NATURAL INCIDENCE OF SOME WEED FUNGI AND THEIR EFFECT ON YIELD DURING MILKY MUSHROOM (*CALOCYBE INDICA*) CULTIVATION

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ABSTRACT

Incidence of weed fungi at monthly intervals during milky mushroom cultivation under natural climatic conditions was reported. Fifteen contaminating fungi were identified. *Trichoderma harzianum* was the most predominant (21.5 %) followed by *Coprinus comatus* (13.2 %) and *Sclerotium rolfsii* (13.1 %). Considerable presence (10.0-12.3 %) of species of *Penicillium, Aspergillus, Rhizopus* and *C. lagopus* were also noticed. Weed fungi like *Fusarium* sp., *Chaetomium* sp., *Mucor* sp., *A. nidulans, A. fumigatus* and *A. niger* showed varied presence (4.0-9.3 %) in the cultivation substrates. *Rhizoctonia* sp. and *Curvularia* sp. showed significantly lower presence (0.12 %) compared to others. The wet season (June-August 2006) witnessed a surge in the rate of contamination. Maximum yield loss (60.0 %) was induced by *T. harzianum* followed by *C. lagopus* (57.6 %), *Penicillium sp.* (21.73 %), *S. rolfsii* (21.52%) and *Chaetomium*(18.76 %).

Key words: Weed fungi, Milky mushroom,Yield, *Calocybe indica*

INTRODUCTION

As mushroom cultivation is a controlled biological activity which depends upon many biotic and abiotic factors, contamination by several microorganisms during cultivation
is manifested (Liao 1993; Singh *et al.* 2006). Among the biotic factors, fungi both parasitic and competitor, are the most important group which adversely affect both the quality and quantity of sporophores. Substrate used for mushroom cultivation, besides the source of air-borne fungal spores, mainly harbor these weed fungi. The sterilized substrate predisposes the crop to the attack by various weed fungi as they face little competition from the substrate contaminants except the edible fungus. The risk of incidence of the contaminants increases manifold in absence of proper substrate sterilization facilities. The cultivation of *Calocybe indica* in high temperature and humidity conditions increase the chance of contaminating fungi many fold. In view of scarcity of relevant literatures pertaining to the undesirable fungi during cultivation of *C. indica* excepting few (Pandey *et al.* 2003), the current study was undertaken to identify them mainly at the genus level as well as to measure their frequency of incidence and the loss in mushroom yield under natural climatic conditions.

MATERIALS AND METHODS

Cultivation of mushroom was carried out as per the standard procedure (Pani and Das 1998) and the substrates were periodically inspected from March to October (2006) for presence of undesirable fungi. The beds were selected at random in the cropping house. Right from spawning the substrate, the paddy straw substrates were critically examined from time to time for locating the weed moulds. Small pieces of straw showing the presence of weed fungi were picked up with sterilized forceps and surface sterilized with 0.1 % Mercuric chloride for 10-15 seconds followed by 2-3 washings with sterile distilled water. These pieces were transferred to PDA petriplates which were incubated at 28° C (Tuite 1969). The developing cultures were purified and maintained on PDA slants. The fungal growth directly taken from the substrate as well as from pure cultures was compared. Identification of the weed fungi was based on their microscopic, morphological as well as cultural characteristics. The yields from beds predominantly infected by the specific weed fungi were compared with that of apparently healthy beds for assessment of yield loss. The percent incidence of undesirable fungi and yield loss were followed as per Sharma *et al.* (1991).

RESULTS AND DISCUSSION

Fifteen undesirable fungi were encountered during the cultivation of *C.indica*. Among the weed fungi, incidence of *Trichoderma harzianum* was maximum (21.5 %) followed by *Coprinus comatus* (13.2 %) and *Sclerotium* rolfsii (13.1 %). Higher incidence of these weed fungi in the cultivation substrate has been reported in other edible mushrooms (Pani 2000). Sinden and Houser (1953) were the first to recognize *Trichoderma* species as a potentially important pathogen and/or competitor that may effect the production of white button mushroom. Lopez *et al.* (1993) reported *Trichoderma* species as the common contaminants during mushroom production process. Considerable incidence (10.0-12.3 %) of *Penicillium* sp, *Aspergillus flavus, Rhizopus* sp. and *Coprinus lagopus* was also recorded during the cropping period. Undesirable fungi like *Fusarium* sp., *Chaetomium* sp., *Mucor* sp., *A. nidulans, A. fumigatus* and *A. niger*

Table 1: Incidence of weed fungi and their effect on yield of *Calocybe indica*

Weed Fungi	Per cent Incidence								Mean	Yield Loss (%)
	Mar.	Apr.	May	June	July	Aug.	Sept	Oct		
Aspergillus niger	5	3	7	9	17	12	5	4	7.25	7.50
A. flavus	7	10	9	9	25	15	5	6	10.75	14.96
A. fumigatus	11	14	8	7	19	7	5	4	9.37	6.90
A. nidulans	3	2	4	15	11	9	3	2	4.87	4.80
Rhizopus sp.	9	11	9	16	22	20	5	3	11.87	4.20
Trichoderma harzianum	22	15	24	27	30	33	15	7	21.50	60.02
Sclerotium rolfsii	15	10	12	16	20	22	7	3	13.12	21.52
Coprinus comatus	15	22	27	14	12	12	10	4	13.25	6.56
Coprinus lagopus	14	20	25	10	13	10	5	2	12.37	57.60
Mucor sp.	7	5	8	12	15	14	4	4	8.62	8.70
Penicillium sp.	8	15	9	15	17	7	7	2	10.00	21.73
Chaetomium sp.	2	8	4	10	10	9	6	2	6.37	18.76
Fusarium sp.	4	3	7	2	8	4	2	2	4.00	3.20
Rhizoctonia sp.	-	-	-	-	-	-	-	1	0.12	1.26
Curvularia sp.	-	-	-	-	-	-	-	1	0.12	0.12
Mean	8.1	9.2	10.2	10.1	14.6	11.5	5.2	3.1	-	

Each of the observation was the average of three replications from three cropping seasons.

showed varied presence (4.0-9.3 %) in the cultivation substrates. Among the weed fungi, *Rhizoctonia* sp. and *Curvularia* sp. showed significantly lower presence (0.1 %) compared to others. The beds predominantly infected by species of *Trichoderma* and *Sclerotium* induced rotting of young fruiting bodies. Species of *Aspergillus, Trichoderma, Penicillium* and *Chaetomium* appeared quite early in the substrate and were more confined to in and around the applied spawn bits.

In general, the wet season (June–August) witnessed an increase in rate of fungal contamination due to more congenial conditions for their growth and development. Incidence of weed fungi was maximum (14.6 %) during July followed by August (11.5 %). Least incidence (3.1 %) of weed fungi was observed during October. It was further noticed that *Coprinus* species were more prevalent during relatively warmer part of the season (April–May) preferably in areas of straw beds with high moisture content.This is in agreement with Pani (2000).

Experimental results (Table 1) also indicate that the competitor fungi reduced the mushroom yield to varied extent. Maximum loss (60.0 %) in mushroom yield was caused by *T. harzianum* followed by *C. lagopus* (57.6 %). *Trichoderma* outbreaks leading to a total loss of mushroom production in many commercial mushroom farms have been reported (Morris et al., 1995). Different levels of crop losses ranging from 10 to 80 % have been reported from various parts of the world (Rinker and Alm, 1977; Seaby, 1987; Staunton, 1987; Sharma and Vijay, 1996). Appreciable loss in mushroom yield (18.7–21.7 %) was recorded in substrates predominantly contaminated by species of *Penicillium, Sclerotium and Chaetomium*. One of the factors contributing towards higher percentage of loss by species of *Trichoderma, Penicillum and Chaetomium* might have been due to their appearance quite early during the cropping period affecting the initial growth and establishment of mushroom mycelia. Among the aspergilli, highest reduction in mushroom yield was reported with *A. flavus* (14.9 %) while it was least with *A. nidulans* (4.8 %). Beds infected with *Rhizoctonia* and *Curvularia* species produced yields almost comparable to the yields obtained from healthy beds. Reduction in mushroom yield could have been due to their action as nutrient competitors (Doshi and Singh 1985; Rai *et al.* 1993) or due to liberation of some diffusible toxins inhibiting the growth of the edible fungus (Repper and Pennickx 1987)

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