

## INSECTS-DISEASES-PESTS

## CHALKBROOD IN ALFALFA LEAFCUTTING BEES

Chalkbrood is prevalent in some of the alfalfa seed producing regions in the western U.S. and has recently been recorded in some provinces of western Canada. It can result in heavy leafcutting bee (*Megachile rotundata*) losses in a relatively short time. There is no cure at present; the cause and symptoms and measures for control or possible eradication are detailed below.

**Cause**

Chalkbrood is a disease of leafcutting bee larvae, caused by the fungus *Ascosphaera aggregata*. Other species of *Ascosphaera* are common in leafcutting bee cells, usually growing on pollen stores, but do not appear to be pathogenic to the bees. The chalkbrood disease of honeybee larvae is caused by a different fungus species which does not harm the leafcutting bee.

**Spread**

Chalkbrood is spread by the spores of the fungus, which can remain infective for many years. They may be introduced into an area on contaminated equipment or nesting material or by infected bee cells and leaf material.

**Symptoms of infected larvae**

Infected larvae shrink and harden. Their interiors turn chalk white from the fungal growth and their outer surfaces become glossy and cellophane-like. Some of the dead larvae remain white, but most turn dark grey to black. Cells containing such larvae are fragile and collapse easily.

**Methods of infection**

Only larvae become infected by chalkbrood. A healthy larva is infected when it eats pollen that is contaminated with chalkbrood spores. When these spores germinate, the fungus grows inside the gut of the larva, and later moves through the wall of the gut into the body cavity. The fungus eventually forms black spore cysts under the skin. These mature, shatter and disperse a large number of new spores. The continued growth of the fungus eventually kills the larva.

**Contamination of pollen**

If emerging bees crawl through infected leaf material or chew through infected dead larva, they become

covered with massive numbers of spores that adhere to their body hairs. These new adults then contaminate their mates, eggs and pollen provisions.

**Preventing entry of infected material**

- Ensure that each consignment of cells purchased has been screened for chalkbrood.
- If cells are brought into an area from an outside location, run the consignment separately and isolate the offspring until they are screened for chalkbrood.
- Disinfect all nesting material, equipment and storage facilities annually.
- Use the loose-cell management system. Tumble groups of cells to break them into individual cells. Chalkbrood cadavers are light and a large percentage can be removed during tumbling. Breaking up the groupings will also ensure that the new adults do not have to chew through chalkbrood cadavers to emerge; an emerging bee can become dusted with up to 300 million spores when it chews through such a cadaver.
- If equipment has to be shared, ensure that it is properly disinfected before and after use. Avoid sharing equipment whenever possible.
- After bee emergence is complete, incinerate all leaf debris from the incubation trays.
- Relocate field shelters each year to prevent buildup of fungal spores around them. Spray shelters and surrounding ground with a 5% sodium hypochlorite solution (household bleach) after nesting boxes are taken indoors.

**Control and eradication**

For control and possible eradication of chalkbrood, use the following in conjunction with prevention methods.

- Remove infected cells, nesting material and incubation trays from area.
- Disinfect storage facilities and all equipment that cannot be moved from area.
- In the early spring, burn top growth in any alfalfa field where infected bees were used for pollination in the previous growing season.
- If possible, do not use leafcutting bees or other pollinators in the above field during the following growing season. Then place trap nests in the field





Healthy larva



Chalkbrood-infected larva



Chalkbrood-infected larva



Chalkbrood-infected larva

to determine whether bees are still in the area. If so, screen samples of their larvae for chalkbrood.

- If 'clean' leafcutting bees have to be introduced into a field where chalkbrood-infected cells were found in the previous growing season, follow procedures recommended for preventing entry.
- If the offspring of the 'clean' bees are disease-free, sterilize cells before use as an added precaution. If offspring are infected, then remove them from the area.

#### Disinfection of bee cells and equipment

Any practice used to control fungus or mold will also help control chalkbrood.

**LEAF-CUTTING BEE CELLS** Cells can be surface-sterilized by immersing them in a 3% sodium hypochlorite (household bleach) solution for 1-2 minutes. The cells should then be dried away from direct sunlight or excessive heat. Do this *before* incubation.

**NESTING MATERIAL** It is preferable to incinerate all nesting material that is known to have contained chalkbrood-infected cells. If this is not possible, disinfect it.

Wood nesting material can be disinfected by placing in an oven at 100°C for 24 hours. Both wood and

polystyrene nesting boards can be dipped in a 5% sodium hypochlorite solution, or a 3-5% solution of stabilized dry chlorine to which a wetting agent has been added. Disinfect the boards in the spring and dry them completely before use. Some loss of nesting material due to cracking or warping is inevitable.

**SHELTERS, EQUIPMENT AND STORAGE FACILITIES** To disinfect shelters, equipment (e.g., strippers and tumblers) and storage facilities, use a mist spray of a 5% sodium hypochlorite solution.

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