

Survey of *Nosema* and Varroa mites in Dominican Apiaries

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Abstract

The health status of honeybees was observed in beehives at different sites on the island of Dominica. Twelve different sites each containing one to ten different colonies were sampled for varroa mites and *Nosema* spores. It was concluded that *Nosema* was not present in any of the hives, but varroa mites were abundant.

Introduction

Both varroa mites and *Nosema* disease can weaken, and possibly destroy honeybee colonies. The varroa mite, *Varroa destructor*, is a parasite that can be seen with the naked eye and is usually located on the abdomen of bees (Bessin, 2013). These mites suck the blood from the bee, usually targeting the brood or drone. When the brood is targeted, the bee cannot develop to its full potential. This includes a “shortening life span, altering behaviors, vectoring or activating a host of bee viruses, and suppressing immune systems” (Delaphane, 2010). If one colony is infested with these mites, other colonies surrounding may be affected since they can travel from hive to hive.

Nosema disease is found in adult honeybees that affect the digestive system. The bees can ingest *Nosema* spores when they clean their combs. *Nosema* can cause the honeybees to have weak immune systems, protein deficiencies, different foraging behaviors, dysentery, and energy stress (Huang, 2011). This can affect the entire colony. Once the bee is infected with *Nosema*, they can die, leading to the death of the whole colony. There are two species of *Nosema* fungi, *Nosema apis* and *Nosema ceranae*, that affect the honeybee (Mussen, 2011). Through a microscope

with high power, *Nosema* spores appear as small ovals with a dark outline. Testing for *Nosema* spores and checking for mites can lead to treatment of infected colonies.

Methods and Materials

The twelve different sites were located all over the island (Figure 2). At each site, a bee suit was used to protect from stings. A smoker was used, with burning grass or hay, to calm the bees as we worked around them. Before opening each layer of the managed hive, the smoker was used.

The varroa mites were checked at the site using the powdered sugar shake method. This included a mason jar with wire gauze on top. A half-cup of bees were poured into the mason jar with two tablespoons of sugar. The bees and sugar when mixed up separated the mites from the bees. This was a more humane way to sample the bees because they were then returned to their hive after the mason jar was shaken for the mites.

Vials of about 80 honeybees each were taken from each colony to test for *Nosema* later in the lab. 95% Ethanol was used to preserve the bees. Back at the lab, the bees were counted from each vial and checked again for varroa mites using the alcohol shake method. This method separated the alcohol and mites from the bees using a mason jar.

Twenty-five bees were randomly selected from each vial to contribute to the sample for *Nosema*. Bees from this sample had their abdomens removed using forceps and placed into a mortar. Using a pestle, the abdomens were ground up with 12.5mL of water. A pipette was used to fill two chambers of a Hemacytometer and

then a cover slip was placed on top for examination through the microscope. At first an American Optics bright-field microscope was at low power, or 100X, in order to find the grid on the Hemacytometer. Once it was found, it was switched to high power, or 400X (10X eyepiece, 40X objective). Within the grid, there are five squares of which to look for the spores and make the count. To get the *Nosema* spore count for the entire sample, the sum of the spores in the five squares is multiplied by 25,000.

Results

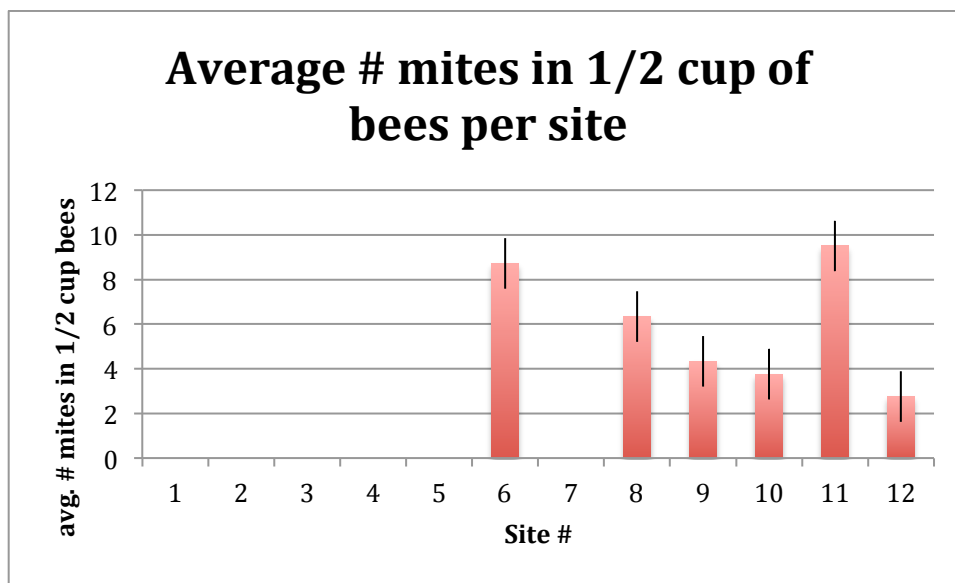


Figure 1 Average number of mites in a sample of ½ cup of bees from 12 sites

Varroa mites were not checked for using the powdered sugar shake method until June 4, 2015 when we sampled site 4, located at the Prison. There were no varroa mites at this location. There were no varroa mites located at Soufriere, either. Sites 6, 8, 9, 10, 11, and 12 all had multiple colonies that contained varroa mites.



Figure 2. Beehive sites in Dominica



Figure 3. Sample location same as Figure 2. Red circle icons indicate beehive sites that contained varroa mites. Yellow circle icons indicate no varroa mites. Blue icons were not screened for varroa mites.

Most of the sites were located on the west coast of Dominica. Only one site was on the east coast. Both the west and east coast contained mites.

Discussion

Varroa mites were found in most of the beehives throughout Dominica. Using both the powdered sugar shake method and the alcohol shake method, it was easy to identify the reddish-brown mites. Colonies within a site seemed to be similar with each other in whether or not they had mites. For example, at the Prison, there were no mites in any of the five colonies detected using these methods. But at the Calihout #1 site, mites were found in each of the six colonies. This suggests that the mites can move from colony to colony within an apiary.

Only one feral hive was sampled in this study; the rest of the hives were managed. The feral hive, located in the Botanic Gardens, contained mites so there was not an association with mite infestation and whether or not the hive was managed.

Sites 1 and 2 were not checked for mites using the powdered sugar shake method, but with the alcohol shake method. These sites contained at most 3 mites, which means that the colony needs to be treated. As for the Prison beehive, their health status was good. The rest of the sites varied in whether they contained mites. The majority had more than 3, so these colonies also need to be treated.

Nosema spores were not found in any of the 48 colonies examined throughout Dominica. Even in the feral hive, no spores were present. It is concluded that these hives are in good health status with regard to *Nosema* disease. To maintain this status, bees should routinely be checked for *Nosema*.

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