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NUTRITIONAL WASTE MANAGEMENT BY AEROBIC COMPOSTING AND ITS EVALUATION OF CARBON AND NITROGEN

[1]Dr. Snehal Dapke, [2]Dr. Kirti Paturkar, [3]Aakanksha Mairal, [4]Chanchal Waghwani

[1] Lecturer, [2] Assistant Professor and Head of the Department of Zoology, [3, 4] Student

Department of Zoology

Dharampeth M.P. Deo Memorial Science College Nagpur, Maharashtra, India

Abstract:

Carbon and nitrogen are crucial for plants to perform routine and fundamental cellular activity. Compost is an excellent source for enhancing the nutritional value of soil. Although vermicomposting is generally seen as a more efficient method, this method is not suitable for indoor apartments due to various constraints. So, we prefer another composting method, aerobic composting. For this experiment, green waste like fruit waste, flower waste, vegetable waste was collected from households. Brown matter, like dried leaves and cardboard collected from the college campus. The experiment was set up for 90 days. An analysis of different samples was done to determine the percentage of organic carbon and available nitrogen. Results showed the percentage of organic carbon is higher in vegetable waste (1.097) than fruit waste (0.672), flower waste (0.601) and combining all (vegetable waste, fruit waste and flower waste) (0.194). It is found that there is an extremely high percentage of available nitrogen, which is greater for vegetable waste (175.61) than flower waste (163.07), fruit waste (125.44), and combined waste (100.35). According to the present study, managing nutritional waste through aerobic composting is both feasible and easily achievable.

Keywords: Compost, Aerobic, Indoor, Carbon, Nitrogen

I. INTRODUCTION

Urbanization and population growth are solely responsible for the enormous rate of solid waste and its proper management of a major problem for the Municipal Corporation of every city. Generation of solid waste from households, fruit and vegetable venders, florists is hazardous to health and leads to the spread of infectious diseases. (Zamorano et al. 2009). It is also leading to various smell and odour problems. Most cities spend 20-50% of their annual budget on solid waste management and only 20-80% of the waste is collected (Achankeng, 2003). Only a small portion of it is processed. Rapid development, population increase and changes in consumption patterns have directly (and indirectly) resulted in the generation of enormous amount of waste, ranging from biodegradable to synthetic waste (Kadafa et al., 2013). The major burden of the city's municipal waste comes from residential areas, making them the main focus of the waste management strategy (Mohammed, 2017). Organic domestic solid wastes are generally produced from household activities like food preparation, use

of flowers for Pooja or decoration and garden waste. Reuse or recycle the organic solid waste is a desperate necessity.

Vermicompost is an eco-friendly and cost-effective method for managing organic solid waste. Vermicomposting is a simple biotechnological process of composting, in which certain species of earthworms are used to enhance the process of waste conversion and produce compost (Adhikary S.2012). Handling earthworms is a major challenge in vermicomposting. It is also a time-consuming task. To maintain the earthworm, it is necessary to have some basic infrastructure. If vermicomposting is not feasible, aerobic composting is a great alternative.

II. MATERIAL

Green waste like-Flower waste, Fruit waste, vegetable waste,

Brown matter like- dried leaves, cardboard pieces,

Finished vermicompost or manure, garden soil, four compost bins. Shovel or pitchfork

III. RESEARCH METHODOLOGY

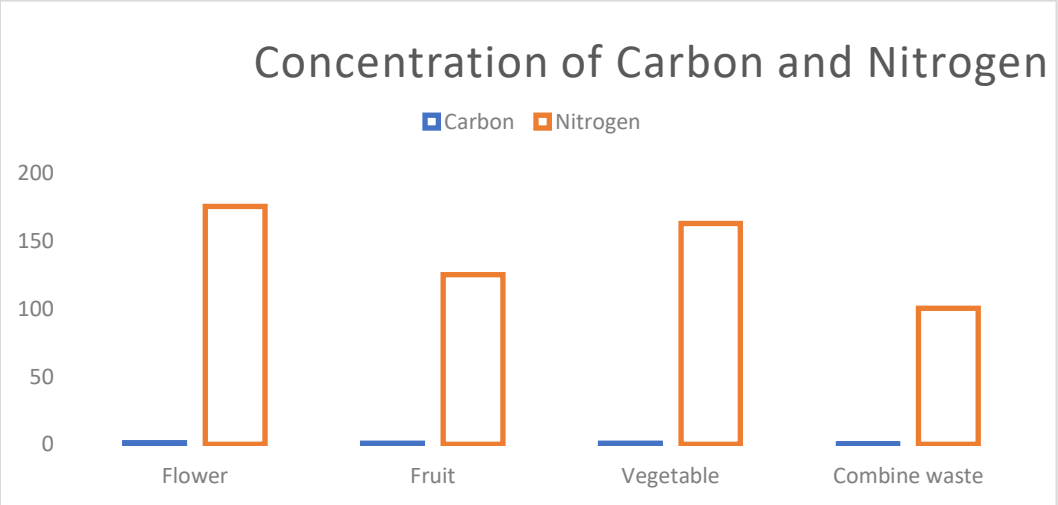
After ensuring holes at some places in compost bins, we placed them in a dry, partially shady area at one corner of our department near the window. Green waste like vegetable, fruit, flower waste was cut into tiny pieces. Then added kitchen scraps and other "green" waste to the compost pile. We took separate bins for flower waste, fruit waste, vegetable waste and one compost bin for a combination of all. Brown matter like- dried leaves, cardboard pieces was added to each compost bin in the form of layers. After that, a one-inch layer of well-decomposed compost or manure and garden soil was added as a catalyst. A pile was constructed by adding more layers of green and brown matter and catalyst. The pile turned with the help of a shovel or a pitchfork and covered it. The compost was mixed every week and then the layers on top were added. After four weeks of filling, the material shrank. Then we added the above layers for another four to five weeks. The surface was then covered with garden soil and manure. To prevent dryness, water has been sprayed. The compost was ready for use in the garden within 90 days. It has a dark colour and a fine texture with an earthy odour.

After 90 days the samples were analysed using Kjeldahl assembly and Walkley-Black method for percentage of nitrogen and organic carbon respectively.

IV. OBSERVATION

Observation Table: Percentage of Carbon and Nitrogen in various types of wastes

Sr. no	Type of waste	Organic carbon percentage	Available Nitrogen percentage
1	Vegetable	1.097	175.61
2	Fruit	0.672	125.44
3	Flower	0.601	163.07
4	Combine waste	0.194	100.35



V. RESULTS AND DISCUSSION

Soil organic matter is a key indicator of soil health because of its important parameters that affect soil fertility, productivity and the environment (Singh, 2018). In the present study, the percentage of nitrogen was found to be higher from vegetable waste (175.61) than in fruit waste (125.44), flower waste (163.07) and from all three combined (Fruit+Flower+Vegetable) wastes (100.35). The organic carbon percentage is more on vegetable waste (1.097), than in fruit waste (0.672) and flower waste (0.601). It is lowest in combined waste (0.194). Tropical soils are deficient in all necessary plant nutrients. The use of organic inputs has the potentiality for improving soil productivity and crop yield (Islam, 2016). The water holding capacity of soil is a major soil hydraulic property that governs soil functioning in ecosystems and greatly affects nutritional supply to plants. Due to low organic carbon contents and organic matter, water retention is low in sandy soils. An increase in organic matter content led to an increase of water retention in sandy soils. At higher organic carbon values, all soils showed an increase in water retention (Rawls,2003). The growth and development of plants depend on nutrients in the soil.

Another indicator of soil fertility is the total nitrogen content. Nitrogen is essential for plant growth. All plants utilize nitrogen (N) and it is most imperative element for proper growth and development of plants which significantly increases the yield and its quality by playing a vital role in biochemical and physiological functions of plants (Leghari et al. 2016). The total nitrogen content of soil is a crucial factor in boosting the growth of crops. Nitrogen (N) is a soil nutrient that often limits plant growth, and is needed by plants in large quantities. This nutrient does not exist as a constituent mineral (rocks) but comes from the atmosphere (78% N) and soil organic matter. Soil is the main source of N for plants and most plants get 50% to 80% of their N requirement from the soil, even in high doses of N fertilizer (Kundu DK and Ladha JK 1995). It is suggested that aerobic composting could be a great source of nitrogen for the plants.

The above study showed a fewer percentage of carbon in comparison to the extremely high percentage of nitrogen. This may be due to the high proportion of green matter added compared to brown matter. It is also suggested that in future studies more carbon-based brown matter should be added to achieve the proper carbon to nitrogen ratio in aerobic compost.

Aerobic composting provides all nutrients in readily available forms and also enhances uptake of nutrients by plants and plays a major role in improving growth and yield of crops (Sreenivas et al. 2000). The safe disposal of nutritional solid waste has been regarded as a prime necessity in this period of green economy and the concept of

producing high quality fertilizers with an enriched nutrient content. The use of aerobic composting, a green and inexpensive renewable resource, has been proven to solve many problems related to nutritional waste management.

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