EFFECT OF DIFFERENT CASING MATERIALS ON THE CULTIVATION OF CALOCYBE INDICA

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Abstract

Agro-residues, or agrowaste, are converted into nutritious, protein-rich food through the dormant biotechnological practice of mushroom culture. The *Calocybe indica* (milky mushroom) is growing in popularity throughout the world due to its strong size, appealing milky look, delectable taste, attractive colour, outstanding shelf life, and distinctive texture, in addition to having a sustainable yield. The goal of the current study was to evaluate the suitability of various casing materials, including paddy straw + vermicompost, paddy straw + vermicompost + red soil, and paddy straw + red soil + black soil, for the growth of milky mushrooms. Paddy straw + vermicompost (350g) had the highest BE (87.5%) rating of the three casing materials, followed by paddy straw + vermicompost + red soil (290g) with BE (82.84%), and the lowest rating was found in paddy straw +red soil + black soil (185g) with BE (41.08%). In the present study, paddy straw substrate with vermicompost casing material is an important substance for the cultivation of milky mushrooms.

Keywords: *Calocybe Indica,* Efficacy, Casing Materials, Vermicompost, Cultivation.

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1. INTRODUCTION

The varieties and strains of mushrooms grown in India have seen a significant revolution in recent years (Krishnamoorthy 2002, Viji *et al.*, 2023). Increasingly more people are growing mushrooms and eating them because of their excellent nutritional and therapeutic value. Mushrooms are regarded as the "poor man's protein" due to their high vitamin, protein, and mineral content (Velusamy *et. al.*, 2014a). India has tremendous opportunities for the growth of a large range of edible mushrooms due to its diverse agro-climate, but only a small number of species have been successfully farmed thus far. In 1974, Purkayastha and Chandra discovered the milky mushroom, *Calocybe indica*, in West Bengal, India. However, it is still only grown in a small number of locations across the nation (Pani 2010, Navathe *et. al.*, 2014, Rawal and Doshi 2014).

According to Amin *et. al.*, (2010), the *C. indica* contains significant amounts of protein, fibre, carbohydrates, vitamins, and vital amino acids. For diabetic individuals, it is advised as an appropriate diet (Yadav *et. al.*, 2021). Various lignocellulosic substrates are used to cultivate this mushroom (Bokaria *et. al.*, 2014, Velusamy *et. al.*, 2014a). *C. indica* fruiting bodies are appealing because they have a tall, thick stem and a big, meaty white head. There is no browning during storage because the mushrooms have a longer shelf life than oyster and button mushrooms. It is best suited for tropical areas because it needs temperatures between 25 and 35 °C for growth and fructification (Kumar *et. al.*, 2017). After button and oyster mushrooms, the milky mushroom has now been farmed for commercial purposes in India (Maurya *et. al.*,2019).

India has only recently begun to commercially cultivate this mushroom. The biological efficiency of this mushroom is significantly higher than that of oyster mushrooms, so it is necessary to introduce the growing technology into new agroclimatic regions of the nation. Although milky mushrooms are grown similarly to oyster mushrooms, they also go through a casing process (Maheshwari *et. al.*, 2018). As opposed to oyster mushrooms, milky mushrooms require an additional step called casing during manufacture. The first time this mushroom was grown was in 1976 by Purkayastha and Chandra using a soil, sand, and maize meal (12:6:1) mixture in soil jars. Later, better growth techniques were developed. The objective of the current study was to compare the effects of three different case materials on the development and production of milky mushrooms.

2. MATERIALS AND METHODS

2.1 Spawn Collection

The spawn of *Calocybe indica* was obtained from Vaicha Enterprises in Chennai, Tamil Nadu.

2.2 Substrate preparation

The substrate, such as paddy straw, was cut into pieces measuring 2 to 3 inches in length. It was then steeped in fresh water for 6 to 8 hours before being sterilised in hot water for 2 to 3 hours. Soaking is mostly used to completely submerge the substrate in water. The substrate was then removed and dried until it had between 60 and 70 percent moisture. Growing was carried out in 100 gauge polythene bags (Bano and Nagarajan 1976, Pani and Das 1998, Marimuthu *et. al.*, 2002). On a wet weight basis, 3 kg of substrate were prepared in each of the beds.

The bags were left undisturbed in the cropping room after the application of the casing materials to allow for pinhead formation. Water was sprayed lightly twice daily to keep the casing materials damp. After 14 to 18 days of casing, the first flush of mature mushrooms was collected. These mushrooms had distinct pileus, gills, and stipes. Each bed's yield was noted, and the Biological Efficiency (B.E.) was calculated using the following formula (Chang 1978):

$$\text{BE (\%)} = \frac{\text{Fresh weight of total Harvested Mushroom}}{\text{Dry weight of Substrate}} \times 100$$

2.3 Analysis of Variance (ANOVA) in PAST Software

Based on the observations for the period of three months, correlation, significance, variance, and F-value, between the growths of *C. indica* CO2 strains in the different casing materials were calculated using PAST 4.6.0 software.

3. RESULTS AND DISCUSSION

One of the most crucial commercial steps towards agricultural diversification is mushroom production. In India, agro-waste can be recycled on a massive scale with the aid of microbial technologies. On uncomposed substrate, milky mushrooms flourished in simulated indoor settings. Milky mushroom production involves the use of a wide variety of different cellulosic substrates. The most typical lignocellulosic substrates used for mushroom cultivation include cotton waste, paddy straw, wheat straw, soybean straw, sugarcane bagasse, and coconut coir pith. The major substrate for growing milky mushrooms, paddy straw, produced a promising crop. According to Krishnamorthy (2002), paddy straw can be the optimum substrate for the commercial production of *C. indica*. In the current study, paddy straw was used as a primary component of *C. indica* production to prepare beds.

According to Purkayastha and Nayak (1979), they supplemented the basal substrate by adding sawdust (5% compost). They claimed that sawdust only produced 0.4 g of yield per 400 g of substrate. In vitro tests were also conducted to assess the outcomes of adding different substrates to a base medium of sand or soil, and it was found that wheat bran and maize meal provided the highest yield. Chakravorty *et. al.*, (1981) grew this edible mushroom on a variety of substrates using sterile and non-sterile casings.

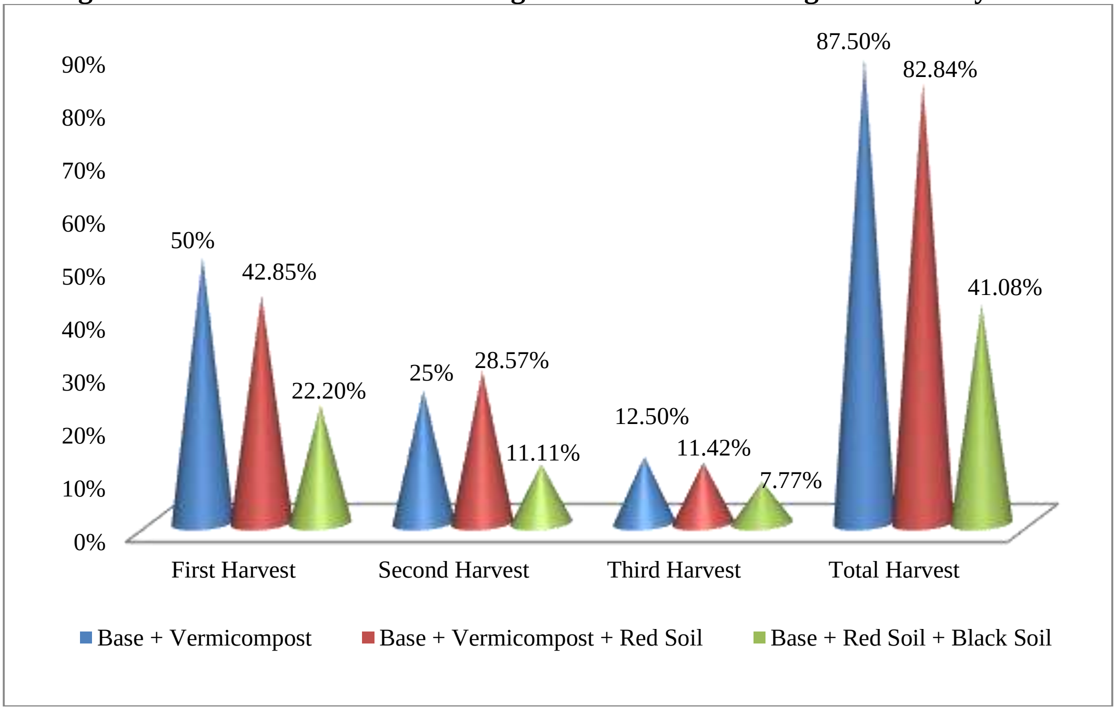
Table 1: The yield of the *C. indica* CO2 strain at different Casing materials

S.No	Substrate Name	Days required for complete mycelial run	First yield Weight (g)	Second yield Weight (g)	Third Yield Weight (g)	Total Yield Weight (g)
1	Paddy straw + Vermicompost	18	200	100	50	350
2	Paddy straw + Vermicompost + red soil	18	150	100	40	290
3	Paddy straw + Red soil + black soil	21	100	50	35	185

Table 2: Effect of casing materials on the *C. indica* CO2 strain at different harvest stages

Casing Types		First Harvest (%)	Second Harvest (%)	Third Harvest (%)	Total Harvest (%)
***C. indica* Co$_2$**	**Base + Vermicompost**	50	25	12.5	87.5
	Base + Vermicompost + Red Soil	42.85	28.57	11.42	82.84
	Base + Red Soil + Black Soil	22.2	11.11	7.77	41.08

Figure 1: Influence of different casing materials on the biological efficiency of *C. indica*



In the present study, the effects of the various casing materials (vermicompost, vermicompost + red soil, and red soil + black soil) on the characteristics of *Calocybe indica* were investigated. The outcomes are presented in Table 1. The pinhead initiation lasted for 28-30 days. Overall, 33–45 days were required for the first harvest. The ability of various casing materials to produce several fruiting bodies per bag has demonstrated considerable variance between them. Of the three casing materials, paddy straw + vermicompost (350g) had the highest BE rating (87.5%), followed by paddy straw + vermicompost + red soil (290g), with BE (82.84%), and paddy straw + red soil + black soil (185g), with BE (41.08%). Paddy straw and vermicompost produced the most milky mushroom fresh weight, whereas red and black soil produced the least (Table 2 and Figure 1). Different casing materials' varying physical characteristics and nutritional make-up may be the cause of their differential output potential. Bhardwaj (2000) reported that the use of vermicompost as a casing material layer had an effect on the yield of *C. indica*. Doshi and Sharma (2000) also used vermicompost as casing material gave good yield.

To test the overall significance between the yields in different casing materials, an ANOVA was carried out using PAST software. The difference between the groups and within the groups, Variance F-value, df-value, and Probability at 5% were analysed. The case of unequal variances was calculated as $F = 7.698$, $df = 2.897$, and $p = 0.0693$ for Co2 *C. indica*. The residual test shows a linear correlation with normal probability. Alternative hypotheses are accepted.

4. CONCLUSION

The casing layer has microorganisms and provides an environmental change that helps mushrooms shift from the vegetative stage to the reproductive stage. Paddy straw substrate with vermicompost and casing material is an important substance for the cultivation of milky mushrooms. Based on the present investigation, it can be concluded that the combination of paddy straw and vermicompost as a casing material was found to be best for maximising the yield of milky mushrooms. It was revealed that the casing material plays a decisive role in increasing the biological efficiency of milky mushrooms.

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