

Cultivation of *Pleurotus djamor* - a new species of oyster mushroom in North Bengal

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Oyster mushroom is one of the most popular mushrooms cultivated in North Bengal and a large number of mushroom growers are cultivating oyster mushrooms. There are only three species of oyster mushrooms i.e. *Pleurotostreatus*, *P. sajor-caju* and *P. florida* have been cultivated widely in this region. However, *Pleurotusdjamor* is a new introduction in North Bengal, which is commonly cultivated in North Western part of India. Cultivation of this mushroom showed significant growth and yield in plastic bag as well as in bottles. Nutritional parameters were assessed and it was observed that it showed very good amount of protein (145-275 mg/g tissue), reducing sugar which ranges from 20-56 mg/g tissue and also showed a good amount of total sugar (100-260 mg/g tissue) in both bag and bottle cultivation.

Key words: *Pleurotus djamor*, oyster mushroom, edible mushroom

INTRODUCTION

Pleurotus species, commonly known as Oyster mushrooms are edible fungi cultivated worldwide especially in south east Asia, India, Europe and Africa. The Oyster mushroom (*Pleurotostreatus*) is an edible mushroom having excellent flavour and taste. Although mushrooms are often grouped with vegetables and fruits, they are actually fungi. They are macro-fungi which belong either to Basidiomycotina or Ascomycotina and they are very distinct from plants, animals and bacteria (Mushigeni and Chang, 2001). Bioconversion of lignocellulosic residues through cultivation of

Pleurotus species offers the opportunity to utilize renewable resources in the production of edible, protein-rich food that will sustain food security for people in developing countries (Sanchez *et al.*, 2002). Mushrooms are valuable health foods which are low in calories and provide essential minerals (Weinheim, 2006). It contains high amount of proteins, fibers, vitamins, minerals and low amount of calorie and cholesterol (Pathak *et al.*, 1998). It enables us to obtain substrate materials at low prices or even for free and to conserve our surroundings by recycling wastes (Khan *et al.*, 2012). Mushrooms with their flavour, texture, nutritional value and high productivity per unit area have been identified as an excellent food source to alleviate malnutrition in developing countries

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(Eswaran and Ramabadrán, 2000).

Pleurotus species are efficient lignin degraders which can grow on wide variety of agricultural wastes with broad adaptability to varied agro-climatic conditions (Jandaik and Goyal, 1995). *Pleurotus* species are rich source of proteins, minerals (Ca, P, Fe, K and Na) and vitamin C, B complex (thiamine, riboflavin, folic acid and niacin) (Çađlarýrmak, 2007). They are consumed for their nutritive as well as medicinal values (Agrahar-Murugkar and Subbùlakshmi, 2005). Mushroom protein is intermediate between that of animals and vegetables (Kurtzman, 1976) and is of superior quality because of the presence of all the essential amino acids (Purkayastha and Nayak, 1981).

MATERIALS AND METHODS

Maintenance of mother culture

Mother culture of the fungal mycelia was collected from the Directorate of Mushroom Research (ICAR) Solan and maintained in Potato Dextrose Agar medium and sub-culturing the same following the method suggested by Fritsch (1978).

Preparation of Spawn

Wheat grains are used for the preparation of spawn. Wheat grains were boiled in for 20 min and the water drained off. Then it was allowed to dry for overnight in a clean place after which 0.5% (w/w) CaCO₃ and 2% (w/w) CaSO₄ were added and mixed well. The grains (200 g) were filled in each polypropylene bag and it was autoclaved at 121°C for 1 h. The grains were inoculated with actively growing mycelium of the *Pleurotus djamor* from PDA slant and incubated at 25-28°C for mycelial growth for 14 days until the mycelium fully covered the grains. Completely covering the grains with mycelium rapidly colonizes the bulk growing substrate (Sánchez, 2010).

Cultivation of mushroom *Substrate preparation*

Paddy straw was used for the cultivation of oyster mushroom. Chopped (2-4 cm long) rice straw was washed and soaked in water for overnight. The straw was again cleaned and pasteurized at 55-65°C for 30 min. then it was allowed for cooling at room temperature. Spawning was done using the

polypropylene bags.

Spawning

Layer spawning was done using the cooled pasteurized straw. 100 g of spawn was used for 1kg of substrate for spawning. The bottles and bags were then filled using the substrate and spawn and the bags were closed tight and the bottles were closed using the lid. Small holes were made in each bottle and bag for aeration. The bags and bottles were then incubated at room temperature (20-30°C) for 10-12 days. After 10-12 days, the white mycelia covered the whole substrate. Then the plastic was removed and the lid of the bottles was opened. 80-90% moisture was maintained by spraying water on the substrate for 2-3 times in a day for the initiation of pinhead (Sarkeret. al., 2007).

Harvesting of fruiting body

The pinhead appeared after 4-5 days of opening the bags and the lids. Fruiting body was developed at room temperature and 80-90% relative humidity.

Extraction and estimation of soluble protein content

Protein was extracted from the mushroom using phosphate buffer (pH 7.2) and protein content was determined.

Extraction and estimation of sugar

One g of fresh mushroom tissue was crushed with 95% ethanol and the alcoholic fraction was evaporated in boiling water bath. Then the fraction was collected and the volume made up to 5 ml using distilled water. Then it was centrifuged at 10,000 rpm for 15 min and the supernatant was collected for estimation.

Total sugar

One ml of extracted sample was taken and 4 ml of Anthrone's reagent was added and incubated on boiling water bath for 10 min. Then it was cooled down in tap water and observed at 620 nm in colorimeter.

Reducing sugar

Ethanol (80%) extract was used for estimating the reducing sugar. Extract (2 ml) was mixed with 2 ml of Alkaline copper tartrate and boiling was done.

Determination of reducing sugar using Arsenomolybdate was carried out at 620 nm.

RESULTS AND DISCUSSION

Cultivation of Pink oyster mushroom was done in winter season and it was observed that the optimum temperature of its growth is about 15-18°C and it requires 70-80% relative humidity for its mycelial growth. It was observed that the mushroom pileus is thinner as compared to other species, leathery in texture and looks like a pink queen on the beds (Fig. 1). The pileus is up to 7.5-10cm in diameter, with little or no stipe and pileus thickness is 7.5-10 at the outer edges. Outer border on pileus top is pink; gills on the lower side are pinkish too. This mushroom is not fleshy as compared to other species of oyster mushrooms as reported by Dhar *et.al.* (2011).

Total yield was estimated on the basis of 1kg of substrate used for cultivation and it was observed that the highest amount harvested in three flushes is about 340 g when cultivated in bag. In bottle cultivation it was found that the highest yield was 400 g (Table 1). Cultivation of oyster mushroom using waste bottle is a new introduction in North Bengal and showed a significant result. Using of

waste plastic bottles is a sustainable technique for the mushroom cultivation and it was observed that the rate of contamination is being reduced. Using waste chemical bottles and other waste bottles of water and cold drinks could be another way to recycle the waste bottles in a good way and it reduces the cost of plastic bags. Hence the plastic bottles are very promising in the cultivation of oyster mushroom.

The data in Table 2 show the protein content of different stages of the mushroom and it was observed that the total protein content was higher in pinhead stage (235 mg/g tissue) while it was quite lower in mature stipe (145 mg/g tissue). Breene (1990) reported that the total protein content of oyster mushroom ranged between 190-300 mg / g tissue. On the other hand, total sugar and reducing sugar of the different stages were done and it was observed that the total sugar was higher in young pileus stage (260 mg/g tissue) and lower in case of pin head stage (100 mg/g tissue) and it was also reported by Patilet. *al.*, (2008). In case of reducing sugar, it was observed that the mature pileus contained lower amount of reducing sugar (20 mg/g tissue) while young stipe (56mg/g tissue) and pinhead (50 mg/ g tissue) showing significant amount of reducing sugar.

Table 1 : Yield of Pink oyster mushroom cultivated in bags as well as in bottles

No of container	Flush	Amount of production (g)			
		Bag	Total production	Bottle	Total production
1	1 st Flush	100		200	
	2 nd Flush	40	160	110	400
	3 rd Flush	20		90	
2	1 st Flush	150		150	
	2 nd Flush	100	280	100	310
	3 rd Flush	30		60	
3	1 st Flush	100		150	
	2 nd Flush	75	205	90	165
	3 rd Flush	30		25	
4	1 st Flush	180		100	
	2 nd Flush	100	340	75	195
	3 rd Flush	60		20	
5	1 st Flush	150		100	
	2 nd Flush	90	285	75	205
	3 rd Flush	45		30	



Fig.1 : Cultivation of *Pleurotus djamor* in plastic bag.(A): Pinhead stage,(B-D): Young stage,(E&F): Mature stage,(G-J): Grown in plastic bottles

Table 2 : Total protein, reducing sugar and total sugar content of *P. djamor*

Stages of mushrooms	Content (mg/g tissue)		
	Total protein	Reducing sugar	Total sugar
Pin head	235	50	100
Young Stipe	275	56	110
Young Pileus	200	40	155
Mature Stipe	145	25	145
Mature Pileus	230	20	120

In conclusion, it can be stated that the cultivation of Pink oyster mushroom (*P. djamor*) is a new introduction in North Bengal and it can be cultivated in the prevailing environment easily. In our study, it is also very clear that the species *P. djamor* can

be cultivated in plastic bottles as well as in plastic bags. The optimum temperature for its growth ranges from 18-20°C which is common in North Bengal. From the above results it can be concluded that the chemical composition of pink oyster mushrooms determines their nutritional value and sensory properties. They differ according to the atmospheric conditions, age and part of the fructification. In our study we found that the nutritional value differs in different parts of the fructification. And it can be said that Pink oyster mushroom is very good for health and its cultivation is very fruitful for the mushroom growers in North Bengal.

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