

Original Research Article

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Effect of Different Grains on Mycelial Growth and Yield of *Pleurotus sajorcaju*

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ABSTRACT

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The present investigation was carried out to know the effect of different grains such as paddy, maize, wheat, sorghum and ragi on linear mycelial growth for spawn development, yield performance and biological efficiency of *Pleurotus sajorcaju*. Maximum mycelial growth of *P. sajorcaju* was recorded in ragi grains which was on par with sorghum grains followed by wheat grains, paddy grains and maize grains. Among the different grains tested, highest total yield and biological efficiency was recorded in maize grains followed by wheat, paddy, sorghum grains. Lowest yield and biological efficiency was obtained in ragi grains.

Introduction

A mushroom is a fleshy fruiting body of a fungus. Oyster mushroom (*Pleurotus* species) is the third largest commercially produced mushroom in the world and ranks second in India. Among different species of oyster mushroom, *Pleurotus sajorcaju* is an important edible mushroom which is grown commercially in India. Demand for oyster mushroom is increasing day by day in India because of its high yield potential, excellent taste, flavor, texture and longer shelf life. In India it is mainly grown within a temperature range of 20°C to 30°C during winter season. Mushrooms are good source of high quality proteins. They contain good amount of

vitamin C and B-complex (thiamine, riboflavin and niacin), potassium, phosphorus and sodium. They are rich in lysine and tryptophan, the two essential amino acids that are deficient in cereals (Caglarirmak, 2007; Manzi *et al.*, 1999).

In addition to food value, medicinal value of mushrooms for diabetics and in cancer therapy has been reported (Sivrikaya *et al.*, 2002). Oyster mushrooms grow on different agricultural waste substrates containing lignin and cellulose like paddy straw, wheat straw, sugarcane bagasse, banana leaves, paper etc and transform lignocellulosic waste residues into protein rich food with medicinal properties (Dehariya and Vyas, 2013; Hossain,

2017). Spawn is the medium impregnated with mycelium of the mushroom. The supporting medium such as grains provides nutrition to the mushroom fungus during its growth. Spawn serves as the seed for mushroom cultivation. Quality of spawn determines both yield and quality of cultivated mushroom. Mainly cereal grains are used for spawn production of mushroom. Different grain substrates such as maize, wheat, oat, sorghum, barley, pearl millet influenced mycelial growth of *Pleurotus* species for spawn production (Mishra *et al.*, 2018). It is necessary to find out suitable grains for spawn production and commercial cultivation of oyster mushroom. Therefore the present investigation was carried out to evaluate different locally available cereal grains such as maize, wheat, paddy, ragi and sorghum grains for spawn production and yield of *P. sajorcaju*.

Materials and Methods

Pure culture maintenance

Pure culture of *Pleurotus sajorcaju* was obtained from Orissa University of Agriculture and Technology, Bhubaneswar. The culture was maintained on potato dextrose agar slants at 4°C. Sub culturing was done in every 15 days.

Spawn preparation

Five different kinds of grains such as paddy, wheat, maize, sorghum and ragi were tested to know the best suitable grain for spawn development and yield of *P. sajorcaju*. Healthy grains were collected, washed thoroughly in tap water and soaked overnight in water till they become soft. Then grains were boiled till they become soft, drained off excess water and mixed with calcium carbonate at the rate of 2 % on dry weight basis of the grains. The grains were filled into

glucose bottle upto 12.5 cm of the bottle. Four replications were done for each treatment. Bottles were then plugged with non-absorbent cotton and sterilized in autoclave at 121 °C for 2 hours. Each sterilized bottle was then inoculated with 10 mm disc of actively growing mycelium of *P. sajorcaju* maintained on PDA. Inoculated bottles were incubated at 25°C for spawn development. The linear mycelial growth of *P. sajorcaju* in each bottle was measured on 7th day and 14th day of inoculation when entire grains of any spawn bottle was completely colonized by mycelia of *P. sajorcaju* (Modified method of Michael *et al.*, 2011).

Preparation of substrate and cultivation

Disease free paddy straw was collected and used as cultivation substrate. The straw was chopped into 2-3 cm pieces. The chopped straw was soaked in 100 liters of water in a 200-litre G.I. drum for 12 hours. 10g of carbendazim and 120 ml of formalin were added in water. After soaking, straw was taken out and excess water was drained. The straw was spread as thin layer on cemented floor and shade dried to get 60% moisture.

The beds were prepared by using polythene bags of 35 x 45 cm. One kg of paddy straw was used to fill up in each bag. Five different spawn grains such as maize, wheat, paddy, ragi and sorghum were used separately for cultivation of *P. sajorcaju*. Four replications were done for each treatment. Spawning was done in five layers and spawning rate was 2% of wet substrate. The inoculated bags were kept in the spawn running room in dark at room temperature (20 to 28°C). When the substrate was completely covered by the white cottony mycelia growth, the bags were shifted to cropping room in the thatched shed for initiation of buttons. Using a new blade polythene covers were cut and removed fully. Water was sprayed on the bed from second

day of opening using an atomizer. Crop was harvested in three pickings and fresh weight of mushroom in each picking was recorded. Total weight of all the fruiting bodies harvested from all the three pickings were measured as total yield of mushroom. Biological efficiency was calculated by dividing average yield of mushroom per bed by dry weight of substrate.

$$\text{Biological efficiency} = \frac{\text{Fresh weight (g) of mushrooms harvested}}{\text{Dry weight (g) of substrate}} \times 100$$

Results and Discussion

Effect of different grains on linear mycelial growth

The present investigations are carried out to know the effect of five different grains on spawn development of *P. sajorcaju* and data in this regard are presented in Table 1. There was significant difference in spawn development of *P. sajorcaju* on different grains. Mycelial growth of the mushroom fungus on different grains ranged from 3.6 cm to 5.5 cm on 7th day of inoculation and 9.0 cm to 12.25 cm on 14th day of inoculation, respectively. Data reveals that among different

grains tested on 7th day of inoculation, maximum mycelial growth of *P. sajorcaju* for spawn development was recorded in ragi grains (5.5 cm) which was on par with sorghum grains (5.25 cm). It was followed by wheat grains (4.5 cm) and paddy grains (4.2 cm). Lowest mycelial growth of the mushroom fungus was observed in maize grains (3.6 cm). Similarly on 14th day of inoculation, maximum mycelial growth was obtained in ragi grains (12.25 cm) which was on par with sorghum grains (12.0 cm). It was followed by wheat grains (10.0 cm) and paddy grains (9.5 cm). Lowest mycelial growth was recorded in maize grains (9.0 cm). Our findings in the present investigation are almost similar to the results obtained by other workers. Shah *et al.*, (2004) took three types of grain for spawn production viz., kurakkan (*Eleusine coracana*), maize (broken) (*Zea mays*), sorghum (*Sorghum bicolor*) and reported less time requirement for spawn run in kurakkan. Pathmasini *et al.*, (2008) used locally available grains of kurakkan (*Eleusine coracana*), maize (broken) (*Zea mays*), sorghum (*Sorghum bicolor*) and paddy (*Oryza sativa*) for spawn production and reported early development of spawn in kurakkan grains as compare to maize, sorghum and paddy grains.

Grains	Linear mycelial growth* (cm)	
	7 th day	14 th day
Ragi	5.50	12.25
Wheat	4.50	10.0
Maize	3.60	9.00
Paddy	4.20	9.50
Sorghum	5.25	12.00
SEm±	0.18	0.31
CD at 1% level	0.74	1.33
* Average of four replications		

Table.2 Effect of different grains on yield and biological efficiency of *Pleurotus sajorcaju*

Grains	Yield* (g/ Kg dry substrate)			Total	Biological efficiency (%)
	I picking	II picking	III picking		
Ragi	285.90	168.75	138.10	592.75	59.28
Wheat	363.40	196.60	154.30	714.30	71.43
Maize	367.80	224.20	155.60	747.60	74.76
Paddy	340.60	195.60	148.80	685.00	68.50
Sorghum	309.10	181.10	147.90	638.10	63.81
SEM±	5.50	3.73	2.37		
CD at 1% level	22.90	15.56	9.87		

* Average of four replications

Kumbhar (2012) reported that ragi, maize, pearl millet and sorghum grain spawns accelerated the spawn run, pinning and maturity of sporophores and gave higher sporophore yield of *P. eous*. Sahu *et al.*, (2013) tested different grains for spawn development of *P. eous* and found that among cereal grains, sorghum, paddy grains and maize grains took significantly less time for spawn development

Mushroom yield and biological efficiency

Total yield and biological efficiency of *P. sajorcaju* on different cereal grains were evaluated and data are presented in Table 2. Crop of *P. sajorcaju* was harvested in three flushes. Among three flushes, maximum yield was obtained in first flush, followed by 2nd and 3rd flush. Highest total yield was recorded in maize grains (747.6 g) followed by wheat grains (714.3 g), paddy grains (685.0 g), sorghum grains (638.1 g). Lowest total yield was observed in ragi grains (592.75 g). Highest biological efficiency was recorded in maize grains (74.76 %) followed by wheat grains (71.43%), paddy grains (68.5%) and sorghum grains (63.81%). Lowest biological efficiency was observed in ragi grains (59.28 %). Our present findings are almost similar to the results obtained by other scientists. Chaurasia (1997) found that bajra and sorghum grains were suitable for early spawn

development of *P. columbinus*, but he obtained higher yield from maize grains. Sahu *et al.*, (2013) studied effect of different grains on yield of *P. eous* and recorded maximum yield on maize grains with biological efficiency (83.96 %) compared to other grains.

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