Selection of different substrates for the cultivation of milky mushroom  
*(Calocybe indica* P & C*)

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*Calocybe indica* is one of the best edible mushrooms which can be grown at high temperature or summer season. It replaces the non-vegetarian food. The present experiment was conducted to find out the efficacy of different substrates such as paddy straw, wheat straw, soybean straw, coconut coir pith, cotton waste and sugarcane bagasse for the cultivation of milky mushroom. Among the six different substrates, wheat straw substrate was superior which recorded minimum days for spawn run 15.67 days, pinhead formation 28.67 days and for first harvest 33.67 days with highest no. of fruit bodies 24.33, highest diameter 7.66 cm, length of stalk 7.86 cm, maximum yield 1463 gm and highest biological efficiency 146.3 %. Paddy straw was the next best superior substrate for cultivation of milky mushroom.

**Keywords:** Milky mushroom, *Calocybe indica* P & C, Substrates, Cultivation

**IPC Int. CL:** A61K 36/00, A01G 1/04, A01H 15/00, C12N 1/14, A47G 19/26, A47J 39/02

Mushroom cultivation is one of the most commercially important steps towards diversification of agriculture. Microbial technology can help in large scale recycling of agro waste in India. Milky mushroom (*C. indica*) is a tropical edible fungus and now it has greater demand due to robust, fleshy and milky white sporophore. It provides the people with an additional vegetable of high quality and enriches the diet with high quality proteins, minerals and vitamins which can be of direct benefit to the human health and fitness.

Milky mushroom grew well on uncomposted substrate under artificial indoor condition. Wide ranges of diverse cellulosic substrates are used for cultivation of milky mushroom. Paddy straw, wheat straw, soybean straw, sugarcane bagasse, cotton waste and coconut coir pith are the common lignocellulosic substrates used for cultivation of the mushroom.

The cultivation of the mushroom under South Gujarat has wide scope because of suitable environment and availability of substrates. Keeping this in a view the present study was conducted to find out the potentiality of different substrates for growth and yield of milky mushroom.

**Material and methods**

The study was carried out in South Gujarat during year 2010-2012. The native isolate of *C. indica* was collected and identified using cultural and morphological characters of the fungus.

**Substrate preparation**

Six substrates like paddy straw, wheat straw, soybean straw, sugarcane bagasse, cotton waste and coconut coir pith were selected for cultivation of milky mushroom. The substrates such as paddy straw, wheat straw, soybean straw and sugarcane bagasse were chopped into 2 - 3 inch pieces and soaked in water containing carbendazim (75 ppm) and formalin (500 ppm) for 14 - 18 hrs. After that, each of the substrates was taken out from the solution and excess water was drained out for 2-3 hrs. A moisture content of about 60 % was maintained in the wet substrate prior to spawning. Spawning was done @ 5 % by wet weight of the prepared substrate. Cultivation was done in high density polythene bags 60 x 40 cm with 100 gauge. Each treatment was replicated three times in completely randomized design. Data on number of days required for spawn run, days for pinhead formation, total number of fruit bodies, days for first harvest, pileus diameter, length of stalk, biological efficiency and yield (gm) were recorded.
Results

Results on days for spawn run, pinhead formation and first harvest were presented in Table 1.

Spawn run

The days required for spawn run on different substrates ranged from 15.67 days to 19.00 days. Significantly, minimum days required for spawn run in T2 (wheat straw) was 15.67 days which was at par with treatment T3 (coconut coir pith) with 16.33 days and T4 (soybean straw) 17.00 days.

Days for pinhead formation

Significantly, minimum 28.67 days was required for pinhead formation in the treatment of T2 (wheat straw). T3 (coconut coir pith) performed better in the next order (31.00 days).

Days for first harvest

Overall, 33.67 - 40.67 days were required for first harvest. Significantly minimum 33.67 days required for first harvest in the treatment of T2 (wheat straw).

Total number of fruit bodies

The highest numbers of fruit bodies were observed significantly in the treatment T2 (wheat straw) 24.33 fruit bodies which was at par with T1 (paddy straw) 23.33 and T4 (soybean straw) 23.00 fruit bodies.

Diameter of pileus

The diameter of pileus was significantly highest on T2 (wheat straw) 7.66 cm. The next best in the order were T4 (soybean straw) 7.33 cm which was at par with T5 (cotton waste) 7.30 cm and T1 (paddy straw) 7.26 cm.

Length of stalk

The results about length of stalk showed that the significantly highest stalk length was recorded in the treatment T2 (wheat straw) 7.86 cm. The next best in the order were T1 (paddy straw) 7.66 cm which was at par with T4 (soybean straw) 7.56 cm.

Yield

Overall, the yield ranged from 515.7 to 1463 gm, significantly highest yield was recorded in substrate T2 (wheat straw) 1463 gm/ 1 kg dry substrate. Whereas, soybean straw, coconut coir pith and cotton waste yielded 1261 gm, 1087 gm and 920.7 gm/ 1 kg dry substrate. Lowest yield was recorded in the treatment of sugarcane bagasse i.e. only 515.7 gm/ 1 kg dry substrate.

Biological efficiency

The biological efficiency of different substrate ranged from 51.57 - 146.3 %. The highest biological efficiency 146.3% was observed in treatment of T2 (wheat straw). The next best in order was T1 (paddy straw) 132.4%. Whereas, soybean straw coconut coir pith and cotton waste performed 126.1%, 108.7 % and 92.07% biological efficiency respectively.

Discussion

In the present investigation, wheat straw was found to be a good substrate for cultivation of milky mushroom which is in agreement with the earlier reports of several scientists. Highest yield of milky mushroom was observed on wheat straw by\textsuperscript{4-6}. The next best option was paddy straw. Several workers had reported that paddy straw was the best substrate for cultivation of \textit{C. indica}\textsuperscript{7-10}. This varied production potential of different substrates might be due to the variations in their physical properties and nutritional composition.

The present study indicates the suitable scope for cultivation of milky mushroom in South Gujarat. The environment and availability of substrates helps in the cultivation of milky mushroom in South Gujarat.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Treatments</th>
<th>Spawn run</th>
<th>Pinhead formation</th>
<th>First harvest</th>
<th>Average No. of fruit bodies</th>
<th>Pileus diameter (cm)</th>
<th>Length of stalk (cm)</th>
<th>Yield (gm)</th>
<th>Biological efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Paddy straw</td>
<td>17.67</td>
<td>32.33</td>
<td>37.33</td>
<td>23.33</td>
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<td>1324</td>
<td>132.4</td>
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<td>Wheat straw</td>
<td>15.67</td>
<td>28.67</td>
<td>33.67</td>
<td>24.33</td>
<td>7.66</td>
<td>7.86</td>
<td>1463</td>
<td>146.3</td>
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<tr>
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<td>Coconut coir pith</td>
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<td>31.00</td>
<td>36.67</td>
<td>20.33</td>
<td>7.10</td>
<td>7.30</td>
<td>1087</td>
<td>108.7</td>
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<td>4</td>
<td>Soybean straw</td>
<td>17.00</td>
<td>32.67</td>
<td>38.00</td>
<td>23.00</td>
<td>7.33</td>
<td>7.56</td>
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<td>126.1</td>
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<td>Cotton waste</td>
<td>17.33</td>
<td>32.00</td>
<td>39.00</td>
<td>17.33</td>
<td>7.30</td>
<td>7.20</td>
<td>920.7</td>
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<td>Sugarcane bagasse</td>
<td>19.00</td>
<td>34.67</td>
<td>40.67</td>
<td>10.33</td>
<td>6.73</td>
<td>6.70</td>
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<td>2.34</td>
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</table>
Evaluation of different substrates for cultivation of milky mushroom revealed that among the different substrates, wheat straw was superior which recorded minimum days for spawn run (15.67 days), pinhead formation (28.67 days) and for first harvest (33.67 days) with highest no. of fruit bodies (24.33). Highest pileus diameter and length of stalk were, i.e. 7.66 and 7.86cm. Similarly, wheat straw as substrate also recorded maximum yield (1463gm) and highest biological efficiency (146.3%). The coconut coir pith was next superior substrate in terms of spawn run, pinhead formation and first harvest which recorded 16.33, 31.00 and 36.67 days respectively.

Significance of study and conclusion
The present work help the researchers/society that C. indica can be grown among rural as well as urban population where wheat straw and paddy straw are easily available. From the present study, it can be concluded that wheat straw or paddy straw can be used as best substrate to get a good yield of C. indica. Mushroom cultivation technique is spreading nowadays throughout the world as they are easy to grow and no skilled person is required. A substrate is an important substance for researchers as well as for growers for the cultivation of mushroom. The research will help the researcher to select wheat straw as the best substrate for the cultivation of mushroom followed by paddy straw. The study proved that wheat straw substrate took minimum days for spawn run, pinhead formation and for first harvest with 15.67 days, 28.67 days and 33.67 days with highest no. of fruit bodies 24.33, highest diameter 7.66 cm, length of stalk 7.86 cm, maximum yield 1463 gm and highest biological efficiency 146.3 %, respectively as compared to other selected substrates.

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References