



Exploring the Potential of Oyster Mushroom Cultivation as Remunerative Agri-Enterprise in Punjab

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Abstract: Mushroom cultivation is a remunerative activity that has potential for economic upliftment and empowerment of farmers. While button mushroom cultivation is already established among many farmers in Punjab, oyster mushroom cultivation has not gained as much popularity in the region despite its high nutritive value. In order to evaluate the production and economic efficacy of oyster mushroom cultivation, on-farm trials with 30 farmers were conducted in District Sangrur, Punjab under Farmer FIRST Project. Farmers were provided with spawn and polythene bags for mushroom production, and data were collected on production parameters, yield, economic efficacy, and prospects of the farmers. Results from the trials showed that the average time for the first harvest of produce was 40.1 days (min 34, max 47), with an average yield of 66.2 kg of mushrooms per 100 kg of dry substrate used. So, farmers are getting produce within the 1-1.5 months of the enterprise start. The cost of producing mushrooms from a 5kg compost bag was Rs. 56 while yielding the net profit of Rs. 208 per bag. Furthermore, 70 percent of the surveyed farmers expressed interest in continuing oyster mushroom cultivation, with 62 percent of them showed interest to increase the scale of production. The ease of cultivation, availability of raw materials, and good taste of the oyster mushroom were expressed as favourable factors for adoption. Overall, these results suggest that oyster mushroom cultivation is an easy and profitable agricultural practice and a viable occupation for farmers with minimal resources. However, market feasibility for large-scale production will need to be considered and developed through processing and marketing facilities.

Keywords: Dhingri, Enterprise, Mushroom, Oyster

The state of Punjab, located in Northern India, is known for its vibrant agricultural sector, with a primary focus on staple crops such as wheat and rice with 35.26 and 31.44 lakh hectare area under these crops, respectively. However, the traditional agricultural practices in Punjab face numerous challenges, including decreased profit margins, depleted soil fertility, and water scarcity. Moreover, majority of the farmers (66.78%) in Punjab have landholding size upto four hectares only (GOP 2022). In order to address these challenges, it is crucial to identify and promote remunerative agri-enterprises as subsidiary occupation, that can supplement the income of farmers and contribute to sustainable agricultural development.

One such promising alternative is mushroom cultivation. Punjab produced 19.75 thousand metric tonnes of mushroom which account for 6.93 percent of country's total production in the year 2021-22 (Anonymous 2023). Among the various mushroom types, mushroom industry in the state as well as whole country is dominated by the white button mushroom (Sharma et al 2017). Various processes in button mushroom cultivation specially compost making is a laborious process, which takes 26-27 days for long method and 18 days in short method of composting. So, complexity limits the scalability of this enterprise. In this context, oyster mushroom cultivation is a good and viable option, which is relatively quite easy to cultivate as compared to button

mushroom. Oyster mushroom (*Pleurotus* spp.), which is also called "Dhingri" are highly nutritious and have gained significant popularity in recent years due to their medicinal properties, culinary versatility, and potential for commercial cultivation (Nongthombam et al 2021). Oyster mushroom industry has been growing rapidly in various Asian countries due to its low production cost and high yielding capacity (Raman et al 2021).

Oyster mushroom has the potential to grow on a wide range of agricultural residues such as wheat straw, paddy straw, sorghum residues and mustard straw etc. The cultivation of oyster mushrooms has several advantages over traditional crops. Firstly, it requires relatively less land and can be practiced in small spaces, making it suitable for marginal and small-scale farmers. Secondly, oyster mushroom cultivation has a shorter cropping cycle, typically ranging from 30 to 45 days, allowing for multiple harvests in a year and faster returns on investment. Further oyster mushroom does not require the compost preparation as in button mushroom cultivation. Additionally, oyster mushrooms have unique flavor, high nutritional value and health benefits (Tolera and Abera 2017)

Several studies have highlighted the economic viability and profitability of oyster mushroom cultivation, citing its potential to generate higher returns as compared to traditional crops. In addition to economic benefits, oyster mushroom

cultivation can offer environmental advantages. It promotes the utilization of agricultural residues viz paddy residue, wheat straw, sugarcane bagasse, corn cobs and mustard straw. Moreover, the cultivation process requires minimal water and pesticide usage, making it environmentally sustainable and aligning with the principles of organic farming.

However, despite its potential, oyster mushroom cultivation in Punjab is still at a nascent stage, with limited awareness and adoption among farmers. Therefore, this research paper aims to explore the potential of oyster mushroom cultivation as a remunerative agri-enterprise in Punjab. By examining the field experiments and surveys, we assessed the economic viability, market potential, technical requirements, and policy implications of oyster mushroom cultivation in the context of Punjab. The findings of this study will provide valuable insights for policymakers, agricultural extension services, and farmers, facilitating informed decision-making and promoting sustainable agricultural diversification in Punjab.

MATERIAL AND METHODS

The current study was conducted under the Farmer FIRST Programme (FFP). Farmer FIRST Programme (FFP) was introduced in Punjab in the year 2016-17. Two villages Chatha Nanhera and Tranji Khara in district Sangrur were selected under FFP. Button mushroom cultivation as a subsidiary occupation was introduced in these two adopted villages in the year 2016-17. Button mushroom has been popularized among the farmers in project area.

Further to determine the efficacy and potential of oyster mushroom cultivation, oyster mushroom cultivation has been introduced in collaboration with Director of Mushroom Research, Solan, HP. Training camps were organized to equip farmers with the knowledge regarding production technologies of oyster mushroom. To determine the efficacy of oyster mushroom, 30 on-farm trials were conducted in the project villages. Data regarding time taken for first harvest, yield per dry substrate, average weight of fruit body were collected from the 10 locations. One-way Anova with post-hoc LSD was performed to check the difference between 10 locations on the basis of selected parameters. To determine the economic efficacy of the oyster mushroom cultivation in terms of cost, gross benefits, net benefits and benefit to cost ratio were calculated. To explore the farmers reactions towards oyster mushroom cultivation, they were surveyed regarding prospects of oyster mushroom cultivation and favourable factors were also explored from the cultivators.

RESULTS AND DISCUSSION

The on-farm trails of oyster mushroom cultivation

provided the data to explore the potential of cultivation in terms of production and temporal indicators. Table 1 presents the findings of on-farm evaluation trials, providing detailed information on the time taken for first harvest, yield per 100 kg of dry substrate, and average weight of a fruiting body for each of the ten locations. The average values across all locations were calculated to determine the overall performance.

The results of the on-farm evaluation trials indicated variations in the performance of oyster mushroom cultivation across different locations. The time taken for first harvest ranged from 34 to 47 days, with an average of 40.1 days. The yield per 100 kg of dry substrate varied between 61.4 kg and 71.6 kg, with an average yield of 66.19 kg. The average weight of a fruiting body ranged from 11.8 g to 17.3 g, with an average of 14.98 g. These findings highlight the importance of location-specific factors, such as climate, substrate quality, and management practices that influences the growth and yield of oyster mushrooms.

Table 2 presents a comparison of oyster mushroom yield obtained by using different crop residues as the substrate. The study aimed to evaluate the impact of varying straw compositions on the yield of oyster mushrooms. Three

Table 1. On-farm evaluation cultivation trials data for oyster mushroom

Farmers	Time taken for first harvest (d)	Yield (kg/100 kg dry substrate)	Av. wt. of a FB (g)
Location 1	34 ^a	62.5	13.0 ^{bc}
Location 2	42 ^{bc}	65.7	17.0 ^a
Location 3	38 ^{cd}	68.0	16.7 ^a
Location 4	45 ^{ab}	70.2	15.5 ^{ab}
Location 5	42 ^{bc}	61.4	12.4 ^{bc}
Location 6	37 ^d	61.8	11.8 ^c
Location 7	35 ^d	63.9	15.2 ^{abc}
Location 8	45 ^{ab}	67.4	14.9 ^{abc}
Location 9	47 ^a	69.4	16.0 ^{ab}
Location 10	36 ^d	71.6	17.3 ^a
Average	40.1	66.19	14.98
CD	4.96	NS	3.65

Level of significance = 5%

Bag size: 5kg

Average of 5 bags; Temperature: 25±2°C; Relative humidity: 80-85%

Table 2. Oyster mushroom yield comparison with different crop straw

Straw	Yield (kg/q)
Wheat (100%)	65.25
Wheat: Paddy (1:1)	52.50
Wheat: Mustard (1:1)	49.80

different types of straws were tested: wheat straw alone, a mixture of wheat and paddy straw in a 1:1 ratio, and a mixture of wheat and mustard straw in a 1:1 ratio. The results showed that 100% wheat straw as the substrate resulted in the highest yield of oyster mushroom, with a recorded yield of 65.25 kg/q. This suggests that wheat straw alone provides most favourable conditions for the growth and development of oyster mushrooms, leading to a higher yield.

In contrast, the yields obtained from the mixtures of wheat and paddy straw in a 1:1 ratio and wheat and mustard straw in a 1:1 ratio were lower. The wheat: paddy mixture yielded 52.50 kg/q, while the wheat: mustard mixture yielded 49.80 kg/q. These findings suggest that the presence of paddy and mustard straw in the substrate may have a slightly negative impact on the growth and yield of oyster mushrooms as compared to using pure wheat straw.

Data in Table 3 evaluate the financial aspects of cultivating oyster mushrooms using a standardized unit of measurement, a 5 kg bag. The table provides information on various economic parameters, including total cost, average yield, gross returns, net returns, and the benefit-to-cost ratio. The total cost per bag of oyster mushroom was recorded to be Rs. 56. This figure includes all the expenses incurred in the cultivation process, such as substrate procurement, labour costs, overhead expenses, and other miscellaneous costs.

The average yield per bag of oyster mushroom was found to be 2.20 kg. Based on the average yield, the gross returns per bag of oyster mushroom amount to Rs. 264. For calculating the net return per bag, the total cost was subtracted from the gross return. In this case, the net returns amount to Rs. 208. The benefit-to-cost ratio was calculated by dividing the net returns by the total cost. In this analysis, the benefit-to-cost ratio was observed to be 3.71. This ratio indicated that for every unit of cost invested, the cultivation of oyster mushrooms yields a benefit that was approximately 3.71 times higher.

Table 4 presents the prospects of oyster mushroom cultivation based on the responses of surveyed farmers. The table displays the percentage of farmers who indicated their intentions for the future of oyster mushroom cultivation.

Data revealed that 43.33% of the farmers expressed their intention to increase their oyster mushroom cultivation efforts. These farmers see potential in expanding their mushroom cultivation activities, likely due to positive experiences, expected or experienced profitability. Another 26.67% of the farmers stated that they plan to maintain their current level of oyster mushroom cultivation. These farmers see their current production at household level as satisfactory and have no immediate plans to increase or

Table 3. Economic analysis of the FLDs on Oyster (Dhingri) mushroom cultivation

Particular	Amount (Rs/5 kg bag)
Total cost (Rs./bag)	56.0
Average yield (kg/bag)	2.20
Gross returns (Rs/bag)	264
Net returns (Rs/bag)	208
Benefit: cost ratio	3.71

Table 4. Prospects of oyster mushroom cultivation

Prospect	% farmer
Increase	13 (43.33%)
Same	8 (26.67%)
Discontinue	9 (30.00%)

decrease their efforts. Factors such as personal preferences, or limitations in resources or capacity may contribute to this decision. On the other hand, 30.00% of the farmers expressed their intention to discontinue oyster mushroom cultivation. These farmers have decided to cease their mushroom cultivation activities, possibly due to challenges they faced, such as time constraints, labor constraints, or other factors that have negatively impacted their experience with oyster mushroom cultivation.

Favourable factors for adoption of oyster mushroom cultivation as perceived by the farmers: The cultivators were also asked about the factors responsible for favourable perception towards oyster mushroom cultivation and to determine the scalability of the oyster mushroom cultivation, favourable factors for the adoption were determined through qualitative observations from the farmers. It was found that easy availability of raw material, ease in cultivation and good taste of produce are playing a major role in enhancing the favourableness towards adoption among the farmers.

Farmers recognize the easy availability of raw materials required for oyster mushroom cultivation as the most favourable factors. As for the production of oyster mushroom, farmers require wheat straw (or paddy, mustard straw) and spawn. The straw is often readily available on farms or can be sourced locally, reducing the need for extensive investments or reliance on external inputs. The accessibility of raw materials contributes to the feasibility and cost-effectiveness of oyster mushroom cultivation. Further farmers perceived and experienced the ease in cultivation of oyster mushroom. They narrated that it is only one time process, in which they have to soak the straw, pack the straw and spawn in the polythene bags. After the bag process, there is no major task in the cultivation of oyster mushroom other than the watering. The cultivators cooked at their home and also

distributed the oyster mushroom in their neighbourhood. Most of them found oyster mushroom tasty and want to include in their daily diet.

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