

INCIDENCE OF THE HONEY BEE PARASITE *ACARAPIS WOODI* (RENNIE) (ACARI: TARSONEMIDAE) IN GEORGIA AND IMPLEMENTATION OF AN ERADICATION PROGRAM

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ABSTRACT

The detection of the honey bee tracheal mite in the U. S. in 1984 caused the Georgia Department of Agriculture to adopt a regulatory program to deal with the possible invasion of the mite into Georgia. A mite infestation in Georgia first was discovered in April 1985 during a routine bee inspection by the Georgia Department of Agriculture. Quarantine and destruction of the infested apiary and a quarantine of all yards within a 2-mile radius was imposed.

Key Words: *Acarapis woodi*, honey bee, eradication.

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INTRODUCTION

The honey bee tracheal mite, *Acarapis woodi* (Rennie), causes acarine disease in adult honey bees, *Apis mellifera* L., by invading the tracheal system. Infestation by *A. woodi* may lead to premature death of the bees and reduce honey production (Shimanuki and Cantwell 1978). Flight of infested bees usually becomes impaired, probably as the result of inhibited gas exchange in tracheae servicing the flight muscles (Shimanuki and Cantwell 1978). Tracheal damage results from feeding punctures made by mites to derive nourishment from the hemolymph (Anderson 1928). In addition to increased numbers of crawling bees, another reported symptom of mite infection is the abnormal position of wings in infested bees which appear forked due to the abnormal hooking of fore- and hindwings (Sardar 1956).

Gochnauer et al. (1978) claim that although the mites may not kill a colony immediately, colony death is possible because mite-weakened bees may be predisposed to infection by other pathogens. This, in combination with unfavorable weather conditions, scarcity of pollen, or a poor foraging season, may increase colony mortality in winter (U. S. Plant Protection and Quarantine 1984). Much conflicting information about the severity of mite infestations exists and the Georgia Department of Agriculture adopted a quarantine and depopulation policy.

The first report of *A. woodi* in the United States was in 1984 at Weslaco, TX, (Gruszka 1984). By June 1985, twenty states reported the presence of *A. woodi*, including Alabama, Florida, Louisiana, and North Carolina (California Department of Food and Agriculture 1985). An infestation of *A. woodi* was found in Thomas

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County, GA, in April 1985. The discovery was made during routine tracheal mite sampling that had been performed during each apiary inspection of queen and package bee operations since September 1984. An eradication program was implemented immediately, and is described here.

MATERIALS AND METHODS

Field Collection

The sampling procedure used was a design specified by USDA APHIS PPQ (1984) in its Action Plan for tracheal mites. A sample consisting of 100 bees was collected from each selected apiary. This collection was a pooled sample of 5 to 10 bees from each colony. Moribund bees that were crawling near the hive entrance were collected. Bees that were dead for an indeterminate period were not included in the sample.

Bees were collected randomly by combinations of the methods that follow. Bees were captured at the entrance as they were leaving or returning to the hive. Bees collected within the hive were taken from under the hive cover, or were taken only from honeycomb because brood comb generally had young bees unlikely to be infested. End hives in a bee yard or hives at or near a honey house that may have had a mix of stray bees were included in the sampling.

Bees were killed immediately in a killing jar and then transferred into a container partially filled with 70% alcohol, or bees were placed directly into the alcohol.

Laboratory Inspection

From the 100 bees per apiary, 50 bees were selected at random for dissection and preparation for examination. Dissection involved a procedure similar to that described by Shimanuki and Cantwell (1978). Although several methods have been suggested by other researchers, the procedure described here has been the least expensive, most rapid, and most efficient for our purposes.

Each bee was placed supine on a wax-bottomed dissection dish. The head and forelegs were scraped from the body with a scalpel, and discarded. A thin transverse section of the mesothorax anterior to the mesocoxae and wing bases were cut in such a way to obtain a disc. The remaining thorax and abdomen were discarded. The discs, which contained the spiracles and tracheal trunks, were removed and placed in 20 ml of 5% potassium hydroxide aqueous solution (KOH). The discs were stored at room temperature for 48-72 hours or in a 90°F environmental chamber for the 24 hours to dissolve the soft tissues and to expose the tracheae for clear viewing under a microscope.

After clearing, each disc was examined under a dissecting microscope at 50×. Discs with clear or whitish tracheae were diagnosed as healthy. Brownish, discolored, or scarred tracheae were indicative of mite damage. When mites were present or when mite damage was evident, the tracheae were removed from the section and placed on a microscope slide. The slide mount was prepared with Permout mounting medium (Fisher Scientific Co., Fair Lawn, NJ) and a glass cover slip. Mounted mites were sent to the Beneficial Insects Laboratory, USDA APHIS PPQ, Beltsville, MD, for species confirmation. However, because no other mite inhabits honey bee tracheal trunks (Shimanuki and Cantwell 1978), any mite found there can be considered as *A. woodi*.

QUARANTINE AND ERADICATION

Any apiary found free of mites was issued a mite-free certificate by the Georgia Department of Agriculture. If damaged tracheae were observed but not mites could be located, the remainder of the sample was prepared, cleared, and examined. Presence of a single mite invoked a quarantine of the area surrounding the original collection site.

Any apiary found infested with *A. woodi* and all apiaries within a 3.2-km (2-mile) radius of the infested yard, were placed under quarantine for a minimum of 60 days. All honey bees in the hives in the infested apiary were destroyed as soon as possible. The hives were fumigated with cyanide gas or other chemical fumigants at night. Hives could be restocked 24 hours after the hives were cleaned and the dead bees were removed.

All other apiaries in the quarantine area were inspected and released from quarantine if found to be mite-free. If, however, any other apiary was infested, these colonies also were destroyed. The quarantine area then was expanded to cover a 3.2-km radius from the new source of infestation. Any quarantine could be removed after 60 days from the finding of the infestation when sampling determined that the apiary was mite-free.

RESULTS AND DISCUSSION

All of Georgia's mite infestations have been traced to hives illegally brought into the state from infested areas (primarily Florida), or traced to transient beekeepers whose hives were moved in and out of the state without the required inspection. In all instances, depopulation procedures were effective in eliminating *A. woodi* infestations. Furthermore, the 3.2-km radius seemed sufficient to control infestations.

Georgia's bee industry represents an annual \$4.4 million enterprise in queen and package bees, and annual sales of \$2.5 million in honey and beeswax production. Sales of queen and package bees have doubled since the 1970s (Georgia Crop Reporting Service 1981, 1984). Preserving a mite-free status is imperative to maintain the integrity of Georgia's bee industry. Quarantines imposed by the USDA, and by states and countries receiving package bees have resulted in the collapse of the industry in areas with widespread infestations.

The Georgia Department of Agriculture is equipped to inspect and certify mite-free status and to act quickly when mites have been discovered. The survey and quarantine program has allowed the Georgia bee industry to regain mite-free status and thus to continue to provide uninterrupted service in Canada, Great Britain, Australia, and throughout the U. S.

Several regulations serve to protect the Georgia bee trade. Out-of-state beekeepers may move bees and equipment into the state only after receiving a permit issued by the Commissioner, and only if the state of origin certifies that the bees have been inspected 60 days before shipment and were found free of mites and foulbrood disease. Bees may be moved through Georgia with no restrictions if certified as mite-free. Without the certificate of inspection, bees may be moved through the state only at night and under netting, or transported during the day only in a sealed vehicle.

Monitoring all resident bee hobbyists is difficult, but inspections are made in response to requests. The primary threat to the current program is from migratory beekeepers who transport hives into Georgia's southern counties from infested areas, such as Florida, without permits or inspections. These actions eventually may undermine the quarantine program in Georgia. Unless provisions are made for routine inspections of all apiaries, and for stricter penalties for failure to comply with regulations, *A. woodi* may become established within the state despite the effectiveness of the current quarantine program.

The Georgia Department of Agriculture continues to monitor for honey bee tracheal mite. Inspection procedures will expand to include any additional pests that threaten the Georgia bee industry.

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