CULTIVATION OF *PLEUROTUS SAJOR-CAJU* ON DIFFERENT AGRO WASTES

S. S. Patil

Department of Botany, Sharad Chandra Mavidyalaya, Naigaon, Dist- Nanded (MS).
shyampatilss@yahoo.co.in

ABSTRACT

Pleurotus sajor-caju was cultivated on different agro wastes viz. soybean straw, paddy straw, wheat straw, groundnut straw, sunflower stalk and pigeon pea stalk to determine the suitability of these agro waste on yield , biological efficiency, moisture content, total carbohydrate, protein, fat, crude fiber, ash content. Soybean straw showed significantly highest yield (84.56% B.E.) with maximum crude protein (25.33%) content. Significantly maximum moisture and crude fiber content of *Pleurotus* was recorded on sunflower stalk, i.e. 89.35 and 7.82 % respectively. Maximum total carbohydrate (56.00 %) was recorded on wheat straw, while maximum fat and ash content of *Pleurotus* was recorded on ground nut straw, i.e. 2.85 and 7.00% respectively.

Key words: *P.sajor-caju*, B. E., yield, agro waste, fruiting body,

INTRODUCTION

Mushrooms are the reproductive structure of fleshy macro fungi and rich with protein, vitamin and minerals. More than 2000 species of edible mushrooms are known, out of which only few species have been cultivated commercially by preparing beds (Nair, 1994). Among the various edible mushroom types, *Pleurotus* species have become more popular and widely cultivated throughout the world particularly in Asia and Europe as they have simple and low cost production technology shows higher bioefficiency. *Pleurotus* mushroom comes under the family *Tricholomataceae* and commonly called as oyster mushroom, due to its oyster like shape. *Pleurotus* species are rich source of vitamin C, B-complex (thiamin, riboflavin, folic acid and niacin), minerals (Ca, P, Fe,K and Na) and protein (Sturion and Otterer,1995; Justo *et al.,* 1998; Manzi, et al.1999 Caglarirmak, 2007). *Pleurotus* species content high potassium: sodium ratio, which makes mushrooms an ideal food for patients suffering from hyper tension and heart diseases. The cultivation of edible mushroom offers one of the most feasible and economic method for the bioconversion of agro-lignocellulosic wastes Bano *et al.,* 1993; Cohen *et al.,* 2002). The technology can also limit air pollution associated with burning agriculture wastes as well as to decrease environmental pollution due to unutilized agricultural wastes.

MATERIAL AND METHODS

Culture and cultivation:

The pure culture of *Pleurotus sajor-caju* was obtained from National Collection of Industrial Microorganisms (NCIM) National chemical laboratory (NCL), Pune, India. The cultures were maintained on 2% malt extract agar slants at 4 ºC. Sub culturing were done after every 15 days.

Spawn Preparation :

Spawn was prepared in polythene packets. Sorghum whole grains were boiled in water bath for 10 to 15 min. at the ratio of 1:1 (sorghum grain: water) and mixed with 4% (w/w) CaCo3 and 2 % (w/w) CaSo4. Sorghum grains then packed (250g) in polythene bags (200 x 300mm. size and sterilized in an autoclave at 121 ºC for 30 min. After sterilization, the bags were inoculated with actively growing mycelium of the *Pleurotus* from the malt extract slants and incubated (at 27 ± 2 ºC) for mycelial growth without any light for 10-15 days until the mycelium fully covered the grains.

Cultivation:

The agro waste , soybean straw, paddy straw, wheat straw, groundnut straw, Pigeon pea stalk and sunflower stalk were collected from local farms and were used as cultivation substrate, following the method prepared by Bano and Shrivastava (1962) with slight modifications.

The substrates were chopped to 2-3 cm. pieces and soaked in water over night to moisten it and excess water was drained off. After soaking, the substrate was steam sterilized at 121 ºC for 20 min. in an autoclave. The polythene bags of the size 35 x 45 cm were filled with sterilized substrates and multi layered technique was adopted for spawning. Each bag was filled with 1 kg dry substrate and the spawn was added at the rate of 2% of the wet weight basis of substrate.

After inoculation, the bags were kept in house where the temperature and humidity were maintained around 25 ºC and 80 to 90 % moisture respectively with sufficient light and ventilation for 20 days. The spawn run was completed within 18 days. The polythene bags were tear-off following the spawn run. Formation of fruit bodies was evident within 3-4 days after removal of poly bags. The beds were maintained up to the harvest of the third flush, which was completed in 35 days after spawning. A small layer of substrate was scrapped off from all the side of the beds after each harvest. Each of the six treatments was replicated three times.

Yield and Biological efficiency:

Total weight of all the fruiting bodies harvested from all the three pickings were measured as total yield of mushroom. The biological efficiency (yield of mushroom per kg substrate on dry wt. basis) was calculated by the following formula Chang *et al.* (1981)

$$\boldsymbol{B.E.}\,\% = \frac{Fresh\ weight\ of\ mushroom}{dry\ weight\ of\ substrate} \times 100$$

Moisture content:

The moisture content of mushroom was also expressed in percent and calculated by the formula-

$$\text{Moisture content}\ \% = \frac{weight\ of\ fresh\ sample - weight\ of\ dry\ sample}{weight\ of\ fresh\ sample} \times 100$$

Nutritional Analysis:

Protein, fat, ash and total carbohydrate were determined with the procedure recommended by AOAC (1995) and Wankhede *et al.,* (1976). The crude fiber was determined with procedure recommended by Ranganna (1986). The recorded data in the present work was subjected to statistical analysis as per the procedure given by Panse and Sukhatme (1978).

RESULT AND DISCUSSION

The results reveal the yield, biological efficiency (B.E.) of the *P. sajor-caju* cultivated on different agro wastes (Table 1). Significantly maximum yield of *P. sajor-caju* was obtained when it was cultivated on soybean straw (845.66 gm/kg straw) with 84.56 % B.E., this was followed by yield on paddy straw (836.66 gm/kg straw) with 83.66 % B.E. while list was recorded with Pigeon pea stalk (716.33 gm/kg straw). Similar results were reported with *P. sajor-caju* by Dias *et al.,* (2003). Superiority of soybean straw over paddy, wheat, jowar straw in terms of yield was reported earlier by Patil and Jadhav, (1999).Comparing the six lignocellulosic residues as substrates for the cultivation of *P. sajor-caju* shows that, soybean straw supported best growth of *P. sajor-caju* as evidenced by completed and heavy colonization of substrates forming a compact white mass of mycelium within 2 weeks of inoculation.

Moisture , total carbohydrate, protein, fat, crude fiber and ash content of mature fruiting bodies of *P.sajor-caju* cultivated on different agro wastes are shown in Table 2. Moisture content of *P. sajor – caju* was found maximum when cultivated on (89.35 %) sunflower stalk, followed by on (89.30 %) paddy straw while least was found on (87.95%) wheat straw. Carbohydrate content of *P. sajor-caju* was 56.00 % grown on wheat straw being the highest followed by on (55.50 %) paddy straw. These results are confirmed with the findings of Patil *et al.,* (2008). Protein content of *P. sajor-caju* fruiting bodies grown on different substrates ranged from 20.33 to 25.33 %. Significantly maximum protein content of mushroom was 25.33 % in fruiting bodies cultivated on soybean straw while least was 20.33 % on sunflower stalk. Highest fat content of *P. sajor-caju* fruiting bodies was found on (2.85 %) ground nut straw, and lowest was found on (2.46) Pigeon pea stalk. The % content of protein and fat were similar as reported in earlier studies (Syed Abrar *et al.,* 2009). The crude fiber content of *P. sajor-caju* fruiting bodies was ranged from 6.78 to 7.82 % when grown on different substrates.

Table 1: Effect of different substrate on yield of *P. sajor-caju*

Substrate	Yield (gm) / Kg dry straw			Total	B.E.(%)
	Ist Picking	IInd Picking	IIIrd Picking		
Soybean straw	388.00	298.33	160.33	845.66	84.56
Paddy straw	402.00	325.00	109.66	836.66	83.66
Wheat straw	310.33	256.33	154.00	720.66	72.06
Ground nut straw	370.00	320.33	120.00	810.33	81.03
Sunflower stalk	325.33	265.00	171.66	761.99	76.19
Pigeon pea stalk	292.00	240.00	184.33	716.33	71.63
S.E.+-	17.82	6.72	3.86	-	-
C.D. at 5%	55.20	21.45	13.18	-	-

Table 2: Effect of different substrates on Nutritional content of *P.sajor-caju.*

Substrate	Moisture (%)	Total carbohydrate (%)	Protein(%)	Fat (%)	Crude fibre (%)	Ash (%)
Soybean straw	88.50	52.20	25.33	2.80	6.78	6.68
Paddy straw	89.30	55.50	23.60	2.60	7.15	6.35
Wheat straw	87.95	56.00	22.10	2.75	6.90	6.15
Ground nut straw	88.75	51.30	23.00	2.85	7.50	7.00
Sunflower stalk	89.35	52.80	20.33	2.60	7.82	5.90
Pigeon pea stalk	88.50	50.20	21.70	2.46	7.68	6.42
S.E.+-	0.30	0.68	0.45	0.05	0.09	0.14
C.D. at 5%	0.98	2.24	1.41	0.15	0.28	0.42

Maximum crude fiber content was observed when mushroom grown on sunflower stalk (7.82 %) , followed by on groundnut straw (7.50 %) while minimum crude fiber was noticed when mushroom produced on (6.78 %) soybean straw. Ash content of *P. sajor-caju* fruiting bodies was 7.00 % grown on ground nut straw being the highest followed by on soybean (6.68 %) straw and minimum ash content was reported on (5.90 %) sunflower stalk. Observed values of crude fiber and ash content in present study are in accordance with the previous studies Khydagi *et al.,* (1997) and Bonatti *et al.,* (2004). The variation in these nutrients content might be due to the quality and quantity of nutrients available in substrates.

Acknowledgement:
This work was funded by university Grant Commission, New Delhi

LITERATURE CITED

***AOAC* 1995.** Official methods of analysis. Association of official analytical chemists. 16th Ed., Arlington, VA.

Bano Z and Shrivastava HC, 1962. Studies in the cultivation of *Pleurotus* sp. on paddy straw. *Food Sci.*, **12**: 363-368.

Bano Z, Shasirekha MN and Rajarathan S, 1993. Improvement of the bioconversion and biotransformation efficiencies of the oyster mushroom (*Pleurotus sajor-caju*) by supplementation of its rice straw with oil seed cakes. *Enzymes and microbial technology*, **15**: 985-989.

Bonatti M, Karnopp P, Soares HM and Furlan SA, 2004. Evaluation of *Pleurotus ostreatus* and *P. sajor-caju* nutritional characteristics when cultivated on different lignocellulosic wastes. *Food Chemistry*, **88**: 425-428

Chang ST, Lau OW and Cho KY, 1981. The cultivation and nutritive value of *P. sajor-caju* . *European J. Appl. Micro boil. Biotechnol*., **12** : 58-62.

Cohen R, Persky L and Hadar Y, 2002. Biotechnological applications and potential of wood degrading mushrooms of the genus *Pleurotus* . *Applied Microbiology and Biotechnology*, **58**:582-594.

Caglarirmak N, 2007. The nutrients of exotic mushrooms (Lentinula edodes and Pleurotus sp.) and an estimated approach to the volatile compounds. *Food chemistry, **105***(3), 1188-1194.

Dias ES, Koshikumo EMS, Schwan RF and Silva R, 2003. Cultivation of mushroom P. sajor-caju on different agricultural residues. *Ciencia-e- Agro Technologia*, **27**(6): 1363-1369.

Jesto MB, Guzman GA, Mejia EG, Diaz CLG, Martinez G and Corona EB, 1998. Composition quimica de tres cepas mexicanas de setas (*Pleurotus ostreatus*). *Archivos Latinoamericanos de Nutricon*, **48**(4):359-363.

Khydagi KS, Sharada GS and Meera Rao, 1998. Proximate composition of oyster mushrooms. *Karnataka J. Agri. Sci.,* **11**(2): 548.

Manzi P, Gambelli L, Marconi S, Vivanti V and Pizzoferrato L, 1999. Nutrients in edible mushrooms. An inter species comparative study. *Food Chemistry*, **65**(4): 477-428.

Panse VG and Sukhatme PV, 1978. Stat. Math. Agri. work. ICAR publication, New Delhi.

Patil MB and Jadhav VT, 1999. Studies on productivity of oyster mushroom on different agro wastes under marathwada condition. *J. Maharashtra Agri. Univ*., **24(**2): 162-163.

Patil SS, Kadam RM, Shinde SL and Deshmukh SA, 2008. Effect of different substrate on productivity and proximate composition of *P. florida* . *Int. J. Plant sci*. **3**(1): 151-153.

Ranganna S, 1986. Hand book of analysis and quality control for fruit and vegetable products. pp.25-26.

Sturion GL and Oetterer M, 1995. Composicao Quimica de Cogumelos comestiveis (*Pleurotus sp*.) originados de cultivos em diferentes substrates. *Ciencia e Tecnologia de Alimentos*,**15**: (2), 189-193.

Syed Abrar A, Kadam JA, Mane VP, Patil SS and Baig MMV, 2009. Biological efficiency and nutritional contents of *P. florida*(Mont.) Singer cultivated on different agro wastes. *Nature and Sci*., **7** (1): 44-48.

Wankhede DB and Tharanthan RN, 1976. Sesame (*Sesamum indicum*) carbohydrates. *J. Agri. Food Chem*., **24**: 655-659.