

Optimization of the spawn of shiitake mushroom [*Lentinula edodes* (Berk.) Pegler]

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Abstract

Mushroom cultivation is one of the technology for the efficient conversion of energy utilising the agro residues. In the present study we have evaluated the various substrates for the spawn production for the cultivation of shiitake mushroom. Spawn was prepared using wheat, sorghum and pearl millet grains solely and in combination with their respective grain powder at 9:1 proportion as substrate. The fastest coverage of mycelia was observed on the sorghum grains (20 days), whereas slowest mycelial run on the grain surface was observed on the pearl millet grains (45 days). There was a significant difference between all the spawning substrates in their pure form and their combinations except for the pearl millet and its grain combination. The study documented the best substrate for the shiitake mushroom spawn production.

Keywords: Spawn production, shiitake mushroom, *Lentinula edodes*

1. Introduction

The depletion of resources and increase in the population has posed a major challenge to the agricultural system globally [6]. This problem can be tackled by using the non-consumable biomass [4]. One of the technology that can efficiently make use of such substances is mushroom cultivation [2]. Mushroom cultivation date backs to millennium years [8] but the methods are improved for efficient cultivation in recent decades [4]. The global mushroom consumption between 1993 to 2013 has been increased from 1 to 4.7 kg (fresh weight) per person [7]. The shiitake mushroom (*Lentinus edodes*) is the worlds most cultivated mushroom followed by oyster (*Pleurotus* spp.), wood ear (*Auricularia* spp.) and button mushrooms (*Agaricus bisporus*). Shiitake, wood ear and oyster mushrooms are categorized as primary decomposers and all of them inhabit wild wood [8]. The agricultural residues such as wheat, rice, sorghum and pearl millet straw can also be used for the cultivation of shiitake mushroom [3]. However, the shiitake mushroom cultivation requires the spawn production on grains which will be inoculated on the substrates for fruiting body production. The spawn can be produced on various agro-substrates and in the present study we have evaluated the spawn run on the wheat, sorghum and pearl millet grains to find the best substrate for spawn production for the cultivation of shiitake mushroom.

2. Materials and Methods

2.1 Preparation pure culture

The strain OE-388S of shiitake was obtained from ICAR-Directorate of Mushroom Research, Solan, India, and used in the present investigation. The pure culture of the fungus was maintained by regular subculturing on potato dextrose agar (PDA).

2.2 Optimization of the spawn

An experiment was conducted using CRD design with 3 replications using various grains as treatments for spawn production. Spawn was prepared using standard procedure

using separately wheat, sorghum and pearl millet grains solely and in combination with their respective grain powder at 9:1 proportion as substrate. The grains were washed and later boiled for 30-45 minutes until they become soft. The excess water was drained and grains were spread on clean surface. Thereafter, the grains were mixed with calcium carbonate (3.5%) and calcium sulphate (1.25%). Then the grains were filled in the conical flasks (500 ml) uniformly up to the height of 200 ml (250g). The flasks were plugged with non-absorbent cotton and autoclaved at 15 psi at 121.6 °C for 90 min. The tubes were then inoculated with uniform size 10 mm discs of OE-388S strain of the shiitake and incubated at 25 ± 2 °C. The horizontal growth of mycelium was observed in the flasks until it completely covers the surface layer of grains in the flask. Different kind of grains used for spawning:

1. Wheat grain
2. Pearl millet grains
3. Sorghum grains
4. Wheat grains + wheat grain powder (9:1)
5. Pearl millet grains + pearl millet grain powder (9:1)
6. Sorghum grains + sorghum grain powder (9:1).

3. Results and Discussion

An experiment was conducted using various grains as treatments for spawn production. Spawn was prepared by using wheat, sorghum and pearl millet grains solely and in combination with their respective grain powder at 9:1 proportion as substrate. The fastest coverage of mycelia was observed on the sorghum grains (20 days) which showed significant difference with respect to other substrates. The slowest mycelial run on the grain surface was observed on the pearl millet grains (45 days) (Fig. 1) which also exhibited the significant difference with other spawning substrate except pearl millet grain + pearl millet grain powder combination that took 44 days. There was a significant difference between all the spawning substrates in their pure form and their combinations except for the pearl millet and its grain combination which showed no

significant difference in growth pattern (Table 1). The strain preferred sorghum, wheat and pearl millet grains sequentially for its fastest coverage which took 20, 34 and 45 days respectively to colonize the spawning substrate. Addition of the powder of their respective grains reduced the degree of colonization significantly. But the order of colonization remained same with respect to time taken to cover the substrate completely. With the addition of grain powder the strain required 26 days on sorghum, 30 days on wheat and 44 days on pearl millet (Fig. 2). The results were found to be similar with Puri (2011) [5] on her investigation by the use of locally available poplar and teak sawdust, sorghum and wheat grains in combination with chalk powder and gypsum for selection of an ideal material for shiitake spawn production. She found the maximum and faster linear growth rate on test tubes containing sorghum and its combinations. The fungus rapidly colonized the sorghum substrate without any contamination and the spawn prepared using sorghum had maximum yield and biological efficiency at 6-8 per cent spawn doses. The results showed that sorghum is an ideal substrate for shiitake spawn production. Alemu (2014) [1] observed that the sorghum based spawn required 25 days to completely colonize the substrate which is also in accordance with the investigation conducted.

4. Tables and figures

Table 1: Time requirement for *L. edodes* to colonize substrates for spawn preparation.

Substrate (250 g)	Days for colonisation*
Sorghum grain	20.3
Wheat grain	34.6
Pearl millet grain	45.3
Sorghum grain + sorghum grain powder	26.3
Wheat grain + wheat grain powder	30.3
Pearl millet grain + pearl millet grain powder	44.0
CD @ 5%	3.6
SE (m) ±	1.1



Fig 1: Mycelial growth on pearl millet grains.



Fig 2: Mycelial growth on wheat grains

5. Conclusion

The shiitake mushroom is traditionally cultivated on wooden logs, however in the recent times many attempts were made to cultivate using the agro residues. The spawn production is very important step in the cultivation of mushroom and during the present investigation we have used the wheat, sorghum and pearl millet grains for the spawn production. The study found the sorghum grains as best for the spawn production followed by wheat and pearl millet grains.

6. References

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