Management of major diseases of mushroom crops

Dr. Anil Kumar
Scientist (Plant Pathology)

ICAR- Directorate of Mushroom Research, Chambaghat, Solan (HP)
खुम्ब अनुसंधान निदेशालय *(भारतीय कृषि अनुसंधान परिषद्)*
चम्बाघाट, सोलन (हि.प्र.)–173213

Introduction

- **Fungal diseases of mushrooms viz., wet bubble (*Mycogone perniciosa*), yellow mould (*Myceliophthora lutea* (Const.), *Sepedonium chrysospermum* (Bull.) and *Sepedonium maheshwarianum* (Mukerji)) dry bubble (*Lecanicillium fungicola*), web cob (*Cladobotryum dendroides*), green mould (*Trichoderma* spp.) etc. are more devastating as compared to other of mushroom crops.**

- **Mushroom crops diseases are being managed mainly by using non-chemical methods. However, in India none of the fungicides have the label claim.**
- **All the fungicides used in European countries or elsewhere are used on mushrooms in India.**
- **Mushroom diseases like Wet bubble of button mushroom (*Mycogone perniciosa*) are of economic importance. Under severe cases, they may cause complete crop failure.**

- There are some specific chemicals which are permitted by the competent authority of the respective country like
  i. Iprodione and prochloraz- Mn by spenish legistation (De Linon, 2006).
  ii. Carbendazim and thiophanate methyl permissible in European countries (Annonymous, 2006).
  iii. Thiabendazole and thiophanate methyl permissible in USA (https://americanmushroom.orgbestpractice_IPM_fungicides.htm) etc.
- In India, there is a need for developing some mushroom diseases and insect/pests specific pesticides to sustain expanding mushroom industry in India.

Wet bubble (Mycogone perniciosa)

- If the pathogen infects mushroom before the differentiation of stipe and pileus, the sclerodermoid masses are formed.

Sclerodermoid (wet bubble infection)

- **Whereas infection after differentiation results in the production of thickened stipe with deformation of gills**

Thickened stipe: wet bubble inaction

Management:

- **Use standard crop management practices and be the earliest to jump to any disease control strategies.**

- **Chlorothalonil spray/drench @ 0.1% after casing but much before pinhead formation give complete disease control.**
- **Application of carbendazim (0.1%) in casing soil.**

- **At the time of disease appearance, wear gloves in hands and sprinkles some pinches of above recommended fungicides (if not available then common salt) on the infected fruit body. Then take a piece of paper/newspaper, wrap up the infected fruit body, pluck it and burry it in a pit somewhere away from the mushroom house.**

Dry bubble *(Lecanicillium fungicola)*

- If infection takes place in an early stage, typical onion shaped mushrooms are produced.
- When mushrooms are infected at a later stage, they are often imperfectly formed with partially differentiated caps or with and tilted caps.

Typical onion shaped mushroom symptoms

- **When fully differentiated infected fruit body, show small pimple-like out growths from the top of the cap or grey spots on the cap surface.**
- **The spots or discoloration make the mushrooms unmarketable**

Spots on the cap surface

Management:

- **Use of sterilized casing soil**

- **Proper disposal of spent compost and proper hygiene and sanitation are essential to avoid primary infection.**

- **Drenching with carbendazim (0.1%) on casing soil.**

Cobweb (*Cladobotryum dendroides*)

- Cobweb appears as small white patches on the casing soil, which then spreads to the nearest mushroom by a fine grey white mycelium.
- As the infection develops, mycelium becomes pigmented turn pink at later stage.

Cobweb disease on button mushroom

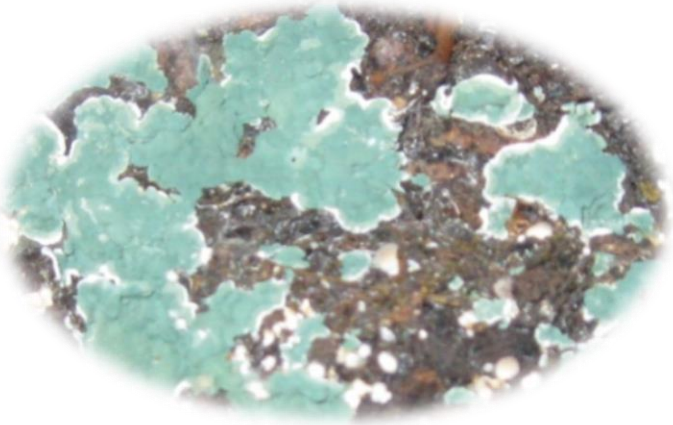
Cobweb of oyster mushroom

Management:

- Regular cleaning, removal of cut mushroom stems and young half dead mushrooms after each break.
- Controlling temperature and humidity helps in controlling the disease.
- Annual disinfection of houses and surrounding areas with 2% formalin solution is helpful in controlling disease.
- Application of carbendazim (0.1%) at early stage of disease appearance.
- Under oyster crop substrate sterilization with thiophanate methyl 40mg/ litre + formalin 500 mg/ litre is very effective in management of different disease of oyster mushroom.

Green mould (Trichoderma spp.).

- A dense pure white growth of mycelium may appear on casing surface or in compost which resemble to mushroom mycelium.
- Later on mycelia mat turns to green colour because of heavy sporulation of causal agent which is characteristic symptom of the disease.
- Mushroom developing in or near this mycelium are brown, may crack and distort, and the stripe peels in a similar way to mushroom attacked by *Veticillium fungicola* causing dry bubble disease.



Green mould

Management:

- Very good hygiene.
- Proper pasteurization and conditioning of compost.
- Sterilizing the supplements before use and mixing them thoroughly preferably after spawning.
- Spray after casing with chlorothalonil/ carbendazim @ 0.1% controls the disease.

False truffle (*Diehliomyces microsporus*)

- **Whitish, solid, wrinkled, rounded to irregular fungal masses of false truffle**

False truffles

Management:

- Compost should be prepared on a concrete floor and never on uncovered soil.
- Pasteurization and conditioning of the compost should be carried out carefully.

- Temperature above 26-27°C during spawn run and after casing should be avoided. During cropping, temperatures should be kept below 18°C- Button.

- Young truffles must be picked and buried before the fruit bodies turn brown and spores are mature.

- Compost temperature 70°C for 12h kill mycelium and spores of the pathogen in the compost.

Olive green mould (*Chaetomium olivacium*)

Management:

- The fermentation period of the compost should not be too short. It is essential to achieve active compost that is not too wet and has a good structure.

- Do not add nitrogen sources like, ammonium sulphate, urea, chicken manure or similar materials just before filling.

- Compost should be properly pasteurized and conditioned with ample supply of fresh air. Higher temperatures (above 59°C) for longer time should be avoided.

Grey-green cockle burn of olive green mould

Brown plaster mould (*Papulaspora byssina*)

Management:

- Composting should be carried out carefully using sufficient gypsum and not too much water.
- Peak heating / pasteurization should be for sufficient duration and at proper temperature.
- The compost should not be too wet before or after peak heating/ pasteurization.

Brown plaster mould

Yellow mould (Myceliophthora lutea, Chrysosporium luteum)

- This disease produce three major types of symptoms in growing room:

  i. Mat formation,
  ii. Confetti
  iii. Sporulation

Yellow mould

Management:

- **Properly pasteurized short method compost should be used.**
- **Proper pasteurization of the casing mixture is very essential.**
- **Add 0.1% Single Supper Posphate (SSP) is effective for the control of this disease.**

Sepdonium yellow (*Sepdonium spp.*):

Management:

- Strict temperature monitoring and control during compost pasteurization.
- An adequate post-crop cook out is essential to eliminate the threat of infection.

Tikki mould/ Sepdonium yello

Ink caps (*Coprinus* sp.):

Management:

- Use properly pasteurized compost and casing soil. Avoid excessive watering. Rogue out young fruit bodies of the weed fungus to avoid its further spread.

- Prepare compost using fresh straw.

- Ammonia in the compost at spawning should be less than 10 ppm i.e. no smell of ammonia.

Ink caps

Cinnamon mould (Chromelosporium fulva)

Management:

- Casing soil should be properly sterilized by steam or formaldehyde.
- Maintain proper moisture content in casing layer.

Cup like fleshy fruit bodies of cinnamon brown mould

Bacterial blotch (*Pseudomonas tolaasii*):

- **At those places where the mushrooms stay moist for longest yellowish brown patches or blotches occur initially.**

- **In serious cases can turn dark brown and spread over the whole surface of the mushroom cap.**

Bacterial blotch on white button mushroom

- **Infected fruit bodies become yellow and sticky bacterial oozing.**

Yellow blotch of Pleurotus

Management of bacterial diseases

- Avoid surface condensation on developing mushrooms.
- Adjust conditions so that evaporation takes place when ever required.
- Spray calcium chloride(1g/litre water) or bleaching powder (2-3g in 15 liter water) if calcium chloride is not available.
- Keep nematodes under check as they play important role in spreading of bacterial diseases

Disease management schedule for button mushroom crop

The five steps mentioned below must be followed for the management of button mushroom diseases

Step 1: One spray of chlorothalonil (1g/liter water) on 2nd days after casing.

Step 2: Second spray of carbendazim (1g/liter water) 7 days after first spray (or before pinhead formation)

Step 3: Spray of calcium carbonate (1g/liter water) on completion of first flush followed by spray of calcium chloride (1g/liter water) after 2 days.

Step 4: Repeat the third step on completion of second flush (if 3rd flush is to be taken)

Step 5: Treat the used bags and room with formalin (2%) and keep the door closed for at least 3 days + Post crop cook out at $\geq 70^0$C temperature (for 6-8hr).

Important points:

1. Always add the appropriate quantity of all the ingredients of compost like gypsum etc.
2. Pasteurization of casing soil must be done at 65-67^{0}C temperature for 6-8hr.
3. Always remember the levels of pH (7.1 to 7.5) and nitrogen level of compost (above 2% at the time of spawning).
4. Don't release raw steam at the time of pasteurization of compost and casing soil.
5. During spawn run room temperature should not go beyond 27^{0}C and during cropping period it must be between 16-18^{0}C.
6. The moisture (%) level of casing soil and compost should be proper.
7. Compost should not be prepared on the open filed and it should be prepared on concrete floor.
8. Cook out at $\geq$70^{0}C temperature (for 6-8hr) is the best method to make your mushroom house disease free.
9. Mushroom flies must be kept under control using suitable control measures.

etc…

Thanks

Dr. Anil Kumar, Scientist (Plant Pathology)
Mob. No. 9568233711 E-mail id:
anilrao_mpp@yahoo.co.in

ICAR- Directorate of Mushroom Research,
Chambaghat, Solan (HP)
खुम्ब अनुसंधान निदेशालय *(भारतीय कृषि अनुसंधान परिषद्)*
चम्बाघाट, सोलन (हि.प्र.)–173213