

Morphology and Yield Performance of Edible Mushrooms on Different Substrates

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Abstract

Edible mushrooms were studied for morphology and yield performance. Oyster mushroom, milky mushroom and paddy straw mushroom were studied for spawn run, pin head formation and fruiting bodies. Sugarcane bagasse, coconut coir, mixture of sorghum and maize stalk, saw dust were used as substrate. Highest yield observed on mixture of sorghum and maize stalk for *P.sajor-caju* (800.16g) followed by *P.ostreatus* (675.14g). *C.indica* has good yield on paddy straw (500g). *V.volvacea* has good yield on (550.18 g). These mushrooms can be further explored for medicinal properties.

Keywords: Mushrooms, Substrates, Yield, Morphology

Introduction

Mushrooms occur in different parts of the world, ranging from arctic to the tropics. While some species are endemic, others exist in areas that are widely separated geographically. However, most of the species show a preference for a certain type of habitat. Some are, found primarily in upland wooded areas; others exist in swamps and still others prefer open areas such as gardens, trees, lawns or pasture e.g *Pleurotus* spp. Many species particularly the mycorrhizal forms are associated with certain types of vegetations. Mushrooms may also show a preference for a particular substratum within a certain habitat. Basidiocarps of some are typically produced on the soil and are terrestrial forms. Others are saprophytes found on dead leaves (follicolous) or litter e.g *Cortinarius melliolens* and *Tricholoma lobayensis*, on wood (lignicolous) e.g *Lentinus edodes*. Mushrooms are mostly found on wastes such as sawdust, garbages and composting materials. The recent production data revealed that button mushroom production holds the maximum share of about 73 per cent and followed by oyster mushroom with 16 per cent [1]. The next most common commercial species are shiitake (*Lentinus edodes*), straw (*Volvariella volvacea*), oyster (*Pleurotus ostreatus*), and enoki (*Flammulina ostreatus*). There are several species of *Pleurotus* identified in the world and suitable for cultivation, some of them are *Pleurotus ostreatus*, *P. florida*, *P. sajor-caju*, *P.eryngii* [2]. Oyster mushroom (*Pleurotus* spp.) is very easy to cultivate and various agricultural wastes are being used as substrates for its cultivation. Cultivation of edible mushrooms might be the only current process that combines the production of protein-rich food with the reduction of environmental pollution [3]. Studies have revealed that mushrooms offer a diversity of flavour, texture, and nutrients [4].

Material Methods

Spawn of milky mushroom (*Calocybe indica*) and paddy straw

mushroom *V.volvacea* obtained from Indian Institute of Horticulture (ICAR), Bangalore Oyster mushroom spawn (*Pleurotus sajor-caju*) was obtained from College of Agriculture pune. *Pleurotus ostreatus* spawn was obtained online.

In the present investigation yield performance of *Pleurotus ostreatus*, *Pleurotus sajor-caju*, *V.volvacea* and *Calocybe indica* studied on different substrate. Substrate used is mixture of Maize stalk and sorghum stalk, saw dust, sugarcane bagasse and coconut coir were soaked in water with bavastin, bleaching powder and 5% formalin overnight. Substrate were kept for sun dry to remove excess water. 6X4 polythene bags filled with substrate. Casing is done with (soil + cow dung) for milky mushroom after spawn run.

Collection of Mushroom Substrate

The substrate for mushroom cultivation (Sorghum stalk, Coconut coir, Sugarcane stalk, Paddy straw) was collected from the farmer's field nearing the substrate after chopping into 3-4 cm length was stored under a covered shade.

Spawning and Cropping Of Mushroom

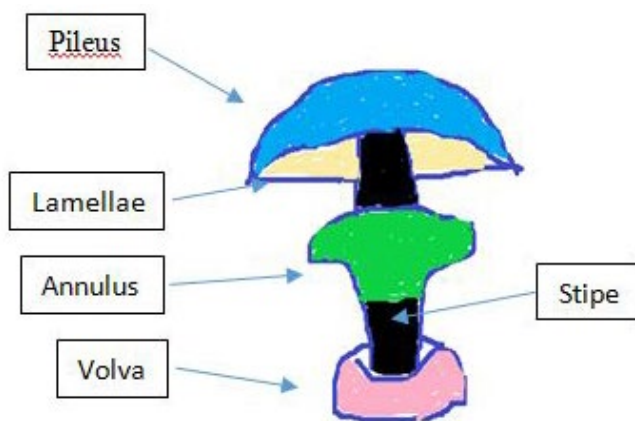
After sterilization, the straw was taken out from water, put in a slanting position to drain out the excess water or cooled in case of hot treatment and then bags were prepared. Polythene bags of 40x60 cm size were taken, perforated by making random holes in each bag and used to put the spawn and substrates. The bagging was done by layer method by putting 3 per cent of spawn on wet weight basis of the substrate. Each bed contained one kilogram of substrate. After completing spawning the bags were kept in dark room and necessary records were taken periodically. On completion of spawn run the poly bags were removed from the bed, kept in cropping room, watering was done regularly to keep them moist. The mushroom was harvested up to third flushes.

Recording of Data

Days for completion of spawn running. Time was recorded in days for the completion of 100 per cent growth of mycelium on each substrate in polythene bags. Days for the appearances of pinhead: The data were recorded in days taken for appearance of mushroom primordial formation in substrates. Maturation of

fruiting bodies: Time period was recorded in days from pinheads to maturation of fruiting bodies in all treatments. Yield: The data were recorded for the harvesting of mushroom up to three flushes. The first and respective harvesting was done at maturity and the yield of different flushes of fruiting bodies was noted.

Result & Discussion



Mushroom Morphology

Table 1

	<i>Pleurotus ostreatus</i>	<i>Pleurotus sajor caju</i>	<i>Calocybe indica</i>	<i>V.Vovacea</i>
Habitat	Wood, leaf litter,trees	Wood, leaf litter,trees	Grassland	Paddy straw
Volva	Present	Absent	Absent	Present, prominent
Lamellae	Circular	Blade	Equal	Angular
Pileus	Present,white	Present, Grey color, large	White, Umbrella	Angular
Stipe	Tapping at base	Small	Present, Bulbous	Thin stalk
Annulus	Present	Absent	Absent	Absent
Odour	Bitter sweet	Farinaceous	Farinaceous	Not distinctive

Edible mushroom (oyster, milky mushroom, paddy mushroom) were studied for presence of different parts of mushroom i.e. pileus, lamellae, annulus, stipe given in (table1). *Pleurotus sajor-caju* is large sized mushroom without stipe. Milky mushroom (*C.indica*) has white cap like pileus with rounded base. Paddy mushroom *V.volvacea* is pink in color conical shaped, thin stipe with prominent volva.

Along with the methodical characterization of fungal communities in casing soil, a practical analysis is needed to highlight potentials and applications [5]. *Pleurotus sajor caju*, *Pleurotus ostreatus*, *C.indica* and *V.volvacea* studied for spawn running, pinhead formation, fruit body formation and yield. Studied

the effect of apple pomace on the growth rate of *Pleurotus ostreatus* mycelium. Yield performance varied within substrates *Pleurotus sajor-caju* has highest yield on substrate of maize and sorghum stalk (800.16 g) (Table2). *Pleurotus ostreatus* shown good yield on paddy straw with (675.14g) [6]. *C.indica* has good yield on paddy straw (500g). Coconut coir is good substrate but has low yield as compare to paddy straw and mixture of maize and sorghum stalk (Table 2, 3). Saw dust is not recommended for any of these mushroom. Higher yield of quality mushroom depends upon proper maintenance of pure culture as well as purity and quality of the spawn used. Hence, low cost and quality spawn is the basic requirements for mushroom growers [7, 8].

Pleurotus Sajor Caju

Table 2

Substrates	Spawn running	Pinhead formation	Fruiting body formation	Yield (g)
Paddy straw	17-20	21-23	25-27	650.14
Mixture of Maize & sorghum stalk	20-23	24-27	27-30	800.16
Saw dust	20-25	27-28	30-32	---
Coconut coir	20-23	23-25	25-27	500.12

Pleurotus Ostreatus

Table 3

Substrates	Spawn running	Pinhead formation	Fruiting body formation	Yield (g)
Paddy straw	17-20	21-23	25-27	675.14
Mixture of Maize & sorghum stalk	21-22	23-25	25-28	650.12
Saw dust	20-24	23-25	27-29	----
Coconut coir	20-21	23-25	25-27	500.16

*Poor Spawn Run and Fruit Body Formation on Saw Dust as Substrate

Calocybe Indica

Table 4

Substrates	Spawn running	Pinhead formation	Fruiting body formation	Yield (g)
Paddy straw	23-25	27-29	31-35	500
Mixture of Maize & sorghum stalk	25-27	30-32	33-36	300
Saw dust	20-25	27-28	30-32	---

V.Volvacea

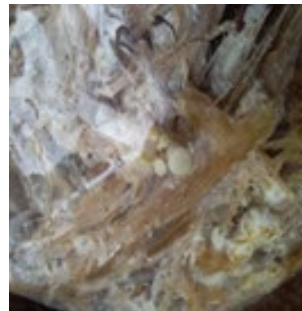
Table 5

Substrates	Spawn running	Pinhead formation	Fruiting body formation	Yield (g)
Paddy straw	17-20	21-23	25-27	400.15
Mixture of Maize & sorghum stalk	20-23	24-27	27-30	550.18

Spawn Run



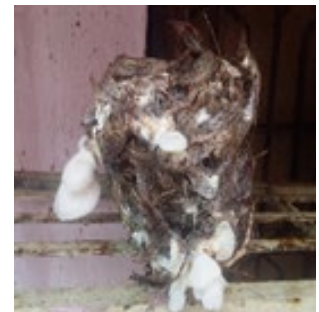
Pin Head Formation



Sorghum Stalk /Maize Stalk Mix



Coconut Coir





V.volvacea



Pleurotus and C.indica on sugarcane



Conclusion

Oyster mushroom, milky mushroom and paddy straw mushroom are edible and has medicinal properties. These mushrooms can be grown on a number of substrates available in agricultural fields. Oyster mushroom and paddy mushroom are easy to cultivate whereas, milky mushrooms require optimum growth conditions and good casing material. Oyster mushroom and paddy straw mushroom can be grown round the year whereas, milky mushrooms grown in tropical regions from March to October months. These edible mushrooms could be explored for medicinal, aromatic and chemical compounds.

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