# Yield Performance of Different Species of Oyster Mushroom (*Pleurotus* spp.) under the Agro-ecological Condition of Lateritic Zone of West Bengal, India

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**Abstract**

Different species of *Pleurotus*, i.e. *Pleurotus sajor-caju, Pleurotus flabellatus, Pleurotus florida ,Pleurotus eous*, *Pleurotus ostreatus* and *Hypsizygus ulmarius* [Synonyms:*Pleurotus ulmarius* (Fr.) P. Kumm] were evaluated under in-house conditions of lateritic zone of West Bengal during winter season of 2008. The newly introduced elm oyster mushroom *Hypsizygus ulmarius* was found to be most appropriate species in this region in terms of biological efficiency (156%), spawn run period ( 15 days) and average weight of sporophore (7.98 g), followed by *Pleurotus florida* (121.5%), *Pleurotus sajor-caju* (115.5% ) and *Pleurotus ostreatus* (103.25%) biological efficiency. *Pleurotus eous* was found to be less suitable under this climatic condition.

## 1. Introduction

Mushroom cultivation is a profitable agribusiness. Oyster mushroom (*Pleurotus* spp.) is an edible mushroom having excellent flavor and taste. It is popularly known as *Dhingri* in India. Cultivation of the oyster mushroom, has increased greatly in India during the last few decades. Its popularity has been increasing due to its ease of cultivation, ability to grow in a wide range of environmental conditions, low cost of production and excellent in recycling of agricultural waste like paddy straw and wheat straw. The technology of artificial cultivation of mushroom is somewhat recent innovation, incorporation of non conventional crops in existing agricultural system can help in improving the social as well as economic status of small farmers. Mushrooms are useful against diabetes, ulcer and lungs diseases (Quimio, 1976). Mushrooms are the good source of protein, vitamins and minerals (Khan et al., 1981). Mushrooms contain about 85-95% water, 3% protein, 4% carbohydrates, 0.1% fats, 1% minerals and vitamins (Tewari, 1986). Mushrooms contain appreciable amount of potassium, phosphorous, copper and iron but low level of calcium (Anderson and Feller, 1942). Mushroom protein is intermediate between that of animals and vegetables (Kurtzman, 1976). Mushroom also contain appreciable amount of Niacin, pantothenic acid and biotin (Subramanian**,** 1986). China, the world leader in oyster production, contributing nearly 85% of the total world production. Mushroom production of India is about one lakh mt, which is about 3% of the world mushroom production. The production of oyster mushroom in West Bengal is nearly 50 mt in 2010 (Wakchaure, 2011). The main obstacles for increased mushroom production in West Bengal are non availability of suitable species, poor quality of the basic materials, poor cultivation techniques and the frequent contamination of the mushroom growing beds with competitor moulds, diseases, insects and nematodes. Paddy straw was reported to be the best substrate for the cultivation of oyster mushroom (Bano and Srivastava, 1962). Performance of different species of oyster mushroom was tested by many workers under different agro-ecological conditions (Dutta and Chakravarty, 1989; Shanmughavel and Velliangiri 1994; Patra and Pani 1995; Biswas et al., 1997; Dubey, 2000). The present investigation was undertaken with a view to identify a suitable species of *Pleurotus* for cultivation in the lateritic zone of West Bengal having wide range of adaptability and higher biological efficiency.

## 2. Materials and Methods

The investigation was carried out at a mushroom farm of

Sukumar Patsala, a unit of Ganasahayata Welfare Society Kolkata, West Bengal during 2008-09. A well-ventilated room with a cemented floor and wall was used as cropping room. Spawn of oyster mushroom was prepared from fresh fruiting body in the laboratory. Various species of oyster mushroom, i.e. *Pleurotus sajor-caju*, *Pleurotus flabellatus*, *Pleurotus florida*, *Pleurotus eous*, *Pleurotus ostreatus* and *Hypsizygus ulmerius* [Synonym:*Pleurotus ulmarius* (Fr.) P. Kumm, one common species that used to be in the genus *Pleurotus* is the elm oyster] were evaluated using paddy straw as a substrate under in-house conditions of lateritic zone of West Bengal. Paddy straw was soaked in water for 18 h. Layering method of spawning @ 4% by wet weight basis was followed. The spawned substrate was filled in polypropylene bags (45x30 $cm^2$). A unit of 2 kg of $dry^{-1}$ straw was used for each treatment and 500 g of dry straw was taken for each replication. The moisture content of the straw at the time of spawning was kept around 72-75%. The filled bags were incubated in a dark room at a temperature ranging between 24-30°C where 90% relative humidity was maintained till the spawn run was complete. Observations on spawn run period, average weight of sporophores and cumulative yield of fleshy harvested mushroom were recorded at a regular interval. The biological efficiency was calculated from the sum of total weight of all flushes harvested from one kg of substrate on dry weight basis and expressed in percentage.

$$\text{Biological efficiency (\%)} = \frac{\text{Fresh weight of mushroom}}{\text{Air-dried substrate}} \text{X } 100$$

## 3. Results and Discussion

Most of the species except *Pleurotus eous* performed well in terms of yield and biological efficiency (Table 1). Maximum yield and biological efficiency (156%) was obtained from *Hypsizygus ulmarius* which differ significantly from other species followed by *Pleurotus florida* (121.5%), *Pleurotus sajor-caju* (115.5%), *Pleurotus ostreatus*(103.25%) and *Pleurotus flabellatus* (92%).

Table 1: Evaluation of various species of *Pleurotus* for higher biological efficiency

| Sl. No. | *Pleurotus* species | Average yield from 500 g of substrate (g) | Total yield from 2 kg substrate (g) | Biological efficiency (%) | Average weight of sporophore (g) | Time taken for complete spawn run (days) | Remarks |
|---|---|---|---|---|---|---|---|
| 1. | *Pleurotus florida* | $607.50^{d}$ | 2430 | $121.50^{d}$ | $6.97^{b}$ | $20^{cd}$ | |
| 2. | *Pleurotus sajor-caju* | $577.50^{cd}$ | 2310 | $115.50^{cd}$ | $6.39^{a}$ | $19b^{cd}$ | |
| 3. | *Hypsizygus ulmarius* | $780.00^{e}$ | 3120 | $156.00^{e}$ | $7.98^{c}$ | $15^{a}$ | |
| 4. | *Pleurotus ostreatus* | $516.25^{bc}$ | 2065 | $103.25^{bc}$ | $7.34^{b}$ | $18^{abc}$ | |
| 5. | *Pleurotus flabellatus* | $460.00^{b}$ | 1840 | $92.00^{b}$ | $7.10^{b}$ | $22^{de}$ | IN, CMA |
| 6. | *Pleurotus eous* | $380.00^{a}$ | 1520 | $76.00^{a}$ | $6.10^{a}$ | $24^{e}$ | IN, CMA |
| | SEm± | 24.471 | | 4.894 | 0.180 | 1.142 | |
| | CD ($p$=0.05) | 72.712 | | 14.542 | 0.537 | 3.394 | |

IN=Insect infestation, CMA=Competitor mold attack

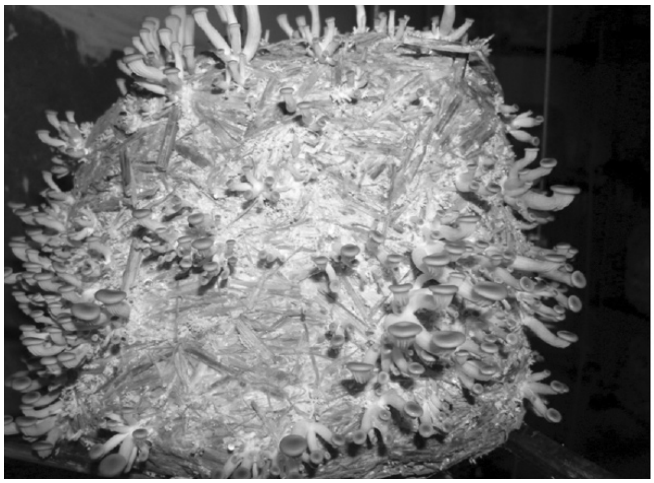

Plate 1: Primordia of *H. ulmerious* which tern into white colour during maturity

Plate 2: Full grown sporophores of *H. ulmerious (blue oyster mushroom)*

Plate 3: *Penicillium* sp.

Plate 4: *Coprinus* sp.

Plate 5: *Aspergillus niger*

Plate 6: *Sclerotium rolfsii*

Minimum period (15 days) was taken by *Hypsizygus ulmarius* for completing the spawn run followed by *Pleurotus ostreatus* (18 days), *Pleurotus sajor-caju* (19)days and *Pleurotus florida* (20) days. While, maximum time (24 days), was taken by the species *Pleurotus eous* for completing the spawn run. Competitor moulds attack (*Coprinus* sp., *Aspergillus niger*, *Penecillium* sp., *Sclerotium rolfsii* etc., (Plate 1-4) and insects infestation in the beds of *Pleurotus eous* and *Pleurotus flabellatus* resulted in poor growth of mycelium which contributed negatively towards spawn run and yield. Maximum size of sporophores were recovered from the species *Hypsizygus ulmarius* (7.98 g), followed by *Pleurotus ostreatus* (7.34 g), *Pleurotus flabellatus* (7.10 g) and *Pleurotus florida* (6.97 g) (Plate 5). The present investigation corroborated with the report of Indian Institute of Horticultural Research (IIHR), Bangalore (Anonymous, 2008) and (Patra and Pani, 1995). The competitor molds degrade the polymers of substrate (paddy straw) such as cellulose, hemicelluloses, pectin and lignin, and also storage compounds like starch, sucrose and insulin through broad range of enzymes which could probably the reason of less biological efficiency obtained from *Pleurotus eous*.

## 4. Conclusion

Newly introduced elm oyster mushroom (*Hypsizygus ulmarius*) is a high yielding oyster mushroom developed from Seoul, South Korea and evolved through selection and tissue culture methods. Its buds are bluish grey in the early stages of development and they fade to white at maturity. Cultivation of elm oyster mushroom (*Hypsizygus ulmarius*) can be used successfully in place of common cultivated species of West Bengal, i.e. *Pleurotus florida*, *Pleurotus sajor-caju* and *Pleurotus ostreatus* for maximization of yield and profit.

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