

Production of protein by fungi, *Pleurotus* species from different agricultural wastes

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ABSTRACT

Five *Pleurotus* species namely, *P. Sajor-caju*, *P. astreatus*, *P. eous*, *P. florida* and *P. flabellatus* were evaluated for their protein content during different pickings when grown on different substrates (Groundnut, paddy, green gram, black gram straw and their combination in 1:1 proportions). The protein contents of *Pleurotus* species were ranged between 38.00 - 18.92% when cultivated on different substrates. Among five *Pleurotus* species, *P.ostreatus* had shown maximum protein content (38.00%) during Ist picking when grown on groundnut straw, followed by *P.eous* (30.90%) during IInd picking on green gram straw.

Key words : Proteins, *Pleurotus* spp., Different substrates, Agricultural wastes.

The most renewable biomass on earth consist of cellulose and much of cellulose in nature is bound physico - chemically with lignin. As lignin is highly resistant, which protects cellulose from attack by most of microbes. Some higher fungi such as mushrooms can convert ligno - cellulose (Biologically) into fungal protein suitable for human consumption. *Pleurotus* spp. are an efficient lignin degrading mushroom, they can grow well on different types of ligno - cellulosic materials. The cultivation of *Pleurotus* spp. becomes more popular in Indian plains because of availability of large quantities of agro-wastes along with tropical to sub-tropical weather in large part of country and this mushroom has simple and low cost production technology.

Protein is important component of food and decides about the dietary level of human being. Mushroom protein is intermediate in quality between vegetable and animal protein (Kurtzman, 1976). It is rich in all the essential amino acids Hayes and Haddad (1976), Buigut (2002), Stephen *et al.* (2004), Purkayastha and Nayak (1980), Akindahunsi and Oyetayo (2006), Maw and Flegg (1975), reported the digestibility of mushroom protein ranged between 71-90%. *Pleurotus* species are valuable for protein requirement for human nutrition (Breene, 1990, Mattila *et al.*, 2000, Dikeman *et al.*, 2005). In general *Pleurotus* spp. contains 20-37% protein (on dry weight basis) Ortega *et al.* (1992) reported 23-33%, Hafiz *et al.* (2003) reported 33.18%, Rathor and Thakore (2004) reported 35%, Patil *et al.* (2006) reported 27-29% protein in different *Pleurotus* spp. Protein content of *Pleurotus* spp. differed from species to species and differ as per the substrate used.

Though, the protein content of *Pleurotus* spp. are

known, there is no literature available on effect of different substrates on protein content of *Pleurotus* spp. during different pickings. Therefore this work was undertaken.

MATERIALS AND METHODS

The cultures of *Pleurotus sajor - caju*, *P. ostreatus*, *P. eous*, *P. florida* and *P. flabellatus* were obtained from N.C. I. M., National chemical laboratory, Pune. The substrates, groundnut, paddy, green gram, black gram straw and their combination in 1:1 proportions were used for filling the bags. The substrates were chopped to pieces of 2-3 cm. and soaked in water overnight to moisten them. After soaking, the substrates were steam sterilized at 121°C for 30 min. in an autoclave. The polythene bags of size 40-60 cm were used and filled with sterilized substrate (1kg dry substrate sample in each bag) Multi layered technique was adopted for spawning the substrate. The spawn was added to the bags at the rate of 2% of wet weight basis of substrate. Five replications were maintained for each treatment. After inoculation, the bags were transferred to mushroom house where temperature and humidity were maintained at 20-25°C and 80-90%, respectively.

When spawn run (mycelial growth) was completed, the polythene bags were removed to promote mushroom formation. The bags were moistened and ventilated throughout the harvest period. The beds were maintain up to the harvest of three flushes.

Protein estimation:

Nitrogen content was estimated by micro - kjeldhal method. The protein content was calculated by using the

protein conversion factor 4.38% total N. This estimation of protein was more accurate than the conversion factor 6.25 because of chitin or other N contributor (non protein N) compounds in mushrooms (Garcha *et al.*, 1993, Manzi *et al.*, 1999, Dikeman *et al.*, 2005).

Statistical Analysis :

The recorded data in the present study was subjected to statistical analysis as per the procedure recommended by Panse and Sukhatme (1978).

RESULTS AND DISCUSSION

The protein content of *Pleurotus* spp. differed significantly (ranged between 38.00 - 18.92%) when grown on different substrates (Table.1)

P. Sajar - caju showed significantly maximum protein (28.85%) content during Ist picking when cultivated on black gram straw, it was found minimum (18.92%) during IIIrd picking when grown on paddy straw. Protein content of *P.astreatus* was reported significantly maximum during Ist picking (38.00%) when cultivated on groundnut straw, whereas it was observed minimum (23.80%) during IIIrd picking when cultivated on combination of blackgram + Paddy straw. The protein content of *P.eous* was significantly higher during IInd picking (30.90%) when grown on green gram straw, the lower protein content was reported on paddy straw (21.32%) during IIIrd picking. Maximum protein content was reported on paddy straw (21.32%) during IIIrd picking. Maximum protein content in *P.florida* was reported (26.80%) during Ist picking when grown on groundnut straw, the minimum protein was obtained during IIIrd picking (21.30%) on paddy straw. In case of *P.flabellatus*, protein content was found significantly higher (25.62%) during IInd Picking. When cultivated on combination of green gram + paddy straw, whereas lower protein content was reported during IIIrd picking (19.60%) when cultivated on combination of blackgram + paddy straw.

Protein contents of different *Pleurotus* species determined in this research were generally in accordance with the previous studies (Chang *et al.*, 1981, Ortega *et al.*, 1992, Dhanda *et al.*, 1996, Khydagi *et al.*, 1998, Periasamy and Natrajan, 2002, Vidz and Karakaplan, 2003, Hafiz *et al.*, 2003, Patil *et al.*, 2006, Patil and Dakore 2007, Patil *et al.*, 2008.)

From the result it could be concluded that the protein content of *Pleurotus* species differed from species to species and substrate to substrate used for cultivation. *Pleurotus* species observed to be rich in protein and can become important food item.

Table 1 : Protein content of Pleurotus spp.

Substrates	P. Sajar-caju			P. astreatus			P. eous			P. florida			P. flabellatus		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Groundnut Straw	28.61	26.90	24.22	38.00	37.80	36.85	28.50	27.10	26.00	26.80	26.80	25.00	23.62	24.12	22.60
Paddy Straw	22.98	20.19	18.92	29.70	29.00	28.88	23.00	22.90	21.32	22.90	22.90	22.80	20.55	20.92	19.92
Green gram straw	27.40	24.82	23.62	35.00	34.65	31.90	30.00	30.90	27.90	23.15	23.15	23.60	23.12	23.60	20.18
Black gram straw	28.85	28.12	27.92	37.00	36.30	34.10	29.80	27.00	24.50	25.90	25.90	24.85	23.65	24.20	21.25
Groundnut + Paddy straw	24.55	22.30	21.12	33.25	31.30	29.00	26.92	24.10	22.72	22.30	22.30	23.00	22.90	23.40	22.15
Green gram - Paddy straw	23.84	21.20	21.00	34.20	34.00	35.98	25.70	25.00	23.68	25.80	25.80	24.12	24.50	25.67	23.96
Black gram + Paddy straw	23.98	23.43	30.36	33.10	31.62	23.80	23.80	25.40	22.72	22.90	22.80	22.30	19.62	21.12	19.60
Green gram + Black gram straw	27.90	25.10	22.81	35.50	35.10	32.75	27.65	26.50	23.32	24.38	24.38	24.10	25.00	25.26	22.90
S.E. ±	0.56	0.38	0.75	0.90	0.68	0.93	0.5	0.39	0.45	0.53	0.53	0.46	1.02	0.51	0.28
C.D. (P=0.05)	1.82	1.17	2.26	2.72	2.03	2.84	1.66	1.20	1.46	1.70	1.70	1.51	3.27	1.63	0.88

Where I = First Picking
II = Second Picking
III = Third Picking

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