ATTTA
Atlantic Tech Transfer Team for Apiculture

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Wax Moth

The Greater and Lesser Wax Moth

There are two primary species of wax moth that can infest a western honey bee hive – the greater wax moth (*Galleria mellonella*) and the lesser wax moth (*Achroia grisella*). In Canada, both species can cause significant damage to honey bee colonies by feeding on beeswax, pollen and remains of honey bee larvae[1]. The greater wax moth larvae are creamy white but turn grey after reaching their fully grown size of 28mm in length[2,3]. The lesser wax moth larvae are smaller at approximately 20mm in length[3]. In Canada, the greater wax moth is usually the cause of hive damage[1,3], and therefore will be the primary management focus for this document.

Figure 1. Galleria mellonella larvae (© Ellis, University of Florida)

Life Cycle

Adult stage greater wax moths are nocturnal and therefore are mostly active during warm evenings of the summer months[1]. Mated female moths can lay up to 300 eggs on comb and in cracks between frames, lids and supers[1,2]. Wax moths prefer to lay eggs on dark brood comb or comb that is littered with hive debris[1].

When larvae hatch they begin to move throughout the comb forming feeding tunnels that are covered with silk-like fibres that form insulative webbing[1,2]. The dense webbing makes removal of the larvae by worker bees difficult, especially in heavier infestations[1].

Figure 2. Wax moth damage[5] (VitaBeeHealth©2020).

Prior to entering the pupal stage, mature larvae spin tough, white cocoons between frames, supers and underneath hive lids[1]. Eventually adult moths emerge from the cocoon and mate outside the hive, continuing the life cycle[1].

In Canada, wax moth overwinters as mature larvae and pupae[1]. Both availability of food and climate will impact the number of generations of wax moth per year[1].

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Damage

The larvae of wax moths typically tunnel within the comb while leaving webbing and frass throughout the hive[1,2]. Most often this pest is an issue with stored beekeeping equipment but can also be a problem with weaker active colonies[1]. Left unattended, wax moths can destroy weak colonies within one season[2]. Common signs of wax moth damage include tunnels in comb, silk trails, frass (small dark specs) on bottom board, presence of silk cocoons, destroyed comb and the presence of larvae throughout the hive[2].

Differentiation to Small Hive Beetle

At some instar larval stages the greater wax can look similar to another hive pest known as the small hive beetle. This is not true of all instar larval stages. Therefore, it is important that beekeepers know how to correctly identify wax moth larvae. The distinguishing feature of wax moths is three sets of thoracic legs on the back of their body, and they have sets of uniform legs across their body. In contrast, small hive beetles only have three sets of thoracic legs without additional legs[1,3].

Figure 3. (A) Greater wax moth (Galleria mellonella) early-stage larvae (© Buss, University of Florida); (B) Small Hive Beetle (Aathini tumida) late-stage larvae (© Ellis, University of Florida).

By the final in-hive stage for small hive beetle larvae (L3) and the final larval stage of the greater wax moth larvae (L6/7) there is a clear size difference - 10mm vs 28mm respectively. Figure 4 shows a relative comparison of the later instar (larval) stages for each pest.

Figure 4. Late-stage greater wax moth larvae (Galleria mellonella) (top) compared to a late-stage small hive beetle (Aathini tumida) (© University of Georgia).

Management of the Greater Wax Moth

In most cases, wax moth infestations occur in unmonitored frames of comb being stored. The moths prefer infesting stored combs that are not actively populated by bees[1]. When beekeepers transport these frames between colonies, they can accidentally spread larvae to other hives. Additionally, unmonitored colonies, and weak colonies, of bees can become infested[1].

An integrated pest management strategy utilizing cultural, physical and biopesticide controls can be effective at decreasing damage caused by wax moth[1].

Cultural Practices

Cultural practices are one of the most useful tools for beekeepers to prevent greater wax moth infestations. This includes:

- keeping colonies strong with adequate food sources[1,8]
- sealing cracks of hive equipment[8]
- regular removal of wax and debris from bottom boards[1]
- avoiding unnecessary exposure to pesticides that can weaken the colony and increase the risk of wax moth infestations (this also includes using only registered products and following the label directions)[1,8]
- replacing combs regularly (remember that wax moths prefer older dark brood comb because these frames have more debris and provide a higher nutritive value to developing larvae)[1,8]
- destroying combs showing high levels of infestation[8]
- proper storage of used hive equipment and hive products (such as wax, honey and pollen)[1,8]

All hive equipment should be stored in a closed building or storage container and should not be left outside. In some provinces it is against provincial beekeeping regulations to leave used hive equipment accessible to bees outside their possession, care or control[9,10]. Leaving used equipment within an apiary or within close proximity to an apiary can promote robbing and the spread of pests and disease, such as infestations of wax moth[8].

If possible, equipment should be stored in well-lit areas with good ventilation. Light deters female moths from laying eggs[2] as does good air flow between supers[8]. Alternatively, it is also common practice to seal up stacks of supers to prevent wax moth from having access to equipment, which can be done using pallet wrap or sealed garbage bags – best practice is to do this after freezing equipment[8].

Physical Control

Cold treatment of comb and contaminated beekeeping equipment is effective in eliminating all life stages of the greater wax moth[1]. To be effective, equipment should be stored at -15˚C for 2hr, -12˚C for 3hr, -7˚C for 5hr, or 2˚C for 240hr[1,2,8].

Heat treatment of comb can also eliminate all stages of the greater wax moth. To be effective, equipment should be stored at 46˚C for 80min or 49˚C for 40min, but any higher temperature than that will soften and distort the wax[2,8].

Biological Control

A number of biological controls, such as the microbial pesticide *Bacillus thuringiensis* (bacterium that occurs naturally in soil), a parasitic wasp, red imported fire ants, a larval ectoparasitoid, a nuclear polyhedrosis virus, and the use of semiochemicals, have all been identified as potentially effective control agents against the greater wax moth[1,2,8]. However, only one of the mentioned biological controls is currently registered for use in Canada.

Certan®, containing the active microbial pesticide *Bacillus thuringiensis* is currently available to Canadian beekeepers commercially. Certan® has been approved through an Emergency Registration in Manitoba, Nova Scotia, New Brunswick and Prince Edward Island until May 8, 2026.

Figure 5. Certan®11 (©Dancing Bee Equipment).

Certan®, with *Bacillus thuringiensis* as the active ingredient (Bta ABTS 1857), controls wax moth infestations by producing a crystallized protein that is toxic to the greater wax moth larvae[11,12]. This micro-organism is harmless to humans and honey bees, leaves no residue in wax or honey and does not alter the taste of honey[11,12].

The product is intended to be used after the honey harvest on frames prior to storing equipment and it will kill young wax moth larvae[11,12]. **Therefore, the product is intended to be used prior to wax moth infestations**[11,12]. The product is not to be used in active honey bee colonies. A single application of the product will provide very high efficacy against wax moth until the following season[11,12].

Application of Certan® must follow the manufacturers label instructions.

Chemical Control

There are no currently registered chemical control products specifically for use against greater wax moth or lesser wax moth infestations in stored equipment or active colonies in Canada. It is important that beekeepers understand that the use of organic acids (ex. acetic acid) and/or essential oils (ex. lavender) are not registered as products to use against wax moth, and, therefore, should not be used in beekeeping practices for the safety of honey bees and humans.

Summary

Although wax moth continues to be a challenge to bee health and the Canadian beekeeping industry, there are options available to beekeepers to help prevent and treat wax moth infestations.

Overall, the best way to prevent wax moth infestations is through good beekeeping practices. Beekeepers should strive to manage strong and healthy colonies, free of other pests and diseases, and they should make sure colonies have adequate food stores. Beekeepers should check for signs of wax moth each time they do a hive inspection.

Used equipment should be stored properly to prevent wax moth infestations. Ideally, non-infested equipment should be stored inside a building and sealed using pallet wrap or garbage bags.

If needed, temperature treatment of comb can eliminate all stages of wax moth prior to storing non-infested equipment. Using temperature treatment is also good practice if a beekeeper wants to be certain that no wax moth is present prior to storing equipment.

Finally, there is one biological product available to treat beekeeping equipment against the greater wax moth – Certan®.

For additional information or potential questions on wax moth management in Atlantic Canada, please reach out to the Atlantic Tech Transfer Team for Apiculture at: attta@perennia.ca.

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