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Influence of Grain Spawns on Yield and Productivity of Pink Oyster Mushroom (*Pleurotus djamor*)

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Abstract

The present investigation was carried out during 2022–24 at the Department of Plant Pathology, College of Agriculture, Navsari Agricultural University, Waghai, Gujarat, India, to evaluate the suitability of different cereal grains for spawn production and their influence on growth, yield and biological efficiency of Pleurotus djamor. Six grains namely wheat, sorghum, nagli, bajra, maize and vari were tested under a Completely Randomized Design. Maize grain exhibited the fastest spawn colonization (9.66 days), whereas vari grain spawn resulted in the shortest spawn run, earliest pinhead initiation and first harvest. Sorghum grain spawn produced superior fruit body characteristics and recorded the highest yield (1150.66 g/bag) and biological efficiency (76.71%). The study demonstrated that grain substrate significantly affects spawn quality and crop productivity. Sorghum grains were found most suitable for commercial cultivation of pink oyster mushroom.

Keywords: *Pleurotus djamor*, grain spawn, biological efficiency, yield, mushroom cultivation

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Introduction

Mushroom cultivation is an important component of sustainable agriculture, converting lignocellulosic residues into nutritious food. Edible mushrooms provide nutritional security and contribute to environmental sustainability by converting agricultural wastes into value-added products. Among cultivated species, oyster mushrooms (*Pleurotus* spp.) are recognized for rapid growth, substrate adaptability, ease of cultivation, and high biological efficiency [1, 2], making them suitable for commercial cultivation and small-scale entrepreneurship. Moreover, production generates income for farmers while promoting efficient waste management and reducing environmental pollution.

Pink oyster mushroom, *Pleurotus djamor* (Rumph. ex Fr.) Boedijn, is gaining commercial importance due to its attractive pink fruiting bodies, pleasant flavour, short cropping cycle, and excellent nutritional quality. It is rich in proteins, dietary fibre, vitamins, minerals, and amino acids, making it a valuable functional food [3, 4]. Beyond nutritional value, *P. djamor* contains bioactive compounds with antioxidant, antimicrobial, anti-inflammatory, and immunomodulatory properties [5-7].

Cultivation success largely depends on spawn quality. Spawn serves as the mycelium carrier and directly influences substrate colonization, crop establishment, fruiting, yield, and biological efficiency. Cereal grains are commonly used as substrates because they provide readily available nutrients for rapid mycelial growth. However, grain spawn effectiveness varies by grain size, nutrient composition, moisture-holding capacity, and physical structure, which collectively influence spawn vigour and productivity [8].

Various cereal grains like wheat, sorghum, maize, pearl millet, finger millet, and little millet are utilized for spawn preparation. However, information on the comparative suitability of different grains for *P. djamor* cultivation is limited under South Gujarat conditions. Therefore, this investigation evaluated the effect of different grain substrates (wheat, sorghum, nagli, bajra, maize, and vari) on spawn production, growth, yield, and biological efficiency of pink oyster mushroom (*Pleurotus djamor*).

Materials and Methods

A pure culture of pink oyster mushroom (*Pleurotus djamor* (Rumph. ex Fr.) Boedijn) was obtained from the Directorate of Mushroom Research (DMR), Solan, Himachal Pradesh, India, and maintained on Potato Dextrose Agar (PDA) slants

at 25 ± 2°C. Sun-dried paddy straw collected from the Hill Millet Research Station, NAU, Waghai, was chopped into 2–3 inch pieces and chemically sterilized following the method of Vijay and Sohi [9] using carbendazim (75 ppm) and formalin (500 ppm) for 14–18 h. The treated straw was drained to obtain a moisture content of 65–70%. Six cereal grains, viz., wheat, sorghum, nagli, bajra, maize, and vari, were evaluated for spawn production. The grains were boiled, shade-dried to 50–55% moisture content, and amended with calcium carbonate (2%) and gypsum (2%). Sterilized grains were inoculated with actively growing mycelial discs of *P. djamor* and incubated at 25 ± 2°C until complete colonization. Commercial spawn was prepared using fully colonized mother spawn. For crop cultivation, chemically sterilized paddy straw (1.5 kg dry weight) was filled in polyethylene bags (40 × 100 cm) and spawned at the rate of 100 g spawn per bag following the layer spawning method. The bags were incubated under standard cropping room conditions. Cropping room conditions were maintained at 24–28°C, 85–90% relative humidity, 12 h diffused light, adequate ventilation and air exchange. Water was sprayed 2–3 times daily to maintain humidity. Observations were recorded on spawn colonization, spawn run, pinhead initiation, first harvest, pileus diameter, pileus length, stipe length, fruiting body weight, yield, and biological efficiency. Biological efficiency (BE) was calculated according to Chang and Miles [10] as: BE (%) = (Fresh weight of mushrooms harvested / Dry weight of substrate used) × 100. The experiment was conducted in a Completely Randomized Design (CRD) with six treatments and three replications. Data were analyzed using analysis of variance (ANOVA), and treatment means were compared at the 5% level of significance following Gomez and Gomez [11].

Results and Discussion

Effect of Different Grains on Spawn Production

The grain substrate significantly influenced spawn colonization of *Pleurotus djamor* (**Table 1**). Among the grains tested, maize (T_5) recorded the shortest spawn colonization period (9.66 days), followed by sorghum (T_2; 10.00 days) and bajra (T_4; 10.33 days), whereas vari (T_6) and nagli (T_3) required significantly longer periods. All treatments produced white mycelial growth after 15 days of incubation. Cottony and compact mycelial growth was observed in wheat, sorghum, bajra, and maize grains, whereas nagli and vari exhibited comparatively loose and fluffy growth. The pH of spawn after incubation ranged from 7.09 to 7.24, indicating favorable conditions for mycelial development. Similar observations on the influence of grain characteristics on spawn growth have been reported previously [12, 13]. The rapid colonization observed in maize and sorghum may be attributed to their higher carbohydrate reserves and favourable grain structure, which facilitate efficient nutrient utilization and mycelial proliferation [8, 14].

Table 1 Effect of different grains on spawn production of *Pleurotus djamor*

Treatment	Spawn colonization (days)	Colour	Texture	pH
T_1 (Wheat)	10.66	White	Cottony	7.15
T_2 (Sorghum)	10.00	White	Cottony	7.18
T_3 (Nagli)	12.00	White	Fluffy	7.22
T_4 (Bajra)	10.33	White	Cottony	7.20
T_5 (Maize)	9.66	White	Cottony	7.24
T_6 (Vari)	12.33	White	Fluffy	7.09
S.Em. ±	0.272	–	–	–
C.D. (P=0.05)	0.838	–	–	–
C.V. (%)	4.35	–	–	–

Effect of Grain Spawn on Growth Parameters

Significant differences were observed among grain spawns with respect to crop growth and development (**Table 2**). Vari spawn (T_6) recorded the shortest spawn run (11.66 days), earliest pinhead initiation (15.33 days) and first harvest (19.66 days), followed by nagli spawn (T_3). In contrast, maize spawn (T_5) required the longest duration for crop establishment. Sorghum spawn (T_2) produced the maximum pileus diameter (8.47 cm), pileus length (6.87 cm) and stipe length (1.43 cm) which were statistically at par with nagli grain spawn (T_3). Faster crop establishment in vari and nagli may be attributed to their smaller grain size, which provides a greater number of inoculation points and promotes rapid substrate colonization. Similar observations have been reported in oyster mushroom cultivation studies [15, 16].

Effect of Grain Spawn on Yield and Biological Efficiency

Grain substrate significantly affected fruit body weight, yield, and biological efficiency of *P. djamor* (**Table 3**). Sorghum spawn (T_2) produced the highest fruit body weight (10.67g) and total yield (1150.66g), followed by nagli (T_3) and vari (T_6) grain spawns. The lowest yield was recorded in maize grain spawn (T_5). Biological efficiency followed a similar trend, with sorghum recording the highest value, followed by nagli and vari. The superior performance of sorghum may be attributed to its balanced nutrient composition, moisture-holding capacity, and ability to sustain mycelial activity during successive flushes. The superior performance of sorghum may be attributed to its balanced nutrient composition, moisture-holding capacity, and ability to sustain mycelial activity during successive flushes. Similar findings have been reported in studies on oyster mushroom cultivation [2, 17, 18]. The decline in yield during later flushes across treatments may be due to progressive depletion of nutrients within the substrate. Overall, the findings indicate that sorghum provides an ideal combination of physical and nutritional characteristics for spawn production and commercial cultivation of *P. djamor*. Nagli and vari also exhibited promising performance and may serve as suitable alternatives under local production systems.

Table 2 Effect of grain spawn on growth parameters of *Pleurotus djamor*

Treatment	Spawn run (days)	Pinhead formation (days)	First harvest (days)	Pileus diameter (cm)	Pileus length (cm)	Stipe length (cm)
T_1 (Wheat)	16.33	19.66	23.66	7.20	5.70	1.03
T_2 (Sorghum)	15.33	18.66	23.33	8.47	6.87	1.43
T_3 (Nagli)	12.66	16.33	20.66	8.43	6.80	1.33
T_4 (Bajra)	13.66	17.33	21.66	7.47	5.90	1.27
T_5 (Maize)	17.33	20.66	24.66	7.07	5.67	1.03
T_6 (Vari)	11.66	15.33	19.66	7.70	6.03	1.33
S.Em. ±	0.33	0.33	0.78	0.15	0.14	0.03
C.D.(P=0.05)	1.02	1.03	2.408	0.46	0.42	0.10
C.V. (%)	3.98	3.21	6.08	3.32	3.81	4.66

Table 3 Effect of grain spawn on yield and biological efficiency of *Pleurotus djamor*

Treatment	Fruiting body weight (g)	First flush yield (g)	Second flush yield (g)	Third flush yield (g)	Total yield (g)	Biological efficiency (%)
T_1 (Wheat)	8.67	665.66	237.66	172.66	1076.00	71.73
T_2 (Sorghum)	10.67	691.66	252.00	207.00	1150.66	76.71
T_3 (Nagli)	10.33	687.66	252.66	197.66	1138.00	75.87
T_4 (Bajra)	8.67	678.33	248.33	193.33	1120.00	74.67
T_5 (Maize)	8.33	614.66	222.33	167.33	1004.33	66.96
T_6 (Vari)	9.00	686.00	256.66	193.66	1136.33	75.76
S.Em. ±	0.25	14.18	5.86	3.22	21.50	–
C.D.(P=0.05)	0.78	43.70	18.07	9.94	66.25	–
C.V. (%)	4.75	3.66	4.15	2.97	3.37	–

Overall, the present investigation demonstrates that the selection of an appropriate grain substrate is a critical factor influencing spawn quality, mycelial colonization, earliness, yield and biological efficiency of *Pleurotus djamor*. The superior performance of sorghum grain observed in the present study may be attributed to its balanced nutrient composition, favourable moisture-holding capacity and ability to support rapid and vigorous mycelial growth. Similar findings have been reported in recent studies, which demonstrated that suitable cereal grains significantly improve spawn quality, mycelial growth and mushroom productivity in *Pleurotus* species [19, 20]. Furthermore, optimization of spawn substrate, substrate formulation and cultivation practices has been reported to enhance spawn vigour, shorten the cropping cycle and improve biological efficiency under commercial cultivation systems [20, 21]. The efficient utilization of cereal grains and agricultural residues for mushroom production also contributes to sustainable waste management and value addition to agro-industrial by-products, thereby promoting environmentally friendly and economically viable mushroom cultivation [22]**.** Recent investigations on *Pleurotus djamor* and other oyster mushrooms have further demonstrated that improved spawn substrates, appropriate environmental conditions and efficient crop management practices collectively enhance mushroom productivity, quality and economic returns under commercial production systems [23, 24]**.** Therefore, the findings of the present study are consistent with recent advances in oyster mushroom research and support the use of suitable cereal grains, particularly sorghum, for efficient spawn production and sustainable commercial cultivation of *Pleurotus djamor* [19–24].

Conclusion

The grain substrate used for spawn production markedly influences the cultivation performance of *Pleurotus djamor*. Among the grains evaluated, sorghum proved to be the most suitable substrate for producing vigorous spawn and achieving better crop performance. Therefore, sorghum grain can be recommended for the commercial cultivation of pink oyster mushroom

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