NBU Journal of
Plant Sciences

Vol. 7, No. 1 March 2013 p. 51-54
ISSN No 09746927

Cultivation and yield of *Pleurotus sajor-caju* on various lignocellulosic substrates

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Abstract
Oyster mushrooms have ability to grow utilizing various lignocellulose substrates (Khan and Garcha, 1984). In our present work a comparative study on the cultivation and yield of *Pleurotus sajor-caju* using different compost composition were carried out. Six different lignocellulose materials like paddy straw, saw dust, shredded wood, rice husk, paper waste and sugarcane bagasse were used to prepare ten types of compost combinations for the cultivation of oyster mushroom. The shortest period for pinhead formation was determined to be 9 days on sugarcane bagasse compost, where as the longest period for the same was determined to be 18 days on paddy straw and saw dust combination. The total harvest period of oyster mushroom was noted to be 41 days for sugarcane bagasse and the longest harvest period noted was 55 days on paddy straw and saw dust mixture. The highest yield was 154.8 gm on paddy straw and sugarcane bagasse mixture (1:1).

Keywords: *Pleurotus sajor-caju,* compost, lignocellulose.

Introduction

Cultivation of oyster mushroom has been universally recognized for its nutritional value and minimal technology requirement. Cultivation of edible mushroom is a biotechnological process, which aids in reducing and equally protecting the environment from excess solid waste (Mshandete and Cuff, 2008; Sanchez, 2010). Oyster mushrooms have ability to grow at wide range of temperatures and utilizing various lignocellulose substrates. Importance of mushrooms as food and its medicinal value is now well recognized and hence, development of high commercial interest is noted worldwide. For this reason, there is need to have a constant supply of the substrates which is readily available with low cost price rather than depending on specific types of materials or some seasonal forest supply for cultivation of mushroom (Onuoha et al, 2009).

Several reports regarding the suitability of various substrates for mushroom production namely straws of rice (*Oryza sativa*), wheat (*Triticum aestivum*), ragi (*Elucine coracana)*, bazra (*Pennisetum typhoides*), sorghum (*Sorghum vulgare*), maize (*Zea mays*) (Bano et al., 1987; Goswami et al., 1987; Gupta and Langer, 1988) have been recorded. Utilization of woods of poplar (*Populus robusta*), oak (*Quercus leucotrichopora*), cotton stalk, pea shells and poplar saw dust (Philippoussis et al., 2001; Zervakis et al., 2001) has also been studied. Utilization of agricultural waste as a substrate for the production of mushroom plays a dual role in reducing the waste and at the same time being used as a fertilizer (Sher et al., 2011). The palm oil related study carried out by Pathmashini et al. (2008), Saidu et al. (2011) who reported sorghum, kurakkan, maize and paddy are suitable substrate for edible mushroom production. Many studies reported that organic supplement enhances the yield of mushroom, but Mane et al. (2007) corroborated that supplementation also increases the production, though not popular as a commercial ingredient for large scale production. The aim of this study is to investigate the cultivation of oyster mushroom (*Pleurotus sajor-caju*) on different substrates.

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Materials and Methods

Mushroom strain:

The strain of *Pleurotus sajor-caju* was collected from Mushroom Cultivation Unit of Ramkrishna Mission Ashrama, Narendrapur, Kolkata and was

maintained on Potato Dextrose Agar (pH 6.5), containing 40% potato extract, 2% dextrose and 2% agar.

Substrate Preparation and Cultivation:

Six different lignocellulosic materials like paddy straw, saw dust, shredded wood, rice husk, paper waste, sugarcane bagasse were used to prepare ten types of substrate composition for the cultivation of oyster mushroom. Mushroom grown on substrate using only paddy straw was taken as control set.

The substrates were separately soaked in water overnight and after 15 hours the materials were squeezed to drain off the excess water. Then the substrates were spread on the surface of clean blotting paper and air dried for 15 minutes. Wet substrates (500 gms) which was either individual lignocellulosic waste or combination of each lignocellulosic waste and paddy straw (1:1) ratio was taken for use as substrate for mushroom cultivation. Spawning was done in layering technique with 4-5 layers for each bed using 20% spawn (wet wt/ wet wt) in a nylon net bag. The spawned substrates were then put into 28 x 40 cm polythene bags, tightly closed and pin holes were made on the surface of the bag. Those bags were then kept in a hanging condition in the mushroom house for spawn running at 25 ± 1°C under dark condition until primordial was formed. After appearance of primordia (pinheads), the polythene bag was removed to allow normal development of fruit bodies at 22 ± 1°C and 80-90% relative humidity. Proper ventilation was provided to prevent increase of CO_2 concentration. Mushrooms were harvested in clusters manually.

The days required for spawn running, pinhead formation and fruitbody formation was recorded. The yield of mushroom (gm fresh weight) was noted upto three flushes in each case.

Results and Discussion

Spawn running- According to the results obtained from above experiment it is found that completion of spawn running took 12-22 days after inoculation of the substrate. All substrates were inoculated at the same day. The shortest spawn running period on sugarcane bagasse taking 12 days [Table 1, Fig: A]. These results are in agreement with Kulshreshtha et al. (2010) who reported nearly similar spawn running time for *Pleurotus florida* using various biological waste materials.

Pinheads formation- The pinheads formation is the next stage of mycelial growth during cultivation process. Small pinheads like structures were

Table 1: Days for completion of spawn running, pinheads formation and fruiting bodies formation using different substrates.

Name of Substrate	Days for completion of spawn running	Days for pinhead formation	Days for fruiting bodies formation (flush)		
			1st	2nd	3rd
Paddy Straw	17	22	26	33	43
Paper	17	25	29	39	50
Paper + Paddy straw	16	24	30	41	51
Rice husk	22	28	33	42	55
Rice Husk + Paddy Straw	19	24	27	36	48
Sawdust	18	25	29	40	54
Sawdust + Paddy Straw	21	28	32	41	52
Shredded Wood	19	26	32	42	54
Shredded Wood + Paddy Straw	17	23	28	37	49
Sugarcane Bagasse	15	20	24	36	50
Sugarcane Bagasse + Paddy Straw	12	16	22	33	48

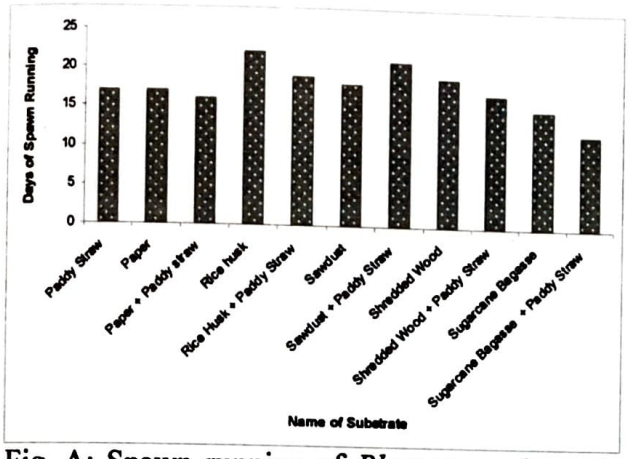

Fig. A: Spawn running of *Pleurotus sajor-caju* using different substrates

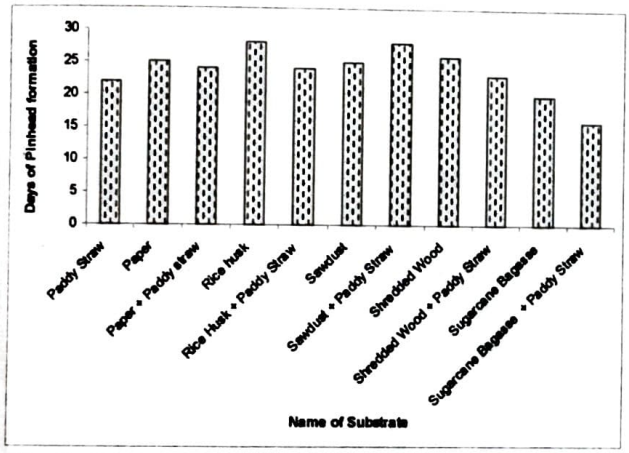

Fig. B: Pinhead formation of Pleurotus sajor-caju using different substrates

observed, these pinheads were formed 16-28 days after spawn running [Table 1, Fig: B]. these results agree with the findings of Shah et al. (2004) who studied the cultivation of oyster mushroom on different substrates.

Fruitbody formation- This is the final stage during the cultivation of mushroom. The fruiting bodies appeared 4-6 days after pinheads formation which is in conformity with Kulshreshtha et al. (2010) and took 8-13 days later after inoculation of spawn. [Table 1, Fig: C, Plate A].

Yield of oyster mushroom- The crop of oyster mushroom was harvested in three flushes. The maximum yield was obtained in first flush than the second and third flush. Maximum average yield of 154.8 gms was obtained from paddy straw and sugarcane bagasse mixture in (1:1) ratio (w/w). This is 121% greater yield than the control set (paddy straw, where the total average yield was

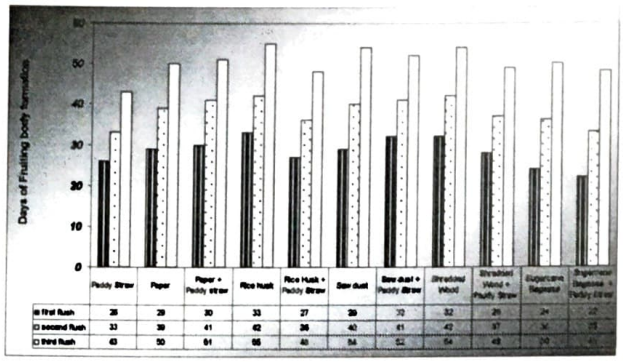

Fig. C: Fruitbody formation of *Pleurotus sajor-caju* using different substrates

Plate. A: Fruitbody formation of oyster mushroom

noted to be 127.9 gms only. This was followed by paper waste and paddy straw mixture and the minimum yield of mushroom were found to be 43 gm [33.62% of the control set] when shredded wood alone was used as the compost. [Fig: D, E]. It is reported that washed fresh sugarcane bagasse is viable as a substrate for the production of the

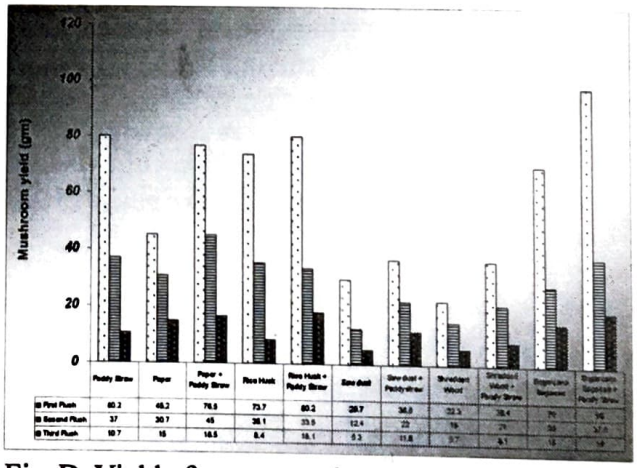

Fig. D: Yield of oyster mushroom (*Pleurotus sajor-caju*) in different substrates

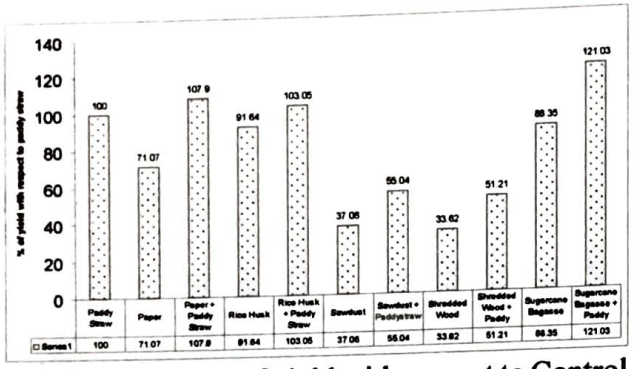

Fig. E: Percentage of yield with respect to Control set (Paddy Straw)

mushroom *Pleurotus sajor-caju*, especially in view of its low contamination and of a reduction in substrate disinfection cost [Moda et al. 2005]

Acknowledgement

Thanks are due to Prof. T.B.Jha, Head of the Department of Botany, Presidency University, Formerly Presidency College, Kolkata, for constant encouragement for the completion of work.

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