



## Low Varroa Growth (LVG) FAQ

### Q: What is Low Varroa Growth (LVG)?

**A:** LVG is a practical field test that beekeepers can use to assess their colonies for genetic traits that confer resistance to Varroa mites. LVG testing can be used for two purposes:

- a) To identify colonies that strongly exhibit resistance traits, in order to selectively breed from them.
- b) To identify colonies with High Varroa Growth (HVG) in order to cull and replace those queens.

LVG testing does not assess the presence of specific resistance traits (e.g. grooming behaviour, Varroa Sensitive Hygiene). LVG testing assesses Varroa population growth in a colony over the course of a season, which encompasses a variety of resistance traits. In other words, it captures how much each colony's Varroa population has grown between two time points, rather than providing a snapshot of the Varroa population at a single point in time.

Colonies that exhibit LVG likely possess a combination of resistance traits; some of which may not yet be fully understood. Because of this, LVG assessments are an opportunity to collectively test and select for a combination of resistance traits, eliminating the need to individually test and select for specific resistance traits.

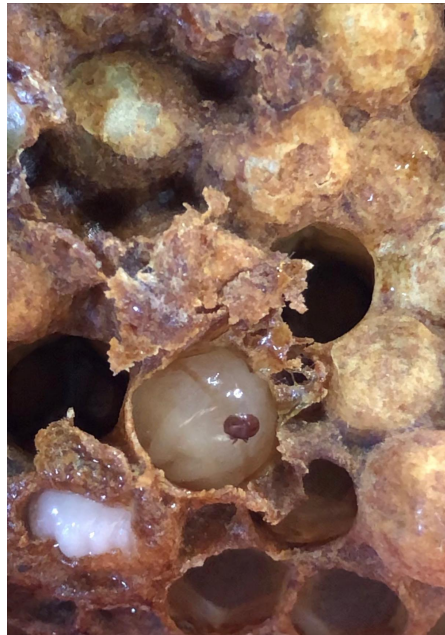
### Q: Why is LVG important?

**A:** Varroa mites pose the greatest threat to honey bee health globally. While monitoring and the appropriate use of chemical controls are effective tools, keeping Varroa mites under control remains a constant challenge for beekeepers. Varroa mites are also prone to developing resistance to the chemicals used to control them, which presents a significant threat to the beekeeping industry. Increasing Ontario's honey bee population's resistance to Varroa mites through selective breeding is a great option for increasing the sustainability of the industry.

Until recently, breeding for Varroa resistance traits was challenging to incorporate into commercial operations. While specific traits - such as grooming behaviour or Varroa Sensitive Hygiene - confer Varroa resistance, these assessments are prohibitively labour intensive and costly. Selecting for specific resistance traits requires specialized assessments, necessitating training and specialty equipment. LVG testing simplifies the process by utilizing methods that beekeepers are already familiar with, and greatly reduces the labour hours required. LVG testing is a straightforward and cost effective way to select



for a variety of Varroa resistance traits, compared to individually selecting for specific traits, making it a feasible option to incorporate into commercial breeding programs.



Varroa mite reproducing in a brood cell.

**Q: How does LVG testing work?**

**A:** Relative Varroa population growth is assessed in all colonies included in the LVG assessment. To do this, Varroa counts are taken at two different timepoints throughout the season for each colony in the assessment, using the [alcohol wash](#) or [sticky board](#) method. The monitoring method used must be the same for each colony at both timepoints. The ideal length between timepoints is 16 weeks, with a minimum requirement of 9 weeks.



Alcohol wash method.



Sticky board method.

The Varroa mite populations should be allowed to grow with as little interference as possible for the duration of the assessment period. This means that cultural and chemical Varroa controls (eg. organic and synthetic treatments, drone brood removal, splitting, etc.) cannot be used during the assessment period. For reliable results, the colonies being tested must be managed as similarly as possible throughout the assessment period. Colonies must retain the original queen throughout the assessment period.

Once Varroa counts have been taken for both timepoints, the absolute Varroa growth can be calculated for each colony. Then a ranking can be made of the relative Varroa growth of each colony in the assessment. The top-ranking colonies can then be bred from.

Click [here](#) for the complete testing protocol.

**Q: How many colonies should I include in the assessment?**

**A:** The more the better! At least two colonies per yard are required to have meaningful results. It is likely that some colonies will experience issues that cause them to be removed from the assessment (eg. swarming, supersedure, disease, etc.). As such, it is helpful to include many colonies so that several colonies will still remain in the assessment if some colonies must be removed.

**Q: How do I choose which colonies to include in the assessment?**

**A:** Colonies included in the assessment should be as equal as possible in terms of colony strength (brood and bees), colony health, queen age, and any other factors that would affect Varroa population growth. This is so that they are as comparable as possible, and the results are not skewed by factors other than the presence of genetic traits. Strong, healthy colonies should be prioritized for the assessment. Any colonies showing signs of health





issues should not be included. Colonies that exhibit other desirable traits (e.g. Hygienic behaviour, overwintering ability, low defensive behaviour) should also be prioritized.

**Q: When should I take my timepoint 1 and timepoint 2 Varroa counts?**

**A:** Early enough that you will be able to complete the 9 to 16-week assessment period, but not too early! Timepoint 1 should occur after the queen has started laying in the spring, and brood is present in the colony. Be mindful of what management will need to occur in your colonies 9-16 weeks from timepoint 1. Aim to take your timepoint 2 Varroa before the end of August, when Varroa populations are peaking and chemical treatments are likely to be necessary.

**Q: Can I equalize my colonies before taking my timepoint 1 Varroa counts?**

**A:** While choosing colonies that are already equal is ideal, colonies can be equalized prior to timepoint 1 sampling if necessary. For example, you can redistribute brood frames between colonies to make them more equal. However, once the assessment period begins (ie. once you have taken your timepoint 1 Varroa counts) you should stop making these adjustments, and instead take notes of any inequality between colonies, or outliers in terms of colony performance. Note: replacing older queens prior to timepoint 1 is not advisable, unless they can be requeened at least 50 days before the timepoint 1 Varroa count is taken. This will allow the worker population to be replaced by the new queen's offspring, otherwise it is the old queen's genetics that are being assessed.

**Q: Can I pull frames from the colonies in my assessment in order to make nucs/splits/cell builders?**

**A:** This is not recommended. Because Varroa mites reproduce under capped brood, removing brood frames from a colony will affect the number of Varroa mites present in the colony. This can artificially lower your results and make it appear that your colonies are more resistant than they actually are. Similarly, you should avoid adding brood frames to colonies that are part of the assessment. If it is absolutely necessary for you to pull frames, ensure that you are removing similar numbers of frames from each colony in the assessment, and keep detailed records of these changes. Be aware that doing this can make your LVG results less reliable.

**Q: Can I include colonies located in different beeyards in my assessment?**

**A:** You can certainly perform LVG testing in multiple beeyards, however the results won't be comparable between beeyards (unless the yards are very close together). There are several



environmental factors that can affect Varroa population growth. For example, access to food resources can affect brood rearing and colony strength, which in turn impacts Varroa

population growth. When performing LVG testing, the goal is to remove as many variables as possible so that the testing conditions are standardized. Beeyards in different locations will have different environmental variables that can make LVG results unreliable. This doesn't mean that you can only test one yard, only that separate rankings will have to be created for each yard. After the first round of testing, you can move the top-ranked colonies from each yard into one location and compare those results the following season.

**Q: What if I need to treat for Varroa mites before the assessment period is over?**

**A:** You should still be monitoring consistently for Varroa mites throughout the assessment period, and if your monitoring indicates that you are above the treatment threshold, then it's important to treat your colonies as soon as possible. Do NOT prioritize LVG testing over colony health – there's no point getting data from a colony that is going to die of parasitic mite syndrome! We recommend taking a timepoint 2 Varroa count before applying the treatment, as it may still provide usable – if less reliable – data. Please note that you can also apply a Varroa treatment in the spring before taking your timepoint 1 Varroa counts, if necessary. Ensure that the treatment period has ended before taking your timepoint 1 Varroa counts.

**Q: Do I need to find the queen before I take my Varroa counts?**

**A:** Yes. If you are using the alcohol wash method, it is necessary to find the queen first to keep her safe. Regardless of the method you are using, it is important to find the queen at the time of monitoring to ensure that the same queen is present throughout the assessment period. For this reason, we recommend marking all queens that will be part of the assessment.

**Q: Do I need to keep records throughout the assessment period?**

**A:** Yes. It's very important to keep track of everything going on in the colonies being tested. This will help you parse out any external factors that may have skewed your results. We recommend printing out a logsheet and placing it with a pencil inside a Ziploc baggie and leaving the baggie in the inner cover. This way you won't forget it, and you can take notes every time you work in that colony. You should keep track of any changes to colony health, colony strength, brood rearing, and any other management decisions or concerns.



# LVG LOGSHEET

Beekeeper:

Hive number:



Date	Queen (age, colour)	Colony strength (Very good, good, average, poor)	Frame changes <small>*note: this is not recommended for LVG</small>	Varroa monitoring or visual symptoms	Drone frame (yes/no) <small>*note: for breeding only</small>	Supplemental feed	Other issues or comments

Example of a logsheet for LVG testing.

## Q: Do I have to perform LVG testing every year?

**A:** Breeding for any trait – including LVG – is an ongoing process. Progress can only be made through recurring testing and selection from highly ranked colonies. However, if you are not interested in breeding, LVG testing can be used to assess your stock, and replace any poorly ranked queens. Used this way, LVG testing is a great addition to your Integrated Pest Management toolkit. LVG testing for this purpose does not have to be done every year.