Environment & Ecology 29 (2A) : 853—855, 2011
 ISSN 0970-0420

Effect of Substrate Quality and Bed Dimension on Production of Straw Mushroom, *Volvariella volvacea*

K. B. MOHAPATRA, B. BEHERA AND S. S. MAHAPATRA

Department of Plant Pathology, Orissa University of Agriculture & Technology
Bhubaneswar 751003, India
E-mail : drkailashmohapatra@yahoo.com

Abstract

An experiment was conducted during *kharif* (rainy) season in 2005 to evaluate six different qualities of paddy straw for their mushroom yielding abilities. The beds prepared out of hand-threshed tall indica straw produced the highest sporophore yield of 1,682.5 g/bed with the corresponding biological efficiency of 16.8%. Trial on bed dimension (substrate quantity) conducted during *kharif* (rainy) and summer seasons of 2005-06 with seven treatments including the standard check (2′ × 2′ × 2′) revealed that biological efficiency as high as 25.72% during summer (643.33 g/bed) and 29.72% during rainy season (743.33 g/bed) could be achieved from the bed size of 2′ × 1′ × 1′. The standard check (0.60 × 0.60 × 0.60 m) yielded 1,396.66 g/bed (13.96% BE) and 1,463.33 g/bed (14.63% BE) during summer and rainy seasons respectively.

Key words : Substrate quality, Bed dimension, Straw mushroom, Biological efficiency.

Paddy straw mushroom (*Volvariella volvacea*) is an edible mushroom of tropics and sub-tropics. Cultivation of straw mushroom is confined to coastal states like Orissa, Andhra pradesh, Tamil Nadu, Kerala and West Bengal (1). It is popular owing to its excellent taste and flavor, low crop cycle, simple and easy method of cultivation and availability of production inputs relatively at cheaper rates. Straw mushroom grows well in the temperature range of 30—35 C and RH 75—85% (2). Therefore, cultivation is confined within the months of March to October in the coastal belt. Straw mushroom is traditionally grown on rice straw in India. However, the yield is unstable and low with average biological efficiency (BE) of 10%. Literature reveals that manipulation of crop culture could lead to improved yield of straw mushroom. Keeping this in view, the present studies were undertaken to evaluate the substrate quality and bed dimension in improving the yield of straw mushroom.

Methods

The experiment on substrate quality was conducted in the mushroom growing room of Center of Tropical Mushroom Research and Training (CTMRT), Department of Plant Pathology, Orissa University of Agriculture and Technology, Bhubaneswar during *kharif* season of 2005. Six different qualities of paddy straw such as hand threshed deshi variety, hand threshed improved variety, hand threshed high yielding variety, cattle threshed deshi variety, cattle threshed improved variety, and cattle threshed high yielding variety were evaluated in four replications following randomized block design. Substrate was soaked in clean and cold water for a period of 12 hours. Bundles were cut at both ends to have the required length (2). The excess water was drained out and shade-dried to have 65—75% moisture. Cuboidal beds were prepared (0.60×0.60×0.53 m) with 3 layers each of 6′′ thickness and the cover layer of 3′′ thickness. For each bed 10.0 kg of dry straw was required. Spawning was done @ 3% of dry substrate in 3 layers, first two layers at the periphery only with a spacing of 7.6 cm between spawn segments and all over the third layer with the same spacing. The beds are supplemented with gram flour at 2% of the dry substrate. Beds are covered with transparent polythene sheets till mycelial run was over and then withdrawn. Beds were moistened appropriately. Observations on days taken for pin head emergence, number of fruit bodies and weight of fruit bodies were recorded. Biological efficiency in respect of each treatment was calculated

Table 1. Effect of straw quality on mushroom productivity. *Mean of four replications.

Treatments	Days taken for emergence of pinhead	Number of fruit bodies*	Weight of fruit bodies* (q)	Biological efficiency (%)
T_1 Hand threshed deshi variety	10	112	1682.50	16.80
T_2 Hand threshed improved variety	11	99	1477.50	14.70
T_3 Hand threshed high yielding variety	10	95	1420.00	14.20
T_4 Cattle threshed deshi variety	13	38	557.50	5.50
T_5 Cattle threshed improved variety	14	32	470.00	4.70
T_6 Cattle threshed high yielding variety	14	32	445.00	4.40
CD (0.05)	–	6.08	93.00	–

using the following formula :

$$\text{Per cent biological efficiency (BE)} = \frac{\text{Fresh weight of mushroom}}{\text{Dry weight of substrate}} \times 100$$

The experiment on evaluation of bed dimension was raised during *kharif* and summer seasons of 2005-06. Seven treatments including bed size of 0.91×0.91×0.60, 0.91×0.91×0.30, 0.60×0.60×0.60, 0.60×0.60×0.30, 0.60×0.30×0.60, 0.60×0.30×0.30 m and circular bed (0.60 m breadth) with three replications were raised following randomized block design. Beds were prepared adopting standard procedures. Care was taken to maintain suitable temperature and humidity in the growing room. Observations on days taken for emergence of pinhead, number of fruit bodies and weight of fruit bodies were recorded and biological efficiency calculated treatment wise.

Results and Discussion

Table 1 shows that pinhead emergence was earlier on beds prepared out of hand threshed, uncrumpled straw irrespective of their types. The pinhead emergence was delayed by 3—4 days in cattle threshed straw types. The hand threshed straw types had superior yielding abilities in comparison to cattle threshed types. The maximum sporophore yield of 1,682.50 g/bed with the corresponding biological efficiency of 16.80% was realized from the bed having hand threshed deshi variety straw (Panidhan). The beds prepared out of hand threshed improved variety(CR 1009) and hand threshed high yielding variety (Swarna) were statistically at par in respect of their sporophore yielding abilities (1,477.50 g/bed and 1,420 g/bed respectively) which followed the above mentioned treatment. However, the cattle threshed straw types were found inferior in respect of sporophore yields (445 g to 557.5 g/bed) reflecting their unsuitability for the purpose. Paddy straw mushroom prefers high cellulose, and low lignin containing substrate like paddy straw which is available in plenty in tropical and subtropical climates (3). However, better yield with tall, hand threshed and rigid straw as com-

Table 2. Effect of bed dimension on mushroom productivity. *Mean of three replications.

Treatments (m)	Days taken for emergence of pinhead		Number of fruit bodies		Weight of fruit bodies (g)*		Biological efficiency (%)*	
	Summer	Rainy	Summer	Rainy	Summer	Rainy	Summer	Rainy
T_1-0.91×0.91×0.60	9	12	178	149	3210.00	2813.33	9.17	8.03
T_2-0.91×0.91×0.30	10	12	124	121	2551.66	2183.33	14.57	12.47
T_3-0.60×0.60×0.60	9	12	138	114	1396.66	1463.33	13.96	14.63
T_4-0.60×0.60×0.60	10	12	87	67	716.66	748.33	14.32	14.98
T_5-0.60×0.30×0.60	10	12	71	70	1125.00	1048.33	22.50	20.96
T_6-0.60×0.30×0.30	10	13	43	45	643.33	743.33	25.72	29.72
T_7-Circular bed	10	13	100	98	1450.00	1326.66	19.33	17.68
CD (0.05)	–	–	15.80	16.18	334.06	325.31	–	–

pared to dwarf, cattle threshed and flexible straw has been reported (4). Good aeration and percolation of light in beds prepared out of uncrumpled straw could be the factors responsible for realization of better yields.

Table 2 indicates that pinhead emergence was earlier during summer season by 2—4 days as compared to rainy season. However, it took 9—13 days for pinheads to emerge depending upon the weather conditions irrespective of bed size. The large sized beds (0.91×0.91×0.60 m and 0.91×0.91×0.30 m) yielded well, but with low biological efficiency and therefore, were uneconomic. The highest biological efficiency of 25.72% during summer and 29.72% during rainy season was recovered from the bed with dimension 0.60×0.30×0.30 m (T_6) which was followed by T_5 (0.60×0.30×0.60 m) giving biological efficiency of 22.50% during summer and 20.96% during rainy season. The standard check (0.6×0.6×0.6 m) yielded 1,396.66 g/bed during summer and 1,463.33 g/bed during rainy season with biological efficiency of 13.96% and 14.63% respectively. Sporophore yield/bed ranged from 643.33 to 3210.00 g in summer and 743.33 to 2813.33 g in rainy season. Higher biological efficiency realized out of smaller beds may be attributed to more surface area exposure and better penetration of light and air compared to that of larger beds. Realization of better yields from smaller beds in the hot regions was confirmed earlier (5, 6).

The findings of the experiments thus revealed that better quality substrate obtained from tall indica rice varieties along with smaller size beds in the warm and humid regions of the coastal agro-ecological situations could improve the straw mushroom yield substantially.

References

1. Ahlawat O.P. and R. P. Tewari. 2007. *Cultivation technology of paddy straw mushroom (Volvariella volvacea).* Nat. Res. Cen. Mush. (ICAR), Solan (HP), India.
2. Quimio T. H., S. T. Chang and D. J. Royce. 1990. *Technical guidelines to mushroom growing in the tropics*. FAO, Rome, Italy.
3. Sukara E., I. B. Hendrarto and C. H. Dickinson. 1985. The cultivation of paddy straw mushroom. *Bull. British Mycol. Soc.* 19 : 129—132.
4. Pani B. K. and R. P. Naik. 1998. Yield performance of paddy straw mushroom (*Volvariella* sp.) under natural climatic conditions in Orissa. *Environ. Ecol.* 16 : 968—969.
5. Gupta G. K., B. S. Bajaj and D. Suryanarayana. 1970. Studies on the cultivation of paddy straw mushroom (*V. volvacea* and *V. diplasia*). *Ind. Phytopath.* 23 : 615—620.
6. Agarwala R. K. 1973. How to grow mushroom. *Ind. J. Mush.* 1 : 17—21.