Low Varroa Growth Testing Protocol

Measuring relative Varroa mite growth over the course of a season is used to identify honey bee colonies that exhibit Low Varroa Growth (LVG) when compared to other colonies under the same conditions and management practices. In order to estimate mite growth, each colony is assessed at two different time points – once in the spring, and again in the late summer or fall. Looking at mite levels once in the year is not enough to estimate mite growth. An ideal amount of time between measurements is 16 weeks, though anywhere between 9 to 16 weeks is acceptable. The longer mite levels have to increase over the season, the more reliable the assessment will be. Proper testing conditions require that all colonies being assessed be managed as similarly as possible. Varroa should have the same conditions to reproduce and grow in each colony, meaning that brood production should be comparable.

Step One: Select colonies to include in the assessment.

1. Select a minimum of two colonies per yard to include in the assessment.

2. Select colonies that are strong, healthy and queenright. Colonies showing signs of disease, slow spring build up, or other health issues should not be included in the assessment.

3. Selected colonies should be as equal as possible in terms of colony strength (bees and brood).

4. Colonies should ideally be headed by queens of similar ages.

5. If necessary, you may equalize colony strength prior to taking your timepoint 1 Varroa count by redistributing brood frames.

Step Two: Take your timepoint 1 Varroa counts.

1. Decide if you are using the alcohol wash or sticky board method to take your Varroa counts. Use the same method consistently throughout the assessment, to ensure that results are comparable.

2. Take all timepoint 1 Varroa counts for the yard on the same day.

3. If using the alcohol wash method, we recommend taking a 600 bee (1 cup) sample for each colony, instead of the standard 300 bee (1/2 cup) sample. This will increase the chances of finding Varroa mites in timepoint 1, which will increase the reliability of your results.

4. Ensure that all queens included in the assessment are marked.

5. Ensure that all colonies included in the assessment are labelled with a hive number.

6. Take detailed notes on the colony's status as of timepoint 1. This includes health status, colony strength (bees and brood), queen status (mark colour, age and origin) and any other comments.

Step Three: Maintaining colonies throughout the assessment period.

1. Each colony in the assessment must maintain its original queen throughout the assessment period. Be diligent in inspecting colonies every 10 days in order to prevent swarming. Any colonies that swarm, supersede or are requeened are invalid and must be removed from the assessment.

2. Colonies must be managed as similarly as possible throughout the assessment period. Any management decisions applied to one colony should be applied to all colonies (E.g. if one colony in the assessment receives supplemental feed, they should all receive supplemental feed).

3. Varroa mite populations should be allowed to grow without interference. No form of Varroa control - chemical or cultural - should be used throughout the assessment period. This includes synthetic chemicals, organic chemicals, drone brood removal, splitting, etc. Note: drone frames are allowed for the purpose of drone flooding only. If using drone frames for drone flooding, ensure that a drone frame is present in every hive in the assessment.

4. Frames should not be removed/swapped throughout the assessment period.

5. Colonies should still be monitored regularly for Varroa mites throughout the assessment period (in between timepoint 1 and timepoint 2). If the results of your monitoring indicate

that treatment is required, then you should remove the colony from the assessment and treat it.

6. Take detailed notes every time you inspect, monitor or make any changes to a colony.

Step Four: Take your timepoint 2 Varroa counts.

1. Once 9-16 weeks have elapsed, it is time to take your timepoint 2 Varroa counts. Take all your timepoint 2 Varroa counts for the yard on the same day.

2. Use the same method you used for your timepoint 1 Varroa counts.

3. Any colonies that have swarmed, superseded or requeened, or been managed significantly different than the others should be removed from the assessment.

4. Once your timepoint 2 counts are taken, the assessment period is complete, and you can manage your colonies normally.

Step Five: Calculate your results and create a ranking.

1. If you used the alcohol wash method, calculate the number of Varroa mites per 100 bees. If you used the sticky board method, calculate the number of Varroa mites per 24-hour drop. Do this step for each colony in the assessment for both timepoint 1 and timepoint 2.

2. Determine the absolute Varroa population growth for each colony.

Absolute growth = # of Varroa mites/100 bees in timepoint 2 - # of Varroa mites/100 bees in timepoint 1

OR

Absolute growth = # Varroa mites/24 hour drop in timepoint 2 - # of Varroa mites/24 hour drop in timepoint 1

3. Create a ranking for each yard included in the assessment, based on relative Varroa population growth. Colonies should be ranked from lowest to highest absolute Varroa population growth. Any colonies with the same absolute growth will share a rank. Note: LVG results are not directly comparable between different yards.

4. Compare your results with your notes from the assessment period to ensure that no external factors are skewing your results. For example, if you noted that your highest

ranked colony consistently had less brood than your other colonies, this would indicate that the low Varroa growth was caused by the decreased opportunity for Varroa reproduction, rather than the presence of genetic resistance traits.

Example 1:

The Varroa levels were counted using the alcohol wash method, with a sample size of 600 bees.

Colony #	T1 Varroa Mites	T2 Varroa Mites
1	1	18
2	0	5
3	3	12

Step 1: Calculate the number of Varroa mites per 100 bees.

Colony #	T1 Varroa Mites/100 Bees	T2 Varroa Mites/100 Bees
1	1/6 = 0.17	18/6 = 3
2	0/6 = 0	5/6 = 0.83
3	3/6 = 0.5	12/6 = 2

Step 2: Calculate the absolute Varroa population growth for each colony.

Colony #	T1 Varroa Mites/100 Bees	T2 Varroa Mites/100 Bees	Absolute Growth
1	0.17	3	3 - 0.17 = 2.83
2	0	0.83	0.83 - 0 = 0.83
3	0.5	2	2 - 0.5 = 1.5

Step 3: Rank colonies from lowest to highest Varroa population growth.

Colony #	Absolute Growth	Rank
2	0.83	1
3	1.5	2
1	2.83	3

Example 2:

The Varroa levels were counted using the sticky board method. The sticky boards were left in the hives for 3 days.

Colony #	T1 Varroa Mites	T2 Varroa Mites
1	0	10
2	4	22
3	1	0

Step 1: Calculate the number of Varroa mites per 24-hour drop.

Colony #	T1 Varroa Mites/24 hrs	T2 Varroa Mites/24 hrs
1	0/3 = 0	10/3 = 3.33
2	4/3 = 1.33	22/3 = 7.33
3	1/3 = 0.33	0/3 = 0

Step 2: Calculate the absolute Varroa population growth for each colony.

Colony #	T1 Varroa Mites/24 hrs	T2 Varroa Mites/24 hrs	Absolute Growth
1	0	3.33	3.33 - 0 = 3.33
2	1.33	7.33	7.33 - 1.33 = 6
3	0.33	0	0 - 0.33 = -0.33

Step 3: Rank colonies from lowest to highest Varroa population growth.

Colony #	Absolute Growth	Rank
3	-0.33	1
1	3.33	2
2	6	3

Note: It is possible for the absolute growth to be negative. This indicates that the Varroa mite population declined between timepoint 1 and timepoint 2. While it is possible that this negative growth was caused by resistance traits, it is more likely for it to be caused by the protocol not being followed (e.g. the removal of brood frames throughout the assessment period). Be sure to check your notes for any external factors that may have caused the negative growth.