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CHARACTERISTICS OF ORGANIC COMPOST ORIGINATED FROM *HARPAPHE HAYDENIANA* (WOOD) AND *EISENIA FOETIDA*

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ABSTRACT
Comparative study was conducted to find out the physical, chemical and physico-chemical properties of compost obtained from Millipede (*Harpaphe haydeniana)* called Milli-compost and that of earthworm (*Eisenia foetieda)* called Vermi-compost. The effect of mechanical breakdown of plant-wastes by a group of millipedes called *Harpaphe haydeniana* was studied in a 'microcosm'. The microcosm contained incubated plant wastes, inoculums, soil and millipedes-*Harpaphe haydeniana.* After two months time significant changes were found in soil of microcosm. Concentrations of Phosphorus (P), Calcium (Ca), Potassium (K), Magnesium (Mg), Nitrogen (N) and Carbon(C) were increased. It was found that concentration of all these plant nutrients were more in Milli-compost as compared to Vermi-compost.

INTRODUCTION
Wastes of plant origin can be degraded to compost by the activity of soil macro – invertebrates like millipedes which are major saprophagous fauna that decompose the plant and leaf litter. Millipedes (*Harpaphe haydeniana)* are arthropods belonging to class Diplopoda .They have around ten thousand species. They are detritivores and eat dead and decaying leaves and other parts of the plants. They excrete decomposed organic matter as fecal pellets. These fecal pellets are called compost (Ashwini & Sridhar, 2002). This compost is beneficial to plants in the similar way as vermi-compost (fecal pellets of Earth Worm-*Eisenia foetieda).*

The outcome of the proposed research activity will result into development of technology that will be used in production of compost of high economic value with the help of millipedes and from wastes of plants. The studies taken up in this regard to compare the quality of millipede compost with Vermi-compost so that the millipede compost can be further improved for use in agriculture.

MATERIALS AND METHODS

(a) Three experiments were conducted. One with millipede (*Harpaphe haydeniana*), another with Earthworm (*Eisenia foetieda*) and third experiment was carried away without Millipede or Earthworm.

(b) Millipedes were cultured in wooden boxes called 'microcosm' of 3'x 4'x 3.5' dimension with 3 inches of soil at the bottom of the box.

(c) Soil, cow dung, vegetable waste, leaves, grass and paddy straw were kept in

all the three boxes. Kitchen waste including vegetable peels, grasses and leaves (6kg), paddy straw (1kg) were added periodically in all the three boxes as feeding material.

(d) About 100 Millipedes (*Harpaphe haydeniana*) were put in first box, 100 Earthworms (*Eisenia foetieda)* were put in the second box.

(e) Third box was cultured as control, without millipede or earthworm.

All the boxes were covered with moist sac and kept under thatched roof. The experiment was carried away for two months, (from June 2008 to August 2008).

Periodically Collected Samples were Classified and Designated as under:

Milli-compost (S_1), Ordinary soil (S_2), Vermi-compost (S_3), Ordinary Compost (S_4)

S1 = soil +cow dung + Vegetable wastes + paddy straw + Millipedes

S2 = soil of the given locality

S3 = soil + cow dung + vegetable wastes + paddy straw + earthworms

S4 = soil + cow dung + vegetable waste

LABORATORY ANALYSIS

(A) PHYSICO CHEMICAL PARAMETERS

(a) **pH** : pH of the soil and organic samples were measured using standard pH meter in 1:2 (soil : water) ratio**.**

(b) **EC:** Electric conductivity of the given samples were measured by conductivity meter (EC machine) in 1:2 (soil: water) ratio.

(c) **Organic Carbon:** O.C. was determined by the titration method (Walkley and Black 1934).

(B) CHEMICAL PARAMETERS

(a) **Nitrogen (N):** Available Nitrogen of the samples were determined by Potassium Permangenate (KMnO4)

Method (Subbiah and Asija, 1956)

(b) **Phosphorus (P):** Phosphorus was determined with the help of 0.5 M Sodium Bicarbonate as extranatent and Ammonium Molybdate for determination with the help of Spectrophotometer (Datta et al. 1962).

(C) **Potassium (K):** Determination of Potassium of the organic samples were done with 1 N Ammonium Acetate solution using Flame Photometer (Hanway and Heidel, 1952)

(D) **Calcium(Ca) & Magnesium (Mg):** Determination of Calcium and Magnesium were done using Complexometric Titration Method using ethylene diamine tetra – acetic acid (EDTA) , first introduced by Schwartzenbach et al. (1946)

(C) *PHYSICAL PARAMETERS*

Apparent Specific Gravity (Bulk Density), Absolute Specific Gravity, % Pore Space, Water Holding Capacity (WHC), %Volume Expansion - Determination of soil Constants was done using Keen Rackzowski Box.

Table 1. Physico–Chemical characteristics of study samples

Types of samples	pH (1:2)#	EC (1:2)#	Organic Carbon %	Potassium Kg/ha	Phosphorus Kg/ha	Available Nitrogen Kg/ha	Calcium+ Magnesium Meq/100gm
Millipede Compost (S_1)	7.20	0.24	3.55	784	148	499.84	49.43
Ordinary Soil (S_2)	8.20	0.31	0.16	301	22.5	218.68	18.00
Vermi-Compost (S_3)	7.00	1.85	15.4	560	96.63	450.26	47.60
Ordinary Compost (S_4)	7.65	0.32	0.66	326	88	234.30	19.20

#Soil to water ratio

Table 2. Physical properties of different study samples:

Types of samples	Apparent Gravity (Bulk Density)	Absolute Specific Gravity	% Pore Space	%Water Holding Capacity (WHC)	Volume Expansion
Millipede compost	1.08	1.76	55.60	25.98	28.80
Ordinary soil	1.24	2.44	50.24	24.15	0.88
Vermi-compost	0.63	1.24	67.15	70.25	22.67
Ordinary Compost	1.29	2.51	55.3	24.90	6.07

RESULTS AND DISCUSSION

Chemical and physical properties of the milli-compost, ordinary soil, vermi-compost and ordinary compost were studied and data were tabulated (Table 1 & 2)

Chemical Properties

Available Nitrogen (N): Available Nitrogen content varied from 218 to 499 kg/ha. Lowest value was observed in ordinary soil (S2) due to low organic matter content which generally contributes to the available forms of Nitrogen, as indicated by higher value in Milli-compost and vermin-compost.

Available Phosphorus (P) : Similarly, as that of available Nitrogen, higher values of available Phosphorus also showed that digested organic matter through millipede and Earthworms releases more available forms of 'P'. Available P ranged between 22.5 Kg/ha and 148 Kg/ha. Available 'P' content was higher in Milli-compost than Vermi- compost (Table 1).

Available Potassium (K): It ranged from 301 to 784 Kg/ha. Highest K content was observed in Millipede compost. It may be due to addition of higher amounts of millipede casts to the compost during their activity. Millipede compost observed to be superior to vermi compost with regard to K content.

Available Calcium + Magnesium: As observed above both of these elements were also high in organic samples compared to Soil samples. However, highest value was observed in millipede compost. This is attributed to digestion of vegetable and crop based wastes by millipede activity to release of Calcium and Magnesium. Further, addition of worm casts weight contributed to their amount in the compost (Table. 1).

Physical Properties

Bulk Density: Bulk Density varied from 0.63 to 1.29g/cc among the samples. Lowest B.D. was seen in Vermi- compost. As percent organic Carbon increases the Bulk Density decreases.

Particle Density: As this parameter depends on inorganic components of the soil, lesser inorganic components contributed to lower values of Particle Density in vermin-compost and Millipede-compost. It ranged between 1.24 to 2.51 g/cc.

% Pore Space: Total pore space depends on finer inorganic and organic materials of the samples. As observed, the higher amounts of finer materials in organic samples the % pore space was high compared to samples with higher coarser materials. The highest % pore space was observed in vermi-compost (67.2%) followed by 55.6% in case of Milli-compost.

% Water Holding Capacity: Similarly, the highest %WHC (70.31) was observed in Vermi- Compost followed by Milli-compost. This is attributed to higher absorption and adsorption properties of organic components present in them as compared to soil. Lower WHC of Milli-compost is due to high chitinous content of Millipede casts and mouldings to the compost (Table -2).

%Volume Expansion: Volume of Expansion depends upon % of clay and organic matter content in the sample. Even though % clay content in Vermi- compost and Millipede-compost is low because of high organic material the values of %Volume expansion are high in these materials as compared to soil samples. %volume of expansion varied from 0.88 to 28.8.

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