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Insect- Pest, Weeds and Disease Problems in Mushroom Cultivation and Their Management

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Mushroom is a fleshy, spore-bearing fruiting body of some fungi arising from a group of mycellium buried in the substratum. Most of the mushrooms belong to the Sub-Division: Basidiomycotina and a few belong to Ascomycotina (Chang and Miles, 1992).

Mushrooms are fungi that have a heterotrophic mode of nutrition, lack chlorophyll, and cannot manufacture nutrients through photosynthesis, requiring them to obtain nutrients from other sources. Most mushrooms are saprophytic, meaning they consume organic matter from dead plants and recycle carbon in the soil. The mushroom, on the other hand, may manufacture a wide range of enzymes, such as cellulose and hemicelluloses, which digest the complex substrates on which they grow and absorb the soluble elements for sustenance. Fungi are known for their absorptive nourishment (Chang and Miles, 2004)".

Mushrooms are rich sources of protein, lipids, amino acids, glycogen, vitamins, and mineral elements (Okhuoya *et al*., 2010). Mushroom cultivation is the process of converting residual organic matter and lignocellulose resources into a food source. Mushrooms are utilized as food for their nutritive value and as dietary supplements, producing high quality and economic value to the global mushroom market. In general, edible mushrooms have three key food properties: nutrition, flavor, and physiological functions (Chang 2007).

Type of mushrooms:

1. Paddy straw mushroom – *Volvariella* sp.
2. Oyster mushroom - *Pleurotus* sp.
3. Button mushroom - *Agaricus* sp.
4. Milky mushroom - *Calocybe* sp.
5. Shiitake mushroom - *Lentinus* sp.
6. Jew's ear mushroom - *Auricularia* sp.

Major Insect Pest of Mushroom and Their Management:

Insect pests: Many insect pests attack the mushrooms that belong to the Order Diptera. These included the Phorid and Sciarid flies, as well as mites, which are a widespread concern. Rats are another issue since they consume the mushroom bags as well as the spawn layers (Kashangura *et al*., 2005).

a) Flies:

i) Phorid fly: *Megaselia halterata* and *Megaselia tamilnodolensis*

ii) Sciarid fly: *Lycoriellamalli*

Damage: The larvae feed on the mycelium and cause rotting patches in the beds. The larvae also consume young buds. They also tunnel into the grown-up mushroom and cause rotting of the mushrooms. The disease spread from one bed to another by the flies.
Favourable conditions: Temperature of 16-24 is highly favourable and moisture contents of 70 % and above show more incidences. It is more danger in button mushroom when compared to oyster and milky mushrooms.
b) Beetles:
Black beetle: *Sacphiso manigrofaceatum*
Brown beetle: *Sacphiso mapictummotschulsky* - Golden lines seen on the body.
Both feed on young buds and mature mushrooms by scraping the tissues. They typically spread the bacterial blotch disease from one bed to another.
c) Spring tails / Columbolas: Mycelium and buds are eaten by tiny insects with stout antennae. Lepidocyrtuscyaneus and Isotoma simplex.
d) Nematodes: Infestation of nematodes is more severe in button mushrooms. following two nematodes are very commonly: *Aphelenchoides composition* and *Ditylenchus mycelophagus*.
e) Mites: In addition to insect pests, two mites very severely feed on the mushroom spawn as well as on mushroom buttons. They are i) Tarsonemid mite- *Tarsonem usmyceliophagus* and *T. floriculus* both transmit the diseases and feed on mycelium. ii) Tryoglyphid mite- *Tyrophagus longior*, and *Tyrophagus lintneri*.
Integrated Pest Management:

- Bed moisture content should be around 60- 65%.
- Fix insect-proof nets in the windows.
- In button mushroom, the newspaper should be treated with 0.1 % formalin.
- Fix white insect traps to attract the flies.
- Spray malathion @ 1 ml./ lit. or dichlorvos 0.5 ml/lit. in the floor and sides to kill the flies and beetles, never spray on the mushroom beds and buttons.

Weeds and Diseases and their management:

Viruses and bacteria may also compete with the mushroom mycelium thereby decreasing production (Chiu et al., 1998).
i) Ink Cap:
Coprinus comatus is a common weed on mushroom beds. It is favoured by high moisture content of the beds, increased bed compaction, and poor ventilation with increased ammonia levels inside the cropping chamber. It produces dark blue to violet-coloured buds with a long white thin stalk, with opens in a few days and disintegrates as a black mass of tissues, covering the entire bed and development of young buds. The entire bed turns in black colour show the rotting of the spawn.
Management:

- Remove and destroy infected beds immediately.
- Avoid chemical methods of sterilization as this process leads to more weed growth.

b) Fungal diseases: Fungal diseases in the mushroom beds are:
i) Dry bubble- *Verticillium malthouseiand V. psalliotae*
ii) Truffle- *Pseudobalsamiamicrospora*
iii) Mildew/Cobweb- *Dactyliumdendroides*
Management:

- Avoid using old and damaged straw for bed preparation.
- Avoid preparing beds with more than 70% moisture.

c) Bacterial blotch/brown blotch: Bacterial blotch caused by a bacterium, *Pseudomonas tolassi*. It produces pale-yellow spots on the surface of the pileus, which later turn into brown colour. Pits are found just below the surface. This disease causes considerable damage in

storage. The incidence is more when the mushrooms are watered heavily in the early bud stage. Because of very high humidity film of water is always present on the surface of buttons leading to browning and rotting, emitting a foul smell. *Tyroglyphus* mites transmit the pathogen from one bed to another.

Management:

- Avoid pouring excess water into the beds.
- Remove the infected beds periodically to avoid further spread.
- Keep the population of Tyroglyphus mite under control.
- Spray water mixed with bleaching powder @ 2g / 10 liters of water.

d) Viral diseases: Complex viruses cause a disease called the Brown disease/ watering stipe/ X- disease or dieback disease. Very difficult to diagnose the disease based on symptoms- drumsticks like mushrooms and premature opening of veils- because similar symptoms can also be caused by certain cultural and environmental conditions. Even viral infections might be symptomless. Reduction in the yield of mushrooms is most reliable symptom. The other symptom commonly associated with the infected crop is the slow and depressed growth of the mycelium isolated from the infected mushroom. Transmission of the virus is through mushroom spores and spawn.

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