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Effect of Thickness of Casing Soil on Growth and Yield Performance of Milky Mushroom (*Calocybe indica* P&C)

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ABSTRACT: Milky mushroom (*Calocybe indica* P&C) is cultivated commercially in India not only for its nutritional value, but also for its medicinal properties. The present research was carried out to know the effect of casing soil thickness on days for spawn run, days for primordial initiation, days for first harvest, yield performance and biological efficiency of milky mushroom. Among different thickness of casing soil tested, earliest period for spawn running, primordial initiation and first day of harvest was recorded in 2.0 cm thickness of casing soil. Highest yield and biological efficiency of milky mushroom was observed in 2.0 cm thickness of casing soil, whereas lowest yield and biological efficiency was recorded in 3.5 cm thickness of casing soil.

Keywords: *Calocybe indica*, casing thickness, yield, biological efficiency.

INTRODUCTION

Milky mushroom is also known by different local names like "Dudh chatta", "Swetha Mushroom" etc. Milky mushroom (*Calocybe indica* P&C*)* is commercially cultivated in the Southern states of India like Tamilnadu, Karnataka (Krishnamoorthy, 2003) and now-a-days it is gaining its popularity in countries like China, Malaysia and Singapore. This mushroom was first collected in wild form from West Bengal by Purkayastha and Chandra in 1974. Among the different commercially cultivated mushrooms in India, white button mushroom (*Agaricus* spp.) contributes 73%, oyster (*Pleurotus* species) contributes 16%, paddy straw mushroom (*Volvariella volvaceae*) 7%, milky mushroom (*Calocybe. indica*) 3% and other edible mushrooms contributes 1% of the production. This mushroom requires a temperature of 30-35°C and relative humidity of about 70-80 per cent (Singh *et al*., 2009). The protein content of milky mushroom is about 17.69%. It was reported that consumption of milky mushroom maintains the normal concentration of sugar in the blood and helps in treating diabetes. The climatic condition of Odisha is suitable for cultivation of milky mushroom. It can be grown throughout the year except the winter season during the month of November to February. Its attractive white colour, higher biological efficiency under optimum condition, good shelf-life and delicious taste attributed for gaining its popularity among the people (Kumar *et al.,* 2013). This mushroom contains important vitamins like thiamine, riboflavin, nicotinic acid, pyridoxine, biotin and ascorbic acid (Breene, 1990). Mushrooms have anti-tumour effect, anti-fungal, anti-bacterial and medicinal properties (Anusiya *et al.,* 2021; Ghosh and Acharya 2022).

Milky mushroom can be grown on different substrates such as paddy straw, wheat straw, maize stalk, coconut coir pith, soybean straw, sugarcane bagasse, sorghum stalk, cotton waste etc. (Vijaykumar *et al.,* 2014; Chinara and Mahapatra 2020; Sangeetha and Rajappan 2020). The cultivation processes of milky mushroom resemble oyster mushroom but include an additional process of casing (Maheswari *et al.,* 2018). The application of soil and sand mixture alongwith calcium carbonate on the surface of a fully colonized mushroom bag is known as casing. This casing layer not only provides moisture for growth and development of fruiting bodies but also offers physical support for the formation of fruiting bodies. The casing material and thickness of casing soil influences growth and yield of milky mushroom. As yield of milky mushroom is influenced by thickness of casing soil, the present investigation was carried out to find the most suitable thickness of casing soil for commercial cultivation of milky mushroom.

MATERIALS AND METHODS

The present research work was done during rainy season in the year 2022 at Department of Plant Pathology, College of Agriculture, Chiplima, Sambalpur. Pure culture of milky mushroom strain (OCI 04) was obtained from Odisha University of Agriculture and Technology, Bhubansewar.

Spawn was prepared as per the method described by Michael *et al.* (2011) with slight modifications. Undamaged wheat grains were collected and overnight soaking was done in water. Then grains were boiled

until they became soft, excess water was removed and grains were spread on blotting paper and air dried. To maintain pH calcium carbonate was added to the grains at the rate of 2% on dry weight basis of the grains The grains were then filled into glucose bottle, plugged with cotton and sterilized in autoclave at 121°C for 30 min. Grains were then inoculated with pure culture of *C. indica* and incubated at 25°C for 15 days to obtain mother spawn. Paddy straw was collected from field and used as cultivation substrate. Well dried paddy straw were chopped into 2-3 cm pieces and immersed in 100 liters of water containing 10 g of carbendazim. Next day in the morning, straw was taken out and excess water was removed. The substrate was spread as thin layer on polythene sheet and shade dried to get 60% moisture capacity.

For bed preparation, substrate with 60% moisture was filled in transparent polythene bag of the size of 35 x 45 cm. One kg of soaked paddy straw was used to fill up in each bag and spawn was inoculated on the surface of the substrate at the rate of 2 % of wet substrate. Three replications were done for each treatment. The spawned bags were kept in the spawn running room in dark at room temperature (25 to 35 °C). After completion of spawn run, the bags were moved to cropping room in the thatched shed and then casing was done. After complete colonization of the substrate by the mycelium of the milky mushroom, casing was done. Here soil 75% + sand 25% was used as casing material. Calcium carbonate was mixed @ 100g/ kg of casing material. Then casing mixture was sterilized in autoclave at 15lb psi for one hour. Different thickness of casing mixture *viz.*, 1 cm, 1.5 cm, 2 cm, 2.5 cm, 3 cm and 3.5 cm was spread on the top of spawn run bags after opening the mouth of the bags and pressed gently. Then water was regularly sprayed to wet the casing soil. Total yield of mushroom fruiting body from each bed was recorded immediately after harvest. Biological efficiency was calculated by dividing average yield of mushroom per bed by dry weight of substrate.

$$\text{Biological efficiency} = \frac{\text{Fresh weight (g) of mushrooms harvested}}{\text{Dry weight (g) of substrate}} \times 100$$

RESULTS AND DISCUSSIONS

A. Days for spawn run, pin head formation and first harvest

Different thickness of casing soil *viz.*, 1.0 cm, 1.5 cm, 2 cm, 2.5 cm, 3 cm and 3.5 cm were used in the present study to determine the most suitable thickness of casing soil for spawn run, pin head formation and first harvest by *C. indica* and data are presented in Table 1. Time required for completion of spawn run ranged from 19.2 days to 26.8 days. Fastest (19.2 days) spawn run period by this milky mushroom was observed in casing soil of 2.0 cm thickness followed by 1.5 cm (20.5 days), 1.0 cm (21.7 days) thickness of casing soil. Maximum days (26.8) for completion of spawn run was observed in casing soil of 3.5 cm thickness. Similar trend was also observed in days for pinhead formation and days for first harvest by this mushroom. The time ranged between 29.00-38.2 days for formation of pin head on different thickness of casing soil. Time required for days to first harvest by this mushroom varied from 39.2 to 49.5 days. Our results are in agreement with findings of Nirupa and Kududa (2018) who reported that milky mushroom took shortest time for spawn run, pinhead formation and first day of harvest in casing soil of 1-2 cm thickness

B. Mushroom yield and biological efficiency

In order to find out the most suitable thickness of casing soil for yield and biological efficiency of *C. indica*, casing soil of different thickness were tested and the results are presented in Table 2. The results revealed that highest yield was obtained from 2.0 cm thickness of casing soil (741.0 g). It was followed by 1.5 cm thickness of casing soil (705 g), 1.0 cm thickness (665.0 g), 2.5 cm thickness of casing soil (621.0 g), respectively. Lowest yield was recorded in 3.5 cm thickness of casing soil (531.0 g). With increase in thickness of casing soil , yield also started reducing. Highest biological efficiency was recorded in 2.0 cm thickness of casing soil (74.10%) followed by 1.5 cm thickness (70.05%), 1.0 cm thickness of casing soil (66.50%), respectively. Lowest biological efficiency was found in 3.5 cm casing soil (53.10%). Among the different thickness of casing soil, 2.0 cm was found to be the best thickness of casing soil which supports maximum yield and biological efficiency of milky mushroom. Similar result were reported by Pani (2012); Shukla (2007). Nirupa and Kududa (2018) also reported similar observation in which highest yield of milky mushroom was obtained in 2.0 cm thickness of casing soil. Panda and Biswas (2021) found that a 1.0 inch thickness of casing soil was superior to the yield of milky mushroom.

Table 1: Effect of casing soil thickness on spawn run, pin head emergence and first harvest of *C. indica.*

Casing soil thickness	Days for spawn running	Days for pinhead emergence	Days for first harvest
1.0 cm	21.7	31.8	42.2
1.5 cm	20.5	30.6	40.7
2.0 cm	19.2	29.0	39.2
2.5 cm	22.90	33.2	43.5
3.0 cm	24.3	35.1	46.1
3.5 cm	26.8	38.2	49.50
SEm±	0.11	0.15	0.24
CD at 5% level	0.34	0.46	0.71

All the observations are average of three replications

Table 2: Effect of thickness of casing soil on yield and biological efficiency of *C. indica.*

Thickness of casing soil	Yield (g) per kg of dry substrate	Biological efficiency %	
1.0 cm	665	66.50	
1.5 cm	705	70.05	
2.0 cm	741	74.10	
2.5 cm	621	62.10	
3.0 cm	580	58.10	
3.5 cm	531	53.10	
SEm±	9.34		
CD at 5% level	28.78		

All the observations are average of three replications

CONCLUSIONS

Among the different thickness of casing soil tested, 2.0 cm thickness was found to be the best to support growth and yield of milky mushroom (*C. indica*). So, 2.0 cm thickness of casing soil can be recommended to the farmers for commercial cultivation of milky mushroom and also to increase its productivity.

FUTURE SCOPE

As mushroom industry is flourishing day by day, there are lot of scopes to work on mushroom cultivation. As production of milky mushroom in our country is not satisfactory, it is necessary to do more research on milky mushroom and involve large number of farmers to cultivate milky mushroom so that they can earn more profits.

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Conflict of Interest. None.

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