NC STATE UNIVERSITY

2014 Swarm Collective

Citizen science among beekeepers

NC STATE UNIVERSITY

APICULTURE PROGRAM

Background and objective

Varroa mites (*Varroa destructor*) are the most noxious parasite of honey bee colonies, and as such they have been the bane of beekeepers for the last 3 decades. There are many different weapons in the beekeeper's arsenal to control varroa, ranging from genetic stocks, mechanical techniques (e.g., screened bottom boards, drone-brood removal, sugar dusting), "softer" biopesticides (e.g., ApiLife VAR®, formic acid), to the "harder" synthetic acaricides (e.g., Apivar®, Apistan®, Checkmite+®). More information about mites and treatment options can be found in our Beekeeping Note 2.03, as well as the 'Advanced' course on Varroa Integrated Pest Management (BEES 2.02.04) on the online Beekeeper Education & Engagement System.

As part of any good program for sustainable integrated pest control, beekeepers need to regularly monitor the levels of mites in their hives. Moreover, it is important to measure mite levels before and after any intervening action (=treatment) to ensure that the approach is effective. The two most common methods for measuring varroa are the 'sticky board' (Figure 1) and 'sugar shake' methods (Figure 2).

Objective: measure the levels of varroa mites in a pair of colonies before and after treatment to gauge the relative efficacy of different mite-control strategies.

Materials and Methods

You will need at least two colonies to participate. More colonies are welcomed, but they need to be tested in pairs. For each colony pair, you will need to keep one as a 'negative control' where you don't use any measures for mite control (i.e., leave it alone to see how high the mite levels would go if you do nothing). For the second hive in a pair, you will want to implement whichever control measure you wish to compare. Otherwise, *both hives should be as similar to each other as possible*, transferring frames between them to equalize adult population and brood if necessary (but only prior to the start of the experiment).

Then, before taking any action for mites in the 'treatment' hive, you will need to monitor both hives in each pair for varroa using two standard techniques. First, measure the entire 'mite load' of each colony by inserting separate sticky boards into each hive for 72 hours. Second, after removing each sticky board, measure the 'mite intensity' of both colonies using separate sugar shakes and calculating the number of mites per 100 adult bees.

Hardware	Software
Two equally sized honey bee colonies	Mite control product (variable)
Eight (8) standard sticky boards per hive pair	Powdered sugar
Sugar-shake jar	Data sheet (attached)
Magnifying glass (if needed)	

These two mite measurements should be taken twice before varroa treatment (once in July, and once in early August), then twice again after varroa treatment (once in late August and once in September). These measurements will therefore gauge how effective a given treatment has been for reducing the number of mites in your colony.

We will also need some additional information about your beehives—like their general location, the basic equipment, and the genetic stock—since each of these factors may have an influence on mite levels. Note that no personal information is requested or needed to make accurate inferences.

After you have all of the mite counts, send them into us and we'll analyze the data. We can then parse the different mite treatments to compare the average levels of mite control among those using various control strategies. In doing so, we hope to be able to provide empirical evidence as to which tactics work best.

Sticky board (=mite load)

1. Remove protective sheet on sticky board to expose adhesive.
2. To prevent bees from getting stuck to board, insert below a screened bottom board or place a screen on top of adhesive surface.
3. Insert the sticky board below the lowest brood box in the hive, noting the time.
4. Carefully remove the sticky board exactly 3 days (72 hours) after it was placed into the hive.
5. Count the number of mites on the entire adhesive surface, using a magnifying glass if necessary. For high mite loads, it may be helpful to count each board twice and take the average.
6. Enter this number into the appropriate cell on the data sheet (based on date and colony).

Sugar shake (=mite intensity)

1. Remove ~200 adult bees from brood comb into a jar with screen lid.
2. Replace lid on jar; tap jar to settle bees on bottom.
3. Place 2 tablespoons of powdered sugar onto bees.
4. Close jar and shake/roll bees for 15-20 seconds.
5. Shake sugar and mites from jar onto white paper.
6. Count the number of mites and calculate the percent infestation of adult workers:

   (# mites / # bees)*100

7. Enter this number into the appropriate cell on the data sheet (based on date and colony).

For additional information and instruction about both procedures, please visit our website at:

http://entomology.ces.ncsu.edu/apiculture/ncsu-swarm-collective/

Data sheet

		Hive 1: Control hive (untreated)	Hive 2: Treatment hive (mite control)
July mite sampling	What date in July did you *insert* each sticky board?		
	What date in July did you *remove* each sticky board? (should be 72 hours after inserting)		
	What was the *total* number of mites on each sticky board?		
	After removing each sticky board, what was the number of mites per 100 bees using a single sugar shake test?		
Early August mite sampling	What date in early August did you *insert* each sticky board?		
	What date in early August did you *remove* each sticky board? (should be 72 hours after inserting)		
	What was the *total* number of mites on each sticky board?		
	After removing each sticky board, what was the number of mites per 100 bees using a single sugar shake test?		
Treatment	What mite-control strategy did you use for your Treatment hive? (while you can employ any control strategy of your choosing, please use only one treatment type per colony pair and only in Hive 2)	(no treatment)	
	What date did you initiate your mite-control strategy?	(no treatment)	
Late August mite sampling	What date in late August did you *insert* each sticky board?		
	What date in late August did you *remove* each sticky board? (should be 72 hours after inserting)		
	What was the *total* number of mites on each sticky board?		
	After removing each sticky board, what was the number of mites per 100 bees using a single sugar shake test?		
September mite sampling	What date in September did you *insert* each sticky board?		
	What date in September did you *remove* each sticky board? (should be 72 hours after inserting)		
	What was the *total* number of mites on each sticky board?		
	After removing each sticky board, what was the number of mites per 100 bees using a single sugar shake test?		
Other information	In what state and county are the hives located?		
	Do the hives have a solid or screened bottom board?		
	How many brood boxes and honey supers did your hives have *at the end* of the experiment?	Brood boxes: ___ Honey supers: ___	Brood boxes: ___ Honey supers: ___
	What type of genetic stock did you use for your colonies?		
	How were your colonies established: new package, new 5-frame nuc, or from an overwintered colony?		

Submitting your results

Please enter your data into the online form at:

https://docs.google.com/forms/d/1IGzUuOtOeezHn1ivMOqQ3AXKYh1WmoBP4SfjJvBHAdY/viewform

Alternatively, please send in your completed data sheet to the NC State Apiculture Program at:

EMAIL

Scan the data sheet and attach as a PDF
david_tarpy@ncsu.edu
Subject line: 2014 Swarm Collective

FAX: (919) 515-7746

US MAIL

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Analysis and reporting

Mite levels usually increase over the summer, so it is likely that both measures of varroa will increase in the Control colony over the 4 measurement periods. For the Treatment colony, the post-treatment measures (late August) may be temporarily higher depending on the course of action—effective treatments may kill more mites resulting in higher mite drops. Compare the September mite levels to see how effective your control strategy is compared to doing nothing.

Keep posted to the Wolfpack's Waggle and the Beekeeper Education & Engagement System (BEES) for details on our collective findings. Our goal will be to publish the results in a peer-reviewed scientific journal (e.g., the *Journal of Apicultural Research*) or beekeeping periodical (e.g., *American Bee Journal*), depending on the scale, scope, and quality of the data. The more beekeeper participants, the better our data, and the more likely it will be published!