



VARROA MITE MANAGEMENT METHODS

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Varroa mites are one of the greatest threats faced by beekeepers today. This fact sheet will describe treatment methods used to combat Varroa mite infestations, following integrated pest management methods. To learn more information about Varroa mite biology and sampling, see the accompanying *Varroa Mite Biology and Feeding Damage*, and *Varroa Mite Sampling Methods* fact sheets.

INTEGRATED PEST MANAGEMENT (IPM): Informed management decisions can be reached using IPM, which relies on data to empower decision-making. Taking an IPM approach to Varroa mite control is strongly encouraged, as this approach takes into account the individual health of the colony and attempts to keep pest populations below established seasonal economic thresholds. Additionally, using an IPM approach is generally less damaging to colonies, since harsh conventional pesticides are only used as a last resort (Figure 1). To determine this threshold, sampling is crucial. When the economic threshold is reached, cultural and mechanical controls are early preventative options. Treatment rotation using organic acids follows and, when all else fails, rotated conventional pesticides can be used. Sampling post treatment allows one to determine when more serious interventions need to take place. Sampling also gives a good indication of how effective treatments have been. When one hive in the apiary surpasses this threshold, all hives should be treated, as a hive with high mite counts can lead to increased infestations levels in surrounding hives in the apiary.

CULTURAL AND MECHANICAL CONTROL:

Popular control methods include proper sanitation, such as comb culling and maintaining the hive in a sunny location with proper drainage. It is also important not to overcrowd colonies since this can encourage drift. Other tactics, such as entrance reducers and hive decorations, can also help minimize drift, which is an important way that mites spread between colonies. Cultural control would include the breeding of Varroa resistant lines with hygienic traits. This option is currently being explored by researchers, with positive results, and could be an effective long-term solution. Interrupting the brood cycle, either through requeening or caging the queen for one to two weeks, is another way to inhibit a generation of mite reproduction. Because mites

prefer to reproduce in drone brood, one of the most effective mechanical control methods includes drone brood removal, which effectively traps and allows for removal of reproducing mites. Other mechanical control is the implementation of a screened bottom board, brood comb modification and rotation. Screened bottom boards are often used in conjunction with other treatments to improve hive ventilation, and they allow mites to fall out of the hive when they lose their grip on their host.

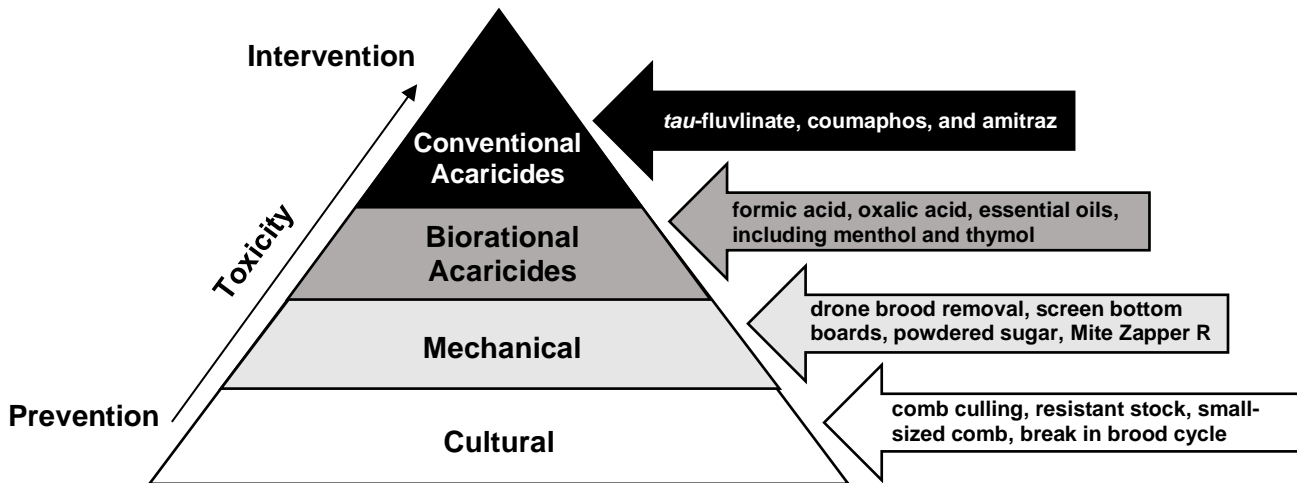


Figure 1. Integrated Pest Management (IPM) pyramid, modified from: <https://hdoa.hawaii.gov/pi/bee-health/>.

BIOLOGICAL CONTROL:

Biological methods have been explored over the years, however, limited results for these methods are available, at best, and many of these treatments have never been field tested. Some of these strategies include the use of pseudoscorpions, entomopathogenic fungi, various bacteria and viruses, kairomones, and benign *Varroa* mite haplotypes.

CHEMICAL CONTROL:

Chemical treatments for *Varroa* mites can be divided into two categories: “hard” and “soft” acaricides. The hard synthetic acaricides include treatments such as Apistan (*tau*-fluvalinate), Checkmite (coumaphos), and Apivar (amitraz). The soft acaricides include organic acids and essential oils, including oxalic, formic, and lactic acid, as well as Thymol and several other essential oils. It is important to take note of the season and hive conditions before using these treatments though, as oxalic acid should not be used when honey supers are in place or with brood present, and formic acid is the only soft acaricide that can penetrate capped brood. Treatments are marketed under various names, and these treatments, along with their concentration levels, must be approved by the EPA for in-hive use (Table 1). Historically, the

synthetic acaricides were (and continue to be) the most common Varroa mite treatments used, though they can detrimentally affect bees and have led to acaricide resistance throughout the world. It has also been suggested that the high buildup of hard acaricide residues in hives is a contributing factor in colony collapse. Soft acaricide treatments have been steadily increasing in popularity, as they rarely accumulate to harmful levels in hives and bee products. However, when used within an IPM approach, both hard and soft acaricides are a useful tactic when mite infestations exceed the seasonal economic threshold. For up to date treatment recommendation and thresholds by colony cycle and season, we recommend the Honey Bee Health Coalition's Tools for Varroa Management available for download on their website listed below.

Table 1. Varroa mite chemical currently approved by the EPA, obtained from www.epa.gov. The active ingredients in each treatment, along with the percentage of this ingredient found in the treatment are shown on the left.

Product Name	Active Ingredient
ZOECON RF-318 APISTAN STRIP; APISTAN ANTI-VARROA MITE STRIPS	Fluvalinate (10.25%)
FOR-MITE	Formic acid (65.9%)
AVACHEM SUCROSE OCTANOATE	Sucrose octanoate (40%)
API LIFE VAR	Thymol (74.09%), Oil of eucalyptus (16%), Menthol (3.73%)
MITE-AWAY QUICK STRIPS	Formic acid (46.7%)
FORMIC PRO	Formic acid (42.25%)
APIGAURD	Thymol (25%)
HOPGUARD II	Hop beta acids resin (16%)
Apivar	Amitraz (3.33%)
OXALIC ACID DIHYDRATE	Oxalic acid (100%)
CHECKMITE + BEE HIVE PEST CONTROL STRIP	Coumophos (10%)

USEFUL REFERENCES:

Honey Bee Health Coalition. 2018. Tools for Varroa Management a Guide To Effective Varroa Sampling & Control,24.
https://honeybeehealthcoalition.org/wp-content/uploads/2018/06/HBHC_Guide_Varroa_Interactive_7thEdition_June2018.pdf.

US EPA. 2018. EPA-registered Pesticide Products Approved for Use Against Varroa Mites in Bee Hives. <https://www.epa.gov/pollinator-protection/epa-registered-pesticide-products-approved-use-against-varroa-mites-bee-hives>.