

Controlling Wax Moths in Honeycombs

In 1976 the Greater Wax Moth, *Galleria mellonella*, caused an estimated \$4 million loss in the U.S. beekeeping industry. Undoubtedly some of the damage attributed to the Greater Wax Moth was actually the work of the Lesser Wax Moth, *Achroia grisella*. The larvae of both species burrow through the combs, leaving a trail of debris and silken webbed tunnels. Entire supers of comb may be reduced to wood and wire in a relatively short time.

The larvae of the wax moth, not the winged adults, are destructive. Larvae live from 1 to 5 months, depending on the temperature and food supply, and may increase the size twenty-twofold; from one twenty-fifth to seven-eighths of an inch or better. The temperatures most suitable for growth are between 85° and 95° F (29° and 35° C), while no activity is noted below 45° F (7° C). Larvae derive most of their nourishment from impurities such as pollen, cocoons, and honey incorporated in the comb rather than from the beeswax itself. Accordingly the larvae prefer older, darker brood comb rather than newly drawn comb or foundation. Accumulated capings and scrapings also may be attacked if not rendered into pure wax. Even comb honey may be infested, given favorable conditions for larval growth.

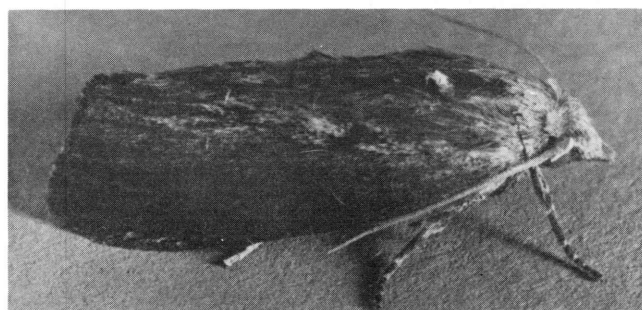
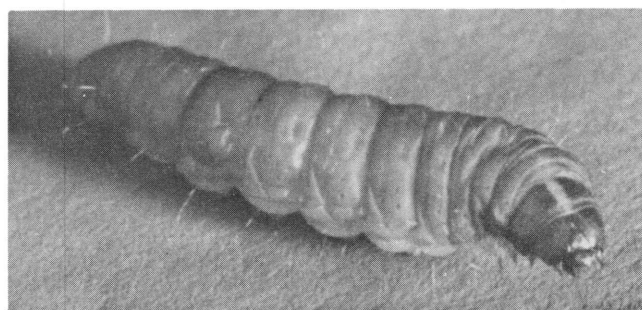
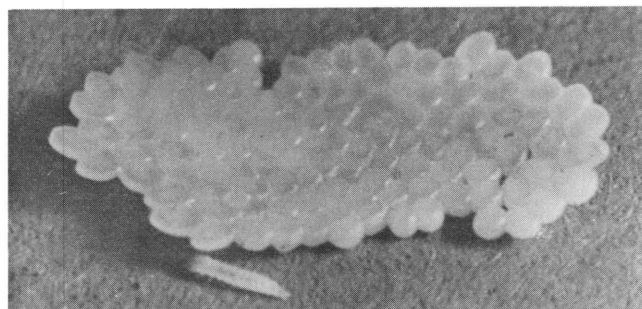
Most of the damage occurs while combs are in storage, but infestations can develop in the field in hives under stress from starvation, extended queenlessness, disease, or pesticide kill. Wax moths do not destroy healthy colonies in the field, but if colonies are weak, wax moth infestations will hasten their demise.

To protect stored combs it is necessary to destroy existing stages of the moth and prevent reinfestation. The methods most often used include both chemical and nonchemical control and apply to both species of wax moth.

Chemical Control

Fumigation

- The fumigant most readily available is moth crystals—paradichlorobenzene (PDB). *Warning: Do not use PDB on combs containing honey intended for human consumption, as honey readily picks up the odor.* The gas formed by the volatilization of PDB is colorless, nonflammable, and heavier than air. Volatilization is most pronounced at temperatures



Eggmass, larva, and adult female wax moth. The wax moth larvae are the destructive stage.

above 70° F (21° C) and increases as the temperature rises. PDB is effective on all but the egg stage of the wax moth and will not harm bees so long as the fumigated combs are allowed to air thoroughly before being placed in a hive.

To administer treatment, stack supers (not more than 5 deep supers nor 10 shallows high) on a square of plywood or other firm base. Tape all seams and holes to insure that the heavy gas will not escape through cracks, holes, or openings at the base. Sprinkle 6 to 8 tablespoons (170 to 227g) of PDB crystals on a piece of cardboard or wire screen and



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place on the top bars of the uppermost super in each stack. A tight-fitting cover will complete the preparations.

Check the PDB crystals at monthly intervals and renew treatment if needed to insure protection throughout the storage period. If only several supers are to be treated, seal them within a large plastic garbage bag, along with an adequate dosage of fumigant. Confinement of PDB fumes should provide effective fumigation.

- Another material, 1, 2 dibromoethane commonly called ethylene dibromide (EDB), is also an effective fumigant. EDB is presently under government review, however, and its future use and availability is dependent upon action by the Environmental Protection Agency. *Warning: Use EDB only on combs containing honey that is not intended for human consumption.* EDB is a heavy, clear liquid which forms a colorless, nonflammable gas heavier than air. Evaporation occurs readily at temperatures above 70° F (21° C), and the resulting fumes are effective in destroying all stages of the wax moth. EDB-treated supers will not harm bees provided the supers are aired thoroughly before being placed on an active colony.

Administer treatment in a well-ventilated area away from human traffic. Prepare supers to be fumigated in much the same manner as for PDB, and make the stack as airtight as possible. Stacks should not exceed a depth of 8 deep supers or 12 to 16 shallows. Place a piece of burlap or other absorbent material on the top bars of the top super, and sprinkle with 1 to 2 tablespoons (20 to 40g) of EDB. Add a tight cover and continue fumigation without disturbance for at least 24 hours.

In commercial operations, fumigation is conducted in an airtight room. Stacks of supers are left open at both top and bottom to insure adequate circulation. EDB is administered at a rate of 2 pounds (.91 kg) per 1,000 cubic feet (30 cubic meters) of storage space.

- Carbon dioxide is effective against all stages of the wax moth. It may be used on both full honeycombs and extracted combs. Its use involves careful control of temperature and humidity and requires a relatively airtight facility. Since this facility is generally not available to the small beekeeper, it is not commonly used.

To fumigate with CO₂, stack supers off the floor, with no cover or bottom board. Maintain concentration of 98 percent carbon dioxide for 4 hours to insure effective fumigation. A temperature of 100° F (38° C) and 50 percent relative humidity throughout the 4-hour period is also required.

Nonchemical Control

Temperature extremes

A benefit of nonchemical control is freedom from the risk of chemical contamination of marketable honey. High or low temperatures will destroy all stages of the Greater Wax Moth. However, reinfestation can and will occur if temperature-treated equipment is not stored in moth-free, well-lighted, ventilated rooms. Inspect stored equipment periodically for signs of reinfestation, especially if temperatures exceed 60° F (16° C) for any length of time.

Heat treatment

In many operations, the honey house may be converted to a hot room by the addition of several electric heater units. To enhance circulation, place one or more ventilation fans about the hot room. Stack supers off the floor, with circulation at the top and bottom of the stack. Efficient exposure times and temperatures for wax moth control are 40 minutes at 120° F (54° C) or 80 minutes at 115° F (46° C).

Allow the combs to reach the required temperature before recording exposure time. After treatment, allow combs to cool before attempting to move supers to storage. Never expose combs to temperatures greater than 120° F (54° C). *Do not heat full honeycombs at any time.* Heat-softened wax will collapse under the weight of the honey.

Cold treatment

This is a more practical means of protecting comb honey against infestation. To administer cold treatment, stack supers in a walk-in or home freezer, with adequate top and bottom circulation. Circulation fans may help in large freezer units. It is important to allow the combs to reach freezer temperature before recording exposure time. Frozen combs will shatter if subjected to impact. After treatment, allow combs to warm up before moving them. Exposure time varies with the temperature of the freezer unit: 2 hours at 0° F (-18° C); 3 hours at 10° F (-12° C); or 4½ hours at 20° F (-7° C).

Wax moths avoid sunlight and fresh air. Combs in supers that are turned on end and exposed to light and ventilation will rarely be attacked. Never store combs in heated buildings. Since wax moths are repelled by printer's ink, place sheets of newspaper between supers in a stack to reduce the spread of larvae from one super to the next.

No matter what the form of protection used, frequent inspection of stored equipment is the only sure way to avoid wax moth damage.

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