds were collected from Arumugam Agro Foundation, Tambaram, Chennai - 600045 Tamil Nadu, India. This experimentation was performed for 20 days. Vermicompost or compost were supplementary mixed with the garden soil at numerous ratio (vermicompost/compost: garden soil) (4:1, 3:2, 2:3, 1:4 and 5:0), over-all of 500g of these mixture was packed in each bag. A control was also maintained which added with garden soil alone (0:5). 45 and 15 seeds of *Brassica nigra* and *Trigonella foenum-graecum* respectively were sown in each bag. Rate of sprouting were noted from the 4^{th} day. It was scrutinized frequently and it was irrigated on a regular basis. After germination and followed growth, the plants root and shoot systems were measured. Rate of sprouting was calculated as follows,

$$\text{Rate of germination} = \frac{\text{No.of seeds germinated} \times 100}{\text{No.of seeds sown}}$$

Soil test analysis

The untreated and vermicompost were tested for soil nutrients at Bio Globe Scientific Park, Madipakkam, Chennai-600 091 Tamil Nadu, India.

RESULTS AND DISCUSSION

On or after this study, it has been renowned that earthworms were reproduced massively and the vermicompost has been obtained from the tank after a period of around 60 days, vegetable waste treated tank was found to have 1012 after their consistent growth period. this proves that the condition favors the growth of earthworm. There are more evidence that earthworm to multiply in pretreated waste paper wastes and bagasse wastes [17,18]. *Brassica nigra* and *Trigonella foenum-graecum* was thriving grownup in vermicompost at the ratio of 5:0 and 3:2 respectively, the height of the shoot and root system of *Brassica nigra* was 3.3cm and 7.2cm. Root was well grown as 8.2 cm in *Trigonella foenum-graecum* at 3:2 (Figure 1,2,3 and 4, table 1 and 2). There are more evidences that vermicompost can influence the growth of several plants [17,19, 20]. Getnet and Raja[19] also found vermicompost to influence the growth of *Brassica oleracea.* There was an increase in pH, moisture, alkalinity, water holding capacity, nitrate, magnesium and potassium content in vermicompost (Table 3). Lazcano et al [21] and Samrot et al[17] also found similar results and it is believed that microorganisms action may be the reason for increase in pH and also nitrogen content[22,23,24].

Figure 1
Influence of growth by vermicompost Brassica nigra growth

Vermicompost ***untreated***

Figure 2
Influence of growth by vermicompost Trigonella foenum-graecum growth

Vermicompost ***untreated***

Figure 3
Influence of shoot and root growth of Brassica nigra by vermicompost

Untreated ***vermicompost***

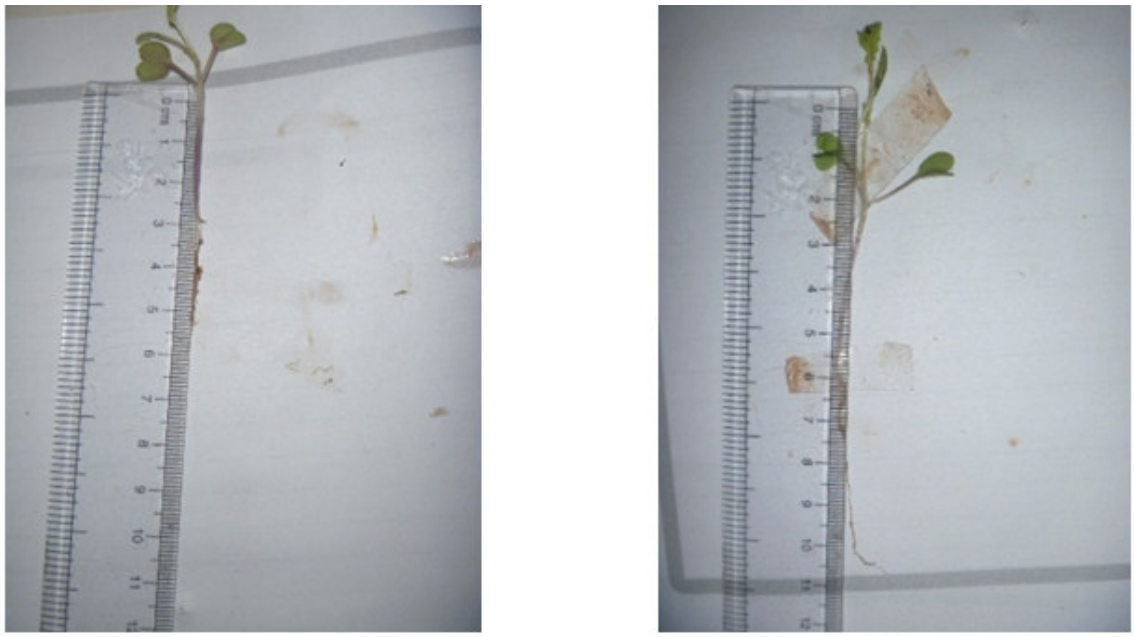

Figure 4
Influence of shoot and root growth of Trigonella foenum-graecum by vermicompost

Untreated ***vermicompost***

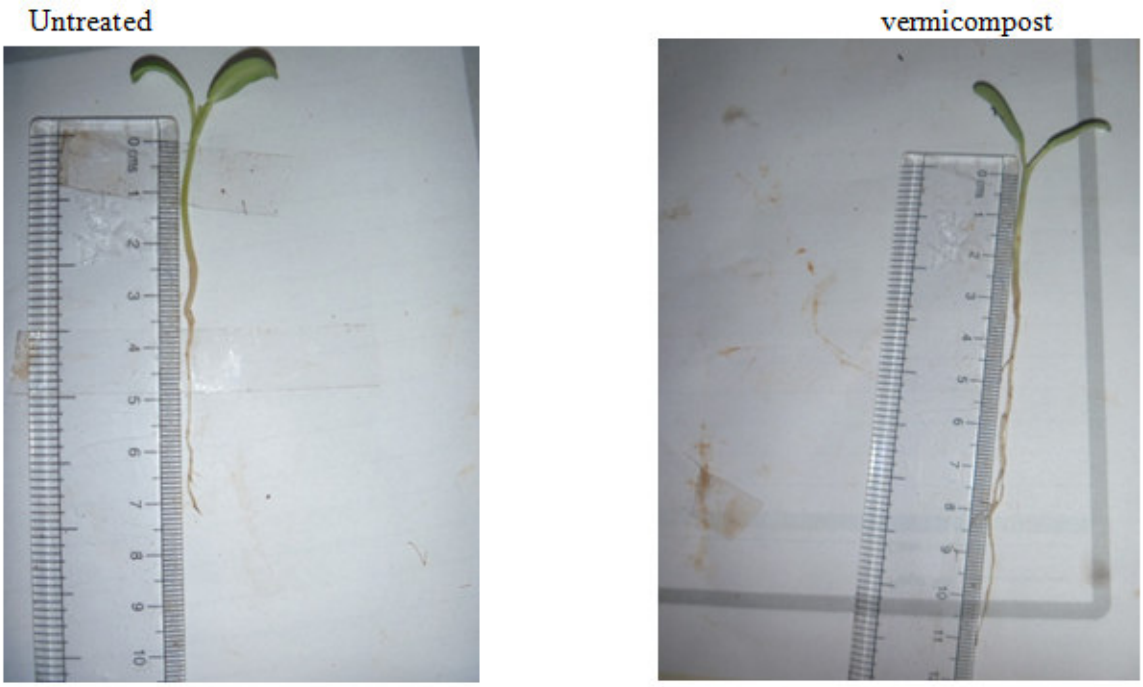

TABLE 1
Influence of vegetable waste vermicompost on Brassica nigra

TOTAL NO. OF SEEDS	RATIO (Compost:soil)	Untreated					Vermicompost				
		% of germination	10th DAY		20th DAY		% of germination	10th DAY		20th DAY	
			Shoot growth (cm)	Root growth (cm)	Shoot growth (cm)	Root growth (cm)		Shoot growth (cm)	Root growth (cm)	Shoot growth (cm)	Root growth (cm)
45	5:0	20	1.8	0.7	3.2	1.5	30	1.9	2.1	3.3	7.2
45	1:4	10	1.3	0.8	3.0	1.2	25	2.1	3.3	3.0	6.2
45	2:3	08	1.0	0.6	2.7	1.1	2	1.12	3.8	3.2	5.6
45	3:2	17	1.2	0.11	2.9	1.3	28	2.4	4.1	3.1	5.9
45	4:1	15	1.4	0.10	2.5	1.4	30	2.0	3.8	3.2	6.3
45	0:5	18	1.2	0.9	2.2	1.1	18	1.2	0.9	2.2	1.1

TABLE 2
Influence of vegetable waste compost/ vermicompost on Trigonella foenum-graecum

TOTAL NO. OF SEEDS	RATIO (compost: soil)	Untreated					vermicompost				
		% of germination	10th DAY		20th DAY		% of germination	10th DAY		20th DAY	
			Shoot growth (cm)	Root growth (cm)	Shoot growth (cm)	Root growth (cm)		Shoot growth (cm)	Root growth (cm)	Shoot growth (cm)	Root growth (cm)
15	0:5	06	1.8	3.0	2.10	3.9	06	1.8	3	2.10	3.9
15	4:1	00	0.0	0.0	0.0	0.0	15	1.0	5.0	0.0	7.0
15	3:2	05	2.0	2.2	3.0	4.2	20	2.1	5.3	3.0	8.2
15	2:3	03	1.9	2.7	2.9	3.9	10	1.7	4.9	2.5	7.1
15	1:4	05	2.1	2.2	3.0	2.8	05	1.5	6.1	2.6	6.9
15	5:0	01	1.8	1.3	2.8	3.1	05	1.3	5.8	2.9	7.4

TABLE 3
soil analysis

S.NO	PARAMETERS	untreated	vermicompost
1	pH	7	7.5
2	Moisture	10%	15%
3	Alkanity(bicarbonate& carbonate) ppm	190	230
4	Water holding capacity	52%	57%
5	Soluble calcium(ppm)	111	190
6	Total heterotropic bacteria (CFU/g)	3.1×10^9	4.7×10^9
7	Chloride	BDR	BDR
8	Nitrate (ppm)	0.1	0.4
9	Potassium (ppm)	0.2	0.8
10	Phosporous (ppm)	0.7	0.9
11	Oil & grease	NIL	NIL
12	Soluble magnesium (ppm)	198	212

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