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Research Article

Standardization of Substrate for Spawn Production of Wild Common Edible Mushroom *Polyporus grammocephalus*

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Abstract

Mushrooms are becoming a popular food in the last few years and an increasing interest in the consumption of mushrooms has arisen. The awareness on its consumption among the recent generation poses a great demand on its availability. Therefore, in the present investigation one of the very common wild edible mushroom, *Polyporus grammocephalus* was studied for optimization of substrate for spawn production was studied. Seven different substrates were used in the study namely sorghum, wheat, pearl millet, finger millet, corn, paddy husk and sawdust among which the promising substrate was found to be pearl millet, followed by wheat and sorghum respectively. Virtually all the grains can be used for spawn preparation but its selection depends on availability of raw materials, yield and experience of spawn makers. But in case of *P. grammocephalus* pearl millet is found to be the promising substrate for spawn preparation. It should be explored further for cultivation and *P. grammocephalus* can be recommended as a promising mushroom for consumption.

Keywords: Mushroom, *Polyporus grammocephalus,* spawn production, substrates, pearl millet.

Introduction

Mushrooms are becoming a popular food in daily meal because of their high nutritional and medicinal values (Wasser, 2002). They are fleshy saprophytic fungus found growing on rich organic substrates with long history of collection and consumption by people around the world for thousands of years (Rojas and Mansur, 1995; Aaronson, 2000). In the last few years, an increasing interest in the consumption of mushrooms has arisen, due to their elevated polyphenol concentration, which correlates with an elevated antioxidant activity. The awareness on its consumption among the recent generation poses a great demand on its availability. Moreover, the total mushroom production worldwide has increased more than 18-fold in the last 32 years, from about 350,000 metric tons in 1965 to about 6,160,800 metric tons in 1997. Bulk increase has occurred during the last 15 years. However, the cultivation of mushroom is still very limited and the industry is still at its childhood in Asian and African countries (Belewu and Belewu, 2005) except few like China, Japan and Korea. However, commercial cultivation in India has started recently and it is still in the state of infancy. Its popularity is growing and it has become a business which is export-oriented. Today mushroom cultivation has been taken up in states like Uttar Pradesh, Haryana, Rajasthan, etc. (during winter months) while earlier it was confined to Himachal Pradesh, Jammu and Kashmir and hilly areas due to the feasible climatic conditions.

But as far as Tamil Nadu is concerned, the work done is very meager. Therefore, in the present study one of the very common mushrooms, *Polyporus grammocephalus*, was chosen to fill the lacuna of the above mentioned area. It is a very common wild edible mushroom throughout the tropics. Although a few species of the genus *Polyporus* were reported to exhibit antioxidant and antitumor activities, but one or two report has been found for *Polyporus grammocephalus* (Roy, 2010). Thus, it is worthwhile to undertake studies on cultivation of this mushroom. However, in the present study initiation was done to standardize the substrate for cultivation.

Materials and methods

Collection of mushroom and development of pure culture: The mushroom species in this study was collected from Madras Christian College Campus, Chennai, India. Using proper taxonomic keys, the mushroom species collected was identified as *Polyporus grammocephalus*. Pure culture was isolated using fresh fruit bodies of *Polyporus grammocephalus* and a small piece of inner tissue from the mushroom specimen was removed and placed on potato dextrose agar medium both on test tube slants and on plates that had previously been prepared and stored at 4°C. Such slant (about 1x1 cm) was used to inoculate newly prepared potato dextrose agar in Petri dishes and were sealed using stretch tape to avoid contamination. They were then incubated at temperatures around 24-27°C.

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Several sub-culturing was made until pure cultures were obtained. The pure culture was deposited in mycology lab culture collection FBFBL 1301C. Mycelial stocks of the isolated fungi were stored at 25°C. Sub-culturing was performed every month to ensure that the organisms remained viable.

Optimization of substrate for spawn production: There were seven substrates chosen among which five were grains and two other were lignocellulosic wastes. The substrates used were sorghum, wheat, pearl millet, finger millet, corn, paddy husk and sawdust which were purchased from three different markets. Sieved and dried sorghum, wheat, millet, corn, paddy husk and sawdust weighing 1 kg of each substrate were washed in clean water three times to remove chaff, dust and other particles. The substrates were then soaked in water overnight for maximum absorption of moisture. The following day, soaked substrates were again washed in water then air-dried and mixed with 2% calcium carbonate ($CaCO_3$) for absorbing excess moisture and to keep the seeds friable. Then 250 g of each substrate viz., sorghum, wheat, pearl millet, finger millet, corn, paddy husk and sawdust were filled into polypropylene bags, sterilized and incubated. The actively growing mycelium was transferred aseptically upon the sterilized substrates inside the spawn covers and re-plugged to avoid contamination. They were incubated at 26-28°C for spawn run for ease of colonization. Best spawn run was recorded on 7^{th}, 14^{th} and 21^{st} day.

Results and discussion

Spawn preparation is an important step in cultivation of mushroom. In this present study, it was prepared with 7 different substrates. The growth was measured in terms of spawn coverage. The observations were made on 7^{th}, 14^{th} and 21^{st} day. Among the seven substrates, pearl millet grains supported best growth, followed by wheat and sorghum. Corn, saw dust and finger millet supported very least respectively (Fig. 1). This result is in contradictory with the results obtained with *L. tuberregium* (Manjunath, 2011), *Pleurotus tuberregium* and *P. pulmonaris* (Stanley and Herbert, 2010) and also with *Lentinula edodes* (Puri 2011; Sher *et al.,* 2011). This is due to good water holding capacity of grains and also availability of enough surface cover area for mycelia growth. On the other hand, less growth was due to less water holding capacity in corn or the little surface cover area for mycelia growth in finger millet (Fig. 1c). Best spawn run was observed in pearl millet (15 d) followed by wheat (18 d), sorghum (20 d) respectively (Fig. 1). In the case of pearl millet spawn, the grains acted as a carrier for evenly distributing the mycelium and also served as nutritional supplement. Therefore, it resulted in fast and uniform mycelial growth.

Fig. 1. Time duration for spawn coverage on different substrates by *P. grammocephalus.*

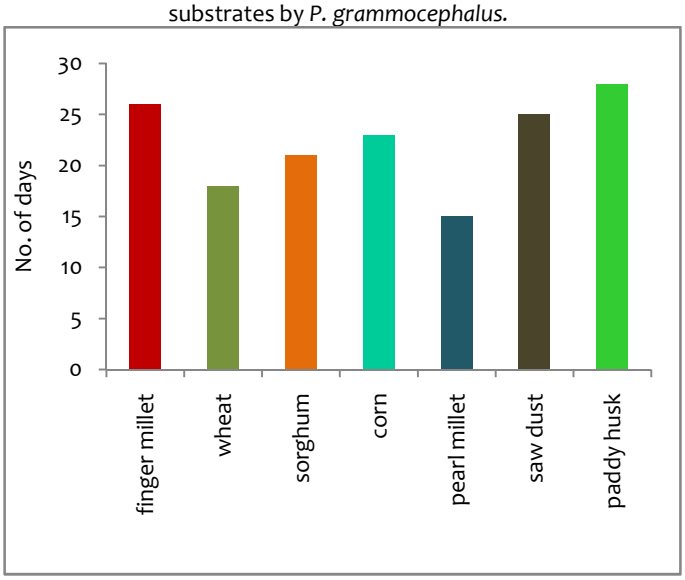

Fig. 2. Growth of *P. grammocephalus* on different spawn substrates.

a. Pearl millet, b. wheat, c. finger millet, d. Corn, e. Sorghum, f. Saw dust, g. rice bran

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Fig. 3. Colour produced on different spawn substrates of *P. grammocephalus.*

h. Saw dust, i. Sorghum, j. Pearl millet

Although sorghum was equally supporting the spawn run, it was less, compared with pearl millet and no significant difference was observed between them. Though wheat grains are the most popular and widely used substrate for spawn production, but considering the highest growth rate, short spawn run period, less or no contamination and higher biological efficiency, pearl millet emerged as an ideal material under Indian condition for the production of *P. grammocephalus.*

But in the case of shiitake cultivation, sorghum served as the best substrate followed by wheat but they haven't used finger millet as a substrate (Puri, 2011), sorghum as best substrate for *L. tuberregium* (Manjunath, 2011), white maize served as best substrate for *Pleurotus pulmonaris* and *P. tuberregium* (Stanley and Herbert, 2010). Faster the growth of the mycelium, shorter will be the spawn running time (Sher *et al.*, 2011). Apart from the result discussed above, the spawn mycelium produced different colours in different substrates. In saw dust, brilliant brown colour or pale brown colour was observed. This may be due to the colour of the wood chips whereas in sorghum and pearl millet the colour was dark brown or blackish brown. The colour of the mycelium in both the substrate was similar because colour formation was not influenced by the grains (Fig. 3). No studies had been performed on this aspect therefore at present it is difficult to interpret this result as it requires further studies.

Conclusion

Virtually all the grains can be used for spawn preparation but its selection depends on availability of raw materials, yield and experience of spawn makers. But in case of *P. grammocephalus* pearl millet is found to be the promising substrate for spawn preparation. It should be explored further for cultivation and *P. grammocephalus* can be recommended as promising mushroom for consumption.

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