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Preparation of Compost from Biodegradable Kitchen Waste and Isolation and Identification of Fungal Decomposer from Compost

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ABSTRACT

Fungi are the major degraders of organic matter in natural environments, and almost every naturally occurring organic compound can be degraded by one fungus or another. An enormous range of organic compounds can be utilized by fungi, especially the major organic compounds such as cellulose, hemicellulose and lignin from compost. The present work aims to isolate and identify fungal isolates from the compost samples. Compost preparation by biodegradable waste using fruit waste, cabbage, tomato, fresh cow dung, leaves, twigs and mixed vegetable waste. The qualitative and quantitative compositions of individual, composts were used for the isolation. Substantially qualitative differences observed in the fungal species of different composts. In this work 4 entities of fungus are isolated at 37°C from compost. It also demonstrates that the quantitative and qualitative characterization of different samples of composts and fungal communities important for best agricultural application.

KEYWORDS: *Isolation, Identification, Fungal isolates, Biodegradable waste, Compost*

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1. INTRODUCTION

Most fungi are saprophytes, feeding on dead or decaying material (Singh and Charaya 2003). This helps to remove leaf litter and other debris that would otherwise accumulate on the ground (Singh et al., 2015b; 2016b; 2016c). Nutrients absorbed by the fungus then become available for other organisms which may eat fungi. Fungi are important decomposers in ecosystems, ensuring that dead plants and animals are broken down into smaller molecules that can be used by other members of the ecosystem. Without fungi, decaying organic matter would accumulate in the forest. Fungi are important components of breaking down compost, combined with bacteria, microorganisms and actinomycetes. Most of the fungi are saprophytic and are efficient in the degradation of major polymers such as cellulose and lignin (Singh et al., 2017c; 2018b; 2019a,b,c). If fungi or their byproducts are used in paper production or the recycling materials, we would be able to eliminate a large source of pollution in the environment. Generally successful composting depends on a number of factors that have both direct and indirect influence on the activities of the microorganisms (Singhand Charaya, 2010; Singh et al., 2015d,e). They include the type of raw material being composted, its nutrient composition moisture content, temperature acidity or alkalinity and aeration. The microorganism that do much of the work need high temperature plenty of oxygen & moisture. In the

traditional method of composting the influence of the listed factors had been largely ignored. The final composts obtained from such unimproved method are poor in quality. It has therefore become highly imperative to develop an alternative technique for the needed good quality compost in shortest period and identify the specific microorganism involved in the degradation with aim of improving the biodegradation process (Taiwo and Oso, 2004; Singh et al., 2016a). Biological conversion of solid organic waste into a usable end product is Composting. Decomposition undergoes invariably by adding fresh organic residue in soil. Compost is highly effective only when the content of organic matteris high. It's well known the decomposition of organic matter on soil carried by variety of microorganisms (Singh et al., 2018a; Singh et al., 2021). During Composting biodegradation and conversion process involved the active components are microbial community in which fungus play most important role including the actinomyctes and bacteria.(Jenson 1974; Bollen 1985; Anusuya 2003; Antonella et al., 2005).This work represents the preparation of compost from biodegradable waste followed by isolation and identification of fungal isolates.

2. MATERIALS AND METHODS

Preparation of compost from biodegradable waste

Compost are prepared by kitchen waste and dry leaves. Separate the edible kitchen waste (vegetable peels, fruit peels, and small amount of wasted cooked food) in a container. Collect and dry organic matter (dried leaves, saw dust) in a small container. Take a large earthen pot or a bucket and drill 4 – 5 holes around the container at different levels to let's air inside. Line the bottom with a layer of soil. Now start adding food waste in layers alternating wet waste (food scarps, vegetable and fruit peels) with dry waste (straw, saw dust, dried leaves). Cover this container with a plastic sheet or a plank of wood to help retain moisture and heat. After few days, use a rake to give the pile a quick turn to provide aeration. If the pile is too dry sprinkle some water so that it is moist. Within 2-3 months' pile should start forming compost that is dry, dark brown and crumbly and smelling of earth

A total of 4 compost samples were prepared from biodegradable kitchen waste in MMDU Campus, Mullana, Ambala. There are Compost-1, Compost-2, Dry Manure (DM) and Liquid Manure (LM). Then characterization of compost has done with the help of Determination of pH, Moisture content, Electrical conductivity (EC), ash content and bulk density. A maximum of 56.5°C temperature was achieved on the fourth day. A proper combination of waste materials is important for the achievement of high temperature as it gives a proper combination of carbon and nitrogen to the microbial population for their growth and activities (Singh and Kalamdhad 2012). The temperature started rising within 24hours and reached its maximum on the fourth day of composting, afterwards it became stabilized. As at the initial time of feeding, organic materials are readily available for microbes to degrade and decompose. In a composting process for proper degradation and maintenance of thermophilic activity, a temperature ranges of 52–60°C is suitable (Ryckeboer et al., 2003).

Isolation and Identification of fungi

Fungi isolated from various prepared compost samples. Dilution technique was employed to isolate fungi from compost (Parkinson et al., 1971).Compost samples were serial diluted in distilled water then dilution were transfer to the petri-plate containing culture medium incubated at ambient temperature for 3 days. After fungal growth mycelia picked up at the point of a sterile transfer needle or scalpel and placed on the agar medium. The colonies produced from the germinating spores after a few days incubation can be sub cultured on separate plate. For identification of fungi procedures of Barnett (1960) and Gilman (1957) were followed.

3. RESULTS AND DISCUSSION

Thus the present study aims to focus mainly on the isolation or identification of fungus by morphological characters from compost prepared by biodegradable kitchen waste.

Compost preparation and its Characterisation:
Compost prepare with the help of kitchen waste and dry leaves. Within the 2-3 months the formation of compost start that is dry, dark brown and crumbly and smelling of earth. The four different samples of compost Compost-1, Compost-2, Dry Manure (DM) and Liquid Manure (LM) prepared (Figure 1) and characterization of compost samples done with the help of pH, Electrical conductivity, Moisture content, Ash content and Bulk Density (Table 1).

Table 1: Characterization of different compost samples

Sr. No.	Name of Compost Sample	pH	Moisture Content (%)	Electrical Conductivity (µs)
1	C_1	7.18	204.816	1.42
2	C_2	7.3	255.102	3.12
3	DM_1	6.6	262.156	2.14
4	DM_2	7.8	201.132	1.52

Isolation and Identification of fungus from compost samples:
On the basis of morphological character that is Colony characteristics, a total of 11 genera were identified from three compost samples of which (*Humicola, Penicillium* and *Scytalidium*) were common to all the composts. In all three composts the most plentiful species are the thermophilic fungi *Humicola* and *Penicillium* Sp. that represent a significant load through the *Sporotrichum, Scytalidium* showed occurrence in cabbage or mixed waste compost and many species slowly present in mixed vegetable waste. (Anusuya and Geetha 2014). In this study four different fungal species are isolated from compost samples these fungal species are: *Rhizopus, Aspergillus,Trichoderma* and *Mucor.* In order to identify the fungal colonies, colony colour, shape, border and spores play a significant role. (Sivaramanan, 2014)

The agricultural wastes and kitchen wastes mainly consistes of lignocellulosic, pectolytic and hemicellulosic polysaccarides (Charaya and Singh, 2005; Singh et al., 2015c; Singh et al., 2016d). The composting process of these wastes depends upon the lignolytic, cellulolytic, hemicellulolytic and pectolytic enzymatic potentials of decomposing microbes. Singh and co-workers reported that *Aspergillus terreus* and *Trichoderma lignorum* showed these enzymatic potentials to decomposed the agro-domestic wastes (Singh et al., 2015a; Singh et al., 2017a.b; Singh et al., 2019c; Singh et al., 2020). In this study the isolates of *Aspergillus and Trichoderma* play a significant role in the composting of different kitchen wastes.

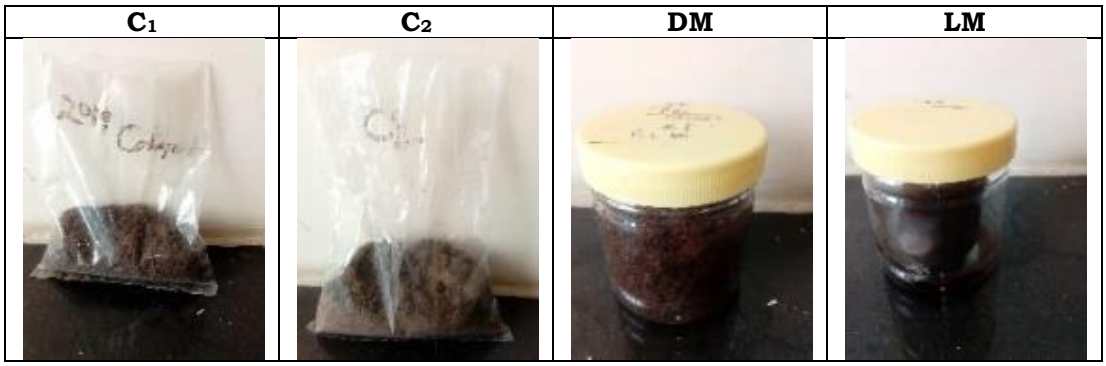

Figure 1: The samples of compost Compost-1, Compost-2, Dry Manure (DM) and Liquid Manure (LM)

4. CONCLUSION

The present study describe the kitchen waste and dried leaves are best way to forming compostFungi are the major degraders of organic matter in natural environments, and almost every naturally occurring organic compound can be degraded by one fungus or another. An enormous range of organic compounds can be utilized by fungi.The Composting of solid organic wastes is an essential requirement of organic farming to minimized the chemical pollution in agriculture.

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