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Impact of nutrient status of the different organic substrates in the production of vermicompost through earthworm *Eudrilus euginae*

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Abstract
Vermicompost which provide macro and micro nutrients to the plants also reduces environmental pollution by providing valuable substitutes for chemical fertilizers. In the present investigation deals with vermicomposting of seven different organic substrates and evaluation of nutrients in those vermicomposts following two bio-chemical analysis. The seven substrates that include (T_1 parthenium, T_2 vegetable waste, T_3 greenmanure, T_4 banana trash, T_5 waterhayacynth, T_6 paddy straw and T_7 farmwaste and vermicomposting speciese Earthworm *Eudrilus euginae*. The experimental results clearly shows that remarkable changes in nutrients composition of different organic substrates noticed at two time bio-chemical analysis done at 30 days before when the substrate under gone partial decomposition and second analysis at 58- 88th days of vermicompost produced by the earthworm *Eudrilus euginae*. Among the seven organic substrates T_2 vegetable waste recorded as many as ten micronutrients with two heavy metals (Barium and lithium) rest of the treatments (T_1: parthenium, T_3: green manure, T_4:bananatrash, T_5:waterhayacynth, T_6: paddystraw and T_7: farmwaste) lacking with 3-5 micronutrients at first bio-chemical analysis. Similarly at second bio-chemical analysis results of the same seven substrates shows further changes in composition of substrates with pH, EC, C/N ratio, major and micronutrients composition *viz*., N, P, K, Zn and Mg composition. Among the seven substrates T_1 parthenium, T_2 vegetablewaste, T_4 bananatrash and T_5 waterhayacynth recorded highest per cent of major nutrients N, P and K and Quite fluctuating propotions of micronutrients zinc and iron recorded by all the susbstrates used in the experiment.

Keywords: Substrate, vermicopost, parthenium, vegetable, waterhayacynth, greenmanure, *Eudrilus euginae*, nutrients

Introduction
Earthworm *Eudrilus euginae* also called the "African night crawller" is an earth worm species native to tropical west Africa and now wide spread in warm regions used extensively under commercial vermiculture. The growth of individual earthworm increases as the population density lowers, but the greatest over all earth worm biomass production occurs at the highest population density (Blakemore, 2015) [3]. Several methods have been developed to convert agro-waste into organic manure to replace chemical fertilizers. Of these methods, vermicompost is one of the better methods of converting organic waste into nutrient rich manure. Among various earthworm species; *Eisenia foetida*, *Eisenia andrei*, *Eudrilus eugeniae* and *Perionyx excavatus* are reported as the most promising earthworm species used for vermicomposting. They also enhance incorporation and decomposition of organic matter, increase soil aggregate stability, improve porosity and water infiltration, and increase microbial activity. Earthworms are important ecological contributors to the cycling and release of detritus-bound nutrients and act as ameliorators of physical properties of the soil. Cooperating with microbes, earthworms can accelerate the decomposition of organic matter, enhance circulation of carbon, nitrogen, and phosphorus and soil fertility. In addition, these species can be relatively easily maintained at high densities in organic media (in the absence of mineral soil). Once processed, these organic media may also have a commercial value (as a soil amendment). As a result, there has been significant research effort focused on the culture and maintenance of this species, As a result wastes are transformed into useful beneficial bio fertilizers. That can be added to soil to improve the environment for plants and crop (Anwar *et al*., 2015) [1]. Nutritional variability of the substrtaes, days of convertion for vermicompost production of different organic substrates used for vermicomposting.

Purpose of this experiment is to avoid unnecessary wastage of organic substrates to reduce the environment pollution and re use of the waste, reduction in chemical fertilizer use and increase the soil fertility by using vermicompost.

Methodology

The field experiment was carried out at Agricultural Research Station, Gangavati, during the year 2020-21. An experiment was laid out on Randomized Block Design with three replication which included seven treatment combinations with cowdung 20 kg and cowurin 3lit mixed with 100 kg of different organic substrates used for conducting the experiment. Compost pit size of 5^{I}.

Treatments details

Sl. No	Treatment. No	Treatment details
1	T_1	Parthenium 100 kg +cowdung 20kg +cow urine 3lit
2	T_2	Vegetable waste 100kg + cowdung 20kg + cowurine 3 lit
3	T_3	Green manure 100 kg + cowdung 20 kg + cowurine 3 lit
4	T_4	Banana trash 100 kg+ cowdung 20 kg + cow urine 3 lit
5	T_5	Waterhayacynth 100 kg+ cowdung 20 kg + cowurine 3 lit
6	T_6	Paddy straw 100kg +cowdung 20 kg + cowurine 3 litr
7	T_7	Farmwaste 100kg + cowdung 20 kg + cowurine 3 litr

To know the nutrient potentiality of different substrates, two times bio chemical analysis done at pre and post treatment imposition of different organic substrates. Approximately 1kg sample drawn from each substrate, when the substrate undergone partial decomoposition at 15-30 days before treatment imposition and send to Pesticides and food quality residue analysis lab at UAS Raichur campus (PFQRAL). The treatment was imposed when the substrate under gone after partial decomposition. For treatment imposition each substrate is added with 20 kg cowdung, 3 litr of cowurine and Approximately 200 gms of earthworm *Eudrilus euginae* adult is released to each treatment. Second analysis was carried out at the end of the vermicompost produced in between (50-60th day). For under taking post treatment imposition bio-chemical analysis same quantity of the substrate as drawn during first analysis send to Organic farming Research (OFRM) lab at MARS (Main Agricultural Research Station) Raichur. Recovery % of vermicompost calculated by using using the formula mentioned below.

$$\text{Recover \%} = \frac{\text{final weight of the vermicompost}}{\text{Initial weight of the added material}} \text{ X } 100$$

The vermicompost produced from each substrate was then analysed to quantify its nutrient composition and various chemical parameters such as pH, EC (dsm), carbon %, nitrogen %, phosphorus %, potassium %, zinc and Iron were analysed. Later the data's were subjected to derive the useful inferences.

Results and Discussion

To know the chemical composition of various organic substrates used in the experiment at 30 days after partial decomoposition of organic substrates first biochemical analysis done (before treatment imposition) it implies that as many as ten micronutrient (Al, Barium, ca, Co, chro, Fe, K, Lithium, Mg and Mn) traced out among all the seven substrates. Out of ten micronutrients two heavy metals (barium and lithium) also noticed in some of the organic substrates. Barium recorded in five substrates lacking with rest of the remaining substrates such as banana trash and paddy straw, but meagre quantity of lithium recorded only in vegetable waste except this none other substrates have recorded this lithium. According to the biochemical analysis result obtained at partial decomposition stage of different organic substrates vegetable waste found superior by recording almost all ten micronutrients including two heavy metals (barium and lithium) followed by parthenium, greenmanure and farmwaste recorded seven micronutirents, missing with three minerals. Banana trash, waterhayacynth and paddy straw stand in subsequent position by recording six and five mineral composition lacking with four and five minerals at partial decomposition of these substrates at 30 days before treatment imposition.

Conclusion

The results of the seven organic substrates (Parthenium, vegetable waste, green manure, banana trash, water hayacynth, paddy straw and farm waste) were converted into nutritionally rich vermicompost by the earthworm species *Eudrilus euginae* at 57 – 88th day of vermicomposting duration. It can be concluded that among the seven substrates vermicompost produced from Parthenium and vegetable waste found superior stand one after the other followed by bananatrash, paddystraw waterhayacynth, and green manure were on par with each other.

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