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INFLUENCE OF ORGANIC SUPPLEMENTS ON YIELD AND PROTEIN CONTENT OF OYSTER MUSHROOM

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ABSTRACT

Studies were conducted to assess different organic supplements to paddy straw for increasing the yield of *Pleurotus citrinopileatus* and *P. sajor caju*. Among the various supplements, neem cake (2% to wet weight) accentuated the yield upto 48.7 per cent and 75.0 per cent over control in *P. citrinopileatus* and *P. sajor caju* respectively. The yield was directly related to protein content in both the species tested. Cost benefit analyses of neem cake amendment showed an additional income of Rs. 9.66 and Rs. 14.26 per kg of paddy straw (dry weight) in case of *P. citrinopileatus* and *P. sajor caju* respectively. Redgram husk, green gram husk and black gram husk were the next best supplements in all respects. Soybean flour was a poor supplement. Sensory evaluation of mushrooms harvested from amended paddy straw showed no variation in flavour and taste as compared to control.

KEY WORDS : Oyster mushroom, paddystraw substrate, supplementation, yield increase

Oyster mushroom is gaining industrial importance in the recent years. Suitability of various agricultural wastes including cereal straw for the cultivation of oyster mushroom has been widely investigated (Bano and Srivastava, 1962; Zadrazil, 1974; Sivaprakasam and Kandaswamy, 1981). Supplementation of substrates with organic and inorganic amendments is one of the ways to boost the yield of oyster mushroom. In some cases of supplementation, increased yield was positively correlated with protein content of fruiting bodies while in others a negative relationship has been established.

The present study was conducted to find out the effect of supplementation of paddy straw with 15 different organic amendments at two per cent (to the wet weight of substrate) level on the yield, protein content and other characters of *Pleurotus citrinopileatus* (Fr.) Singer (strain CO1 and *P. sajor caju* (Fr.) Singer (strain M2).

MATERIALS AND METHODS

The following organic supplements *viz.*, neem cake (NC), groundnut cake (GC), gingelly cake (GK), cotton seed cake (CCC), Coconut cake (COC) rice bran (RB), wheat bran (WB), horse gram powder (HGP), soybean flour (SF), cotton seed husk (CSH), red gram husk, (RGH), black gram husk (BGH), green gram husk (GGH), cassava waste (CW), and composted coir waste (CCW) were used at two per cent level (40g/bed on wet weight basis). At the time of supplementation, the moisture content of supplements ranged from 12 to 15 per cent.

Steam sterilized (1.46 kg per cm^2 1 h) supplements were mixed thoroughly to hot water pasteurized (80^0 C for 1 h) paddy straw. Cylindrical beds (60 x 30 cm) were prepared with sorghum grain spawn following layer method of spawning (Sivaprakasam and Kandaswamy, 1981). Beds were incubated in huts at $25\text{-}30^0$ c and relative humidity was more than 80 per cent. Mushroom yield and other parameters were recorded and the results reported. Mushrooms obtained from each treatment were prepared separately as mushroom fry and given for sensory evaluation (Das, 1990). Protein content of mushrooms in each treatment was also estimated.

RESULTS AND DISCUSSION

Although many amendments boosted the yield and protein content of sporophores of both *P. citrinopileatus* and *P. sajor caju*, only a few of them showed significantly superior results (Tables 1, 2). NC followed by RGH, GGH and BGH increased the yield significantly. There were 48.7 per cent and 75.0 per cent increased yield over control in *P. citrinopileatus* and *P. sajorcaju* respectively due to NC addition. Amendments like SF, GC, and GIC were found inferior and the yield

Table 1. Effect of supplements on yield and protein content of *Pleurotus citrinopileatus* (CO 1)

Supplement	DFSR	DFFH	Yield (g/500g of paddy straw)	Protein content (mg/g fresh wt.)
Neem cake	10.0	23.3	590.0	32.0
Groundnut cake	10.3	23.3	215.0	19.0
Gingelly cake	10.3	25.0	348.3	23.2
Cotton seed cake	10.7	23.0	410.0	27.0
Coconut cake	9.7	22.3	446.7	18.8
Rice bran	10.0	22.3	358.3	25.8
Wheat bran	10.3	200	376.7	26.0
Horse gram powder	9.3	25.0	313.3	25.2
Soybean flour	9.3	28.0	206.7	24.6
Cotton seed husk	9.0	24.0	340.0	28.8
Red gram husk	9.7	24.0	501.7	30.0
Black gram husk	10.7	23.3	460.0	29.4
Green gram husk	9.3	24.0	466.7	28.5
Cassava waste	9.7	24.3	431.7	19.8
Composted coir waste	10.0	23.7	373.3	17.5
Control	9.0	25.0	396.7	25.2
CD (P=0.05)	0.79	1.32	39.3	

DFSR - Days for spawn run; DFFH - Days for first harvest

Table 2. Effect of supplements on yield and protein content of *Pleurotus sajor caju* (M 2)

Supplement	DFSR	DFFH	Yield (g/500g of paddy straw)	Protein content (mg/g fresh wt.)
Neem cake	8.7	18.3	665.0	27.6
Groundnut cake	9.7	24.7	193.3	22.2
Gingelly cake	8.0	22.7	201.7	18.4
Cotton seed cake	7.7	22.3	536.7	26.6
Coconut cake	8.3	23.7	428.3	20.0
Rice bran	8.0	21.3	446.7	20.8
Wheat bran	8.0	20.0	508.3	21.4
Horse gram powder	8.0	19.3	408.3	24.3
Soybean flour	8.0	25.7	196.7	27.0
Cotton seed husk	8.0	20.3	500.0	24.6
Red gram husk	8.0	16.3	603.3	26.0
Black gram husk	8.0	18.7	641.7	25.8
Green gram husk	8.0	18.3	605.0	25.8
Cassava waste	8.0	10.3	486.7	17.7
Composted coir waste	8.0	18.0	430.0	18.0
Control	8.0	20.7	380.0	23.5
CD (P=0.05)	NS	1.57	52.6	

DFSR - Days for spawn run; DFFH - Days for first harvest

obtained from these treatments was below the control. The poor performance of SF might be due to alteration in pH of the growth medium. (Royse and Schisler, 1987; Gunasekaran and Graham, 1987).

Poor yield commensurating with reduction in protein content in such treatments evidently proved that there was a decrease in N conversion rate (Kattan *et al.*, 1991) affecting the availability of nutrients to the mushroom fungi. Alterations in the balance of chemical constituents and C:N ratio to translate decomposition product of substrates into mushroom as quoted in some studies could also be stated as a reason for the variation in yield due to supplements.

The possible role of microbes in stimulating the growth and yield of mushrooms (Stanek, 1972) could also be considered while finding out the reasons for the variation in yield due to supplementation of paddy straw. It was also known that NC amendment stimulated the activity of beneficial pseudomanads that can help in biodegradation of organic substrates (Krishnamoorthy, 1995) and there by increasing the nutrient availability in them. Such increased nutrition might have stimulated excess fruit body production.

When days for 50 per cent spawn run was analysed no much variation could be seen between different treatments in both the *Pleurotus* spp. However, data on days for first harvest in *P. citrinopileatus* indicated that SF amended beds gave first flush 3 and 6 days latter compared to

Table 3. Effect of supplements on yield and protein content of *P. citrinopileatus* (CO 1) and *P. sajor caju* (M 2)

Supplement	Yield (g/kg of paddy straw)		Additional returns (Rs. 1)	
	CO 1	M 2	CO 1	M 2
Neem cake	1180.0	1330.0	9.66	14.26
Groundnut cake	430.0	396.6	-	-
Gingelly cake	696.6	403.4	-	-
Cotton seed cake	820.0	1073.4	0.66	7.86
Coconut cake	893.4	856.6	2.50	2.40
Rice bran	716.6	893.4	-	3.36
Wheat bran	753.4	1016.6	-	6.40
Horse gram powder	626.6	816.6	-	1.40
Soybean flour	413.4	393.4	-	-
Cotton seed husk	680.0	1000.0	-	6.00
Red gram husk	1002.4	1206.6	5.26	13.08
Black gram husk	920.0	1283.4	3.16	11.14
Green gram husk	933.4	1210.0	3.50	11.26
Cassava waste	863.4	973.4	1.76	5.34
Composted coir waste	746.6	861.4	-	2.50
Control	793.4	760.0	-	-

Table 4. Effect of supplements on yield and protein content of *P. citrinopileatus*

Supplement	Appearance	Colour	Taste		Flavour	Accetability
			Raw	Cooked		
Neem cake	5	G	5	5	5	5
Groundnut cake	5	G	3	3	3	3
Gingelly cake	5	G	4	4	4	4
Cotton seed cake	5	G	4	4	3	3
Coconut cake	5	G	5	4	4	4
Rice bran	5	W	5	5	4	5
Wheat bran	5	W	5	5	4	5
Horse gram powder	5	W	5	5	4	5
Soybean flour	5	W	4	4	3	4
Cotton seed husk	5	W	4	4	3	4
Red gram husk	5	W	5	5	4	5
Black gram husk	5	W	5	5	4	5
Green gram husk	5	W	5	5	4	5
Cassava waste	5	W	5	5	4	4
Composted coir waste	5	W	5	4	3	4
Control	5	W	5	5	4	5

Score : Execellent 5 ; Good 5 ; Very fair 3 ; Fair 2 ; Poor 1 G - Grey tinge ; W - White

control and NC added treatments. Similarly, first flush of *P sajor caju* was also delayed by 5 and 7 days compared to control and NC amended treatments respectively. Moreover, RGH supplementation gave yield much earlier compared to all other treatments (16 days). This variation between different treatments could be explained based on delayed release nutrient phenomenon. With respect to average number of sporophores and weight of individual sporophore, though, there was a little variation, in many cases supplements that had given higher yields equally gave more number of sporophores with increased weight of individual sporophore. The cost benefit ratio revealed that the supplementation of NC had given an additional income of Rs. 9.66 and Rs. 14.26 per kg of paddy straw (dry weight) in *P. citrinopileatus* and *P. sajor caju* respectively (Table 3).

Some reports indicated that due to organic amendments the flavour and taste of mushrooms varied. So, mushrooms obtained from each treatment were prepared separately as mushroom fry and given for sensory evaluation. The results indicated that there was no much variations in flavour and taste of mushrooms obtained from different treatments (Table 4).

Thus, the results of present study conclusively indicated that NC, RGH, GGH and BGH would be effectively supplemented to paddy straw in order to increase the yield of oyster mushroom with increased protein production.

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