

ROLE OF DIFFERENT GRAINS IN SPAWN PRODUCTION FOR GROWING MUSHROOMS

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Abstract–This paper gives a detailed study about the use of different grains like wheat, maize, rice, sorghum etc in the production of spawn preparation for growing mushrooms. Different features of different grains. Steps involved in the preparation of mushroom spawn. Advantages and Disadvantages of grains in spawn production. Precautions which we have to follow in spawn production like aseptic environment etc. have been described. Here we provide the desired characters of a healthy spawn which is a must for growing the mushrooms. Hence this paper is of valuable use and provides all the important information about the grain spawn.

INTRODUCTION

Mushrooms are fleshy fruiting bodies (Alexopoulos *et al.*, 1996) that are considered one of the delicious fruits, and are commonly produced worldwide (Madbouly and Al- Hussainy, 1996). It belongs to class Basidiomycetes or Ascomycetes. Over 200 species Of mushroom have long been used as functional food around the world (Kayak, 2013), that grow naturally on the trunks, leaves and roots of trees as well as decaying woody materials (Chang and Miles, 1992; Stamets, 2000; Lindequist *et al.*, 2005). Mushrooms grow on decayed organic matters rich in lignin, cellulose and other complicated carbohydrates. Mushrooms grow in the wild; they have been domesticated in most parts of the world to ensure ready availability all year round and to avoid incidences of mushroom poisoning of inexperienced collectors of wild mushrooms (Tarun Kumar Jtawa *et al.*, 2017).

Mushrooms are a good source of protein, vitamins and minerals and are used as both food and medicine. They are generally called as vegetarian meat. Mushroom is low caloric food with high in sodium and potassium and without starch and cholesterol (Ambalika Gupta *et al.*, 2013). Mushrooms are also known to provide folic acid and folate.

The cultivation of edible mushrooms is a biotechnological process that uses various residues to produce food of high nutritional value which can be a solution to problems of global importance, such as the lack of proteins of environmental management (Sharma *et al.*, 2013). The cultivation of edible mushrooms offers one of the most feasible and economic method for bioconversion of agrolignocellulosic wastes (Bano *et al.*, 1993; Cohen *et al.*, 2002). Such processing of agro waste not only increases nutrient cycling in the environment but the byproduct of mushroom cultivation is also a good source of manure, animal feed and many more uses (Ambika *et al.*, 2017). Improved spawn production technology is also must to increases the production of mushrooms.

SPAWN

The main step in mushroom production is spawn preparation. A number of materials, mostly agricultural wastes, can be used to prepare mushroom spawn (Bilal *et al.*, 2014). Spawn production is a process of fermentation in which mushroom mycelium will increases by growing through solid organic matrix under controlled environment. In almost all cases the organic matrix is sterilized grain or we can say grain is the

propagating material used by the mushroom growers as planting beds. Spawn provides nutrition to the fungus during its growth. The spawn is equivalent to vegetative seed of higher plants (Pathak *et al.*, 2000). From many years grains are used as a source of spawn. Because grains are ideal food source for hungry mushroom mycelium. Grain favors rapid and vigorous development of the mycelium (Yang and Jong, 1987). To take the healthy grain which is not broken is must. In most laboratories, cereal grains such as wheat (Elhami *et al.*, 2008; Chang, 2009; Stanley, 2010), rye (Chang, 2009), sorghum (Chang, 2009; Stanley, 2010), rice (Oei, 1996), millet (Oei, 1996; Elhami *et al.*, 2008; Stanley, 2010) and white maize (Stanley, 2010) are used as mother spawn.

Different type of grains were taken from local market and screened to determine the most suitable grain spawn for better yield, biological efficiency and minimum spawn run time. There are several factors affecting the quality of spawn include moisture 60-70 %, Quality of the carrier as it determine the colonization and growth of mycelium on the substrate.

Different seed grains like: wheat grains, rice grains, sorghum grains, maize grains, gram seed, garden pea and mung seeds were used to evaluate the spawn production of *P.florida*, *P.sajor-caju*, and *P.eous*.

Grains in spawn

The process of making grain spawn was first introduced by the Pennsylvania State University in 1932. Grain spawn is having advantage that it mixed easily and provide many inoculum points. Further grain spawn are perfected by Stoller in 1962. The spawns were prepared using a modified form of the method of spawn preparation outlined by Stamets and Chilton (1983).

Different properties of different grain spawn:

The spawn production technology is divided into three steps-

1. Pure culture preparation

2. Mother spawn preparation
3. Commercial spawn preparation

PURE CULTURE PREPARATION

Pure culture of mushroom can be prepared either by tissue culture or either by spore culture. For tissue culture well grown young mushroom is selected and sterilized by alcohol, after sterilization cuts it into two pieces longitudinally and transferred to pre-sterilized PDA or MEA culture media. In few days hyphae will grow out from the tissue and ready for further multiplication. And for spore culture well developed fruiting body are selected and cut the stalk of the mushroom. Laid the gills down on a clean typing paper, after 12 hours most mushrooms have released thousands of the spores. The spores are collected by spore map techniques by the inoculating loop and then inoculate the spore to the PDA or MEA media under aseptic condition and incubate at room temperature, after few days the spores germinate and will form mycelium. *Spawn production technology.*

STEPS FOR PREPARATION OF MOTHER SPAWN -

Grain like wheat, maize, rice, bajra were taken



All grains are washed and soaked overnight in fresh water



Then cooked for 10-15 minutes till they become soft



Excess water drained and spread on muslin cloth



After cooling add (CaCO₃) 2%
These were filled in conical flask of 250ml and plugged with non-absorbent cotton

1. Rye grain-	It can hold more moisture than any other grain. It doesn't burst or get mushy.
2. Wheat grain-	It cannot hold much water although it is also good choice. Wheat grains break easily also.
3. Barley grain-	It is not ideal for use because it retains wet. It breaks easily also.
4. Millet grain-	It is smallest of the grain and provides a huge number of different "inoculation" pints in substrates. It easily mixes with other grains to make spawn.
5. Rice grain-	It is little mushy and sticky when processed So, not used for commercial growers.
6. Maize grain-	It takes longer time for mycelium to colonize.

↓

Each flask contains 100 gms grains and sterilized in autoclave at 20lbs pressure for 2 hour

↓

Incubate in BOD at 23±20 °C for 20-25days (shake bottles after 10 days)

↓

Mother spawn is ready

STEPS FOR PREPARATION OF COMMERCIAL SPAWN –

↓

Use polypropylene bags instead of bottle

↓

Up to autoclaving steps are same as of mother spawn

↓

Inoculate with 10-15 g of mother spawn per PP bags

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Incubate at 23±20 °C in incubation room (Shake bags after 7-8 days)

↓

Commercial spawn is ready in 2-3 weeks

Storage

At room temperature or 25± 2 °C temperature spawn can be stored up to 30 days, from the date of inoculation. And on under refrigerator conditions, spawn can be stored for another three months. However there will be also decrease in yield of mushroom with increase in storage time above two months (Borah *et al.*, 2019).

Contamination or Spoilage

When bacteria or moulds over grow on the mycelia the growth of mycelia gets stopped and the spawn gets contaminated or get spoilt. Bacterial contamination in spawn packets is generally found as patches. Spoilage caused by the moulds *Aspergillus sp.*, *Penicillium sp.*, *Rhizopus stolonifer* and *trichoderma sp.* And the color of mycelia or

spores gets changed from white. And the factors like excess moisture, bad quality grains, improper sterilization and high temperature during storage is cause of spoilage of spawn (Borah *et al.*, 2019).

Desired characters of planting spawn

1. Spawn should always be taken from reliable and authentic sources as it is the key input for the successful mushroom production.
2. Avoid overcooking of grains as it may lead to splitting of grains.
3. Use only recommended dose of CaCO₃ for mixing.
4. Few things to be taken care like species of mushroom, generation and date of inoculation.
5. A healthy spawn should be white in color with profuse mycelia run.

ADVANTAGES OF GRAIN SPAWN

1. Grain spawn is easier to plant then the manure spawn.
2. It has much more nutritious.
3. The spawn run is faster.
4. It saves labour.

DISADVANTAGES OF GRAIN SPAWN

1. Grains cannot be spawned at high temperature because they are susceptible to green moulds.
2. It is is not good choice for inoculating outdoor.
3. To maintain temperature and humidity is must.
4. Rats and mice dig up the beds for getting grains.

Some important precautions while preparing spawn are

- Always keep the inoculation chamber and the surrounding very clean.
- Switch on the UV tube in the inoculation chamber for 30 minutes before inoculation and keep all the materials which we used like forceps etc in it. Switch off UV tube 15 minutes

Temperature requirement and storage and incubation of Different mushrooms-

	<i>Agaricus</i>	<i>Pleurotus</i>	<i>Lentinula</i>	<i>Volvariella</i>	<i>Calocybe</i>
Days to complete colonization of mother spawn	20 – 21	8 – 12	20 – 22	6 – 8	15 – 17
Days to complete colonization in commercial spawn	12 – 14	8 – 10	15 – 16	5 – 7	12 – 14
Incubation temperature (°C)	25	25	25	32	25
Storage temperature (°C)	4	4	4	^15	^16
Shelf life of spawn	Two months	One months	Three months	15 days	15 days

- before entering the inoculation room.
- Inoculation should always be done near the script lamp.
- Swab hands and clean inoculation area with alcohol.
- Mother spawn should be fresh as it starts to degenerate after a month.
- Shake bottles and bags after 10 days and remove contaminated bottles and bags which show green, black or unwanted growth.
- All the bottles should be labeled by name, species and the date of inoculation.

CONCLUSION

From the following study we concluded that Cereal grains are generally used as spawn substrate. They act as reservoir of carbohydrates which offers sufficient nutrition for mycelia growth.

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