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Productivity and Proximate Composition of *Pleurotus flabellatus* Cultivated on Different Agro-Wastes

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Abstract: *Pleurotus flabellatus was cultivated on selected agro wastes viz. soybean, paddy, green gram straw and their combinations in 1:1 proportion to study the productivity and nutritional content (moisture, crude protein, total carbohydrates, fat, crude fiber, ash and minerals like Ca, P, Fe.) of mushroom. Soybean straw, paddy straw and combination of soybean + paddy straw were found to be more suitable than green gram straw. The bioconversion of different agro wastes by P. flabellatus results into an improved human food.*

Keywords: Proximate composition, *P. flabellatus*, Bio-efficiency, agro wastes

I. INTRODUCTION

Mushroom in a general term applied to the fruiting bodies of fleshy macro fungi which are directly involved with economic, ecological and medical benefits. Mushroom provides a rich addition to the diet in the form of protein, vitamins and minerals. All the essential amino acids required for human body are present in mushroom protein (Buigut, 2002; Akindahunsi and Oyetayo, 2006; N.Caglarirmak, 2007). High Potassium: Sodium ratio content of mushroom is excellent for persons suffering from hypertension and heart diseases (Mandhare et al. 2003). Among the various edible mushroom types Pleurotus species are widely cultivated in India and have very potential resource to convert different agro-wastes into protein rich food. The successful cultivation of Pleurotus species was started in India by Bano and Shrivastava (1962) and suggested paddy straw, the best substrate for mushroom growth.

The different agro-wastes were used for cultivation of Pleurotus species. Among the various agro wastes, soybean straw was reported to be the best substrate for the cultivation of Pleurotus species, followed by paddy straw (Mandhare,2000), where as next to the paddy straw, wheat straw proved to be the best substrate for the cultivation of Pleurotus species (Thampi et al.1996; Bonatti et al.2004). In the present study, the yield and nutritional content of P.flabellatus were analyzed. Based on the earlier studies and local availabilities of the agricultural waste we utilize soybean straw, paddy straw, green gram straw and their combinations for the cultivation of mushrooms.

II. MATERIAL AND METHODS

The study was undertaken in Department of Botany Shivaji Mahavidyalaya, Renapur Dist. Latur during August 2019 August 2020. The culture of Pleurotus flabellatus was obtained from N.C.I.M., National Chemical laboratory (NCL), Pune. Soybean straw, Paddy straw, Green gram straw and their combinations in 1:1 proportions were used for filling the bags. It was chopped to pieces of 2-3 cm. and soaked in water over night to moisten them. After soaking, the substrate was steam sterilized at 121^{o}C for 30 minutes in an autoclave. The polythene bags of size 40-60 cm were used and filled with sterilized substrate (1 kg dry substrate sample in each bag). Multi layered technique was adopted for spawning the substrate. The spawn was added to bags at the rate of 2 % of the wet weight of substrate. Five replications were maintained for each treatment. After inoculation, the bags were transferred to mushroom house where temperature and humidity were maintained as 22-30^{o}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 maintained up to the harvest of three flushes

The data was recorded for yield and biological efficiency (Table 1). The biological efficiency was expressed in percent and calculated by the formula (Chang et.al 1981)

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$$B.E.(\%) = \frac{Fresh\ wt.\ of\ mushroom}{Dry\ wt.\ of\ substrate} \times 100$$

Table 2 gives the data for nutritional contents of mushroom. The moisture content was determined by the direct oven drying method (AOAC, 1990). The protein, fat, ash and carbohydrates were determined by the procedure recommended by AOAC (1984) and Wankhede & Tharanathan (1976). Crude fibre and calcium content were estimated as per the procedure recommended by Ranganna (1986). The iron and phosphorus content were estimated according to the procedure given in laboratory manual of N.I.N.(1980). The recorded data in the present work was subjected to statistical analysis as per the procedure recommended by Panse and Sukhatme (1978).

Table 1: Effect of different substrate on pileus and stipe fresh weight of P .flabellatus.

Sr. No.	Substrates	Pileus weight(gm)	Stipe weight (gm)
1	Soybean straw	7.30	1.38
2	Paddy straw	9.70	1.18
3	Green gram straw	6.35	1.12
4	Soybean+Paddy straw	7.90	1.20
5	Soybean+Green gram straw	7.25	1.00
6	Green gram+Paddy straw	7.52	0.85
	S.E. ±	0.32	0.01
	C. D. at 5%	0.96	0.05

Table 2: Effect of different substrate on yield of P .flabellatus.

Substrate	Yield (gm/kg dry straw)			Total	B.E. (%)
	1st Picking	2nd Picking	3rd Picking		
Soybean straw	410.00	364.00	97.00	870.00	87.00
Paddy straw	375.00	316.33	142.00	833.33	83.33
Green gram straw	327.66	264.00	136.33	727.99	72.79
Soybean+Paddy straw	406.00	323.00	129.00	858.00	85.80
Soybean+Green gram straw	360.33	250.33	173.00	783.66	78.36
Green gram+Paddy straw	310.00	272.00	138.00	720.00	72.00
S.E. ±	10.62	13.16	7.74	-	-
C. D. at 5%	35.31	41.44	26.30	-	-

Table 3: Effect of different substrates on Nutritional content of P.flabellatus.

Substrates	Moisture (%)	Protein (%)	Fat (%)	Total Carbohydrate (%)	Crude fibre (%)	Ash (%)	(mg/100 gm)		
							Ca	P	Fe
Soybean straw	90.20	23.00	2.35	57.90	7.80	8.20	300	926	12.70
Paddy straw	92.50	22.66	2.10	54.00	7.00	6.10	286	800	12.20
Green gram straw	89.50	21.00	2.30	57.20	7.50	6.30	278	862	12.10
Soybean+paddy straw	89.20	22.00	2.58	55.00	8.00	6.90	315	845	13.10
Soybean+Green gram straw	89.45	21.00	2.40	54.50	7.36	6.50	290	818	12.15
Green gram	90.10	20.35	2.00	56.00	7.40	5.95	260	780	11.60

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+paddy straw									
S.E. ±	0.24	0.26	0.03	0.35	0.16	0.06	15.03	0.12	0.24
C.D. at 5%	0.70	0.85	0.10	1.16	0.56	0.18	46.25	0.38	0.70

III. RESULT AND DISCUSSION

The effect of different substrates on yield contributing characters such as pileus and stipe weight varied significantly (Table-1). The pileus weight on different substrates ranged from 6.35 to 9.70 gm. The maximum pileus weight was found on paddy straw (9.70 gm) and minimum pileus weight was found (6.35gm) on green gram straw. The stipe weight of mushroom ranged from 0.85 to 1.38 gm. The maximum stipe weight was observed in fruit bodies grown on the soybean straw (1.38 gm) and minimum stipe weight (0.85 gm)was observed on the combination of green gram+paddy straw. The yield of mushroom was affected by different substrates (Table2). The highest yield of mushroom was recorded (870 gm) on soybean straw with 87.00 % B.E., followed by on combination of soybean+paddy straw (858 gm) with 85.80 % B.E. The minimum yield was recorded (720 gm) on combination of green gram+paddy straw with 72.00% B.E. The results were confirmed with the findings of Mandhare(2000), Kadlag(1998).

The effect of different substrates on nutritional contents such as moisture, protein, fat, total carbohydrates, crude fibre, ash and minerals (Ca, P and Fe) varied significantly (Table-3). Soybean straw showed maximum proteins (23.00%), carbohydrates (57.90%), ash (8.20%), P (926 mg/100gm) content while the combination of soybean+paddy straw showed maximum fat (2.58%), crude fibre (8.00%), Ca (315mg/100gm), Fe(13.10mg/100gm) content in mushroom. Paddy straw showed maximum moisture (92.50%) content in mushroom. The results were confirmed with El-Kattan et al. (1991), Patil and Dakore (2007).

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