



## METHODS OF TESTING FOR VARROA MITE INFESTATION, RESISTANCE, AND TREATMENT EFFICACY

### Method of Testing:

Before mite resistance, Apistan drop and alcohol or soap wash were considered the best tests. Ether role and sugar shake tell you that you have a few or a lot of mites. However, since these methods require taking samples of bees, they are dependant on where the sample was taken from and can therefore be inaccurate. At low infestation levels the mite drop will appear in one to three rows on sticky boards while the rest of the board will be clear of mites. DO NOT USE INTERPOLATION.

### 24-Hour Prorated Natural Drop Test for the Varroa Mite:

Calculating the prorated 24-hour natural drop on a full size sticky board collected over a 3-5 day period provides the best indication of mite infestation levels.

- **The strength of the hive is important** to obtain a reasonable indication of infestation. All data in our literature is for hives of approximately 30,000 bees, 10 frames of bees and 3-5 frames of brood in two deep boxes. In the early spring and late summer your hives will probably be this strength.
- **Always count the entire board.** Prorating and counting half the board is a big mistake.
- **Count only mature female mites.** Concentrate on the size and shape. Be aware that mites can be of any shade of brown from light to dark to fully black and reportedly half black and half white.
- **Do not count mites of smaller size, white, pearly white, or yellow.** These mites are either males or immature mites, which cannot cause future damage.

### 24-Hour Prorated Pesticide or Acid Treatment Drop:

- The boards must be in for the first 24 hours of the treatment but no longer than 48 hours of treatment application. A well working treatment will kill or cause all mites outside of the capped cells to drop in 24-48 hours. After that, only mites emerging with the bees will drop and will dilute your average.
- To do this test, follow the same procedure as in the natural drop but install new sticky boards at the same time you put in the treatment. Record the actual and prorated mite drops into a chart. Any retesting with a higher dose or other product must be done on new hives, not previously used or treated hives.

## What does the 24-Hour Prorated Natural & Pesticide or Acid Drop Tell You?

THE NATURAL DROP: Tells you how high your infestation levels are and what kind of treatment is required. In the case of formic acid and the MiteGone method these are general recommendations:

Natural Drop/24hrs	Infestation Levels
0-8	Low
8-15	Moderate
15-30	High
30+	Critical

See “Treatment Selection” in the Instructions section for your infestation level

The natural drop will also tell you how well your fall treatment worked in the spring and vice versa. **If your natural drop is below 8 – 10 mites, then congratulations, you are doing well!**

TREATMENT EFFICACY AND PESTICIDE RESISTANCE MULTIPLE: The “multiple” is obtained by dividing the 24 hour pesticide or acid drop by the 24 hour natural drop. It will tell you if you have resistance to man-made pesticides and how well your treatment is working at the beginning of the treatment. (see the testing charts for examples) <http://www.mitegone.com/media.asp#charts>

RESISTANCE TO MAN-MADE PESTICIDES: (Fluvalinate, Coumaphos, and Amitraz based treatments). If the “multiple” (the amount of times the pesticide drop is greater than the natural drop) is:

- 20 and more times indicate you have no serious resistance and your treatment will work.
- 10 to 20 times indicate your resistance is building and your treatment may or may not work.
- 5 to 10 times indicates you should switch to another treatment. You will only increase resistance.
- 5 or less times indicate that an alternative treatment is a must.

TREATMENT EFFICACY OF PESTICIDES: If the “multiple” is:

- 30+ times, this is very good and represents 95-100% efficacy.
- 20 to 29 times -this is good be happy at 85-95% efficacy.
- 10 to 20 times – this is satisfactory for low infestation levels at 70-85% efficacy.
- 5 to 10 times – this may or may not be a sufficient treatment at 50-70% efficacy.

### What Level of Efficacy is Sufficient with Natural Substances?

More and more scientists are advising beekeepers that it is not necessary to kill everything at once with 100% efficacy as pesticides originally did. Pesticides act on a narrow band

of nerve genes that easily mutate and mites build resistance quickly. 100% resistance to fluvalinate and coumaphos and 80% resistance to Amitraz was found in Florida in December of 2001. Scientists are advising beekeepers to use natural substances like Tymol, Formic acid, and oxalic acid, which depending on application, have 70-100% efficacy. Since natural substances act on a very wide spectrum of genes from respiration, reproduction, and skin, mites are very unlikely to build resistance quickly. A treatment with 70% efficacy used twice a year can keep mites below the economic damage threshold.

**Keep mites below the 8-10 mite natural drop.** A low presence of mites may also allow bees to build up resistance to mites by increasing bee grooming and building natural defences against mites. All of Brazil has a natural selection population of bees and mites that exist together and Brazilian beekeepers do not treat at all. Unfortunately, having 90% of colonies die through natural selection is not an option in North America.

### **Efficacy of Formic Acid Treatment Depends on the Delivery:**

- **Generally** the higher the infestation of mites the stronger or longer the treatments you need.
- **In short blast methods** (soaked towels, cardboard, napkins, etc) you can increase efficacy by repeating treatment more times (i.e. 7-8 instead of 5 times).
- **In prolonged blast methods** (newspaper pouches, MiteAway, Gel Packs) extra slots / cuts can be made to increase the evaporation rate but generally these methods are not easily adaptable to various hive sizes and conditions. Modifications often shorten the length of treatment.
- **A low dose continuous Formic acid application using Mitegone method** has the advantage of ultimate adaptability. If your acid induced drop is 5 times the natural drop, increase your dosage by 1 pad. If it is 10-20 times, your treatment is working at 75-85% efficacy. You may be happy with these results or you may choose to increase the dosage by 1 pad.

### **What Causes Low Efficacy in Acid Treatments?**

The low efficacy is often due to equipment, bees, or temperature and humidity. Often acid is lost and wasted through unsealed holes in the hive body or cracks in the bottom board. Also, some bees may ventilate too vigorously causing the acid to be ventilated out of the hive. Large, strong hives (over 30,000 bees) will require larger amounts of acid. For example; a hive that is twice as strong may require 4 times or more acid. Extremely large strong hives are difficult to treat.

Placement, internal temperature and the humidity of the hive affect the evaporation rate of the applicator. In temperate climates the bees keep constant temperatures and humidity between the combs but not on the bottom board or under the top cover. They have no means of lowering high humidity in a hot climate. This causes a drop in the evaporation rate and can cease evaporation all together.

To offset the internal reduction of evaporation and humidity,. SEE: Recommendation for “Preparing Hives For Treatment,” on our website [www.mitegone.com](http://www.mitegone.com).

### **Formic Acid Treatments can have 95 – 100% Efficacy:**

See 2003 fall test chart in the test section of our website

- I test for Apistan resistance with statistically corrected (delete low and high) multiple of 30-75. I have no resistance and 95-100% efficacy. I used fluvalinate in the fall as long as it worked.
- I will not consider using coumaphos. Organo-phosphate residues exclude honey from the health food and European markets and the wax from cosmetic use. It contaminates your equipment, causing harm to brood and bees.
- To prepare for resistance and test fall acid treatments, I treated one yard of 40 hives with acid each year. In the test hives I apply 2 pads delivering 12 grams of acid per day to 5 hives and 3 pads delivering 18 grams of acid per day to other 5 hives. The chart shows the multiple of both acid groups at the same level and over 20 times, the 2 pad treatment is working well. If the 3 pad treatment delivering 18 grams will have a higher multiple and 2 pads will be below 20 times I am either losing acid and more acid is necessary or evaporation is low and I will modify the treatment accordingly (see Instructions document).
- The chart also provides a very interesting conclusion. In statistically corrected averages, both acid treatments are in the same efficacy as the Apistan treatment having a 25-75 multiple range.
- **Therefore, efficacy of 95-100% can be achieved with formic acid and the MiteGone method.**

**THE BEST PART OF EFFICACY TESTING IS THAT YOU KNOW THE RESULTS OF YOUR PROPOSED TREATMENT BEFORE YOU TREAT YOUR ENTIRE OPERATION AND YOU CAN DECIDE ON THE APPROPRIATE TREATMENT BEFORE YOU SPEND MONEY ON SUPPLIES.**

The average handyman can make 24 test boards and screens for less than \$50. Then, just buy a counter for \$2 and glasses for \$15. I sell boards and screens to my neighbours for \$5. You may consider doing the same or spread the word so everyone in your area tests and treats properly. Re-infestation is not as big a problem but if it can be avoided, avoid it by teaching and helping your neighbour.

### **WARNING:**

-Efficacy tests after treatment are unreliable. Mites continue dying long after the acid treatment. Natural drop in October can be higher than before treatment in August. Do not despair; testing before spring is what tells you how well you did.

-Efficacy multiple works well in late summer. Do not use it in the spring.

**PLEASE START TESTING! IT WILL SAVE YOU MONEY AND YOUR BEES!**