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Evaluation of locally available substrates for spawn production of Pink Pleurotus [*Pleurotus djamor* (Rumph. ex. Fr.) Boedijn] mushroom

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ABSTRACT

The study was conducted to evaluate different substrates for spawn production of Pink Pleurotus. Among the five commonly available substrates *viz*., barley grains, dried pea grains, maize de-shelled-cob, maize grains and wheat grains were evaluated for their suitability for spawn production of 'Pink Pleurotus', barley and maize grains proved more efficient substrates with regards to spawn run, spawn weight, spawn colour, spawn texture and spawn pH. The spawn run in barley and maize grains was completed in 6.90 days and 7.20 days, respectively as compared to 8.00 days in wheat grains (check). Barley grains resulted in highest spawn weight (30.30g) followed by maize grains (28.00g). The spawn weight in other substrates was significantly lower than the check (27.40g). The spawn weight in maize de-shelled cob and dried pea grains was 22.40 and 20.30 g, respectively. The spawn colour and textures on different substrate showed slight variation and while the spawn colour ranged from 'Delicate Pink' to 'Grace full Pink', spawn texture ranged from 'Creepy' to 'Fluffy'. 'Delicate Pink' coloured spawn was recorded on maize de-shelled cob with 'Creepy' spawn texture while spawn colour on dried pea grains was 'Merrie Pink with 'Cottony' texture. Spawn colour on all other substrates *viz*., wheat grains, barley grains and maize grains, was 'Grace Full Pink' with 'Fluffy' texture. The spawn smell on all the substrates was pleasant.

Key words : *Pink Pleurotus, Substrates and Spawn*

Introduction

Mushroom cultivation is a potential biotechnological process wherein the waste plant materials or negative value crop residues can be converted into valuable food. The genus *Pleurotus* is very versatile, with a large number of edible species that grow in different environment conditions and substrates. The species of genus *Pleurotus* are relatively easy to produce on agriculture waste; this facilitates the development of mushroom farms which can produce at low prices in different geographic regions. Mushrooms are known to have a broad range of uses, both as food and medicine. As a food item, the nutritive value of mushrooms lies between that of meat and vegetables (Maria *et al*., 2000). The protein content of different mushrooms ranges from 19 to 35 per cent, carbohydrates from 50 to 65 per cent (Ahmed *et al*., 2010), fat contents 1.1 to 8.3 per cent and fibre content between 2.76 and 7.40 per cent on dry weight basis (Maria *et al*., 2000). Mushrooms also contain all the essential amino acids and amides. Lysine, which

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is low in most of the cereals, is the most important amino acid in mushrooms (Babu and Subhasree, 2010). Moreover, mushrooms produce a series of metabolites of pharmacological and medicinal interest such as anti-oxidants, immuno-stimulants and antimicrobials (Moradali *et al.*, 2007 and Israilides *et al.*, 2008). Cultivation of *Pleurotus* spp. have become more popular throughout the world particularly in Asia and European countries as they have simple and low cost production technology and exhibit higher biological efficiency (Patil, 2012). They offer lucrative business as they require no arable land for production, and provides benefits such as increased income, employment, and food and nutritional security (Sanchita, 2008).

Materials and Methods

The experiment was conducted at Mushroom Research Training Center of the Department of Plant Pathology, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences & Technology, Kashmir.

Procurement and maintenance of culture

The pure culture of *Pleurotus djamor* (Rumph. ex. Fr.) Boedijn used in present investigation was procured from Directorate of Mushroom Research, Chambaghat, Solan. The culture was multiplied further in tubes containing potato dextrose agar medium, prepared by adopting the following procedure:

Potatoes were washed with plain water, peeled and chopped into slices. Sliced potato (200g) were boiled in a container containing one litre of distilled water till the potato slices were soft. The broth was strained through muslin cloth and the extract was made one litre by adding distilled water and the container was placed over heating source (gas stove). Twenty gram of dextrose was added to it and the extract was continuously stirred with glass rod followed by adding twenty grams of agar-agar. The medium was tested for solidification by placing few drops of medium on steel table. When the medium begin to solidify, the container was taken off the heating source and cooled at room temperature and molten medium was poured in culture tubes and plugged with non-absorbent cotton. These tubes were placed in a wire basket and autoclaved for 20 minutes at 1.05 kg cm^{-2} pressure. The sterilized tubes were then taken out of autoclave and placed in a slanting position on Table. These slants were inoculated with mycelial bits of actively growing *Pleurotus djamor* culture under sterile conditions of laminar air flow cabnet and incubated for 8-10 days at 25±2 °C (Plate 1).

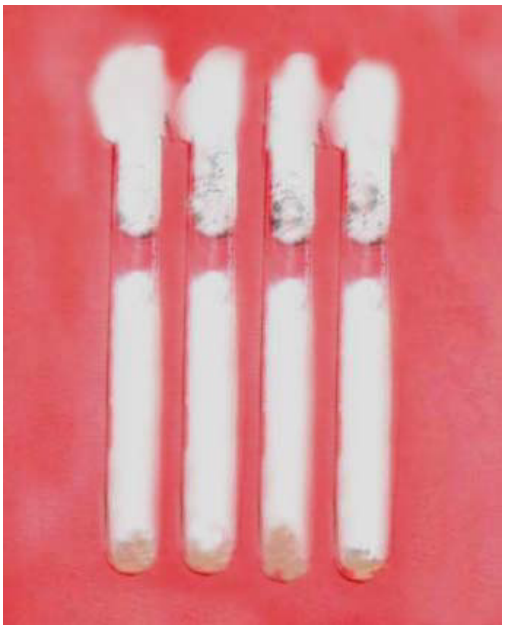

Plate 1. Culture of "Pink Pleurotus" (*Pleurotus djamor)* on potato dextrose agar medium

Preparation of master grain spawn

Apparently healthy, unbroken wheat grains were used for 'Master Spawn' preparation and the procedure given by Patil (2012) was followed. Wheat grains were washed 2-3 times with tap water and boiled in plain water for 10-15 minutes till the grains become soft. These grains were then dried under shade by spreading them on wire mesh followed by mixing with calcium carbonate and calcium sulphate in 1:4 ratio after cooling of grains. The grain mixture was filled in empty, well cleaned narrow mouthed bottles upto $3/4^{th}$ of their capacity and plugged with non-absorbent cotton and sterilized in autoclave at 1.05 $kgcm^{-2}$pressure and 121 °C temperature for one and half hour.

The sterilized bottles were taken out of the autoclave and allowed to cool at room temperature and inoculated with pure culture of 'Pink Pleurotus' (*Pleurotus djamor*), procured from DMR, Chambaghat, Solan, under aseptic conditions of 'Laminar Air Flow Cabinet'. The inoculated bottles were kept for incubation in B.O.D incubator at

25±2°C till the colonisation of the grains was complete.

Evaluation of substrates for spawn production of 'Pink Pleurotus'

Adequate quantities of following substrates (Table 1) were cleaned and after removing the admixture evaluated for spawn production.

Spawn preparation

All the substrates were cleaned, washed and soaked in tap water and boiled in plain water to soften them. The substrates were then cooled at room temperature and excess water was drained out by spreading them on wire mesh under shade followed by mixing with calcium carbonate and calcium sulphate in 1:4 ratio. The substrates were filled in cleaned bottles upto 3/4th of their capacity, plugged with non-absorbent cotton and sterilized in autoclave at 1.05 kg cm^{-2} pressure and 121 °C temperature for one and half hour.

Inoculation

The sterilized bottles containing different substrates were inoculated with master spawn under aseptic conditions and kept for incubation in B.O.D incubator at 25±2 °C. Sterilized bottles containing different substrates but not inoculated with 'Master Culture' of 'Pink Pleurotus' served as check. The bottles were arranged in completely randomised design with 10 replication for each substrate.

Statistical analysis

All the data of laboratory experiments were statistically analyzed using CRD (completely randomized design).

Results and Discussion

The present investigations were undertaken to evaluate commonly available substrates for spawn production of 'Pink Pleurotus' [*Pleurotos djamor* (Rumph. ex. Fr) Boedijn]. During the present investigations, suitability of five commonly available substrates *viz.*, wheat grains, barley grains, maize grains, dried pea grains and maize de shelled-cob were evaluated by adopting the procedure given by Patil (2012) for spawn preparation. Various parameters like time taken for complete spawn run, weight of full run spawn, colour of spawn, texture, smell, and pH of spawn were recorded. All the substrates supported mycelial growth of 'Pink Pleurotus'. Fastest spawn run was recorded in barley grains (6.90 days) and maize grains (7.20 days) than wheat grains (check) (8.00 days). In all the other substrates, spawn run was slower than check. The highest weight of spawn was also recorded in barley grains (30.30 g) followed by maize grains (28.00 g) while the weight of spawn in wheat grains was 27.40g. The colour and texture of spawn prepared on different substrates showed slight variation and while the colour ranged from 'Delicate Pink' to 'Grace full Pink', texture ranged from 'Creepy' to 'Fluffy'. Spawn prepared on wheat grains, barley grains and maize grains were 'Grace Full Pink' with 'Fluffy' texture while spawn prepared on de-shelled maize cob and dried peas was 'Delicate Pink' and 'Merrie Pink' with 'Creepy' and 'Cottony' texture, respectively. Spawn prepared on all the substrates smelled 'Pleasant' and pH in all the substrates ranged between 7.18 to 8.00 and was suitable for spawn preparation. The normal range of pH required for mycelial growth of 'Pink Pleurotus' is 6.00 to 8.00 (Anonymous, 2014). Various workers carried out research on suitability of different substrates for preparation of spawn and finding of this investigation are in conformity with them. Jegadeesh *et al.*, (2018) studied among the six different grains, the maximum spawn run period (16 days) was recorded in paddy (*Oryza sativa*) and wheat (*Triticum vulgare*), followed by foxtail (*Setaria italica*) and bajar (*Pennisetum glaucum*) (14 day). The short spawn run period (12 days) was recorded in the finger millet (*Eleusine coracana*) and sorghum (*Sorghum vulgare*).

Table 1. Substrates evaluated for spawn production of 'Pink Pleurotus'

Vernacular name	Botanical name	Plant part used
Wheat	*Triticum aestivum*	Grains
Barely	*Hordeum vulgare*	Grains
Dried peas	*Pisum sativum*	Grains
Maize	*Zea mays*	De-shelled cob
Maize	*Zea mays*	Grains

Table 2. Effect of different substrates on colour, texture, smell and pH of 'Pink Pleurotus'(*P. djamor*) spawn

Substrate	Colour	Texture	Smell	Mean pH
Barley grains	Grace full pink	Fluffy	Pleasant	7.35
Peas grains	Merrie pink	Cottony	Pleasant	7.57
Maize de-shelledcob	Delicate pink	Creepy	Pleasant	8.00
Maize grains	Grace full pink	Fluffy	Pleasant	7.18
Wheat grains (check)	Grace full pink	Fluffy	Pleasant	7.34
S.E(d)				0.047
C.D ($p \leq 0.05$)				0.096

Jayachandran *et al*., (2017) also revealed that the sorghum (12 days) and wheat grain (13 days) took same period for spawn development. Rice grain recorded minimum (10 days) period for spawn development and it was suggested for spawn production. Kumbhar (2012) experimented with grains of cereals, pulses and crop residues to determine their suitability for production of spawn and sporophores of 'PinkPleurotus' and reported that mycelium of 'Pink Pleurotus'had marked preference for cereal grains over pulses and crop residues.

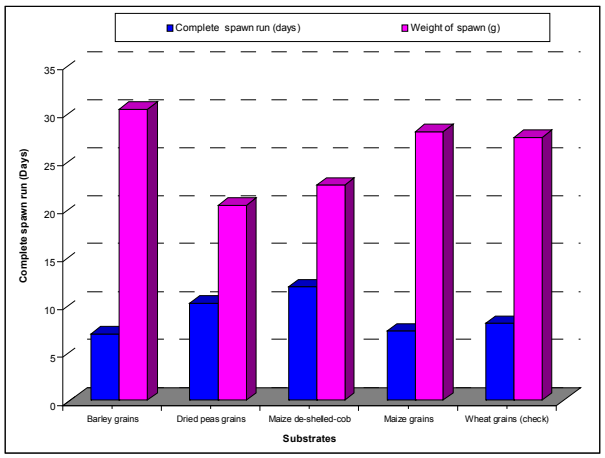

Fig. 1. Effect of different substrates on spawn run and weight of spawn of 'Pink Pleurotus'

Rangad and Jandik (1977) screened various substrates for spawn production of *Pleurotus*. sp and reported jawar and bajra grains as best substrates for spawn production followed by wheat grains. The findings of other scientists in conformity with present results are Jandaik and Kapoor (1974), Garcha (1981); Kumar (1997); Sharma (2003) and Narh *et al*. (2011). All the research findings clearly established the suitability of grain substrates for spawn preparation of 'Pink Pleurotus' data represented in graph.

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