

Varroa Mite Resistance: Testing for Mite Biting Behavior

This article describes the steps involved in testing honey bee colonies for grooming behavior.

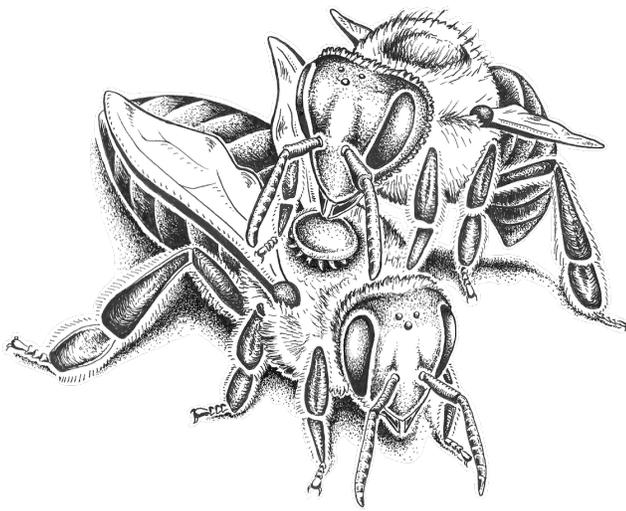


Image 1. One worker removes a varroa mite from another worker. Illustration by Michael Hill.

Introduction

Grooming behavior is characterized by the bees' ability to remove mites from themselves (autogrooming) and their nestmates (allogrooming; Image 1) with their legs and mandibles. A specialized form of this behavior, known as mite *biting* or *mauling*, occurs when workers use their mandibles to chew and, therefore, damage the legs/bodies of the Varroa mites, rendering them immobile. The damaged mites drop to the bottom of the hive and are unable to return to the brood nest. Made popular by Purdue University professor Greg Hunt, bees with high levels of grooming and damaging behavior are often referred to as mite biters.

This behavior can be tested for by placing a sticky board under a screened bottom board and checking for damaged mites with the use of a microscope or magnification. Colonies that have a high proportion of damaged mites (Image 2) on sticky boards under screened bottom boards have lower varroa mite infestations and are said to exhibit varroa mite resistance. This trait has been shown to be genetically controlled. Breeders can make selections based on a mite-biting assay or test to increase

the prevalence of mite-biting behavior in colonies in their operations, reducing chemical applications to control Varroa mites.

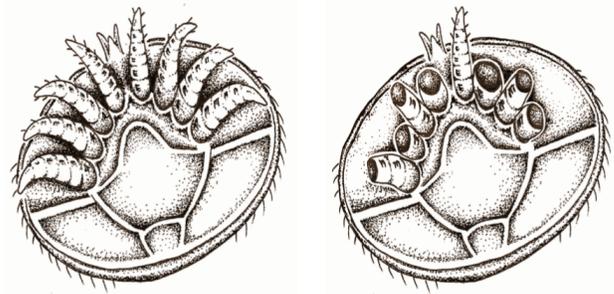


Image 2. Left. The ventral side of an intact Varroa mite. Right. The ventral side of a Varroa mite with 7 of its 8 legs chewed off. Illustrations by Michael Hill.

For this test, the queen must have been laying eggs in the colony for about 7 weeks, and no additional bees or brood should have been added to the colony. The bees that perform this behavior are younger bees, between one and three weeks of age. In order for the test to accurately measure the queen's score, all of the brood and workers must be the daughters of the current queen, and the colony should not have received a miticide treatment for at least 4-6 weeks. There must be sufficient Varroa mite populations to observe mites and damage to their extremities.

Perform this test twice a year and take the average of the two tests as the queen's score.

Procedure

Equipment and Supplies

Hive with screened bottom board, bottom board insert, spray oil, paper towels, soft paintbrush, glass slide or other glass, microscope or other magnification, lighting, and a datasheet

Procedure

1. Spray a new or clean insert for the screened bottom board (also known as IPM board) lightly with aerosolized cooking oil (Image 3). It must not have a sticky substance from the manufacturer or the test will not be accurate.



Image 3. Cooking oil is sprayed onto a bottom board insert.

2. Spread it around so there is a thin, even coating (Image 4).



Image 4. The cooking oil is spread evenly over the board using a paper towel

3. Without disturbing the colony, put the insert in the bottom board under the screen (Image 5). Make sure the bees cannot access the insert.



Image 5. Slide the insert into the slot in the bottom board.

4. Record the colony ID, date and time on your datasheet.

5. After 48 hours, return to the apiary.

6. Carefully remove the insert without allowing it to scrape off any mites or debris (Image 6).



Image 6. Remove and inspect the insert.

7. Count all of the mature mites on the insert (Image 7). If you cannot find at least 10 mites, reinsert the board and return 24–48 hours later to remove the insert. If, after an additional 24–28 hours there are still fewer than 10 mites, repeat the test later in the season when mites have had a chance to build up.

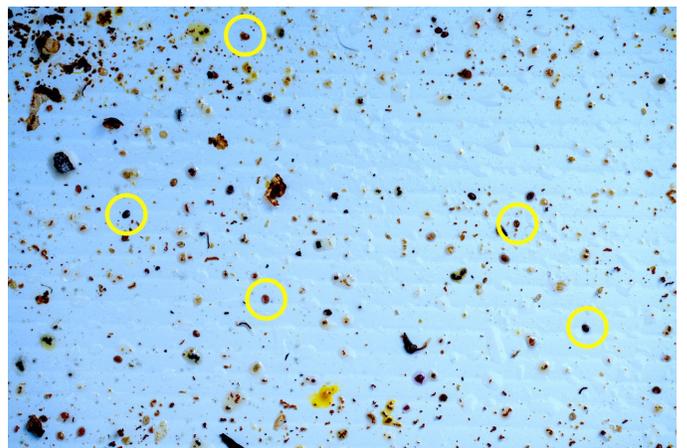


Image 7. Varroa mites and hive debris on an oiled bottom board insert. A few mites are identified with a yellow circle.

8. If at least 10 mites are counted, move the board to a table or other workspace. Carry the insert horizontally to ensure that all mites remain on the board. Do not stack multiple boards on top of one another to avoid touching the mites that have fallen onto the insert.

9. In a quiet, well-lit location, carefully remove mature mites from the board with a soft paintbrush (Image 8).



Image 8. Carefully remove mites from the insert using a soft paintbrush.

10. Place them ventral side up (to see the underside of the mite and her legs) on a glass slide or other glass in rows of 10 for easy counting (Image 9).



Image 9. Line up the mites, ventral side up, on a piece of glass for examination under magnification.

11. Do not count or remove pale mites, as they are immature.

12. Remove up to 100 mites from the insert. You need a minimum of 10 mites for the test to be valid and more than 100 mites is not valuable or recommended.

13. Using a microscope or other magnification, inspect each individual mite carefully, looking for damage. Damage can be to the legs, mouthparts, or main body of the mite.

14. Using hash marks, record the number of damaged and undamaged mites (Image 10). ANY damage qualifies the mite for the “damaged” category - the degree of damage is not important.

Hive 125	9/13/2024
Total mites = 37	
<u>damaged</u>	<u>not damaged</u>

Image 10. A piece of paper with data written on it indicating the hive ID, data, total number of mites, and the number of mites that were damaged or undamaged.

15. Total the number of hash marks for damaged and undamaged mites. Calculate the proportion of all mites (damaged plus undamaged) that were damaged by the colony. A colony with the mite-biting trait will have greater than 35% damaged mites. The higher the percentage of damaged mites, the better. Here, 12 of 37 mites were damaged. $12 / 37 = 0.32$ or 32%, so this colony is not considered to be mite biters.

16. Record this test result with your colony’s data. The information will be used later for selection purposes.

17. Repeat steps 8–15 for each collected bottom board insert.

More Information

[An Introduction to Honey Bee Breeding Program Design](#)

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