

Oyster Mushroom Cultivation

Part II. Oyster Mushrooms

Chapter 8

Pest and Disease Management

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Jae-Soon Cha

Chungbuk National University, Korea

A wide range of diseases and pests can cause serious problems in mushroom cultivation, and management of those diseases and pests is a key factor in successful mushroom production. The main reasons for the existence of many diseases and pests problems in mushroom cultivation can be summarized as

- Mushroom cultivation conditions such as high humidity and warm temperature are favored by many pathogens and pests.
- There is a limit on chemical use for control of diseases or pests in mushroom cultivation.
- Pathogens and pests are readily attracted inside and/or outside mushroom houses involved with continuous cultivation.
- Growing houses are not usually well equipped for environmental control.

Basic Practices for Disease and Pest Management

- Sanitation and strict hygiene are the most important preventive methods for pest and disease control. Without them, effective disease or pest control will never be achieved. Every practice must focus on exclusion and elimination of pathogens or pests.
- Keep doors closed and avoid any practices that expose substrates to pathogens or pests during spawning.
- Keep mushroom flies from entering mushroom houses by installing screens on windows and doors.
- Inspect mushroom bags or beds carefully for early detection of pests and diseases.
- Keep mushroom bags or beds clean by removing any mushroom debris or mushroom stumps shortly after harvest.
- Keep the floors clean. Do not dump any waste near mushroom houses, which can attract mushroom flies.
- Disinfect or pasteurize spent substrate before removing it from mushroom houses after cultivation.
- Clean and disinfect mushroom houses thoroughly before a new crop.
- Clean and disinfect equipment frequently.
- Wear clean clothes and shoes and wash hands before entering mushroom houses.

GREEN MOLD AND *HYPOCREA* DISEASE

Any disease caused by green colored mold (fungi) on mushroom bags or beds is called “green mold disease.” Green color showed by the fungi comes from their spores, not from hyphae. Hyphal color of the fungi is usually white. More than 30 fungi are reported as casual agents of green mold disease on mushrooms. *Trichoderma* spp., one of the major pathogens of green mold disease, reproduce by asexual spores – green conidiospores. However, some of *Trichoderma* spp. have not only asexual cycle but also a sexual stage (*Hypocrea* spp). *Hypocrea* spp. form white or brown stroma in which sexual spores, ascospores are formed. Recently *Hypocrea* spp. that do not produce asexual stage in their life cycle have been shown to cause a severe problem in oyster mushroom cultivation in Korea.

Pathogens

- Major pathogens of green mold disease on oyster mushroom are reported as *Trichoderma virens* (= *Gliocladium virens*), *T. viride*, *T. harzianum*, and *T. koningii* in Korea.
- *Hypocrea* sp. forms white or brown stromata for *Hypocrea* disease.
- Major pathogens of green mold can vary dependant on region or cultivation method or medium because more than thirty fungi are known to cause green mold on mushrooms, and pathogenicity or proliferation conditions of each fungus are different. For example, *T. harzianum* 2 is a major pathogen of green mold in Europe, while *T. harzianum* 4 is a major pathogen in the USA on button mushrooms.

Symptoms

- Hyphal growth stage of pathogens in mushroom bag or on mushroom bed is difficult to distinguish from mushroom hyphae by color since both are white. However, green mold fungi form denser mycelia and more aerial hyphae than oyster mushroom.
- Green color appears when pathogen produces conidiospores from aerial hyphae. If pathogen was introduced at the spawning stage, green patch usually appears 10-15 days later on cultivation bed.
- It is difficult to early identify *Hypocrea* spp. because they do not turn the infected area green and a white stroma formed by *Hypocrea* spp. is similar to the primordia of oyster mushroom.
- If stroma appears, the pathogen has already occupied the substrate deeply and to a wide extent.
- Mushroom hyphae stop their growth around the green patch and are gradually covered by green mold.



Figure 1, 2. Green mold on cotton waste substrate



Figure 3. White stroma of *Hypocrea* sp. on cotton waste substrate
(Photo courtesy of Seung-Hun You)



Figure 4. White stroma of *Hypocrea* sp. on rice straw substrate



Figure 5. Brown stroma of *Hypocrea* sp.

Control Measures

- Sanitation and hygiene are the most important control methods for green mold disease. Stick to the **“Basic Practices for Disease and Pest Management.”**
- Severe infestations with green mold are found in poorly pasteurized substrates with uneven moisture content.
- Do not use green mold-contaminated spawn. Any green patch in or around spawn bottles is a major source of pathogenic spores. Dust from a green patch can provide inoculum for whole mushroom bags or beds at the inoculation stage.
- Observe carefully mushroom substrates during hyphal growth stage, and remove or treat any spot with dense white mycelial growth indicating green mold mycelia. Spray or drench with a 500 ppm solution of Sporgon (prochloraz-manganese complex; 50%) on the spot.
- Spraying the affected parts with 250-500 ppm of Sporgon before pasteurization is reported to prevent green mold and *Hypocrea* disease.
- Benomyl and thiabendazole are also known as control agents for green mold disease. However, resistant strains of the pathogens are more common in Korea, and recent results of experiment showed that prochloraz-manganese complex is by far the most effective.