STUDY ON GOLDEN OYSTER MUSHROOM MYCELIUM *PLEUROTUS CITRINOPILEATUS* SINGER

STUDIU PRIVIND MICELIUL CIUPERCII AURII *PLEUROTUS CITRINOPILEATUS* SINGER

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Abstract. *Few mushrooms are as spectacular as Pleurotuscitrinopileatus Singer. Its brilliant yellow color astonishes all who first see it. This species forms clusters hosting a high number of individual mushrooms, whose stems often diverge from a single base. Spicy and bitter at first, this mushroom imparts a strong nutty flavour upon thorough cooking. P.citrinopileatus grows quickly through pasteurized straw and sterilized sawdust, and thrives at high temperatures.The present study carried out to evaluate suitable grain substrates for spawn development, growth and yield of P. citrinopileatus. The grains taken for this study were wheat, sorghum, millet and maize. A total of four treatments replicated five times were taken under the complete randomized design. The minimum time taken for mycelium run was 17 days and maximum time taken from simulation to primordial initiation was recorded by millet grain spawn.*
Key words: mushrooms, *Pleurotus citrinopileatus*, grain substrates, spawn

Rezumat. *Puține ciuperci sunt la fel de spectaculoase ca Pleurotus citrinopileatus Singer. Culoarea sa strălucitoare galbenă uimeşte pe toți cei care o văd prima dată. Această specie formează buchete care găzduiesc un număr mare de ciuperci individuale, ale căror tulpini pornesc adesea de la o singură bază. Picant şi amar la început, această ciupercă conferă o aromă puternică de nuci la gătit. P. citrinopileatus creşte rapid pe substrat de paie pasteurizate sau rumeguş sterilizat şi se dezvoltă la temperaturi ridicate. Prezentul studiu a fost realizat pentru a evalua substraturile de cereale adecvate pentru producerea miceliului. Cerealele utilizate în acest studiu au fost grâul, sorgul, meiul şi porumbul. Un total de patru experienţe repetate de cinci ori au compus randomizarea. Timpul minim necesar pentru împânzirea miceliului a fost de 17 zile, iar timpul maxim de la simulare până la inițierea primordiilor a fost înregistrată la miceliul pe semințe de mei.*
Cuvinte cheie: ciuperci, *Pleurotus citrinopileatus*, substrat de cereale, miceliu

INTRODUCTION

Oyster mushroom contains 19-35% protein on dry weight basis as compared to 7.3% in rice, 13.2% in wheat and 25.2% in milk. It is rich in essential minerals and trace elements. Mushrooms are source of niacin (0.3 g $100g^{-1}$d.m.) and riboflavin (0.4 mg $100g^{-1}$d.m.) and good source of trypsin

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enzyme. It is also rich in iron, copper, calcium, potassium, D vitamin and folic acid (Hasan *et al.,* 2015).

Oyster mushrooms modulate the immune system, inhabit tumour growth and inflammation, have hypo-glycaemic and antithrombotic activities, lower blood lipid concentration, prevent high blood pressure and atherosclerosis, antimicrobial and other activities (Biswas and Biswas, 2015).

Edible mushrooms have been treated as important tools in modern medicine for their medicinal values (Rahman *et al.*, 2015).

Taxonomic synonyms and considerations: *Pleurotus citrinopileatus* is closely allied to *P. cornucopiae* (Paulet) Rolland and is often considered a variety of it. Moser (1978) and Singer (1986) described *P. cornucopiae* var. *cornucopiae* as having a tawny brown cap whereas *P. citrinopileatus*has an unmistakably brilliant yellow pileus. Singer (1986) separated *P. Citrinopileatus* Singer from *P. cornucopiae* (Paulet ex Fr.) Rolland sensu Kuhn. and Rom. (=*P. Macropus* Bagl.) on the basis of the arrangement of the contextual hyphae. According to Singer, *P. Citrinopileatus* has monomitic hyphae, whereas *P. Cornucopiae* has dimitic hyphae.

Description: Caps golden to bright yellow, 2-5 cm, convex to plane at maturity, often depressed in the centre, thin fleshed, with decurrent gills that show through the partially translucent cap flush. Stems white, centrally attached to the caps. Usually growing in large clusters arising from a single, joined base (fig. 1). Clusters are often composed of fifty to one hundred or more mushrooms. As strains of this species senesce, the yellow cap color is lost, becoming beige, and fewer mushrooms are produced in each primordial cluster (Stamets, 2010).

Fig. 1 *Pleurotuscitrinopileatus* mushroom (original)

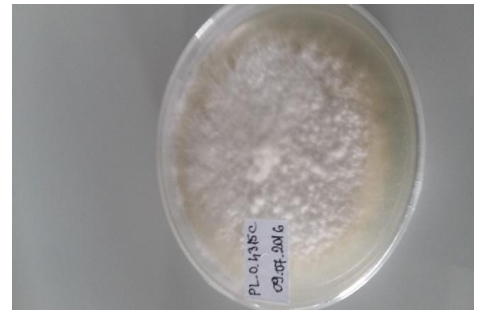

Fig.2 *Pleurotuscitrinopileatus* mycelium (original)

Microscopic features: spore pale pinkish buff, 7.5-9.0 x 3.0-3.5 µ. Clamp connections are present. Hyphal system is dimitic.

Mycelial Characteristics: cottony, whitish mycelium, often with tufts of dense growth, sometimes with yellowish tones and occasionally run through with underlying rhizomorphic strands (fig. 2). Primordia are yellow at first.

Fragrance signature: grain spawn smells astringent, acrid, nutty and sometimes fishy, with a scent that, in time, is distinctly recognizable to this species (Stamets, 2010).

Spawn is a pure culture of mycelium growing on a solid substrate such as grain. Mushroom spawn has a fundamental role in global agricultural productivity. The most frequently used substrate for spawn production is wheat grain. Spawn grains such as wheat, millet and corn have been reported to affect carpophores production (Gupta and Sharma, 2014).

MATERIAL AND METHOD

In this experiment four different grains with five replications were taken up to achieve the desired objectives: wheat (*Triticum aestivum*), sorghum (*Sorghum vulgaris*), millet (*Pennisetum glaucum*) and maize (*Zea mays*). The grains were cleaned to remove inert matter, stubble and debris. The cleaned grains thoroughly washed in sufficient water three to four times. Washed grains were soaked in water for 20 to 30 minutes. The grains were boiled until they became soft. After cooling down calcium sulphate ($CaSO_4$) at the rate of 2% and calcium carbonate ($CaCO_3$) at the rate of 1% were added (on dry weight basis of grains) (Rózsa *et al.*, 2016).

About 200g prepared grains substrate was filled in conical flask up to 2/3 volumes and plugged with non-absorbent cotton. These flasks were autoclaved at 121 ºC for 2 hours. After cooling, the flasks were inoculated with a piece of growing mycelium and incubated at 26 ºC (Rózsa *et al.*, 2016).

Recorded parameters were: days required for complete mycelium run, time taken for primordial initiation, time taken from primordial stage to harvesting stage.

The processing of the obtained results was made by analysing the polyfactorial variance, on each analysed character, and the statistical interpretation was made with the ANOVA program by the Duncan test.

RESULTS AND DISCUSSION

The days required for *P. citrinopileatus* mycelium run on each type of grain spawn substrates was recorded and are presented in table 1. The minimum mycelium run time was recorded by maize grain spawn substrate (16.75 days) followed by wheat grain (17 days), then by millet grain spawn (18.25 days) which was similar to sorghum grain spawn (18.75 days).

The probable reason for such results may be due the availability of specific nutrient in maize grain (eg. maize grain contains 3.6% protein, 66.2% carbohydrates, 2.6% minerals and small amount of B complex vitamins and E vitamin (Singh and Singh, 2013), that may have accelerated the mycelium run. The results of present study corroborate with the study of Chaubey *et al*., (2010). They recorded mycelium run days for complete colonization of substrate (wheat straw) from 18.33-26.00 days. This variation may be due to ecological factors. (Sahu *et al.*, 2014) reported that time taken for mycelium run ranged from 9.66 to 11 days for different grain spawn substrates.

Siddhant *et al*. (2014) also reported that time taken for complete mycelium run, ranged from 13-18 days by use of different grain spawn. These

results are similar to results of the present study. The probable reason for such findings may be due to the size of grains. Small grains provide more points of inoculum per gram of spawn. The spawn prepared on small grains cover the substrates sooner. Chauhan and Gupta (2015) reported the time taken for complete mycelium rum ranged from 13.67 to 18.33 days. This may be due the different types of substrates, wheat straw substrate took 14.67 days for complete mycelium run.

Table 1

Mycelial growth of *P. citrinopileatus* on different grains

Spawn type	Complete mycelium run – days	Primordial initiation – days	Time taken from primordial stage to harvesting stage – days
Wheat grain spawn	17 b	6 a	2.37 b
Sorghum grain spawn	18.75 a	4.75 c	3 a
Millet grain spawn	18.25 ab	5.25bc	2.95 a
Maize grain spawn	16.75 c	5.50 ab	2.5 ab

The time taken from stimulation to primordial initiation of *P. Citrinopileatus* mushrooms ranged from 4.75 to 6 days. The minimum time taken for primordial initiation was recorded in sorghum grain spawn (4.75 days) followed by millet grain spawn (5.25 days), maize grain spawn (5.50), as compared to wheat grain spawn time taken from stimulation to primordial initiation (6 days) as presented in table 1. The variation probably occurred due to lignocellulosic materials, especially carbon and nitrogen ratio in grain spawn substrates which greatly contributed to primordial development.

Similar findings have been reported by Bhattachrjya *et al*. (2014), who found that oyster mushroom, took 6-8 days for primordial initiation, but in present study, it ranged from 4.75 to 6 days. The probable reason for such findings due to different grain spawn substrates or varieties. The results of present study are similar to results of Sahu *et al.* (2014) who reported the time taken for primordial initiation ranged from 2-5.90 days in case of different grain spawn substrates cultivated on wheat straw. Similar findings have been reported by Hasan *et al.* (2015) who recorded the time taken for primordial initiation ranged from 3.33 to 6.50 days, which was in accordance to the present results.

The minimum time taken from primordial stage to harvesting stage of *P. Citrinopileatus* mushrooms was recorded on wheat grain spawn (2.37 days) followed by maize grain spawn (2.5 days) and millet grain (2.95 days). The maximum time from primordial stage to harvesting stage was observed at sorghum grain spawn (3 days). The minimum time from primordial stage to

harvesting stage was recorded from wheat grain spawn substrate, the probable reason may be due to carbon and nitrogen ratio in substrate. Carbon and nitrogen plays an important role in growth of fruiting body. Shah *et al*., (2014) reported that time taken for fruiting body formation of oyster mushroom is 3-6 days. Hasan *et al*. (2015) reported time from primordial stage to harvesting stage, ranged from 3.39 to 5.00 days. The probable reason for such findings may be due to low protein content or supplementation of substrates.

CONCLUSIONS

1. Mycelium run days varied significantly due to different grain spawn substrate used.

2. The maximum time taken for mycelium run was recorded by wheat grain spawn substrate.

3. The maximum time taken from stimulation to primordial initiation was recorded by wheat grain spawn and the minimum time by sorghum grain.

4. The minimum time taken from primordial stage to harvesting was recorded by wheat grain spawn.

5. Millet grains proved to be best for *P. Citrinopileatus* spawn preparation.

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