

## **Pesticide Resistance Management**

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Following the introduction of the varroa mite (*Varroa destructor*) to the United States in the late 1980s, most varroa management focused solely on repeated miticide treatments applied based on calendar dates. Within a few years, beekeepers began to report that Apistan<sup>®</sup> (fluvalinate) and Checkmite +<sup>®</sup> (coumaphos) were no longer effective for varroa mite control. If beekeepers had followed IPM practices, the useful life of these products would have been prolonged. All pesticides, including miticides, should only be used when pest monitoring shows the potential for significant hive loss and only in conjunction with non-pesticide management measures. Miticides continue to play a major role in the management of varroa mite for many beekeepers and with a good strategy, we can ensure their prolonged effectiveness.

The best way to combat pesticide resistance it is to incorporate management methods that will slow its development. This can be accomplished by implementing three strategies:

- 1. Monitoring varroa mite populations in hive.** The most accurate method of sampling mite populations is the alcohol roll method. Collect approximately 300 adult nurse bees (1/2 cup) from the brood area into a jar. Add enough alcohol to cover the bees, close the jar, and shake for 1 minute. Pour the mixture into a light-colored pan, count the number of mites, and calculate the number of mites per 100 bees. For example: a roll with 300 bees and 15 mites has 5 mites per 100 bees or a 5% infestation rate.
- 2. Using economic injury levels to make decisions.** Miticides should be used only if varroa are numerous enough to cause losses. If there are no mites in a hive, treatments should not be applied. There is some variation depending on time of year and growth phase of the colony, but the current rule of thumb is that a 3% infestation rate (9 mites/300 bees) represents a high risk of damage/colony loss and requires treatment.
- 3. Integrating multiple control strategies.** Incorporate many different control strategies to combat varroa, including the use of cultural practices, miticides, and varroa-resistant bee stocks. Several cultural methods (drone brood sacrifice, brood interruption, screened bottom boards, etc.) can slow mite population growth, often reducing the number of miticide treatments necessary. When using miticides, applications must be timed correctly, depending

on the growth stage of the honeybee colony. Some products are most effective when the hive is broodless while others can be used during growth periods or honey production. Make sure to read product labels carefully and follow all directions. Using a miticide differently than described on the label is not only illegal but can harm or kill a colony. A key element of effective resistance management is to alternate/rotate the use of pesticides with different modes of action. Don't rely on one miticide for controlling your mite populations.

For more information, check out the Honey Bee Health Coalition's Tools for Varroa Management: <https://honeybeehealthcoalition.org/varroa/>