Screening of some cellulolytic fungi from Vegetable Waste

Balwan W. Kamble and Anil U. Kulkarni,

Department of Botany, Lalbahadur Shastri Sr. College, Partur Dist. Jalna. 431501.

ABSTRACT

In this investigation fungi were present in high degree of surface of majority decomposed vegetable waste residues. Five vegetable wastes were collected from various market places of Jalna district, these are Onion, Tomato, Brinjal, Sweet Pepper and Green Bean waste.

Twenty three fungal species were isolated from these vegetable wastes. Samples were plated on potato dextrose agar (PDA) medium and incubated at 28°C±2°C and incubated at room temperature for 5 days.

From which 6 *Aspergillus* species, 2 *Alternaria* species, 1 species of *Curvularia*, 6 *Fusarium* species , 4 *Penicillium* species, 2 *Rhizopus* species and 2 species *Trichoderma*. Identification based on morphological characteristics by observing colony features like color, texture conidia and spores structure. Among the isolates *Aspergillus* had the highest rate of occurrence followed by *Fusarium* while *Penicillium, Alternaria, Rhizopus, Trichoderma and Curvularia* were the least.

This clearly indicates that these fungi might be developing ability to degrade. It is clear from the result concluded that deuteromycetes fungi superior for degradation and converted in to valuable product that is compost.

Key word: Isolation of Fungi, Waste Vegetables, PDA.

INTRODUCTION

Fruits and vegetables are important food commodities throughout the world. Fruits and vegetable are rich sources of vitamins, such as vitamin C, folic acid, vitamin A, including minerals such as calcium and iron. Fruits and vegetables have similar nutritive properties; 70% of their weight is water, 3.5% protein and about 1% fat (Obetta *et al.,* 2011).

However fruits and vegetable have serious challenges to their existence and these may affect and get spoilage by pests, in adequate rainfall and fungal attack, Amusa, et al., (2002). In India, 20-30 % of the produce is spoiled in the markets, (FAO, 2002; Deka *et al*., 2006). These wastes create hazards to the environment. A huge amount of these materials are left on farmlands to be decomposed by microorganism such as bacteria and fungi. The ability of some microorganisms to metabolize lignin and hemicelluloses (Silva, *et al.,* 2005), beside the increasing energy demand has focused worldwide attention on the utilization

of renewable resources, particularly vegetable residues, agricultural and agro-industrial wastes, such as sugarcane bagasse (Acuna-Arguelles, *et al.*, 1994), wheat bran (Singh, *et al.*, 1999).

On the other hand, their major components as cellulose, starch, lignin, xylan, and pectin can be used by several microorganisms as a source of energy for their growth and producing enzymes and other products with high commercial value (de Freitas, *et al.*, 2006 and Costa, *et al.*, 2007).

The genus *Aspergillus* encompasses organisms whose characteristics are of high pathological, agricultural, industrial, pharmaceutical, and scientific importance and play an important role in the degradation of organic substrate, particularly plant material (Bignell, 2010; Goldman & Osmani, 2008; Samson & Varga, 2009). The capacity of thermophilic microorganisms to assimilate organic matter depends on their ability to produce the enzymes needs for degradation of the substrate. Tuomela, et al. (2000) reported *Aspergillus niger* is the more efficient for the degradation of agriculture wastes.

This investigation made on the isolation and identification of fungi, responsible for associated with six vegetables wastes, Onion, Tomato, Brinjal, Sweet Pepper, Green Bean, and Spinach were collected from local markets and Agricultural area at Jalna district. This study showed the different incidence of fungi from vegetable wastes.

MATERIAL AND METHODS

Collection of samples

Different vegetable waste like Onion, Tomato, Brinjal, Sweet Pepper and Green Bean waste were collected from agriculture and market places. Samples are separately kept inside clean plastic bags and store at room temperature in laboratory mycological analysis (Mohmoud, et al.,2011). The vegetable wastes appropriate were inoculated on agar medium for isolation of fungi.

Isolation and Identification of fungi

PDA was prepared the standard procedure contained per liter: Potato 200gm, Dextrose 20gm, Agar 20gm and 1000ml distilled water. (Anonymous, 1968) They were prepared according to the manufacturer's instructions. The infected samples were cut into 3 mm pieces with sterile razor blade, surface-sterilized in 0.1% Mercury chloride ($HgCl_2$) for 2 minutes, then placed on Potato Dextrose Agar (PDA) and incubated at room temperature for 5 days. The species encountered were identified in accordance with Chees brough (2000).Identification were made with help of standard literature, Mukadam (1997).

Photographs: Vegetable wastes

Photographs of some dominant fungi

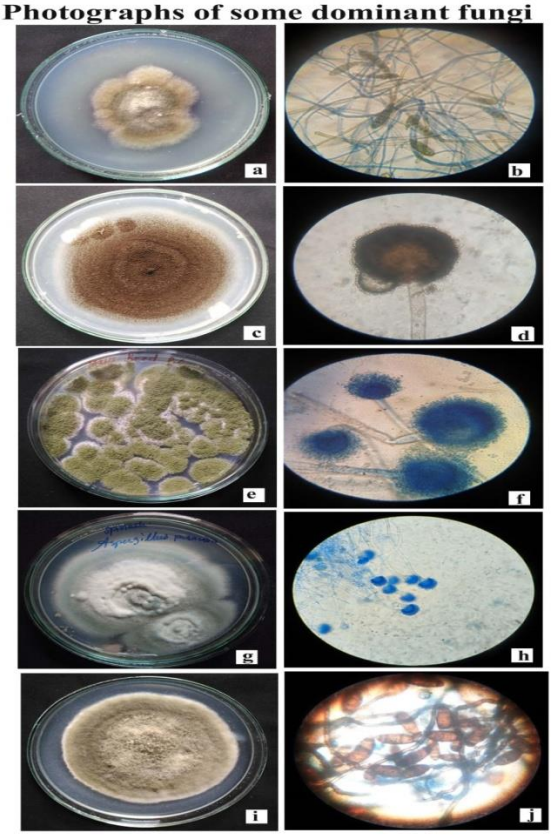
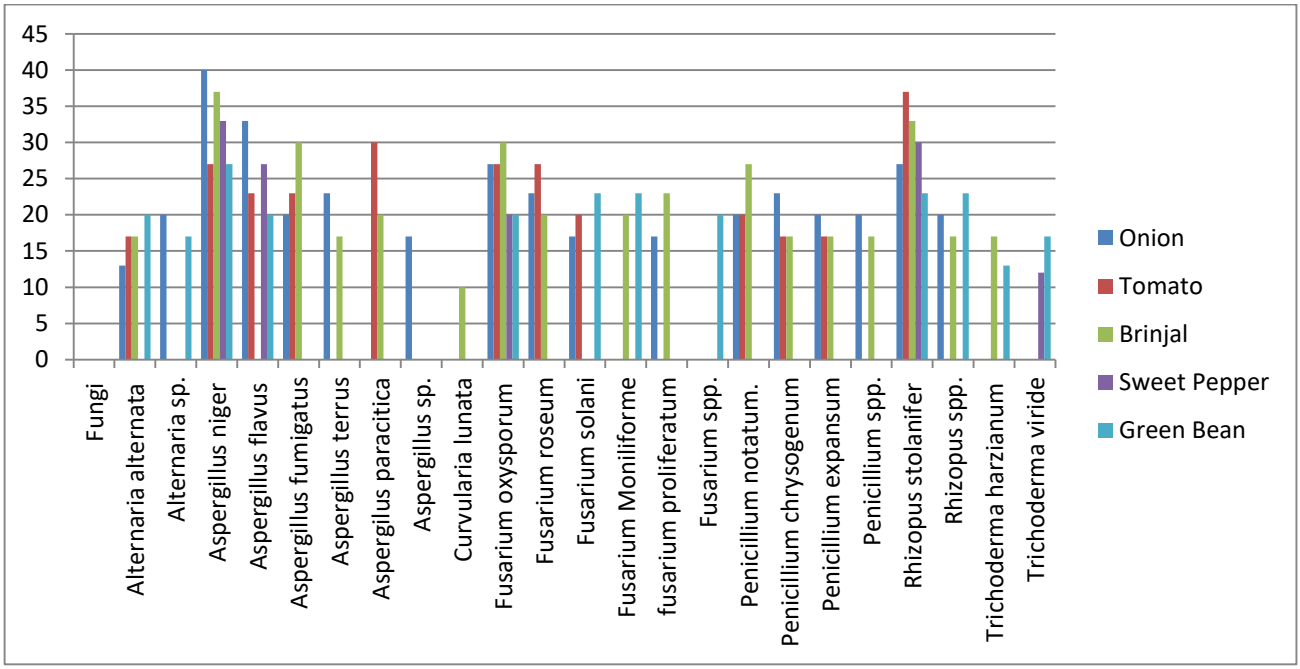


Figure: **a&b** : *Alternaria alternata.*
c&d : *Aspergillus niger.*
e&f : *Aspergillus flavus.*
g&h : *Aspergillus fumigatus.*
i&j : *Curvularia lunata.*

Table: 1. Isolation of fungi from vegetables waste on PDA:

Waste sample	Onion	Tomato	Brinjal	Sweet Pepper	Green Bean
Fungi					
Alternaria alternata	13	17	17	-	20
Alternaria sp.	20	-	-	-	17
Aspergillus niger	**40**	27	**37**	**33**	**27**
Aspergillus flavus	33	23	-	27	20
Aspergillus fumigatus	20	23	30	-	-
Aspergillus terrus	23	-	17	-	-
Aspergillus paracitica	-	30	20	-	-
Aspergillus sp.	17	-	-	-	-
Curvularia lunata	-	-	10	-	-
Fusarium oxysporum	27	27	30	20	20
Fusarium roseum	23	27	20	-	-
Fusarium solani	17	20	-	-	23
Fusarium Moniliforme	-	-	20	-	23
Fusarium proliferatum	17	-	23	-	-
Fusarium spp.	-	-	-	-	20
Penicillium notatum.	20	20	27	-	-
Penicillium chrysogenum	23	17	17	-	-
Penicillium expansum	20	17	17	-	-
Penicillium spp.	20	-	17	-	-
Rhizopus stolanifer	27	**37**	33	30	23
Rhizopus spp.	20	-	17	-	23
Trichoderma harzianum	-	-	17	-	13
Trichoderma viridae	-	-	-	12	17

Graph: 1. Isolation of fungi from vegetables waste on PDA:



RESULT DISCUSSION

The result from table and photoplate, the study revealed seven fungal genera isolated from Onion, Tomato, Brinjal, Sweet Pepper and Green Bean waste.

Total of 23 entities were isolated, 6 *Aspergillus* species, 2 *Alternaria* species, 1species of *Curvularia*, 6 *Fusarium* species , 4 *Penicillium* species, 2 *Rhizopus* species and 2 *Trichoderma* species. Identification based on morphological characteristics by observing colony features with conidia and spore structure of fungi.

On Onion showed highest number of fungi isolates seventeen while Sweet Pepper had the lowest number of fungi isolates five. *Aspergillus niger* was highest incidence percentage recorded 40% followed by *Aspergillus flavus, Fusarium oxysporum and Rhizopus stolanifer* which contained 33%, 27% 27% respectively and lowest incidence percentage showed by *Alternaria alternata* (13%) other species were identified as *Aspergillus terrus*, *Fusarium roseum*, *Penicillium chrysogenum*, *Aspergillus fumigatus*, *Alternaria spp.*, *Penicillium notatum*, *Penicillium expansum*, *Penicillium spp.*, *Rhizopus spp.*, *Aspergillus spp.*, *Fusarium solani* and *Fusarium Moniliforme* However, the genus *Aspergillus* occurred most often on the onion in the present study agreed with the findings of El-Nagerabi and Abdalla, (2004) same result were found by Shehu and Muhammad (2011) , reported the highest frequency of occurrence of 30.0% for Aspergillus niger in the onion bulbs they studied.

12 fungi were isolates from **Tomato,** the maximum incidence percentage was recorded 37% of *Rhizopus stolanifer* followed by *Aspergillus paracitica.* Other fungal isolates - such as *Aspergillus niger, Fusarium oxysporum, F. roseum, Aspergillus flavus, A. fumigatus , Fusarium solani , Penicillium notatum , Alternaria alternata , Penicillium chrysogenum* isolated with varying incidence *and Penicillium expansum minimum incidence* were reported (17%), same result also reported by Onuorah (2015) and Ugwu *et al.* (2014).

Total 17 fungi isolates were found in **Brinjal,** *Aspergillus niger was* highest incidence percentage (37%) followed by *Rhizopus stolanifer* (33%). Lowest incidence percentage was recorded of Curvularia *lunata* contain 10%, Other fungi isolates- such as *Aspergillus fumigatus, Fusarium oxysporum, Penicillium notatum, Fusarium proliferatum, F. roseum, F. Moniliforme Aspergillus paracitica , Alternaria alternata, Aspergillus terrus, Penicillium chrysogenum, P. expansum, P. spp. , Rhizopus spp. and Trichoderma harzianum* from (table), (Usman, Abid, Hussain, Khan, & Sultana, 2014)

From **Sweet pepper,** 05 fungi were isolated . *Aspergillus niger was dominant and it showed 33%. Rhizopus stolanifer, Aspergillus flavus, Fusarium oxysporum and Trichoderma viridae (30%, 27%, 20%, and 12%).respectively* in decreasing order of dominance *from (Table).* Farzana Usman et, al (2014).

A total of 12 fungi isolates found on **Green bean**. *Aspergillus niger showed maximum incidence percentage which was 27%. Fusarium solani , F. Moniliforme, Rhizopus stolanifer, R. spp., Alternaria alternata, Aspergillus flavus, Fusarium oxysporum, Alternaria spp.. Trichoderma viridae and Trichoderma harzianum also isolated from green bean.* Liamngee Kator (2016)

The result summarized indicates that the vegetables wastes decaying successfully take place due to association of fungi. It can be concluded from the results regarding the degradation of vegetables waste with the help of these fungi. However, the fungi which appeared on vegetables waste but they are found to grow fast and degrade vegetables waste successfully among the isolated fungi like Aspergillus, *Fusarium* and *Rhizopus*. Fungi were present in high degree of surface of majority decomposed vegetable waste residues Onuorah Samuel and Obika Ifeanyi, (2015) and Sch. Acad. J. Biosci. (2014). This clearly indicates that these fungi might be developing ability to degrade. It is clear from the result concluded that Deuteromycetes fungi superior for degradation and utilization of vegetables waste in to biocompost.

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