SUCCESSFUL BEEKEEPING

By Bill Ruzicka PEng. . Inventor of **MiteGone®**
Commercial Bee Breeder in British Columbia.

HISTORY OF PESTICIDES AND TREATMENTS IN SIMPLE LANGUAGE, INCLUDING THE SUBJECTS CONSIDERED TABU*. IS THERE A SILVER BULLET? YOU BE THE JUDGE.

Most scientists divide pesticides into the 3 categories: **MAN MADE PESTICIDES, BIO PESTICIDES, and NATURAL SUBSTANCES CONTROLING MITES.**
I would like to add **HIVE MANAGEMENT** to this list but I will leave this topic to the May issue story about IPM, Nukes and Swarms.

I have 25 years experience with using Natural Substances, in Canada, USA, and Word Wide. Running 550 hives made my research in Canada limited but allowed me to go to Florida each year in mid October to mid December. This gave me 5 years head start on all diseases and pests before they reached BC. It also allowed me, after the commercialization of **MiteGone,** to travel and see beekeeping in Australia, New Zealand, Argentina, and the Czech Republic, where **MiteGone,** under license, is sold. I presented many seminars on the use of Formic acid in these countries, over 20 in Canada and 50 plus in the USA. This exposure gave me a great insight into how American beekeeping works. The other thing that gave me an advantage is that I'm originally Czech, and my friend Oldrich Haradsim was the head of bee pathology in the Czech Bee Research Institute, and through him I was able to connect with German and Swiss researchers giving me access to 30 years of European experience with mites. The disadvantage of this it is that you have to put up with my way of writing which may not always be perfect English.

I gathered literary tones of material to help me choose which way to treat my hives. What I found I will share with you in ABSTRACTS:

MAN MADE PESTICIDES:
In the late 60s, after DDT was banned, the US and UK governments dug into the army vaults where nerve gases of WWII were locked. The Germans developed ORGANOTHIOPHOSPHATES which we now know as CHECK MATE with the active ingredient **COUMAPHOS.**
The English and the Americans developed PYRETHROIDS, which we now know as APISTAN with the active ingredient **FLUVALINATE;** and APIVAR and TACTIC with the active ingredient **AMITRAZ.** They released them to chemical companies to create new pesticides.

These nerve gases did not hurt soldiers physically, but damaged their minds. They become 3 year old kids only wanting to eat, not follow any orders, and often got lost and did not return if they went away. This sounds familiar. After 20 years of using these pesticides, we worry that in Colony Collapse Disorder bees fly away and don't return. Why is this a TABU* subject?
All of these pesticides act on a few of the mites' genes however; the mites can easily develop resistance to them. The other side effect is that they contaminate the comb to unusable levels as Coumaphose did, and it can contaminate honey. It is interesting that contamination has been found in Chinese and Argentinean honey, but no one has tested US honey except Germans who have blocked import of US honey to their country.
You should know that the manufacturing of pesticides for the beekeeping industry is a drop in the bucket of the pesticide industry and the development of special pesticides is financially not viable. What the companies do is they adapt existing pesticides to suitable and easy applicable plastic strips and charge lot for it.

*TABU is a subject which no scientist will for any reason touch.

CONCLUSION: I had originally wrote two pages of details for each man made pesticide in this article but I will published it in the next November issue as part 2 of this story. But there is something you should now know:

ADVICE: Amitraz causes sterility of drones if applied at the time when mating drones are reared. A Hawaiian queen breeder found that out the hard way. His queens were badly mated, stop laying, and superseded.
Free advice to our bee breeders: switch to formic in a low dose as it does not cause this problem.

The other advice is for naturalists who do not want to use any treatments in their hives. ***It takes 2 years for the Varroa mites to build up a population to a level which kill your hive. Then you will have to use an organic treatment. You might as well start now before your colony collapses. It is very important for those using APIVAR to learn how to monitor and test for resistance and get ready to use something else.*** I will tell you how in my August story or you can go to my website: www.mitegone.com in the "Testing" section.

My last bit of advice: **Regardless of what method, pesticide, or homemade potion you use, all treatments in late September or October are too late. The damage to the brood of winter bees is already done and the colony may collapse.**

BIO PESTICIDES:
Are other life forms that have the ability to kill pests. The most common are various FUNGUSES. But most scientists believe that funguses kill mites on plants only. They believe that there is no known fungus that will kill mites on living organisms. This is not true. There is such a fungus and I hold the patent to it.

THE FUNGUS IS CALLED **HIRSUTELLA THOMPSONII**. From 1992 to 2000 I spent researching and generating patentable proof that HIRSUTELA works. I established a research centre in Florida, where Florida beekeepers and their association and state apiarist Laurence Cuts helped me. This work led to final proof being generated in Gainesville labs. While driving each year to and from Florida I visited research centers in Weslaco Texas, Baton Rouge Louisiana, and Tucson Arizona. The scientists in those centers became my mentors and made a reasercher of me. I learned how proper scientific and statistically correct tests need to be done and how to judge REPRODUCTION rates of Varroa and many other things to help in future research.

NATURAL SUBSTANCES HAVING THE ABILITY TO CONTROL MITES:
ESSENTIAL OILS: Yes, we have all heard about essential oils and how great they are. Unfortunately I was not able to find a single independent scientifically and statistically correct research document supporting those claims.

MENTOL AND TYMOL: While both have been used commercially and have supporting research, both leave residues in honey. They also have a very limited weather application window. There are too many reports of unreliability on BEE-L.

OXALIC ACID: This is a wood preserver which comes in crystal form and after dissolving it into a liquid solution it turns back into crystals. The jury is still out on the effectiveness of this. If the same thing happens during evaporation in the hive then the crystals will cause the same contamination as Coumaphose did. The Evaporation of OA was used in mass in the old Soviet Union and many beekeepers got sick. There are also many unreliability reports. You can check BEE- L yourself.

FORMIC ACID: In 1992, four independent entities completed research on all European 85% Formic Acid Methods and came to the same conclusions but to different solutions. There are:

Short Blast methods: they consist of applying 30 cc or so of formic acid to bottom boards, or napkins on top of frames, butcher pads, blue towels and other absorbent materials. The oldest method I know about and have and seen in use in Florida by an old German was a piece of white 8x11" cardstock. He applies the Treatment in late October and May. He goes into his yard at dusk, soaks the cardstock in formic acid, and inserts it onto the bottom board. He can do one yard each evening of 20-30 hives. The next day he does the next yard. Three days later, he comes back to first yard, pulls out the cardboard and counts the mites. If there were more than 5 mites, he scraped them off, soaked cardstock again and put it back, that was repeated until there were no more than 5 mites on the cardboard. The last time I saw him was in 2008. He newer used anything else and never lost a hive to Varroa or CCD while all around him hives were dying.

These short methods work as long as they are applied at the right time and during the right weather conditions on strong colonies with clean entrances. They work on the principle of overdosing the hive and relying on bees' ventilation to lower the concentration to the level which will not kill adult bees, but will kill the mites. How do bees know how to do this? No one knows, but we know that it can cause damage to emerging brood and can cause drone sterility. If you apply it at the wrong time on the wrong size of colony or plugged entrance you can kill queens or whole colonies.
Conclusion: while these methods work they are too labor extensive, too weather dependant and hardly usable in large commercial operations.

Prolonged Blast Methods: These work on same principle and have same problems as the short blast method, but are amplified by the weather as changes in daily temperatures cause the blast releases, therefore they must be used during a time of year where weather does not vary too much.
High temperatures could cause disaster and hive mortality.
Conclusion: They can not be used in late summer to protect winter brood, and only Kramer plate was found suitable for commercial beekeeping, but it had all the bad side effects of blast methods and was laborious as the Kramer adjusted the blasts to variouse sizes of colonies by cutting different amounts of evaporating holes.

Low Dose Continuous Release Methods: These have the advantage that the bees maintain constant internal hive temperatures and humidity required by brood. This guarantees a constant evaporation rate and sub lethal exposure which has none of the blast method negative side effects. On the contrary it has the side benefits of reducing NOSEMA, CLEANING CHALK BROOD, and killing LESER WAX MOTH. The evaporators like the POPODI, BURMISTER, and NASENHIDER were placed into fictitious frames and placed into the brood chamber.
Conclusion*: *While the results were ideal the dispensers were jugged unusable in commercial operations, having thousands of little plastic gadgets requiring filling of small containers with acid, cleaning them and storing them just was not suitable.

REASERCHERS AND SOLUTIONS:
USDA Bee Research Laboratory, *Beltsville*, MD: Decided to develop a gel pack which will eliminate problems of blast methods and be a prolonged treatment. Commercially it is known as Apicure. It was discontinued after short use and formic acid become TABU* for any USDA-ARS.

Ontario Tech Transfer Team: Modified the Kramer plate blast method by using perforated bags instead cutting holes, and cutting slots in the bag to increase evaporation after week or two of evaporation on top of frames. It become MITEAWAY and was discontinued.

Dowson Creek Research Centre BC: Developed a blast method; it was newspaper placed in a Ziploc bag. Evaporation was controlled by cutting slots in the bag as treatment progressed. Carry Clark while working on C-94 (a proposition exempting Formic Acid from registration, under which we all happily

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used formic acid until 2005), questioned the 85% concentration and determined that 65% is better, produces the best result, and causes less damage.

Bill Ruzicka, Kelowna BC: I did not like the Kramer plate because of its disadvantages and how laborious it was. I liked the LOW DOSE CONTINUOUSE RELEASE method and its positive side effects, but I did not like the European dispensers and their use of 85% acid. Therefore I borrowed their idea, combined it with Carry's 65% concentration, and designed a better commercially usable dispenser. It took two years of tests and trials. The first pads were used in my hives in 1994 and in 1995. Several Okanagan beekeepers were with me in my shop making the pads by hand and using them. That went on until 1999, when John Gates convinced my daughter to convince me, to go commercial.

She came up with name **MiteGone** and we patented the pads and method. I established contract manufacturing in Canada, USA, China, and half a million pads were used in North America.
In Australia pads were made for New Zealand. I shipped 100 000 pads to Europe and 50 000 were used in Spain and smaller amounts in France, England, Czech Republic and other countries.
It is hard to succeed in Europe. All countries recognize the importance of bees, and subsidize registered and established medicines. It does not matter how good your product is as the "old" ones are free. Getting **MiteGone** accepted is still being worked on by our licensees.

By 2005 my daughter got married had a family and had better things to do. I got to learn how to use computers and MiteGone become one man business. By 2008 I brought my machinery from USA home to Kelowna, designed and made additional machinery and manufacturing line for kits. Now from the same base material I can make both kits and control quality and also eliminate only problem we ever encountered. The original 10"pad when cut in half had one end open by cut and one sealed, when someone did not follow the instructions and installed pads by open end up instead down no evaporation took place. All new Kelowna production pads are already cut to 5" pads with both ends open so no one can install them wrong.

Since beginning we have maintained annual testing and have come to many new discoveries. Many trials, tests and research were done in SPAIN, the Canary Islands, Ruther's university in USA, Florida and the Czech Republic. (All research and testing is on our web site www.mitegone.com under "Scientific Evidence" including credible use histories.)

In 2000, as apart of our HIRSUTELA research of 120 hives; ten hives were set with pads installed vertically as recommended and designed. Pads have an elongated cell structure acting as capillary tubes. They hold exact amount of acid without dripping and as acid evaporates from bottom evaporating surface the gravity pulls the acid down, ensuring a steady flow of fumes. In ten hives, pads were placed horizontally on the top of the frames. This is because many users wanted to and did use them that way.
RESULTS: Efficacy of vertical installation was as good as the control hives treated with APISTAN.
: Horizontal installation FAILED heaving same results as untreated controls.

In the beginning, we used common tests used with man made pesticides to test before treatment and after. It drove me nuts. Often tests after the late summer treatment had more mites than before treatment, but the tests before spring treatment showed very little mites. I was happy with this result but I wanted to know why. We switched to full size drop boards and monitored the efficacy comparing natural and pesticide drops. I did many exploratory tests and searched for reasons:

HOW DOES FORMIC ACID KILL MITES?
Formic acid is believed to act as an asphyxicant. However, one German researcher believes formic fumes kill mites (but not bees) because a mite's exoskeleton or skin is much thinner than that of a bee, allowing the fumes to penetrate their bodies. There is no scientific proof as to how formic acid kills the mites but most scientists believe that the minimum treatment must be over 3 mite reproduction cycles = 3 bee cap (7 day) brood cycles which is 21 days. The likeliness of mites becoming resistant to formic

acid is very low. After 45 years of use in Europe, no resistance has been found. Therefore, multiple long treatments during one year are possible without causing resistance.

WHEN YOU TALK ABOUT FORMIC ACID, ON ITS OWN IT DOES NOT CAUSE OR PRODUCE ANYTHING. YOU MUS SPECIFY **CONCENTRATION AND METHOD USED** FOR EXAMPLE: 65% concentration low dose continuous release method by **MiteGone** repels the Small Hive Beetle. Blast methods and 85% or higher concentration causes stress in hives that attracts the SHB.

HOW THE 65% MiteGone METHOD controls mites:
In low dose continuous release treatments sub lethal fumes, which are heavier than air, flow down onto bottom board where they form pool of heavy acid fumes. The bee's ventilation brings the fumes back up into brood, where it breaks mite's foot pads. They lose grip on the bees and fall off onto bottom board or screen bottom monitoring trays where they die.
Haw do I know? When you install drop boards at a same time as you installed the treatment and check it in first few hours before the pool of heavy acids fumes is formed, most of the mites stuck on sticky boards are still alive by 15th hour they are all dead.
ADVICE: Entrance reducers, pollination blocks, and entrance risers, help in forming the pool and improve efficacy of treatment.
Not all mites fall off the bees and many are hidden in the caped brood. When they emerge, they will be affected by the treatment. Many fall and die, but many survive but become sick and continue dying a long time after the treatment ends. That's why we do not remove the pads after 21 days. A late summer treatment may last 30 to 40 days. ***ADVICE: Leave the pads in until spring.***

It was believed that mites in capped cells were protected against effects of low dose continuous release methods. However, my exploratory tests show that even the mites that entered the cells that got caped before treatment started had a lower rate of reproduction.
How do I know? In my HIRSUTELA research I learned how to examine 18 days old larva (black ayes) and used **VAROA MITE REPRODUCTIONS GUIDELINE** by Jeff Harris & Robert Danka USDA Honey Bee Breeding, Genetics and Physiology Lab Baton Rouge, LA (on our web in supporting research.) ***to judge mite reproduction in exploratory trials. Finally in 2008 in Florida, in a properly scientifically and statistically set up research project, we not only proved that treatment properly controlled Varroa but also REPELED the Small Hive Beetle. Further, Varroa in all stages of treatment and after, did not reproduce in 80% while in non-treated controls 80% did reproduce.***

The three years of research in the MENDEL University in Brno Czech Republic 2007 to 2010 also proved that the **MiteGone** treatment provided better result than Gabon and Amitraz fumigation together. It also emphasized importance of spring treatment.
ADVICE: The prolonged treatment not only cleans your hives but also protects your hives from re-infestation during pollination or robbing times. The infertility of mites controls the population of mites between treatments.
Finally in 2005 our tests showed a building resistance to all Fluvalinate treatments. By than other problems caused by COUMAPHOSE and a building resistance to variouse home potions of Amitrazwas known. We decided to start to use **MiteGone** twice a year. Once late August, before mites can damage the winter brood and again in mid April to protect hives in pollination. The details are in 2006 to 2010 test summary.
CONCLUSION: All tests during that period were overseen, and mites counted by our regional bee inspector **Reg Kienast.** ***To his surprise and dismay, the spring tests in 2009 and 2010, the natural drop before treatment he found a TOTAL OF ONE MITE on 20 boards out of 20 hives, statistically that equals to: ZERO MITES.***

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