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Cultivation of milky mushroom collected from different region of Chhattisgarh state

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Abstract

The present study was conducted to see the biological efficiency of five strains of *Calocybe indica*, collected from different region and cultivated in Raipur district of Chhattisgarh state. The result revealed that the spawn run and pinhead initiation was quickest in strains CI-522 and CI-524 followed by the strain CI-530. The strain CI-524 was also found to be superior in yield attributing characters and yield performance with highest biological efficiency followed by strain CI-530 while, the strain CI-1 gave lowest yield compare to all tested strains. Similar result was recorded after re-casing on the bag, strain CI-524 recorded as superior strain and strain CI-1 did not gave yield.

Keywords: Milky mushroom, strain, CI and biological efficiency

Introduction

Calocybe indica is an edible white summer mushroom also known as milky mushroom. It can be easily grown in the temperature range of 25-30 °C. It has moderate protein content and has a good biological efficiency under optimum conditions. Its sporophores have long shelf life. The major advantage is that it can be best fitted in relay cropping when no other mushroom can be grown at higher temperature. *Calocybe indica* has a very good scope for further cultivation and it can replace the other tropical mushrooms like *Pleurotus* spp. and *Volvariella* spp. (Singh and Mishra).

Calocybe is a small genus of about 40 species of mushroom, which is edible and is cultivated in India. They are distributed in the tropical parts of the world (Shukla and Jaitly, 2013) [9]. The mushroom is of Indian origin and it is widely distributed in the Gangatic plains of West Bengal (Purkayastha and Chandra, 1974) [6]. Beginning from its first artificial cultivation in 1976 on a mixture of soil, sand and maize meal in soil jar (Chakravorthy *et al.*, 1981) [2], improved cultivation techniques were developed later on by various workers (Amin *et al.*, 2010) [1]. It is becoming more popular, due to its robust size, attractive color, sustainable yield, delicious taste, and unique texture. It has become the third commercially grown mushroom in India, after button and oyster mushrooms (Purkayastha and Nayak, 1979) [7]. Different *C. indica* strains are reported which show much diversity in their yield potential depending on the substrates used. This experiment was conducted to explore the yield attributes of milky mushroom for identification of potential strain.

Materials and Methods**Mushroom strains**

The pure cultures of five strains of *Calocybe indica* namely CI-1, CI-4, CI-522, CI-524 and CI-530 were prepared from fresh fruiting bodies, collected from different geographical locations of Chhattisgarh. The cultures were further multiplied on PDA (potato dextrose agar) medium and maintained at 30 °C. The pure cultures were also stored at 4 °C for further work.

Production of *C. indica* spawn

Spawn was prepared from pure cultures of five strains of *C. indica*. Wheat grains were used as substrate for preparation of mother spawn. Clean healthy and bold grains were taken then these were thoroughly washed and dipped in water for 10-12 hours. The soaked grains were cooked for 10-15 minutes till they become soft without rupturing of epidermis. Thereafter, the excess water was drained and grains were spread on muslin cloth so that excess moisture can be eliminated.

In cooled grains, Gypsum and Calcium carbonate (2% w/w) were mixed thoroughly. These prepared grains were filled in conical flask (250 ml) and plugged with nonabsorbent cotton. Each flask contains 100g grains and sterilized at 20 lbs psi for 2 hours. After cooling, inoculation was done with active growing mycelium of five strains of *C. indica* then incubated at 30 °C till the mycelium covered the entire grain surface. The spawn was prepared by this ways called as mother spawn and prepared in sufficient quantity required for the proposed research work.

Mushroom bag preparation

The wheat straw (chopped) was used as substrate for growing of *C. indica*. The substrate was dipped in water (which has already mixed with 75ppm Carbendazim and 500 ppm formaldehyde) for 14 hours as per the method described by Vijay and Sohi (1987). Thereafter, excess water was drained off the next morning and straw was spread over on sloppy, cemented floor till the moisture content of straw remained 65-70 per cent. Before spawning, formaldehyde was sprinkled on floor, and thereafter the spawn was mixed in substrate through layering method @ 4 per cent on wet weight basis in experiments. The spawned substrate was filled in poly propylene bags (18" × 27" -150 gauges) and mouth of the spawned bag was tied with nylon rope. The spawned bags were kept in mushroom growing room, where appropriate temperature (25-35 °C) and relative humidity (80-90 per cent) were maintained by frequently sprinkling of water on walls and floor. After complete colonization of substrate by mushroom mycelium (spawn run), casing were done.

Re-casing

The yield obtained from the bags. After three harvesting, on the bags re-casing was done and observation was recorded for yield of *C. indica*.

Yield and bio efficiency

Total weight of all the fruiting bodies harvested from all the three pickings were measured as total yield of mushroom. The bio efficiency (yield of mushroom per kg substrate on dry wt. basis) was calculated by the following formula (Chang *et al.*, 1981)^[3].

$$\text{Biological efficiency \%} = \frac{\text{Fresh weight of mushroom}}{\text{Dry weight of substrate}} \times 100$$

Results and Discussion

An extensive survey was conducted across Chhattisgarh, and five different strains of *C. indica* were collected from different geographical areas and the GPS details of the collected *C. indica* strains given below (Table 1) and cultivated in Raipur district of Chhattisgarh state.

Among the five strains of *C. indica*, the period for spawn run of *C. indica* differed significantly. Spawn run was faster in both strains CI-522 and CI-524 (12 days) followed by strain CI-530 (13 days), and CI-4 (14 days) while it was slower (15 days) in strain CI-1. Pin head initiation of *C. indica* also differed significant with the strains. Pin head initiation was quicker in strain CI-524 and CI-522 (7 days) whereas it was delayed in strain CI-1 (9 days).

Pileus diameter, stalk length and of different strain of *C. indica* differed significantly with each other. Pileus diameter was more in strain CI-524 (11.26 cm) followed by strain CI-4 (8.68 cm), strain CI-1 (5.51 cm) and strain CI-530 (4.90 cm) while it was less (3.63 cm) in strain.

CI-522 of *C. indica*. The highest stalk length was recorded in strain CI-524 (19.6 cm) followed by strain CI-530 (14.8 cm), CI-4 (12.6 cm) and CI-1 (10.2 cm). Whereas, lowest (9.9 cm) stalk length was recorded in strain CI-522 of *C. indica*. The stalk diameter different strain of *C. indica* did not show any significant difference with each other, it was varied from 2.96-4.10 cm. The average weight of *C. indica* also did exhibit significant difference with each other strains. The average weight of sporophores was significantly maximum (82 g) in strain CI-524 followed by strain CI-4 (75g), strain CI-522 (75g) and strain CI-530 (57 g) whereas it was minimum (54 g) in strain CI-1.

The yield of five strains of *C. indica* differed significantly with each other. The yield of *C. indica* was maximum in strain CI-524 (696.66g) with BE (69.66%) followed by strain CI-530 (485g) with BE (48.5%), strain CI-4 (318g) with BE (31.83%) and strain CI-1 (273.33g) with BE (27.33%) while it was minimum in strain CI-522 (226.67g) with BE (22.66%). Similar result observed after re-casing of bag. The maximum (255g) fresh yield with BE (25%) was obtained in strain CI-524, followed by CI-530 (198.33g) with BE (19.83%) and CI-4 (193.33g) with BE (19.33%) whereas the minimum fresh yield was recorded in strain CI-522 (168.33g) with BE (16.83%).

The results are in accordance with the findings of NRCM (2006) in which nine strains of *C. indica* were evaluated for the yield performance at different places and reported that the strains CI-6 was best on the basis of average data followed by CI-1, CI-7 and CI-3. Kaur *et al.*, (2011) studied on nine strains of *Calocybe indica* (Ci-1, Ci-2, Ci-3, Ci-4, Ci-5, Ci-6, Ci-7, Ci-9 and APK-2). Ci-1 to Ci-7, Ci-9 and APK-2 were grown on wheat straw following the standard adapted cultivation technology. The biological efficiency, estimated from the harvested yield (kg q-1 dry straw), was maximum in strain Ci-3 (81.28%). Five strains Ci-4, Ci-5, Ci-6, Ci-7 and APK-II gave yields at par with each other whereas Ci-1, Ci-2 and Ci-9 showed low biological efficiency (47.82-51.28%).

Table 1: Collection of different *C. indica* strains from different geographical area of Chhattisgarh and their GPS detail

Sl. No.	Local Accession No & GPS Position	Name of fungi	Habitat/ Substrates	Place	Date of collection	Edibility	Designation
1	CI-1 N 21° 15.714' E 81° 34.765' Altitude 1094ft	<i>Calocybe indica</i> * Milky mushroom	Beneath Peepal Tree (<i>Ficus religiosa</i>) Rhizospere region	Dharampura, Raipur	13.08.2015	Edible	DMRO-747
2	CI-4 N 20°13.412' E 81°22.738' Altitude 1240ft	<i>Calocybe indica</i> * Milky mushroom	Beneath Peepal Tree (<i>Ficus religiosa</i>) Rhizospere region	Kanker	09.08.2015	Edible	DMRO-748
3	CI-522 N 20° 43.388' E 81° 59.612' Altitude 1215ft	<i>Calocybe indica</i> * Milky mushroom	Beneath Peepal Tree (<i>Ficus religiosa</i>) Rhizospere region	Bhamni Forest, Gariyaband	11.08.2015	Edible	DMRO-749
4	CI-524 N 21° 12.945' E 82° 12.828' Altitude 1036ft	<i>Calocybe indica</i> * Milky mushroom	Beneath Karanj Tree (<i>Pongamia pinnata</i>) Rhizospere region	Sirpur forest	27.08.2015	Edible	DMRO-750
5	CI-530 N 21° 16.717' E 81° 34.660' Altitude 1096ft	<i>Calocybe indica</i> * Milky mushroom	In between branches of Peepal tree (<i>Ficus religiosa</i>)	Raipur, Professor Colony	14.08.2015	Edible	DMRO-751

Table 2: Effect of five strains on spawn run, cropping period and yield.

Yield g/ kg dry wheat substrate													
S No	Strains	Spawn Run (Days)*	Pin head Initiation (Days)*	Pileus Diameter (cm)**	Stipe Length (cm)**	Stipe Diameter (cm)**	Average Weight (g)**	Yield (g)*	BE (%)	Yield (g)* after Re-casing	BE (%)	Total yield (g)	Total BE (%)
1.	CI-1	15	9	5.51	10.2	2.96	54	273.33	27.33	-	-	273.33	27.33
2.	CI-4	14	8	8.68	12.6	4.00	75	318.33	31.83	198.33	19.83	516.66	51.66
3.	CI-522	12	7	3.63	9.9	3.58	64	226.67	22.66	168.33	16.83	395.00	39.50
4.	CI-524	12	7	11.26	19.6	4.10	82	696.67	69.66	255.00	25.50	951.67	95.16
5.	CI-530	13	8	4.90	14.8	3.50	57	485.00	48.50	193.33	19.33	678.33	67.83
	SEm±	0.33	0.33	1.47	1.51	0.34	5.95	20.38		6.45			
	CD (5%)	1.24	1.05	4.34	4.45	NS	17.57	64.23		21.05			

(*) – Average of three replication.

(**) – Average of five sporophore.

(NS) – Non significant.



Fig 1: Evaluation of five strains of milky mushroom for fruiting bodies

Conclusion

According to present investigation it can be concluded that among collected strain from different region of Chhattisgarh state, strain CI-524, found to be best and may be used for commercial cultivation to getting maximum biological efficiency. Although all strains performed well in yield and biological efficiency but strain CI-524 gave highest yield.

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