



Yield Evaluation of Different Strains of Paddy Straw Mushroom (*Volvariella Spp.*)

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INTRODUCTION

Mushroom farming is gaining importance due to its very low inputsinvestment and less time requirement. The technology adoptability increases in areas where land is a limiting factor and agricultural residues are abundantly available. Paddy straw mushroom is a popular strain among people because of its distinct flavour, pleasant tastes, higher protein content and shorter cropping duration compared to other cultivated mushrooms. One of the easiest mushrooms to cultivate, it can be grown quickly and easily on un-composted substrates such as paddy straw and cotton waste or other cellulosic organic waste materials (Ahlawat and Kumar, 2005). The yield of straw mushroom depends on the cultivation methods and substrates used. However, paddy straw is the material freely available in Odisha and therefore, this cultivation is ideal in rural area where paddy straw is abundant after each paddy harvest and it can provide additional income. The enterprise has assumed the proportion of a cottage industry among the rice farmers in the hot, steamy climate of the east and south eastern coastal plain zone of Odisha (Mohapatra *et al.*, 2011). An outdoor cultivation method was introduced for paddy straw mushroom by the Department of Agriculture in the middle of the 1980's. However, farmers are reluctant to produce mushrooms using this method because of the uncertainty in production with irregular and low yield, due to difficulties to control environment factors.

ABSTRACT

Paddy straw mushroom (*Volvariella volvacea*) is an edible mushroom, which has a high demand in Angul district of Odisha due to its taste, aroma and nutritive value. Two species namely OSM-11 and OSM-12 were experimentally evaluated on treated paddy straw with 2 % lime solution. OSM-11 was observed to perform best with highest productivity in total production in number (51) and weight of (1052.03g). In the present study both OSM-11 and OSM-12 were performed better as compared to the farmers practised paddy straw mushroom. With respect to pin head formation and fructification both the species shows 2-3 days delay than *Volvariella volvacea* and also delayed harvesting of 1-2 days indicating no significant delay in the duration of the crop raising. The lowest biological and economical yields were found in *Volvariella volvacea* (700.45g). The above findings reveal an opportunity for commercial implication of paddy straw mushroom especially for utilization of different strains of paddy straw mushroom.

KEYWORDS

Yield evaluation, *Volvariella spp.*, mycelium, growth.

Therefore, the biological efficiency hovers at 10 %, which is low. However, there is a scope for improvement in biological efficiency by using more productive strains of the species, producing good quality spawn and effective substrate management. Further, higher and more stable yield (30- 40 %) could be obtained through adoption of indoor method of farming (Ahlawat and Tewari, 2007). But after cultivating for years production of paddy straw mushroom is declining day by day and the farmers faced less profitability problem. Species of mushroom have particular preference to temperature, relative humidity and substrate (Sahoo, 2014). The best commercial strain of paddy straw mushroom could be selected by measuring the colony diameter observing formation of chlamydospores, days taken to complete the mycelial run and recording the yield per bed under suitable climatic conditions (Sangeetha *et al.*, 2004). It has a great scope for the rural youth and farm women to earn money in less time with low investment. The climatic condition for its cultivation is suitable as it needs high temperature (33-35 °C) and 85-90 % relative humidity at the growing stage. To overcome this problem CTMRT, OUAT has experimented two strains of high yielding Paddy straw mushroom OSM 11 & OSM 12. Atrial experiment was conducted to identify the suitability of the varieties of paddy straw mushroom under Angul district conditions, using locally available low cost raw materials. The objective of the study was to evaluate the yield of different strains of *V. volvacea* for increasing the production of paddy straw mushroom cultivation.

MATERIALS AND METHODS

The experiment was conducted at the Sandhapala village of Chendipada Block of Angul district from July to September 2016-17. The site belongs to Mid Central Table Land Agro climatic Zone of Angul district, Odisha where the average day and night temperatures are 31.9 °C and 22.4 °C respectively with an annual rainfall of more than 1,400 mm. Two types of Mushroom spawn were prepared using mother

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culture of CTMRT, OUAT at Mushroom spawn laboratory of Krishi Vigyan Kendra, Angul. Both Var. OSM-11, OSM-12 was tested in farmers' mushroom Unit and cost benefit Ratio was calculated according to the yield per mushroom bed. Ten women farmers are selected and they are given the local VV. Strain, OSM-11 and OSM-12 strain to cultivate it in their home stead by raising 10 beds for each strain. The cultivation method for each strain was same. The straw bundles were cut to 2ft size with a straw cutter. Straw bundles (13 Bundles or 10 kg on dry weight for each bed) soaked in a tank of sterilizer solution {formalin (100 ml) +water (100L)} with 2 % lime solution for 10 to 12 hours. Then the straw bundles from water was removed and kept in standing positions for 4 to 5 hours with only 65 % moisture 2 to 3 weeks old spawn divided in to 4 equal parts and make into small pieces. 200g of Dal powder grinded from whole grain of Bengal gram or paddy husk or rice bran used to reduce the cost of cultivation. Straw was put for 6 inches, one part of the spawn pieces on the bed leaving 2 inches from outer side and at 3 inches distance and nutrition Powder was sprinkled over the spawn blocks and nearby area. Second layer 6 inches height of straw over the first layer, straw was arranged on the opposite direction of the first layer and spawn and nutrition powder was sprinkled. 3rd layer of 6 inches of straw as like direction of 1st layer and rest 2 parts of spawn was put over the third layer and 2 parts of nutrition powder was sprinkled too. 4th layer of straw of 1 to 2 inches width was paralleled to the 2nd layer, third layer was covered and spilled straw all around the bed was cut. Bed was covered with white polythene sheet, for 30 minutes daily for aeration after 4-5 days bed preparation removed and spray only dried portion of straw. Polythene cover after 9 to 10 days for aeration purpose was removed. The fruits were harvested in budding stage. The data on production were taken at different stages of the mushroom growth and development to the different times of harvest. The number of pinhead development was recorded. The harvesting was done in three flushes of one week intervals. After the 1st flush, the beds were watered and covered regularly to harvest 2nd and 3rd flushes.

RESULTS AND DISCUSSION

The evaluation of the three strains of the mushroom i.e. VV local, OSM-11 and OSM-12 were made by taking the data obtained from the ten farm women who grew these strains in their home stead and data obtained for these strains were recorded and the average performance of these strains in the

home stead grown by different farm women were subjected for statistical analysis.

It was observed that the days to colonisation for VV Local is taking 9 days while OSM and OSM-12 takes 11 days (Table 1). Harvesting of the three stains was limited within 11.67 days (1st harvest of the Local VV strain) to 21.67 days (3rd harvest of the OSM-12 strain). Loval VV strain takes 11.67 days while improved strain OSM -11 and OSM -12 takes 13.00 and 14.33 days respectively for the 1st harvesting. Loval VV strain takes 14.17 days while improved strain OSM -11 and OSM -12 takes 15.50 and 17.00 days respectively for the 2nd harvesting. Loval VV strain takes 20.17 days while improved strain OSM -11 and OSM -12 takes 20.83 and 21.67 days respectively for the 3rd harvesting.

Table 1: Average days taken to attain different phenology by paddy straw mushroom

Name of the strain	Days to Colonisation	Days to 1st harvest	Days to 2nd harvest	Days to 3rd harvest
VV Local	9.00	11.67	14.17	20.17
OSM -11	11.00	13.00	15.50	20.83
OSM -12	11.00	14.33	17.00	21.67

It was observed that the local VV strain produced 26.68 numbers of fruiting bodies weighing 472.95 grams while improved strain OSM-11 and OSM-12 produced 36.93 and 31.42 numbers of fruiting body weighing 777.47 and 649.23 grams respectively in the 1st harvest (Table 1). Local VV strain produced 9.75 numbers of fruiting bodies weighing 167.83 grams while improved strain OSM-11 and OSM-12 produced 10.45 and 9.45 numbers of fruiting body weighing 205.57 and 185.70 grams respectively in the 2nd harvest. Local VV strain produced 3.40 numbers of fruiting bodies weighing 59.67 grams while improved strain OSM-11 and OSM-12 produced 3.62 and 3.13 numbers of fruiting body weighing 69.00 and 59.60 grams respectively in the 3rd harvest. In the process of the production in total the Local VV strain produced 39.83 numbers of fruiting body weighing 700.45 grams with a biological efficiency of 7.0% while improved strain OSM-11 produced 51.00 numbers of fruiting body weighing 1052.03 grams with a biological efficiency of 10.52% and improved strain OSM-12 produced 44.00 numbers of fruiting body weighing 894.53 grams with a biological efficiency of 8.94%.

Table 2: Average production performance of different paddy straw mushroom

Name of the strain	1 st harvest		2 nd harvest		3 rd harvest		Total harvest		Biological Efficiency
	Fruiting body (No)	Weight (g)	Fruiting body (No)	Weight (g)	Fruiting body (No)	Weight (g)	Total number of fruiting bodies	Total Weight (g)	
VV Local	26.68	472.95	9.75	167.83	3.40	59.67	39.83	700.45	7.00
OSM-11	36.93	777.47	10.45	205.57	3.62	69.00	51.00	1052.03	10.52
OSM-12	31.42	649.23	9.45	185.70	3.13	59.60	44.00	894.53	8.94

From the present study it was observed that the production performance of the Local VV strains is the lowest in all stages of production in number of fruiting bodies (39.83) and weight of fruiting bodies (700.45g) while OSM-11 produced highest number of fruiting bodies (51) and weight of fruiting bodies

(1052.03g). The number and weight of fruiting bodies is highest in the 1st stage of production and decreases in subsequent harvest yielding lowest number and lowest weight in 3rd harvest in all the strains. The biological efficiency of isolates ranged from 7.00-10.52 % in the trial.

The correlation of different yield contributing parameters was done to get the association of different parameters with each other and yield to get the significance of different

days of harvest for yield maximization and is given below (Table 3).

Table 3: Correlation of the different yield contributing parameters of the present study is presented below

Parameters	Days to Colonisation	Days to 1st harvest	Days to 2nd harvest	Days to 3rd harvest	1st harvest		2nd harvest		3rd harvest		Total harvest	
					Fruiting body (No)	Weight (g)	Fruiting body (No)	Weight (g)	Fruiting body (No)	Weight (g)	Total number of fruiting bodies	Total Weight (g)
Days to Colonisation	1.000											
Days to 1st harvest	0.816*	1.000										
Days to 2nd Harvest	0.696*	0.866*	1.000									
Days to 3rd Harvest	0.687*	0.657*	0.617*	1.000								
1st harvest	Fruiting body (No)	0.723*	0.337	0.262	0.431	1.000						
2nd harvest	Weight (g)	0.717*	0.365	0.251	0.353	0.926*	1.000					
	Fruiting body (No)	-0.005	-0.077	-0.071	-0.420	0.185	0.112	1.000				
3rd harvest	Weight (g)	0.262	0.131	0.008	-0.347	0.305	0.484	0.621*	1.000			
	Fruiting body (No)	-0.011	-0.151	-0.037	-0.386	-0.057	-0.012	0.016	0.125	1.000		
Total harvest	Weight (g)	0.100	-0.050	-0.035	-0.385	0.026	0.197	0.015	0.403	0.907*	1.000	
	Total number of fruiting bodies	0.682*	0.290	0.230	0.290	0.977*	0.896*	0.372	0.421	0.039	0.108	1.000
	Total Weight (g)	0.689*	0.343	0.222	0.230	0.876*	0.984*	0.203	0.623*	0.074	0.312	0.875*
												1.000

It was observed that the significant correlation between days to colonisation and days to 1st Harvest, 2nd harvest, 3rd harvest, 1st harvest fruiting body weight and number and total number and total weight. Days to 1st harvest was significantly correlated with 2nd harvest and 3rd harvest. Days to 2nd harvest significantly correlated with days to 3rd harvest. 1st harvest fruiting body number significantly correlated with 1st harvest weight, total number of fruiting body and total weight. 1st harvest weight significantly correlated with total number of fruiting bodies and total weight. 2nd harvest fruiting body number and 2nd harvest weight were significantly correlated. 2nd harvest weight and total weight were correlated significantly. 3rd harvest fruiting body number and weight were correlated significantly. Total number of fruiting body and total weight of the harvest were significantly correlated. So every stage of production is important and care should be taken to the last harvest to

get maximum yield.

CONCLUSION

The improved strains of mushroom perform better than the traditional mushroom varieties and to be adopted to get better production. Collection of mushroom cultures obtained from nature in different countries throughout the world has been the important tool for future strain development programme (Sangeetha *et al.*, 2004). The strain OSM-11 should be advised to farmers of Angul district to get maximum profit in mushroom production. It was observed although the 1st harvest gives the maximum production but from the correlation studies it was found that all stage of production contribute significantly to the production of the mushroom. So mushroom production and care to be continued till the 3rd harvest to maximize the profit.

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