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Effect of Different Supplements and Bio-Fertilizers on Yield of *Calocybe indica* P. & C.

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Abstract

Biofertilizers viz., *Azotobactor croococcum* and *Pseudomonas putida* were evaluated for yield and yield related parameters of *Calocybe indica. Pseudomonas putida* at 5% resulted in maximum yield of 592.5 g followed by 558.7 g at 2% *Azotobactor croococcum.* Supplementation with wheat bran at 5% resulted in maximum yield of 586.7 g. No mycelial run initiated in mustard oil cake supplementation.
Key words : Bio-fertilizers, Supplements, Yield.

Nutrition provided by the substrate is the single most important factor affecting yield of mushroom. Cereal straw with high carbon and low nitrogen content is generally regarded as low quality feed. Hence many researchers have suggested improving the nutrient quality through supplements or biofertilizers. Several rhizospheric microorganisms capable of stimulating plant growth are being used in modern intensive cultivation system, which are commonly referred as biofertilizers. *Azotobactor* was first exploited as source of nitrogen. It has been reported that straw substrate during spawning mixed with different biofertilizers increased the yield and biological efficiency of *Agaricus bisporus* (1) and *Pleurotus* spp. Supplements are the material added to substrate after completion of composting for direct utilization by mushroom (2). In *Agaricus bisporus* supplements are added during composting while in *Calocybe indica* during spawning. An attempt was made to assess the effect of different bio fertilizers and supplements on the yield of *Calocybe indica.*

Methods

Pure culture of *Calocybe indica* was procured from NRCM, Solan (HP). Wheat straw substrate chemically sterilized with 75 ppm bavistin 50% WP and 500 ppm formalin for 16—18 h was spawned at 2% in polythene bags (45.7 × 60.9 cm) up to the height of 30.48 cm. During spawning two experiments were planned. In the first experiment, biofertilizers viz., *Azotobactor croococcum* and *Pseudomonas putida* procured from Indian Institute of Integrative Medicine, (f), Jammu were added to wheat straw substrate at 2 and 5% on wet weight basis at the time of spawning in the polythene bags. In each bag 5—6 kg wet substrate was filled and each treatment was replicated four times. Bags were incubated for spawn run at 25—30 C. Bags without addition of biofertilizers served as control. In another experiment different organic supplements viz., wheat bran, maize meal, cotton seed cake, rice bran, mustard oil cake and soybean meal were added at 2, 5 and 10% to the substrate at the time of spawning. All the supplements before mixing were treated with 5,000 ppm formaldehyde and 0.01%

Table 1. Effect of different biofertilizers on yield and yield related parameters of *Calocybe indica.*

Bio-fertilizer	Conc. (%)	days for spwan run	Pin head formation (days)	Sporophores (number)	Yield
Azotobactor	2	15.25	32.25	12.00	558.7
	5	18.00	35.50	9.25	516.2
Pseudomonas	2	14.75	31.00	8.5	542.5
	5	18.00	37.00	11.00	592.5
Control	–	19.75	41.00	7.75	447.5
CD (0.05)	Treatments	1.19	1.63	1.14	23.21
	Concentration	0.96	1.34	0.93	18.95
	T × C	1.67	2.31	1.61	32.81

Table 2. Effect of different supplements on yield and yield related parameters of *Calocybe indica.*

Supplements	Conc. (%)	Spawn run (days)	Pin head formation (days)	Sporophores (number)	Yield (g/ 500 g dry subs)
Wheat	2	16.00	34.67	9.00	567.70
	5	12.33	38.00	11.33	586.7
Maize	2	18.33	35.33	12.67	566.7
meal	5	16.67	35.00	11.67	561.6
Cotton					
seed	2	16.68	34.00	9.33	475.0
meal	5	15.68	37.00	11.00	481.7
Rice	2	16.65	36.00	9.33	496.7
bran	5	19.67	38.00	10.33	506.7
Mastard					
oil	2	–	–	–	–
cake	5	–	–	–	–
Soybean	2	17.00	38.00	8.00	323.3
meal	5	17.33	40.00	7.00	286.7
Control	–	19.00	38.00	9.00	433.3
CD 0.05					
Treatment		2.24	2.202	2.38	56.6
Concentration		1.29	1.271	0.38	32.7
T × C		3.178	3.11	3.37	0.16

bavistin and covered with polythene sheet. The polythene sheet was removed after 36 hours in order to make the supplement free from formalin fumes. These sterilized supplements were mixed in substrate at the time of spawning. Each treatment was replicated four times. Bags without addition of supplements served as control. After complete spawn run, bags were cased with farmyard manure (1.5 years old cow dung) + loam soil (3 : 1 ; vol/vol). Normal package of practices were used during course of experiment.

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Results and Discussion

Table 1 shows that the biofertilizers viz., *Azotobactor croococcum* and *Pseudomonas putida* reduced spawn run period as compared to control. The application of *Pseudomonas putida* at 2% resulted in minimum of 14.75 days for spawn run followed by *Azotobactor croococcum* at 2% which registered 15.25 days. All the treatments differed significantly from each other. Same trend was noticed in pinhead formation. Earliest pinning of 31 days was observed by application of *Pseudomonas putida* 2% followed by 32.25 days by application of *Azotobactor croococcum* at 2%. The early spawn run may be due to high nutritional status of compost when supplements with biofertiliozers. Dhar and Kapoor (3) observed early spawn run and early pinning by 4—6 days in supplemented trays as compared to unsupplemented trays in *Agaricus bisporus.* Highest yield of 592.5 g was recorded in *Pseudomonas putida* at 5% supplemented compost followed by 558.7 g by *Azotobactor croococcum* at 2%. Both yield parameters differ significantly from each other. This study besides improving nutritional status, *Azotobactor croococcum* and *Pseudomonas putida* might have suppressed or inhibited growth of competitor moulds of *Calocybe indica* and allowed the mushroom mycelium to ramify fast into the substrate and casing without any competition which later initiated early pinning and higher mushroom yield. Ahlawat and Rai (1) also reported early pinning and enhanced mushroom yield when *Azotobactor* and Phosphotica biofertilizers added to compost at spawning and casing.

Addition of organic supplements to substrate at spawning revealed that all the supplements resulted in early spawn run, early pinning and higher yields as compared to control except mustard oil cake (Table 2). The earliest spawn run of 12.33 days was recorded with 5% of wheat bran supplementation followed by cotton seed meal (15.68 days) at 5%. No mycelial run initiated with addition of mustard oil cake. Early pinhead formation 34 days was recorded with 2% cotton seed cake followed by 34.67 days in 2% wheat bran. Maximum time (40 days) for pinhead formation was recorded with 5% soybean meal. Nita Bahl (4) reported inhibiting effects of mustard oil cake on *Agaricus bisporus* as it contains traces of mustard oil having biocidal substance allyisothiocyanate. Later Saharan and Guleria (5) while studying the effect of supplements on yield of *Agaricus bitorquis* reported that all the supplements except mustard oil cake increased button yield. Soybean meal at higher concentrations reduced yield. Dhar and Kapoor (3) observed that increase in concentration of soybean meal reduced yield. There was substantial increase in button yield with supplementation but higher mushroom yield

was not because of high fruit body weight but due to more number of fruit bodies. Shreoder and Schisler (6) also suggested that addition of supplements did not influence mushroom size. The increased yield is accompanied by increase in the number of mushroom fruit body. Highest yield (586.7 g) was recorded with 5 per cent wheat bran followed by 576.7 g with 2% wheat bran, 566.7 g with 2% maize meal and 561.6 g with 5% maize meal. Purkayastha and Nayak (7) reported the suitability of wheat bran / maize meal for *Calocybe indica.* Eswaran and Thomas (8) reported maize meal as best supplement for *Calocybe indica.* Tandon and Sharma (9) also reported suitability of wheat bran as supplement for *Calocybe indica.*

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