

Rapid Composting of Different Wastes with Yash Activator Plus

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ABSTRACT- Microbial composting play an important role in the recycling of different processing wastes and the compost generated by bio-conversion of wastes offers several benefits such as enhanced soil fertility and soil health that can lead to increased agricultural productivity, improved soil biodiversity, reduced ecological risks and a healthier environment. The present experiment was conducted in Plastic pots, which were filled with the different wastes, namely Sugarcane waste, Plants waste, Flower waste, Mausmi waste and Mixed waste, which was inoculated by Yash Activator Plus (2% w/w) with a set control pot of each. The results of this study revealed that with Yash Activator Plus, the temperature was increased rapidly at 20 days of composting which were 50, 52, 58, 54, and 54°C. Control treatments increased temperature up to 45, 44, 48, 46, and 46°C respectively. The total loss of dry matter content at the end of composting amounted to be 37.73, 39.67, 52.94, 51.25, and 40% from the initial amount of Sugarcane waste, Plants waste, Flower waste, Mausmi waste and Mixed waste respectively. The maximum and minimum dry matter contents were decreased in flower waste and sugarcane waste respectively. Increased temperature enhanced the process of composting rapidly due to the thermophilic microorganisms, which reduces the time of composting. On the basis of this study, we can conclude that the mixed consortia of mesophilic and thermophilic microorganisms increased the process of composting, which reduces the time of degradation of different wastes.

Key-words- Compost, Different waste, Microbial composting, Yash Activator Plus

INTRODUCTION

"Yash Activator Plus" is a very effective microbial consortium for rapid composting. It is a mixture of culture of mesophilic and thermophilic microorganisms specifically for accelerating the composting of organic waste. It contains cultures of Bacteria and fungi along with enzymes, which facilitate bio conversion of organic waste into a stabilized end product called "compost. Use of this microbial consortium for rapid composting: The microbiology of composting is very complex. It involves consortium of fungi and bacteria Actinomyces for bio conversion of organic waste into end product for various uses. Microbial growth in composting depends upon so many factors. Carbon and nitrogen sources are the most critical in terms of bio-degradability of the waste/biomass. Microbial composting refers to microbiological process which converts waste materials into organic manure, which are rich in plant nutrients and humus ^[1]. Aeration and moisture control are the main key operating parameters for operating the windrow compost plant.

Addition of specialized bio-culture consortium is proposed for increasing composting activity has great use. Microbial composting gets advantages not only by reducing the volumes of waste materials but also by recycling of nutrients and organic matter to improve the soils. Aerobic decomposition process also generates fewer greenhouse gases as compared to land filling. Thermophilic composting associated with disadvantages of long duration process by which loss of the nutrient occurs during the process and it needed frequent turning to maintain aerobic.

Microbial populations are the active components of biodegradation processes and conversion during composting. Thus, compost quality is directly related to the composition and sequence of microbial communities in the process, being the fungi and bacteria that perform the degradation of organic matter ^[2]. Composting of agricultural waste is an alternative trail to alleviate the negative impact of its accumulation and/or avoid the environmental pollution. Abou *et al.* ^[3] concluded that recycling agriculture wastes is a must for environment as well as economical saving. This recycling will not only increase agricultural production but also will improve its quality. Composting is considered a biological process in which microorganisms convert organic residues into soil-like material called compost. El-Haggar *et al.* ^[4] and Geisel ^[5] reported windrows composting is a commonly used processing method. The microbial decomposition of

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organic wastes is controlled by environmental factors affecting microbial activity within the windrow piles. There are some factors affecting composting and directly influence the rate of decomposition, such as particle size, moisture content, aeration, temperature, C/N ratio and pH. Therefore, intensive management of the composting process by turning and moisture addition is likely to affect the N fertilizer value of the mature compost.

Microbial inoculation of compostable material could allow the inoculated microorganisms like (*Streptomyces aureofaciens*, *Trichoderma viride*, *Trichoderma harzianum*, *Thermomyces lanuginosus*, *Aspergillus niger*, *Bacillus subtilis*, *Bacillus sphaericus*, and *B. licheniformis*, *Bacillus stearothermophilus*) to dominated over the indigenous micro-biota and successfully develop appropriate degradation^[6]. The important advantages of composting are the reduction of the wastes, the destruction of weed seeds and of pathogenic microorganisms^[7]. Additional benefits of composting as mechanism for waste management are production of valuable soil amendments, low operation costs, easy to be applied in most of developing countries, and encouragement of environmentally friendly practices such as reduction of the emission of greenhouse gases, promote the efficiency of fertilizer application^[8]. Microbial composting technologies for agriculture and other waste management are very significant to meet the need of developing countries. Therefore, the present work aims to rapid composting of agricultural and other wastes through the microbial composting process using Yash Activator Plus.

MATERIALS AND METHODS

Place of work- The present study was conducted in the Yash Krishi Takniki Evam Vigyan Kendra, Allahabad, Uttar Pradesh, India in the duration of 2017.

Experimental details- The experiment was conducted in Plastic pots, which were filled with the different wastes, namely Sugarcane waste, Plant waste, Flower waste, Mausmi waste and Mixed waste with a set of control pot and 3 replicates of each. All the weighted amount of wastes was inoculated with the Yash Activator plus, which is mixed culture of Mesophilic and Thermophilic microbial consortia. Inoculum cultures were inoculated with the rate of 2% w/w. The moisture content was maintained at 50-60% and turning of material at one week interval for proper aeration were achieved. The data was taken before and after inoculation of cultures at the interval of 20 days up to 60 days. The data were recorded during the course of study at an appropriate time interval.

RESULTS AND DISCUSSION

Composting generally takes place within two temperatures ranges known as mesophilic (10–40°C) and thermophilic (over 40°C). Although mesophilic temperatures allow effective composting, experts suggest maintaining temperatures between 43°C and 65°C. The thermophilic composting is desirable because they destroyed more pathogens, weed seeds and fly larvae in the composting materials. The experimental results showed that the temperature of the waste materials before inoculation was 34, 35, 37, 35 and 35 °C namely Sugarcane waste, Plant waste, Flower waste, Mausmi waste and Mixed waste respectively. Temperature variations during the composting process are shown in Table 1. The data obtained at 20 days of inoculation with Yash Activator Plus the temperature were increased rapidly at 20 days of composting which were 50, 52, 58, 54 and 54°C with comparison to controls, which were 45, 44, 48, 46, and 46°C respectively. The temperature of composting decreased slowly at 47, 48, 55, 51 and 50°C respectively at 40 days of composting and at 60 days almost the temperature was stabilized, which were 35, 36, 37, 35 and 36°C with comparison to controls which were 37, 38, 40, 38 and 37°C respectively. Temperature, which is an important factor in the composting process and its influences on the activity and diversity of the microorganisms^[9]. Liang *et al.*^[10] reported that the enhancement of microbial activities was induced by increasing temperature.

The results indicate that the maximum temperature increased in flower waste which was 58°C at 20 days of composting this increased temperature rapidly and enhanced the composting process in comparison to natural composting. This rising of temperature during composting was due to the microorganism activity in the waste. Kanotra and Mathur^[11] reported that fungi, bacteria, and actinomycetes play unique and important roles during the composting, mixed cultures of microorganisms enhanced the rate of lignocelluloses degradation, due to their synergistic activity through the utilization of intermediate degradation products. The results can be correlated with the findings of El-Meniawy^[12], Abdel-Aziz and Al-Barakah^[13], Eida^[14]. The maturity of the composting stage was started with the temperature decreased to normal air daily temperature and remains almost constant with turning of the piles^[15]. Therefore, this is considered as a good indicator for the end of the biodegradation phase in which the compost achieves maturity^[16]. The decrease in temperature after peak value was related to the decrease in microbial as well as enzymatic activities. The results are with the agreements of Nogueira *et al.*^[17] study.

Table 1: Temperature variations during the composting process of different waste materials

Waste materials	Temperature variations (°C)						
	Before Inoculation	At 20 days		At 40 days		At 60 days	
		Control	Treated	Control	Treated	Control	Treated
Sugarcane waste	34.0	45.0	50.0	42.0	47.0	37.0	35.0
Plant waste	35.0	44.0	52.0	42.0	48.0	38.0	36.0
Flower waste	37.0	48.0	58.0	45.0	55.0	40.0	37.0
Mausmi waste	35.0	46.0	54.0	44.0	51.0	38.0	35.0
Mixed Waste	35.0	46.0	54.0	43.0	50.0	37.0	36.0



Fig. 1: Different waste materials before inoculation of Yash Activator Plus

Dry matter content results of the different wastes treatments shown that there are decreased gradually during the whole period of composting, which is shown in Table 2. The initial amounts of different waste were 2650, 3000, 3400, 4000 and 3200 gm respectively. The maximum reductions of dry matter are achieved at 20 days data of composting stage, which was characterized by the maximum microbial activity. The total loss of dry matter content at the end of composting amounted to be 37.73, 39.67, 52.94, 51.25, and 40 % from the initial amount, which are Sugarcane waste, Plant waste, Flower

waste, Mausmi waste and Mixed waste, respectively. The maximum and minimum dry matter content was decreased in flower waste and sugarcane waste, which were 52.94 and 37.73 % respectively. These results can be correlated with those of Wallace [18] and Kuok *et al.* [19]. The turning effects on the microbial consortia during the composting enhanced the degradation of organic matter by transferring the undamaged organics at unfavorable temperatures to favorable temperatures, to allow degradation by microorganisms that degrade more vigorously reported by Kuok *et al.* [19].

Table 2: Effect of Yash Activator plus on dry matter of different waste materials during composting

Waste materials	Before Inoculation	Weight of the dry matter (gm)					
		At 20 days		At 40 days		At 60 days	
		Control	Treated	Control	Treated	Control	Treated
Sugarcane waste	2,650	2,313	2,005	2,050	1,830	1,905	1,650
Plant waste	3,000	2,410	2,205	2,235	2,005	2,150	1,810
Flower waste	3,400	2,000	1,742	1,860	1,645	1,860	1,600
Mausmi waste	4,000	2,610	2,400	2,330	2,130	2,220	1,950
Mixed Waste	3,200	2,660	2,260	2,440	2,165	2,220	1,920



Fig. 2: Different waste materials after composting with Yash Activator Plus at 60 days

CONCLUSIONS

The main objective of the research included the characterization and study of the wastes generated in daily life. We could get an idea that the main constituent in the waste was the biodegradable fraction, which included the Flower, Mausmi, market wastes like raw fruits, vegetables, leaves etc. thereby making it ideal for utilizing for composting rather than the land spreading utilized in the dump yard. The present experimental results indicate that the rapid degradation of different wastes treated with Yash Activator Plus compared to control treatments. This may be due to the increase of microorganism's activity in biodegradation and more effective way of biodegradation of waste. Our results showed that the microbial consortium offered a faster medium of treatment or recycling where results were obtained in a span of 60 days.

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