

Original Research Article

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Effect of Different Substrates on the Growth and Yield of Milky Mushrooms in Telangana, India

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ABSTRACT

Performance of milky mushroom (*Calocybe indica*) on different agricultural wastes like paddy straw, castor stalks, sunflower stalks, coconut coir pith, oil palm waste and groundnut shells was evaluated during the summer season. The spawning was done by sterilization of all the seven substrates. The bags were kept in spawn running room with the maintenance of temperature (30°C–35° C) and relative humidity (70–80 %) respectively. The minimum number of days required for completion of spawn run (30 days), primordial formation (10-15 days) and days for first harvest (40–45 days) was recorded with the paddy straw substrate followed by castor stalks where the minimum number of days required for completion of spawn run (33 days), primordial formation (10–15 days) and days for first harvest (43–48days). The experimental results revealed that paddy straw substrate was best and recorded an average yield of 1.0 to 1.5 kg per bed as compared to the other substrates. After paddy straw, the yield of milky mushrooms on coconut coir pith (806 g/ kg substrate) and oil palm waste (830 g/ kg substrate) was found on par with each other and yielded more compared to other substrates. Mushroom growers can adopt paddy straw substrate for growing milky mushrooms during summer season. The relative efficacy of the agricultural by-products analysed in the study indicated that paddy straw substrate is suitable for cultivation of milky mushrooms.

Keywords

Substrate, Growth, Yield, Milky mushroom and *Calocybe indica*

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Introduction

Calocybe indica is the second important commercially grown mushroom in Telangana after button mushroom. Ever increasing production in mushroom like *Calocybe indica* pose challenge to the current supremacy of button mushroom in the world market (Miller, 1994). It is tropical species which recently was collected and consumed from the forests

of West Bengal. The fruiting bodies are attractive with thick fleshy, white cap and thick stalk. The mushrooms have better shelf life as compared to oyster and button mushroom and thereby there is no browning on storage. It requires temperatures of 30 - 35°c for growth and fructification, hence highly suitable for tropical climate. With the depletion of water resources and introduction of WTO regime, cropping pattern is changing

very rapidly, farmers are going for commercial ID crops and information on the utilization of the by-products of these crops is lacking, so there is need to evaluate the by-products of different crops and to bring awareness among the growers about the utilization of the various crop by-products as substrates in mushroom cultivation. Milky mushroom can be cultivated on varieties of cellulosic substrates like, paddy straw, wheat straw, maize stalks, sorghum stalks, pearl millet stalks, sugarcane trace, sugarcane baggase, soya bean straw, cotton waste, coconut coir pith, groundnut haulms etc.

The present investigation was taken up to evaluate the effect of seven different substrates on growth and yield of milky mushrooms during summer season.

Materials and Methods

Pure culture and spawn preparation

The seeds of mushroom are known as spawn. Tissue from mature fruiting body was aseptically placed on Potato dextrose agar medium in Petri plates and placed in the incubator at $25 \pm 2^\circ\text{C}$ for one week. This pure culture was transferred into PDA slants and used to make commercial spawn. Spawn preparation was done by using standard method described by Krishnamoorthy (2003). Method starts with boiling of healthy and clean sorghum grain until it absorb water and get double in size. It is then allowed to cool and excess water was removed. Grains are mixed with calcium carbonate 20g per kg grains and calcium sulphate 5g per kg grains in order to prevent aggregation and to maintain required pH. Non absorbent cotton was plugged and autoclaved at 15 p.s.i for 1.5 to 2 hrs. It was inoculated after cooling and incubated at $23 \pm 2^\circ\text{C}$ for 15 to 20 days. As the grain fully covered with mycelium it is ready for spawning the substrate.

Substrate preparation

The substrate such as paddy straw, castor stalks, sunflower stalks, soybean hulls, coconut coir pith, oil palm waste and groundnut shells were chopped into 2 to 3 inch pieces and soaked in fresh water for 6-8hrs and sterilized in hot water for 2 - 3hrs. After that, the substrate was taken out and substrate is dried till it contains 60-70% moisture. Spawning was done @ 4 percent by wet weight of the prepared substrate. Cultivation was done in polythene bags of 100 gauge thickness (Pani and Das, 1998).

Casing material

Casing mixture was prepared by using black or red soil and pH was adjusted to 8.0 by using CaCO_3 or CaSO_4 . The mixture was treated with 4% formalin solution and covered with plastic sheet for 72 hrs. Thickness of casing material was maintained about 3.0 cm.

The experiment was laid out as completely randomized design with five replication and seven treatments.

Results and Discussion

Among the seven substrates evaluated for the performance of *Calocybe indica*, it was recorded that among all the substrates paddy straw was high and recorded an average yield of 1.0 to 1.5 kg per bed as compared to the other substrates which was used as a check. Time taken for the mycelium to cover the bed is about 30days and mushrooms developed 10 - 15 days after application of casing material either sterilized black or red soil. After paddy straw, the yield of milky mushrooms on two substrates coconut coir pith (806 g/ kg substrate) and oil palm waste (830 g/ kg substrate) was found on par with each other and yielded more compared to other

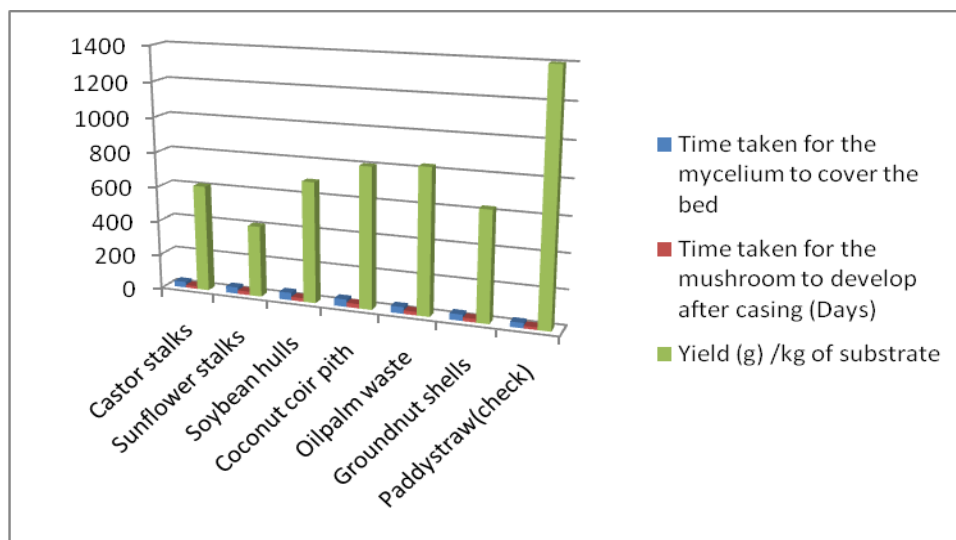
substrates. A maximum period of 43 days was taken for the completion of mycelial growth in the substrates soybean hulls and coconut coir pith. Minimum yield was recorded in sunflower stalks (410g/ kg substrate). The relative efficacy of the agricultural by-products analysed in the study indicated that paddy straw substrate is suitable for cultivation of milky mushrooms. Tewari (1991) provided an evidence for relationship between spawn rate and sporophore yield in

Pleurotus sajor-caju which implied that 4% and 6% of spawn on wet weight basis have enhanced maximum sporophore yield during summer and winter season respectively. Similarly, *Calocybe indica* yielded more at 4% spawn rate (Doshi *et al.*, 1993). In the present experiment paddy straw found to be a good substrate for cultivation of milky mushroom which is in agreement with earlier reports of several scientists (Fig. 1 and Table 1).

Table.1 Effect of different substrates on the growth and yield of milky mushrooms in summer season

S.No.	Name of the substrate	Time taken for the mycelium to cover the bed	Time taken for the mushroom to develop after casing (Days)	Yield (g) /kg of substrate
1	Castor stalks	33	10-15	613
2	Sunflower stalks	37	10-20	410
3	Soybean hulls	43	15-20	693
4	Coconut coir pith	43	15-25	806
5	Oilpalm waste	38	15-20	830
6	Groundnut shells	36	15-20	630
7	Paddystraw(check)	30	10-15	1400
	CD(0.05)			43.8
	CV(%)			3.2

Fig.1 Effect of different substrates on the growth and yield of milky mushrooms in summer season



Highest yield performance of milky mushroom was observed by Krishnamoorthy and Muthusamy (1997), Biswas and Singh *et al.*, (2009), Pani (2010) and Saranya *et al.*, (2011) who had reported that paddy straw was the best substrate for cultivation of *C. indica*.

In conclusion, the result shows that the paddy straw substrate is highly suitable for cultivation of milky mushrooms in Telangana. Mushroom growers can adopt paddy straw substrate for growing of milky mushrooms during summer season.

The result also shows that cultivation of *Calocybe indica* mainly depend on the substrate on which it is cultivated and varied production potential of different substrates is due to the variations in their physical properties and nutritional composition.

Keeping in view the present scenario in climatic changes it is very difficult to farmers to relay on Agriculture alone. In such circumstances farmers can taken up milky mushroom cultivation as small cottage industry with low investment which also provides employment to unemployed youth and rural women and help in reaping profits in short period of time.

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