Factsheet 10/08

Mushrooms

Projects M13, M14a, M22, M26a, M29, M30 and M33

Horticultural Development Company

Bradbourne House
East Malling
Kent ME19 6DZ
T: 01732 848383
F: 01732 848498
E: hdc@hdc.org.uk

Identification and control of Cobweb disease on mushrooms

Helen Grogan, Teagasc and Richard Gaze, WHRI & ADAS

This factsheet is a summary of the most important information currently available on Cobweb disease (*Cladobotryum* spp.). Its objective is to provide guidance on the recognition, prevention and control of the disease.

Introduction

For many years Cobweb disease (Figure 1) was of little importance, causing minor and short lived problems, particularly in the Autumn, when it can be present on mushrooms growing in the wild. In the early 1990s however it became a serious, widespread and persistent disease of epidemic proportions. Many factors may have led to this change, including modern growing practices and the emergence of fungicide resistance within the pathogen population. Today, while the disease is no longer at epidemic levels, it remains potentially capable of causing significant crop losses if not controlled.

1 Cobweb spreading over casing and crop

Symptoms

The characteristic symptom of *Cladobotryum* infection is patches of white cobweb-like mycelium, from which the common name of the disease is derived, spreading over the casing surface (Figure 2). This can be quite diffuse and difficult to see initially. When the *Cladobotryum* mycelium envelopes a mushroom sporophore, it causes a wet brown rot as shown in Figure 3. Eventually the cobweb-like mycelium produces masses of spores making the patches of mycelium look more dense and powdery.

If spores from these patches of Cobweb become airborne and alight on mushrooms they cause cap spotting which can be very extensive throughout a crop as shown in Figure 4. Sometimes cap spotting is the first symptom that is seen when an original patch of Cobweb has been overlooked. It is not possible to distinguish spots caused by *Cladobotryum* from those caused by *Trichoderma* and some other pathogens so laboratory identification may be necessary. Diagnostic services are available from the CSL Plant Clinic in the UK and Teagasc in Ireland – See Further Information on page 4.

2 Cobweb becoming visible on casing

3 Wet brown rot on cap

4 Cap spotting caused by Cobweb

Biology and Epidemiology

Cobweb disease (also known by its old Latin name *Dactylium*) can be caused by several related pathogens, *Cladobotryum dendroides, C. mycophilum* Type 1, *C. mycophilum* Type 2 and several other *Cladobotryum species*. The most commonly found species in the recent epidemic was *C. mycophilum* Type 2. This strain grows and sporulates more rapidly and produces more spores than either *C. dendroides* or *C. mycophilum* Type 1. Thus, *C. mycophilum* Type 2 tends to be more rampant and more difficult to control.

Cladobotryum spores will germinate and grow through casing, producing a fine cobweb-like mycelium within about four days that envelopes any mushrooms in its path. Infected mushrooms rapidly deteriorate due to the onset of a wet rot.

Once the pathogen has encountered a mushroom food source it will start to produce masses of dry spores not only on the infected mushroom but also on any mycelium that has colonised the adjacent casing. If the spores are physically disturbed (eg by the application of water or salt) they become airborne and are rapidly distributed throughout the growing room by the air conditioning system. Warm (18–25°C) and moist (85–95% RH) conditions are most favourable for their production. Once spores land on casing in which *Agaricus* mycelium is growing, a new Cobweb colony can develop and sporulate in as little as six days.

As with many pathogens the original source of infection is usually unclear but *Cladobotryum* spp. can be found infecting wild mushrooms in the autumn. Once an outbreak occurs on a farm, however, it is very mobile due to its dry airborne spores. A single untreated patch of disease in a first flush can result in total crop loss by the second. All stages of production from casing onwards are vulnerable to infection.

Prevention

There are no specific preventative measures for Cobweb disease but the preventative measures for pathogens in general are effective and essential. These consist of rigorous protection of casing from delivery to application, subsequent filtration of cropping houses to exclude entry of dust, continuous scrutiny of developing crops for the presence of disease and an effective steam cook out in situ at crop termination.

Control

If the disease does appear, preventing the spread of pathogen spores has been shown by the HDC funded research programme to be a highly effective control measure.

Early and comprehensive identification of Cobweb patches is essential so that they can be treated **before** watering takes place. Watering over untreated areas of infection will result in a massive spore load being spread throughout the crop.

Salt application

Ironically, the traditional method of treating disease by covering with salt has also been shown to be effective in causing the *Cladobotryum* spores to become airborne so great care must be taken to prevent this happening. The correct process is illustrated in Figures 5–8.

- The patches of disease must first be gently covered with damp tissue, to prevent the spores becoming airborne.
- The tissue should then be covered with fine grained salt. The salt application should first seal the edges of the tissue to prevent the escape of spores.
- Once the edges are sealed, more salt should be applied to completely cover the tissue and underlying patch of Cobweb.

During this process, and during watering, the air conditioning should be temporarily turned off to minimise the spread of any spores that may have escaped into the air.

Chemical control

In the past, the choice of chemical to control Cobweb depended on the resistance status of the offending pathogen isolate with regard to different fungicides. With the loss of all but prochloraz this is now of academic interest only.

Prochloraz (Sporgon 50WP) is still moderately effective against a wide range of *Cladobotryum* isolates. It will not prevent cap-spotting symptoms from developing if spores land on mushrooms but it will slow down the growth of Cobweb on the casing. Due to this partial effectiveness it is particularly important to achieve accurate dosing and delivery of the fungicide and to be aware of the possibility of prochloraz degradation as the crop progresses. It will still be necessary to identify any Cobweb patches that do occur and to treat them with salt as described to prevent spotting symptoms and further spread of the disease.

5 Careful placing of tissue

6 Sealing the edge of the tissue first

7 Edge completely sealed

8 Finally covering the tissue

Key action points for control of Cobweb

General preventative measures

- Protect casing from dust contamination once it has been delivered and during storage and application.
- Install dust filters on cropping houses.
- Ensure that in situ steam cook out of crops is effective.
- Examine crops constantly for disease.

Specific control measures

- Intensify crop examination once Cobweb has been identified.
- **Never** water untreated crops.
- To prevent spores becoming air borne cover all areas of disease with damp tissue before applying salt and apply salt carefully working from the out-side edge inwards.
- Turn off the air conditioning during operations likely to disturb spores (eg watering and tissue-salting).
- Cook out diseased crops in situ.
- If control proves difficult then do not apply water flushes.
- Reduce crops to two flushes if control proves difficult.
- Use prochloraz as efficiently as possible.

Further information

In the UK identification and clinic services can be obtained from:
Plant Clinic
Central Science Laboratory (CSL)
Sand Hutton
York
YO41 1LZ
Submission forms are available from:
www.csldiagnostics.co.uk
Customer helpline. (01904) 462324
Email. diagnosis@csl.gov.uk

In Ireland identification and clinic services can be obtained from:
Dr Helen Grogan
Horticultural Development Unit
Teagasc
Kinsealy R&D Centre
Malahide Road
Dublin 17
Ireland
Tel. 01 845 9023
Email. Helen.grogan@teagasc.ie

Further information: Full copies of the final reports for HDC projects M 13, M 14a, M 22, M 26a, M 29, M 30 and M 33 are available to HDC members from the HDC office (01732 848383) or website www.hdc.org.uk

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