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Effect of different sugars on spawn growth (mm) of milky mushroom (*Calocybe indica*)

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Abstract

A study was conducted to examine the effect of different types of sugars viz. Sucrose (1.5%), Sucrose (1.0%), Maltose (1.5%), Maltose (1.0%), Glucose (1.5%), Glucose (1.0%), Lactose (1.5%) and Lactose (1.0%) were used as supplements in spawn production of milky mushroom strain (CI-16-04). Maximum spawn growth was observed at 20 day observations in glucose @ 1.5% and sucrose @ 1.5% followed by glucose @ 1%. The minimum spawn growth in lactose @ 1% followed by lactose @ 1.5%, which is significantly, at par while in control as observed. Regarding spawn growth rate (mm/day) in strain CI-16-04, maximum spawn growth rate was observed in two treatments in glucose @ 1.5% and sucrose @ 1.5% followed by glucose @ 1%. The minimum spawn growth rate was found in lactose @ 1%.

Keywords: Spawn production, *Calocybe indica*, Sugar supplements, spawn growth

Introduction

The mushroom is recognized as fleshy macro-fungi, a group of achlorophyllous organisms. These are sometime tough and umbrella like sporophore (fruiting body) with spores, Mushroom have anti-cancerous (carcinostatic), hypolipidemic, hypocholesterolemic, hypoglycemic, hypotensive, immune-modulatory, haematoprotective properties including properties of lowering blood sugars and blood pressure, anti-bacterial, anti-viral and anti-fungal activities. They are also useful in bio-remediation (Rai and Verma, 2000). The mushroom industry in India has registered an average growth rate of 4.3% per annum from 2010-2017. Out of the total mushroom produced, white button mushroom share is 73% followed by oyster mushroom (16%), paddy straw mushroom (7%) and milky mushroom (3%). In the year 2016-2017, Indian mushroom industry generated revenue of Rs. 7282.26 lacs by exporting 1054 quintals of white button mushroom in canned and frozen form. By considering the production statistics, the spawn demand in India is estimated about 8000-10000 tons per annum. Majority of this commercial spawn to the growers is being supplied by the private units and the contribution of public sector organizations in spawn supply was limited to 10% only (Sharma *et al.* 2017) [7].

Milky mushroom (*Calocybe indica*) is a tropical edible mushroom of Indian origin and can be cultivated indoor in high temperature and humidity areas, and Milky mushroom is one of the important mushroom commonly called as "Kuduk" but popularly known as "Dudhichhata" or white milky mushroom. It was first reported from India by (Purkayastha and Chandra, 1974) [7]. This is a potentially new species to our Indian mushroom growers. Its edibility was confirmed later by Purkayastha, 1976 [3]. Nutrient content of fresh milky mushrooms (g/100g) Moisture 87.4%, Protein 2.75%, Lipid 0.65%, Fibre 1.63%, Ash 1.28% and Carbohydrate 6.8% and Nutrient content of dried milky mushrooms (g/100g) Protein 21.4%, Lipid 4.95%, Fibre 12.9%, Ash 13.1% and Carbohydrate 48.5%. (Sharma and Lall, 2013; Alam *et al.* 2008) [6, 1]. Milky mushroom requires optimum temperature of 30-35 °C and a relative humidity (RH) of 70-80% for cultivation. It is suitable for hot humid climate and can be cultivated summer and rainy season in India except few places. The demand of milky mushroom in the international market is increasing now. Hence, there is a need to produce mushroom through the use of different sugars percentage viz. Sucrose (1.5%), Sucrose (1.0%), Maltose (1.5%), Maltose (1.0%), Glucose (1.5%), Glucose (1.0%), Lactose (1.5%) and Lactose (1.0%) for best quality spawn production of Milky mushroom (strain CI-16-04).

Materials and methods

Experimental site

The experiments were conducted during 2017-2018 in Mushroom Laboratory, Department of Plant Pathology, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut 250110, Uttar Pradesh, India. Which is situated on the western side of the Delhi-Dehradun

high way (NH-58) at a distance of 10.0 km away in the north of Meerut city. On the basis of meteorological observation Meerut is situated between 29° 01'N latitude and 77° 45'E longitude at an altitude of 237 meters above the mean sea-level.

Establishment of pure culture

Strain of *Calocybe indica* culture was purified and maintained by single hyphal tip method. For this purpose, the cultures were grown in sterilized petri plate on Potato Dextrose Agar Medium (PDA) for 8-10 days. Single branched hyphae from the periphery of the growing colony were marked under low power (10_x) in the compound microscope and transferred to PDA slants. These tubes were incubated at 28-30 °C for about a week, again sub cultured on PDA and then stored (preserved) in a refrigerator at 10 °C for further use.

Spawn production and adding of sugars

To achieve the objective, four sugars in different dose the spawn was prepared on wheat grains in half litre capacity wide mouthed glass bottles. The grains were cleaned to remove any broken, shriveled grains either by sieving or hand picking of undesired grains. The bold grains were soaked overnight in clean water and then washed. Now, they were boiled in water for 15 minutes taking care that grains should not split but remain slightly soft after boiling. The boiled grains were spread in thin layer over a wire net to remove excessive water and enable them to cool about 25-30 °C. The cooled grains were then mixed with 1.2 percent commercial grade gypsum (CaSO₄) and 0.3 percent calcium carbonate (CaCO₃). Gypsum prevents the sticking of wheat grains together and calcium carbonate helps to maintain the pH 5.5-7.5 added different sugars for the growth of spawn viz. Sucrose (1.5%), Sucrose (1.0%), Maltose (1.5%), Maltose (1.0%), Glucose (1.5%), Glucose (1.0%), Lactose (1.5%) and Lactose (1.0%) were filled in spawn bottles mixed with 1.2 percent commercial grade gypsum (CaSO₄) and 0.3 percent calcium carbonate (CaCO₃) pH 5.5-7.5 at the height of 100 mm in three replication of each treatment after autoclaving at 121 °C (15 lbs pressure) for 60 minutes on two consecutive days then inoculation from (strain CI-16-04) seven days old

fresh culture and kept in BOD incubator at 29±1 °C temperature for 20±2 days. The linear mycelial growth in mm was recorded at every 5 days interval till the mycelial growth covered the full spawn bottle.

Statistical analysis

The Complete Randomized Design (CRD) was applied and the data thus obtained were analyzed statistically. Analysis of variance (ANOVA) technique and critical difference (CD) was calculated at five percent level of significance for comparison with other treatment (Steel *et al.* 1997) [9].

Result and Discussion

To examine the effect of different sugars on the spawn growth of *Calocybe indica* strain (CI-16-04), viz. sucrose @ 1.5%, sucrose @ 1%, maltose @ 1.5%, maltose @ 1%, glucose @ 1.5%, glucose @ 1%, lactose @ 1.5%, lactose @ 1% mixed in wheat grain and control (Table 1). Maximum spawn growth (100 mm) growth was observed at 20 day observations in glucose @ 1.5% and sucrose @ 1.5% followed by glucose @ 1% (98.60 mm). The minimum spawn growth in lactose @ 1% (68.67 mm) followed by lactose @ 1.5% (70.67 mm), which is significantly at par, while in control (74.33 mg) as observed. Regarding spawn growth rate (mm/day) in strain CI-16-04, maximum spawn growth rate (5.00 mm/day) was observed in two treatments in glucose @ 1.5% and sucrose @ 1.5% followed by glucose @ 1% (4.93 mm/day). The minimum spawn growth rate (3.43 mm/day) was found in lactose @ 1%.

The results are almost in accordance with the findings of Fallal *et al.* (2003) [2] reported the effect of carbon source (glucose, fructose, maltose, lactose, galactose, raffinose, inositol) on the growth spawn of milky mushroom. Srivastava, (2015) [8] evaluated the two strain of *Calocybe indica* APK-2 and CI-14 were grown in four sugars (viz. glucose, fructose, maltose and sucrose) mixed in wheat grain @ 1%, and in wheat grain without sugar. The maximum spawn growth was found in glucose in strain APK-2 followed by maltose and in strain CI-14 glucose followed maltose. These results were almost similar with the present investigation.

Table 1

Treatment	Sugars	Dose (%)	Spawn growth (mm)				Spawn growth rate (mm/day)
			5 days	10 days	15 days	20 days	
T1	Sucrose	1.5	27.33	47.33	71.00	100.00	5.00
T2	Sucrose	1.0	25.67	43.33	67.33	88.00	4.40
T3	Maltose	1.5	26.67	45.33	68.33	88.00	4.40
T4	Maltose	1.0	24.00	42.00	65.67	87.67	4.38
T5	Glucose	1.5	28.33	51.00	74.00	100.00	5.00
T6	Glucose	1.0	27.33	49.00	72.67	98.67	4.93
T7	Lactose	1.5	13.67	31.67	50.33	70.67	3.53
T8	Lactose	1.0	12.67	30.67	49.33	68.67	3.43
T9	Control		22.33	30.67	51.67	74.33	3.71
CD at 5%		-	1.245	1.729	1.560	4.740	-
SE(m)		-	0.416	0.577	0.521	1.583	-

Average of three replications

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