Mushroom Cultivation : Technological innovations and market trends

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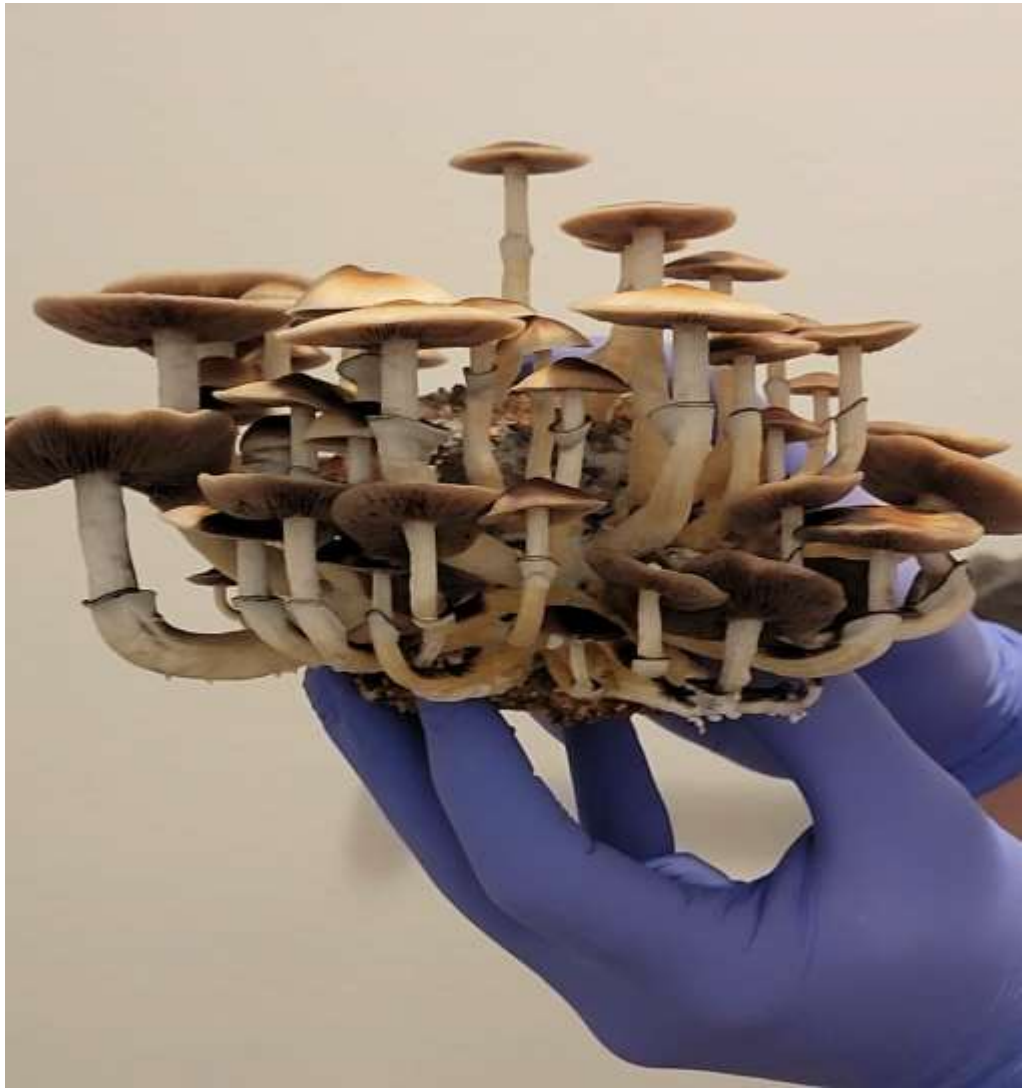
Subject-Bioentrepreneurship and innovations in Microbiology

Subject Code- MSEC (MB) 202 B

Mushroom Cultivation :

Mushroom cultivation involves the intentional farming
Of edible fungi under controlled environmental conditions.
This process encompasses several kay steps:

- **Selection of mushroom species**
- **Preparation of substrate**
- **Sterilization**
- **inoculation**
- **Incubation**
- **Fruiting**



Selection of mushroom species

- Choosing the right species is crucial for successful cultivation . Some commonly cultivated mushroom include:

➢ **Button mushroom**(*Pleurotus spp*.) - The most widely consumed mushroom globally , grown on compost.

➢ **Oyster Mushroom** (*Pleurotus spp.*) – Fast growing and easy to cultivate on straw , paper , and wood.

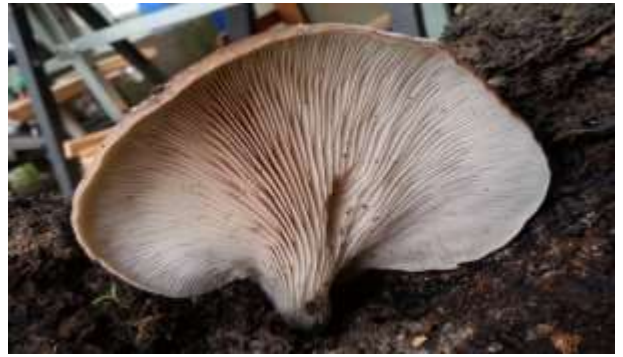
➢ **Shiitake Mushroom** (*Lentinula edodes*) – Requires hardwood logs or sawdust ; has medicinal properties .

➢ **Milky Mushroom** (*Calocybe indica*) – popular in tropical climates; cultivated on paddy straw.

The choice of species depends on climate, available resources and market demand .

Button mushroom

Shiitake mushroom



oyster mushroom

Milky mushroom

Preparation of the substrate (Growing medium)

Mushroom require an organic substrate as a food source . The substrate provides nutrients for mycelial growth . Common substrates include :-

- **Straw** (paddy , wheat , barley , or sorghum)
- **Sawdust** (Hardwood sawdust works best for shiitake mushrooms)
- **Compost** (prepared from wheat straw , poultry manure, and gypsum for button mushroom)
- **Coconut husk** or **corn husks**

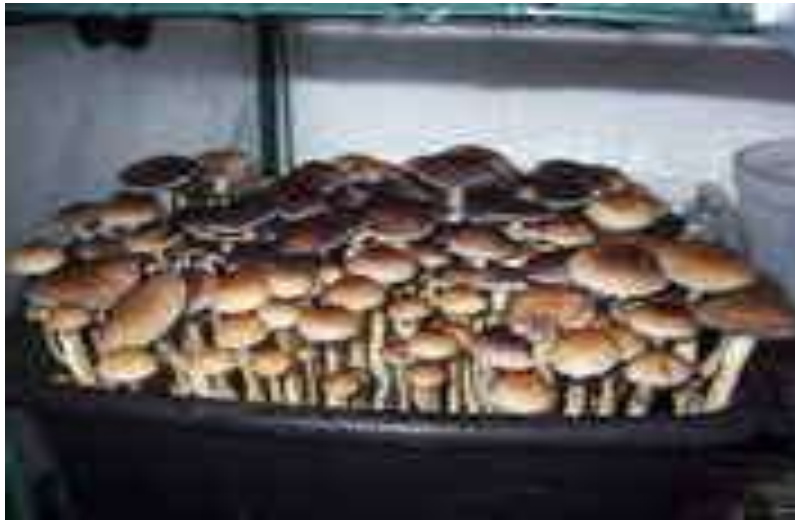
Growing medium

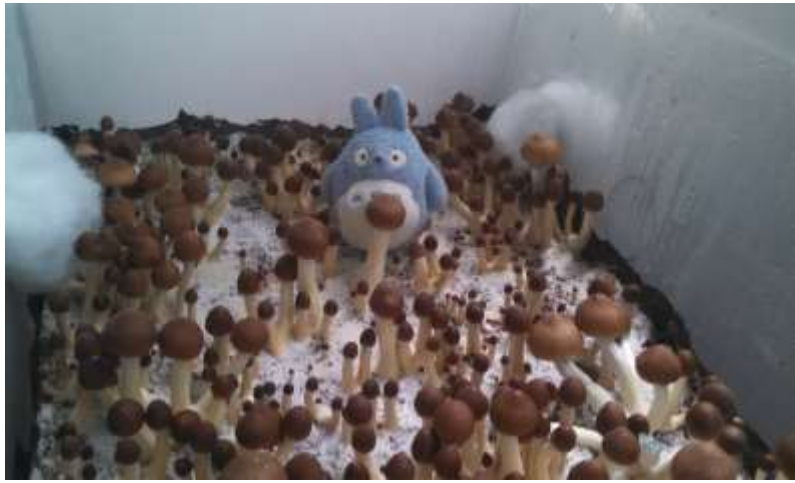
Coconut husk

Sterilization or Pasteurization

Before inoculation, the substrate must be treated to kill unwanted bacteria and fungi.

- Pasteurization (for straw – based substrates): The substrate is soaked in water and heated to 60-70 C for 1-2 hours.
- Sterilization (for sawdust or compost) :
- The substrate is autoclaved at 121 C for 15-20 minutes. This step ensures that only the desired mushroom fungi grow in the medium





Inoculation (spawning):

- Once the substrate is sterilized and cooled , mushroom Spawn (the fungal mycelium grown on grains or sawdust) is introduced. Spawning methods include :

❑**Surface spawning** : spreading the spawn evenly on the substrate surface .

❑**Layer Spawning**: Mixing spawn at different layers of the substrate for better distribution.

The inoculated substrate is then placed in plastic bags , trays or containers

Incubation (Mycelium Growth)

- The inoculated substrate is kept in a warm, dark, and humid environment to allow mycelial growth.
- ***IDEAL CONDITION***
  - ***Temperature : 20-25C (varies by species)***
  - ***Humidity : 80-90%***
  - ***Darkness : Encourages mycelial colonization***
  - ***Duration: 2-4 weeks***

During this period , the mycelium (the vegetative part of the fungus) spreads throughout the substrate , preparing for mushroom formation.

Fruiting (Mushroom Formation)

- Once the substrate is fully colonized , fruiting conditions are introduced :

➢ **Lower temperature** : 15-20C for button mushroom ,25-30C for Oyster and milky mushrooms.

➢ **Fresh air circulation** : Ensures proper gas exchange and prevents CO2 buildup

➢ **High humidity** : 80-90% humidity is maintained by spraying water or using a humidifier .

➢ **Indirect light** : Light exposure for 8-12 hours per day helps in mushroom development

After a few days, tiny mushroom pins (primordia) appear and gradually develop into mature mushrooms.

Harvesting

- Mushroom are ready for harvest when their caps are fully expanded but not yet opened completely
- **Butten mushrooms-** Harvested before the cap opens.
- **Oyster mushrooms-** picked when the cap is 5-10cm in diameter .
- **Shiitake mushrooms –** Harvested when the cap is fully expanded but before the edges curl up.

Harvesting is done by gently twisting and pulling the mushroom from the substrate. A knife can also be used to cut the stem at the base .

Economic benefits of Mushroom cultivation

- Low investment & high returns : Requires minimal land and can be grown indoors.
- Fast growth cycle : some species like oyster mushrooms mature in just 3-4 weeks.
- Nutritional value : Mushrooms are rich in proteins , vitamins , and minerals .
- Medicinal Properties : Certain mushrooms (e.g., shiitake reishi) have immune – boosting and anti cancer properties .

Technological innovations in mushroom cultivation

- **Substrate innovation** : the development of new substrates has been central to improving yields and sustainability . Conventional substrates such as straw and sawdust are being replaced or supplemented by agricultural residues and industrial by-products , enhancing resource efficiency and reducing waste.
- **Artificial intelligence and machine learning** :The integration of AI and machine learning algorithms allows for the optimization allows for the optimization of growing conditions. By analyzing data on factors like CO2 levels, humidity , and temperature , these technologies can identify patterns and predict optimal conditions for mushroom growth , leading to higher yields and better quality.
- **Advanced spawn production techniques**: innovations in spawn production , including the use of liquid inoculation methods and genetic strain improvements, have enhanced the efficiency and scalability of mushroom farming . These techniques contribute to consistent and robust yields.

Market trends in Mushroom cultivation

- **Market growth** : the global mushroom cultivation market has seen substantial growth. Valued at approximately USD 50 billion in 2023, it is projected to reach USD 90 Billion by 2032, growing at a compound annual growth rate (CAGR) of 7% . This growth is driven by increasing consumers awareness of the health benefits associated with mushroom consumption .
- **Consumer Trends** : there is a growing preference for vegan and organic food products, with mushrooms being recognized as a nutritious and versatile food source . This shift towards plant – based diets has significantly boosted the demand for edible mushrooms.
- **Global trades and accessibility** : Advancements in cultivation technology have made mushrooms more accessible and affordable across different regions , supporting global market growth. The integration of mushrooms into non-food industries , such as the development of biodegradable materials from mycelium, also illustrates their expanding role in various sectors .

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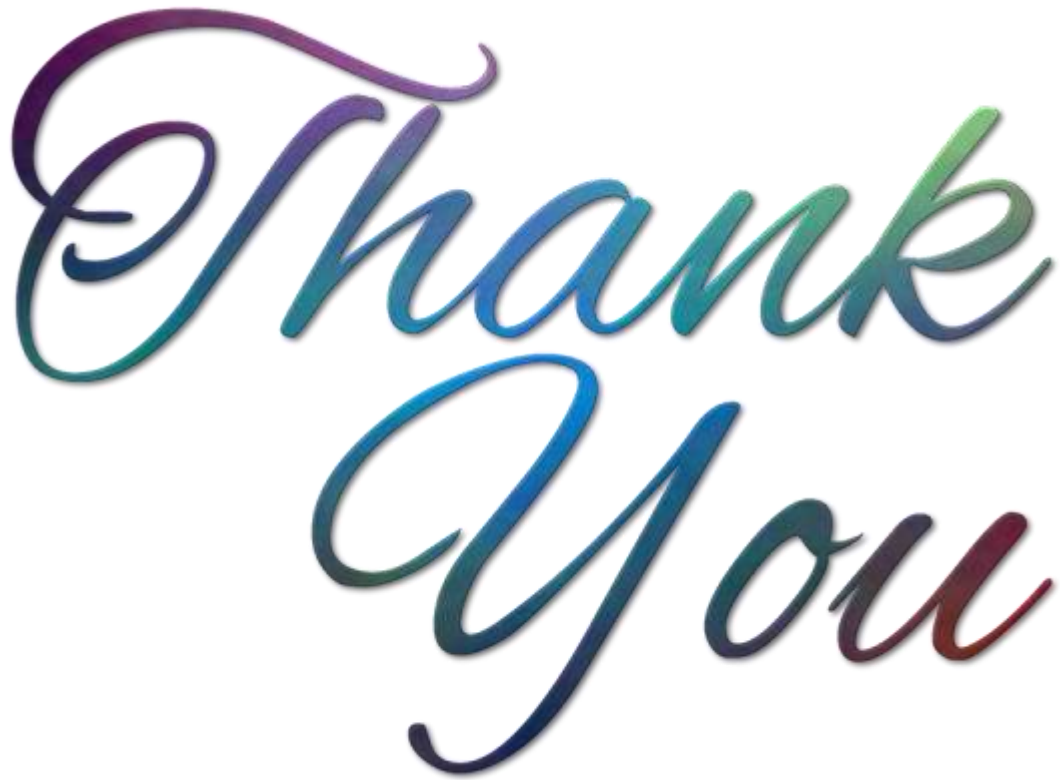
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Any Question???