

Original Research Article

Physicochemical and micronutrients properties of vermicompost produced from municipal solid waste in National Thermal Power Corporation, Barh, Bihar, India

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ABSTRACT

Background: The present study has been carried out to investigate the physicochemical and micronutrients properties of vermicompost generated from the major municipal biodegradable solid waste (fruits and vegetables) by using two common species of earthworm i.e., *Eisenia foetida* and *Eudrilus eugenia* in National Thermal Power Corporation (NTPC), Barh, Bihar (India).

Methods: Compost pH was measured in distilled water (free of CO₂) using 10 g of compost sample and 25 ml distilled water (ratio 1:2.5). The suspension was agitated for 3-5 min and placed for half an hour before measuring the pH value with a glass. Organic carbon was measured by Walkey and Black method, total N by Kjeldahl method, P₂O₅ was determined by means of colorimetric method and K₂O, Cu, Zn, Mo, Mn, Fe and B were determined by the means of Hi Media Kit.

Results: Among the micronutrients in harvested vermicompost, increase in Zn, Cu and B contents and slight decrease in Mo content were observed when compared to standards given in soil health card of the State Government of Bihar. Mn and Fe were found to be critical in the harvested vermicompost samples. The level of boron (B) in vermicompost was found much higher than the required availability in the soil.

Conclusions: On the basis of overall physicochemical as well as micronutrients properties of the vermicompost prepared in NTPC is of better quality in compared to the other vermicompost.

Keywords: Vermicompost, Physicochemical, Micronutrients, NTPC, India

INTRODUCTION

Vermicomposting technology is a popular solid waste management biotechnological process of composting in which earthworms are used to enhance the process of waste conversion and produce a better product. Vermicomposting differs from composting in several ways.¹ Vermicompost is the excreta of earthworms,

which are rich in humus, macronutrients, and micronutrients. It can improve soil health status, enhance crop production, and improve the physical properties of the soil.^{2,3} Vermicompost also contains various plant nutrients such as N, P, K, Ca, Mg, S, Fe, Mn, Zn, Cu, and B, which improve the nutrient content of different plant components such as the roots, shoots, and fruits.⁴ Vermicompost can retain nutrients for a long time, and

has a high water-holding capacity and high porosity compared to conventional compost due to its humus content.⁵

As pollution persists at every point of life, the whole world is looking for the alternate methods for reducing the pollution in day to day life. In recent days, organic products are very famous and grabbing major chunks of kitchen budget. The people are well aware about the adverse and harmful impacts of inorganic and synthetic fertilizer and toxic materials used in food processing industries at various levels. In recent days the organic

farming and its products are buzz words among the consumers.

The study area falls under the National Thermal Power Corporation (NTPC) is located in Barh in the Indian state of Bihar (Figure 1). NTPC, Barh is located barely four kilometers east of the Barh sub-division on National Highway-31 in Patna district situated at 25° 9' 11.4" N, 85° 44' 42".6" E.⁶ The project has been named a mega power project, and is owned by Indian energy company National Thermal Power Corporation. This power plant serves as a beneficiary for Bihar, UP and Uttarakhand states.⁷



Figure 1: Location map of study area (NTPC Barh, Bihar, India).

METHODS

The biologically degradable and decomposable organic wastage such as animal dung, agricultural wastes, forestry wastes, city leaf litter, wastage paper and cotton cloth, city refuse etc. have been used in vermiculture and vermicomposting. The collected solid waste was then classified based on its size (above and below 100 mm) by trammel. The materials which are above 100 mm materials are used for reuse/recycling purposes. Larger inert objects (plastic, metal and glass) in the sorted organic fraction municipal solid waste were removed by hand. Inorganic matter was below 100 mm was used for composting purposes as it contains most of the organic materials. Two most common species of earthworm i.e., *Eisenia foetida* and *Eudrilus eugenia* have been used for vermicomposting. Several parameters like pH, Organic Carbon (OC), N, P₂O₅ and K₂O, Cu, Zn, Mo, Mn, Fe and B were regularly tested in the Plant Pathology laboratory of T. M. Bhagalpur University, Bhagalpur.

Compost pH was measured in distilled water (free of CO₂) using 10g of compost sample and 25 ml distilled water (ratio 1:2.5). The suspension was agitated for 3-5 min and placed for half an hour before measuring the pH value with a glass. Organic carbon (OC) was measured by Walkey and Black method, total N by Kjeldahl method, P₂O₅ was determined by means of colorimetric

method and K₂O, Cu, Zn, Mo, Mn, Fe and B were determined by the means of Hi Media Kit.^{8,9}

RESULTS

All the results of different parameters analyzed such as pH, OC, N, P₂O₅ and K₂O, Cu, Zn, Mo, Mn, Fe and B are depicted in Table 1.

Table 1: Physico-chemical properties of composite samples (converted vermicompost) from harvested pits at Barh in 2017-18.

Parameters	Std.of Govt. of Bihar	VC of NTPC, Barh	VC produced elsewhere
pH	6-7.5	7.5-8.5	7.5-8.0
OC (%)	0.5-1.5	6.3-6.5	9.8-10
P₂O₅(ppm)	28.8	0.27-0.37	0.7-0.8
K₂O (ppm)	163.5	5.5	2.9-4.1
Total N (ppm)	288.5	8.5-9.5	0.3-0.8
Cu (ppm)	>0.46	0.55-1.7	0.4-0.6
Zn (ppm)	>0.6	0.63-1.45	1.7
Mo (ppm)	>0.15	0.15	0.2
Mn (ppm)	>2.3	2.0	5.4
Fe (ppm)	>5.38	3-4.5	74.5
B (ppm)	>0.38	>2.0	0.3

Among the micronutrients in harvested vermicompost, increase in Zn, Cu and B contents and slightly decrease in Mo content were observed when compared to standards given in soil health card of the State Government of Bihar. Mn and Fe were found to be critical in the harvested vermicompost samples. The level of B in vermicompost was found much higher than the required availability in the soil.

DISCUSSION

Several studies on physico-chemical and micronutrients determination from vermicompost have been carried out in India.¹⁰⁻¹⁶ In the present study all the parameters analyzed such as pH, OC, N, P₂O₅ and K₂O, Cu, Zn, Mo, Mn, Fe and B were found to be appropriate in quality point of view. The higher level of boron in final harvest of vermicompost in the present project suggests vermicompost as a better and appropriate bio-fertilizer for application in farming. The boron is always found lower in the agricultural soils of Bihar, hence application of extra boron is always recommended for the crops under cultivation. On the basis of overall physicochemical as well as micronutrients properties of the vermicompost prepared in NTPC is of better quality.

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