

# Mushroom cultivation

1. Air
2. Water
3. People
4. Substrate
5. Spawn



# Insect pests

- Few insect pests attack the mushrooms
- Small larvae of flies, beetles, springtails are very commonly noticed, in addition to mites and nematodes.
- Absolute cleanliness is a must to prevent the infestation of the insect pests in mushroom sheds.

Phorid fly: *Megaselia halterata* and *M. tamilnodolensis*



# Sciarid fly: *Lycoriella mali*



# Damage

- The larvae feed on the mycelium and show rotting patches in the beds
- Young buds are also eaten by the larvae
- They also tunnel into grown up mushroom and cause rotting of the mushrooms
- The flies spread the disease from one bed to others

## **Favourable conditions**

- Temperature of 16-24 °C is highly favorable and moisture contents of 70 % and above show more incidence
- More severe in button mushroom cultivation, when compared to oyster and milky mushrooms

# Spring tails



# Integrated Pest Management

- Bed moisture content should be around 60- 65%
- Fix insect proof nets in the windows.
- Fix white insect trap to attract the flies.
- Spray malathion @ 1 g/ lit. or dichlorvas 0.5 ml/lit. in the floor and sides to kill the flies and beetles, never spray on the mushroom beds and buttons.



# **Mushroom diseases**

# Factors that cause diseases in mushrooms

- **Biotic factors**

- Fungi,
- bacteria and
- viruses

- **Abiotic factors**

- Air,
- temperature,
- nutrition and
- other environmental factors

# Mould

- Olive green mould - *Chaetomium olivaceum* and other spp.
- Green moulds - *Aspergillus* spp. *Penicillium* spp. and *Trichoderma* spp.)
- Black moulds (*Mucor* spp., *Rhizopus* spp.)
- **Causes**
  - From human handling
  - Lack of ventilation- CO<sub>2</sub>
  - Improper sterilization of straw and bed preparation
  - More water content in beds



Olive green mould

Green mould



Black mould

# Management

- Sanitation and hygiene are the most important
- Avoid using damaged and old straw for bed preparation
- Remove and destroy the infected beds immediately
- Proper sterilization of straw and bed preparation
- Avoid preparing beds with more than 70 per cent moisture

# Disease Management

- Take measures to avoid the accumulation of dust in the vicinity of mushroom houses
- It is essential to control flies and every effort should be made to prevent their entry into cropping houses
- As diseased mushrooms appear they should be removed from the beds using a cloth

# Bacterial blotch/ bacterial pit / brown blotch

- *Pseudomonas* - produces pale-yellow spots on the surface of the pileus, which later turn brown
- The incidence is more when the mushrooms are watered heavily in the early bud stage
- Because of very high humidity film of water always present on the surface of buttons leading to browning and rotting, emitting a fowl smell
- In addition, the water splash from the infected bed also carries the bacterial inoculum



**Bacterial blotch**



# Wet Spot/Sour Rot

- *Bacillus* - heat resistant endospores
- A dull gray to mucus-like brownish slime characterized

## Management

- Soaking the grain at room temperature 12 - 24 hours prior to sterilization



# Management

- Clean the mushroom houses thoroughly before a new crop
- Clean and disinfect equipment frequently
- Remove the infected beds periodically to avoid further spread
- Avoid using damaged and old straw for bed preparation
- Avoid pouring excess water to the beds
- Lowering humidity with good air circulation
- Avoid preparing beds with more than 70 per cent moisture
- Spray water mixed with bleaching powder @ 2 g / 10 litres of water.

# HOW TO KEEP DISEASES AND PESTS OUT

- Clean water
  - A mist sprayer will not splash, so it is better.
- Filtered air
  - “Air-lock” entrance room
- Careful pasteurization
  - 55-60°C (131-140°F) for 30 to 60 minutes.
- Clean workers
  - Hand wash after working with substrate
- Clean surroundings
  - Brush, weeds, stumps and old logs should be cleaned

# Problems encountered during mushroom

Problem	Cause	Solution
1. Mushrooms taking very long time to appear after the bags opened	<ul style="list-style-type: none"><li>• Temperature too high or too low</li><li>• Mycelium not mature enough</li><li>• Insufficiently humidity</li><li>• Insufficient ventilation</li></ul>	<ul style="list-style-type: none"><li>• Maintained correct temperature for fruiting</li><li>• Allow to properly mature</li><li>• Maintain at least 85% RH</li><li>• Open ventilators to provide enough aeration</li></ul>
2. Mushroom are small and do not appear to grow as large as expected	<ul style="list-style-type: none"><li>• Spawn weak or degenerated</li><li>• Insufficient nutrients</li><li>• Too many fruit bodies developed at the same time</li><li>• Nutrients in the substrate already exhausted after many harvests</li></ul>	<ul style="list-style-type: none"><li>• Use reliable spawn</li><li>• Increase supplements available in substrate</li><li>• Allow only a few fruit bodies to develop at one time by opening bags only slightly</li></ul>

# Problems encountered during mushroom

Problem	Cause	Solution
3. Rotting of mushrooms	<ul style="list-style-type: none"><li>• Excessive watering</li><li>• Onset of fungal or bacterial diseases and pest infection</li></ul>	<ul style="list-style-type: none"><li>• Avoid direct watering on developing fruits</li><li>• Check fungal or bacterial diseases and pest infection</li></ul>
4. Low production / Few fruit bodies formation	<ul style="list-style-type: none"><li>• Weak or degenerated spawn</li><li>• Temperature too high or too low</li></ul>	<ul style="list-style-type: none"><li>• Use reliable and good quality spawn</li><li>• Provide optimum temperature for fruiting</li></ul>
5. Mushroom long and thin stalked	<ul style="list-style-type: none"><li>• Insufficient light</li></ul>	<ul style="list-style-type: none"><li>• Provide adequate light</li></ul>

**Thank you**