

Treating Colonies for Varroa Mite Infestations

Varroa mites, *Varroa destructor*, are small (flea sized), crab-shaped parasites that spend their time either under the cappings in the brood nest or on adult bees. In either case, they feed by forcing their mouthparts through the exoskeleton of the bee and drinking its blood (hemolymph). During the brood rearing season, most of a colony's mites will be buried in the brood. When there is no brood, the mites attach themselves to adult bees. They must have a blood meal every six days to survive. Contact and fumigant acaricides should be effective against mites when they are not in the brood. Adult mites are pretty chemically sensitive, so a number of substances should affect them adversely.

In 2010 there are six Section 3 ("General Use") products registered for controlling *Varroa* in California. One line of products is called Apistan®. There are three formulations: 1. the hive strip, containing ten percent fluvalinate by weight, 2. the package strip, containing two and a half percent fluvalinate, and 3. the queen tab, containing one percent fluvalinate. Residue of fluvalinate, a unique pyrethroid material with reduced toxicity to honey bees, is rubbed and tracked off the plastic strips onto the bees. Over time, the bees absorb enough acaricide on their exoskeletons and track enough material over the combs to make them toxic to the mites. The package strips and queen tabs are in contact with the bees only for a few days. Hive strips (one for every five frames of bees) are left in the hives for 42 days.

Timing of insertion of hive strips relates to the activities of the bees. The only time that the strips cannot be in the hive is when there is a nectar flow and honey is being produced. The time that the strips would kill the most mites is late in the season after brood rearing has ceased and all the mites are on the adult bees. However, studies

have shown that the most effective time to treat, from the standpoint of honey bee colony health and size, is during the time when new bees are being reared for the overwintering population. That generally occurs from August to October. Thus, that is the best time to treat. Unfortunately, most U.S. *Varroa* populations are resistant to fluvalinate and these strips are no longer very effective.

A second Section 3 product registered in California is CheckMite+®. The active ingredient, coumaphos, is adhered to a plastic strip, similar to Apistan. The plastic bag is opened and the strips introduced into the hives as stated on the labeling. The active ingredient in CheckMite+ strips is coumaphos, an organophosphate material. It is a nerve poison and there is quite a bit of it loose, as a powder, in the plastic packets in which the strips are sold.

In order to prevent exposure to the toxin, the strips should be handled with rubber or nitrile gloves. Polyethylene disposable gloves are inexpensive and will work fine if not punctured or torn. You probably will have to make a special request at a pharmacy to order those gloves. Latex examining gloves also are inexpensive and readily available, but the coumaphos powder tends to stick to latex and builds up on the gloves. Regular "bee gloves" simply will absorb the toxin and will be contaminating everything touched, thereafter. Disposable gloves can be peeled off, inside out, and discarded after they are contaminated. After working with the strips and removing the gloves, wash your hands well before eating, smoking, visiting the rest room, etc.

Open the plastic packets with the wind from your side so that you don't get contaminated by the dust. Put the empty packets into something where the dust won't be a problem (not your pants pocket!!). Dispose of the strips at the time, and in the manner, written on the labeling (probably 42-45 day exposure in hive). They must be removed from the hives at least 14 days before the start of a honey flow.

Recent studies have indicated that healthy queen cells can not be reared when coumaphos strips are in the hives. The strips also interfere with queen mating. It had previously been shown that fluvalinate strips interfere with drone rearing and sexual maturation. So, it is a good idea to use either of the strips sparingly, at specific times of the season when side effects are less critical to the bees. Unfortunately, most U.S. *Varroa* populations are resistant to coumaphos and these strips are no longer very effective.

The third Section 3 control product is Sucroside®. It is a liquid concentrate that is diluted in water and sprayed on the bees on the surfaces of every comb. A series of three treatments, at 7-10 day intervals, is necessary for adequate control. The formulation is similar to an insecticidal soap, but in this case the mites are susceptible and the bees are not. When diluted according to label directions, Sucroside does not contaminate honey and is not toxic to bees or humans. Removal and spraying of combs is too tedious for large commercial operations.

The fourth Section 3 product is called Mite-Away II®. The product is sold as a pad saturated with a formic acid solution. A beekeeper opens the outer plastic wrapping and sets the second, perforated plastic bag on the top bars of the hive (perforations down). In order to obtain the best results, small wooden slats should be placed under the pad so that more holes are left unobstructed. Also, a 1.5" rim is required to form a "fumigation chamber" at the top of the hive and also to provide space so that the cover can be closed. The pad is left on the hive for 21 days. Formic acid fumigation is affected by temperature and relative humidity. Be sure to read the label carefully. The law requires wearing a NIOSH approved organic vapor respirator whenever the beekeeper is working with the pads or visiting the apiary when the pads are in the hives. The respirator should be professionally fitted; checked for air leaks according to accepted guidelines; and have cartridges replaced frequently. To prevent individuals from entering the apiary, without respirators, during the 21 day treatment period, the apiary must be "posted" during treatment with appropriate warning signs.

In the spring of 2010, NOD Apiary Products, Ltd., manufacturer of the Mite Away II pads intends to change the formulation of its product to Mite Away Quick Strip®, and will phase out the pads. The strips are handled with the same human safety precautions (personal protective equipment – PPE) as the pads. The strips are hung between the frames for seven days, then removed and composted or wrapped and thrown in the trash. They should be used only when the temperature is going to be between 50 and 92 degrees Fahrenheit.

Two Section 3 formulations of thymol currently are on the California market. Thymol acts as a fumigant against mites in beehives. Api-Life VAR® is packaged similar to a candy bar. It is broken into four pieces and placed near the corners on the tops of the frames in the brood chamber. Treatments are made two or more times at seven day intervals.

Apiguard® is provided in small (50 g), covered foil “dosing trays” or as a pail of formulated material that is measured out, with the provided scoop and spatula, and placed on provided “delivery pads.” Treatment is repeated after 14 days. In weather approaching or exceeding 90°F, too much thymol can be generated from the Apiguard and bees and brood can be damaged. Be sure to follow the label instructions to prevent contamination of your honey crop. In California, beekeepers have to register with their county agricultural commissioner to obtain a permit if they wish to purchase the bucket-sized treatments. There is a use reporting mandate for the bulk gel.

In 2010 there is one Section 18 (emergency use) *Varroa* control product on the California market. Section 18 materials are strictly regulated. A beekeeper aspiring to use the material must pass a pesticide use test at the local agricultural commissioner’s office. A manual that prepares California citizens to take the free test to become a certified Private Applicator, “Pesticide Safety: A Reference Manual for Private Applicators” (Pub. 3383 – 120 pages), can be purchased from any county UC

Cooperative Extension (Farm Advisors) office for \$7.00 in English or Spanish. Often the Extension and Commissioner's offices are next door to each other. The beekeeper then will be given a permit (number required to purchase the acaricide) and "labeling" describing how the pesticide is to be used in California. Beekeepers must file a Notice of Intent before using the product and a monthly (some commissioners will allow an annual) use report immediately after use.

Hivastan® is the Section 13 product that recently came onto the market. The active ingredient is 0.30% of an acaricide, fenpyroximate. It is formulated as a thick gel and must contact the bees in order to reach the mites. The gel is formulated with honey, to attract the bees. However, sometimes confinement with this product can lead to overexposure and loss of adult bees. Use of this material is best left to beekeepers with many years of experience.

Varroa mites reached their first peak in 1995-96, when they were rampant in feral colonies and beekeepers could barely keep up with them using three Apistan treatments a year. Feral colonies just about disappeared. Then things settled down for a short period of time. We actually were seeing more feral colonies, again. Beekeepers said that the *Varroa* pressure was way down and that, if the mites were still susceptible to fluvalinate, only one treatment a year was necessary. However, the use of a single acaricide, year after year, leads to selection of resistant mite populations and that happened over a 7 year period.

At first described as "Pockets of Resistance," it is apparent that resistant mites are now prevalent in the U.S., including California. Chemical testing has demonstrated that varroa mites commonly are resistant to fluvalinate, coumaphos, and amitraz. Losses of wintering colonies were over twice as high as "normal" during the early 2000's, with one of the worst losses (40-60%) of California (and total U.S.) commercial colonies over the 2004-05 winter. Infested colonies dwindled away during the fall and winter. Brood rearing was inhibited and the few bees that were reared were shrunken and often had

only small stumps for wings. Those signs suggest that varroa mites were vectoring "deformed wing virus" in the colonies and the virus became epidemic. Losses continued to remain as high as those of 2004-05, and eventually the new malady was named "colony collapse disorder" (CCD). Researchers and beekeepers still feel that varroa mites are an extremely harmful stress to honey bee colony populations, but they do not cause CCD on their own.

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