Vegetable Market Waste Management and Potential Uses

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Abstract— The organic waste generated from vegetable market has no proper disposal in our markets and hence dumped in open grounds which ultimately results in various forms of environmental pollution. Study is carried out for better recycling and reusing of vegetable market waste in which the waste can be converted to some usable products. The aim of the study was to evaluate the feasibility of vermicomposting different vegetable and fruits waste including banana, cabbage, tomato and mix veg. using earth worms E-Foiteda. For this, the physicochemical properties such as pH, N, P, total carbon and K of vermicompost was measured after 3 weeks. Nutrient content was higher in case of banana vermicompost compared with other vermicomost and also with control (without earth worms). Plant growth was also studied using various proportions of generated vermicompost:soil. 30:30 proportion of vermicompost: soil gives higher plant growth compared to other ratios. The results suggest that the vermicomposting is a feasible technology for converting vegetable and fruit waste into valuable products there by reducing the land pollution.

Key words: Vegetable Market Waste

I. Introduction

Large amounts of vegetable waste are generated near the vegetable market and farms, thereby polluting the environment. Disposal and environmental friendly management of these wastes are becoming a serious global problem. Efficient low-input technologies are developed to convert organic wastes into valuable products for sustainable environment (Kanimozhi and Jayakumar 2015). However, their high biodegradability and low toxicity make them suitable for reuse. For better recycling and reusing of vegetable market waste, vermicomposting will be carried out using different fruit and vegetables waste (Shrimal and Khwairakpam 2010). Vermicomposting has certain benefits such as enhanced soil fertility and water holding capacity, nutrient supplying capacity of soil, thereby increased agricultural productivity, improved soil biodiversity, the development of resistance in plants to pests and diseases, and also reduced other ecological and environmental risks. The vermicompost of vegetable market wastes exhibited a greater potential as organic biofertilzers for the growth and development of plants for the sustainable agriculture (Nair et al., 2006). On the other hand, utilization of these wastes reduces pollution effect on the environment. In addition it would earn immense economic benefits. Also, the waste which is generated at the farm will be managed in the correct way (Aalok and Tripathi 2010). Farmers will be highly benefitted through this process as the waste generation and vermicomposting can be carried out in the farm itself where they need to spend no extra capital or efforts. Therefore the aim of the study is to evaluate the feasibility of vermicomposting of different fresh fruits and vegetable waste including banana peels, cabbage, tomato, potato and mix vegetables using earthworm E-Foiteda. The project can also be helpful in determining whether the conventional mix vegetable waste is more preferable or the one prepared using segregated wastes. It could be helpful for those who own only one kind of agriculture or farms such as banana farms or tomato or cabbage fields. Hence, the project on a whole for a common man or a farmer will be very much beneficial as it requires very less investment and use of household waste makes it more approachable. It can be taken as an incentive for income generation along with meeting one's own requirements as well as producing chemical free, pathogen free, and eco – friendly fertilizers for others.

II. Materials and Methods

A. Collection of vegetable market waste and cow dung

Vegetable waste was collected from the market in Anand. The vegetable waste was collected in random manner. It includes different leftover putrefied vegetable such as banana, tomato, carrot, brinjal, cabbage, cauliflower, some leafy vegetables. Form these waste banana, tomato, cabbage was separated and chopped in to the smaller pieces. Urine free cow dung was collected locally from fram house located at Navli, Anand.

B. Collection of earthworms

The mature earthworms E-Foiteda was collected from Anand Agriculture University, Anand.

C. Vermicomposting – Experimental Set-Up

Vegetable and fruits waste was collected and separated. All the required vegetables such as banana, cabbage and tomatoes were cut into small pieces. Vegetables and fruit waste was mixed with cow dung and soil at different ratios. Table 1 shows the various compositions of the waste, cow dung and soil.

Sample Name	Composition	Proportions
Banana	Banana + cow dung + soil	3kg + 2kg + 1kg
Cabbage	Cabbage + cow dung+ soil	3kg + 2kg + 1kg
Tomatoes	Tomatoes + cow dung + soil	3kg + 2kg + 1kg
Mix Vegetables	Mix vegetables + cow dung + soil	3kg + 2kg + 1kg
Mix Vegetables (Control without earthworms)	Mix vegetables + cow dung + soil.	3kg + 2kg + 1kg

Table 1: Various composition of waste, cow dung and soil.

Prepared the samples as per the Table 1 and added required amount of water and mixed all the contents. Vermibeds were prepared in plastic troughs (41x33x19 cm). 500 g of earthworms were introduced in each sample of vermibed. The vermibeds were covered with perforated green

cloth for air circulation. Water was sprinkled weekly or alternated days according the requirement of samples. The samples were set under shady place to avoid direct sunlight. The samples were monitored daily. After vermicomposting of 45 days, earthworms were removed by hand from each sample. The resulting vermicompost was homogined and divided into two samples. One was dried and pulverized for chemical ananlysis and another one was used for plantation.

D. Chemical analysis of vermicompost:

The pH of the samples was measured by mixing the sample with the water using pH meter. Total carbon and nitrogen were analyzed by elemental analyzer. Total phosphorus was measured by APHA (1995). The potassium was measured by flame photometric method.

E. Field experiment:

Field investigations were carried out to study the growth and yield of Eranthumum plants. For plantation two combinations of vermicompost and soil was taken. Vermicompost prepared from various vegetable and fruits waste was taken. The ratio of vermicompost and soil was kept as 50:50 and 30: 50, respectively. Plantation of Eranthumum was also carried out for 100% soil. Seeding was done at the same time. The growth of the plant was measured in terms of height of the plant. Watering was done on alternate days and unwanted seeds were removed frequently.

III. Results and Discussions

A. Physicochemical properties of the vermicompost

After vermicomposting of 12 weeks, the end product showed a finely granular appearance as shown in Fig. 1

Fig. 1: Granular form of vermicompost after 3 weeks of process

The physic-chemical properties such as pH, Nitrogen, Phosphrus, Potassium and carbon content are shown in the graph. Fig. 2.

The pH values detected in vermicompost generated from Banana, Cabbage, Tomato, mix-veg etc increased than in the control. The changes in pH values are due to the degradation of organic matter and the formation of intermediate products such as ammonium ions and humic acids during the vermicompost process. It should be noted that different materials generate different intermediate which in turn has different pH values.

Compared to control treatment, Banana vermicompost resulted in increase in the nitrogen content, but cabbage, tomato and mix veg showed opposite trend and reduced than the control. Studies reported that vermicomposting may enrich nitrogen content due to presence of earhworms which provide high amount of nitrogen from mucus and nitrogenous excreta substances. On the contrary, the denitrification process in the earthworms during vermicomposting process resulted in reduction in nitrogen content (Anbalagan and Manivannan 2012).

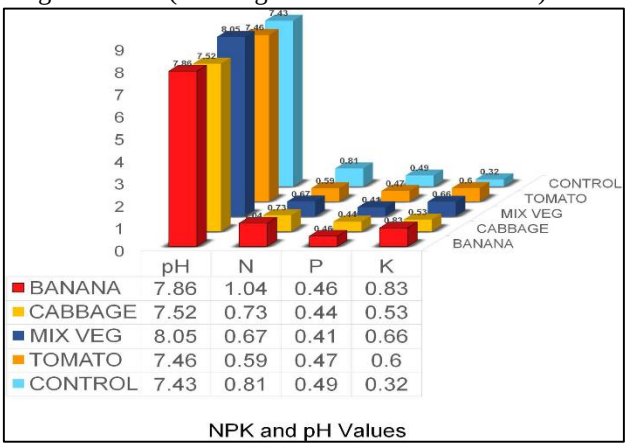


Fig. 2: NPK and pH values of generated vermicompost from various vegetable and fruit waste.

The phosphorus content of all the vermicompost was nearly similar due to mineralization of phosphorus as a result of bacterial and fecal phosphate activity of earthworms. As compared to control, the total potassium content was increased significantly in all the samples in the presence of earthworms. The increase is also due to bacterial and fecal activity of the earthworms.

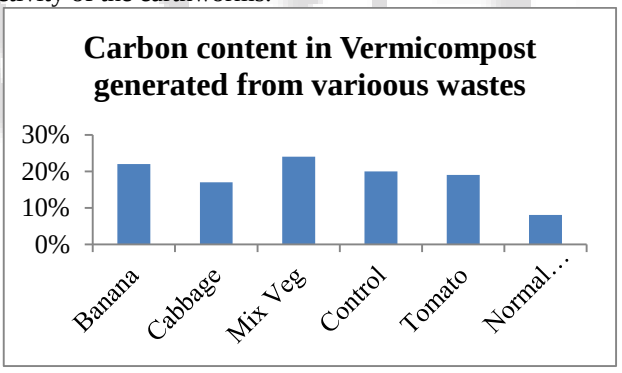


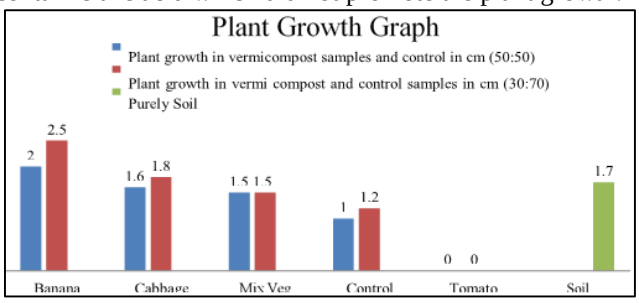
Fig. 3 Total carbon content in vermicompost generated from various wastes

It can be noted from the fig.3 that carbon content was higher in all he cases compared to control and normal soil. All the materials used in the vermicomposting may give rise to specific microbial community responsible for higher total carbon mineralization rate.

B. Effect of vermicompost on plant growth

The results on the effect of vegetable waste generated from vermicompost had positive response. It can be noted from fig4 that use of vemicompost has resulted in increase in plant growth. 30:70 proportions of vermicompost : Soil resulted in higher plant growth than 50:50 proportions. The plant growth in both the combination was similar in all the samples except tomato vermicompost. It was observed that plant growth was higher comared to normal soil. It shows that the use of vermicompost can help in the growth of the plant. It can also be observed that in case of tomato vermicompost there was

negligible growth of the plant. Tomato vermicompost may contain citric acid which did not promote the plant growth.



IV. CONCLUSIONS

Experimental data provided a sound basis that vermicomposting is an efficient technology for recycling of vegetable and fruits waste. The maximum nutrient of nitrogen, phosphorus and potassium was observed in case of vermicompost generated from banana and cabbage. Also, it was observed that the plant growth was higher in case of banana vermicompost. On the other hand, there was no growth of the plant n case of tomato vermicompost due to presence of citric acid. Vermicompost generated from vegetable and fruits waste can be utilized as bio-fertilizer. Farmers growing a particular fruit or vegetable can produce vermicompost at their farm itself and can utilized or sell to others also. Also, land pollution can be minimized as the waste is utilized at the farm itself.

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