Sept/Oct 2004

Mites Influencing Pollination

The varroa mite, *Varroa destructor*, was first identified in the United States in 1987. It was first found in, and abruptly sent out of, California in 1990. By 1992 the mite was pretty well distributed throughout the country.

As with the introduction of an entirely new parasite into any host population, our European honey bees were pretty much unable to fend off the infestations. Both managed colonies and feral colonies became infested. In most cases, within a year or two, the infested colonies died. Those deaths first were attributed to overwhelming mite numbers (which can happen), but a significant portion of the deaths was due to viral epidemics spread by the mites acting as disease vectors.

Dying colonies did not simply dry up and disappear. They became weak and susceptible to robbing. Robbing bees brought more mites to the original hives. Disoriented drones drifted into neighboring or distant colonies, bringing the mites with them. Beekeepers moved infested bees all over the country.

When an infested colony collapsed, hundreds or thousands of adult bees left the hive to find another colony in which to live. Even if the guard bees at the “new” colony fought off the invaders, the mites dropped off the fighting bees and got into the colony.

By 1995-96, there were very few feral colonies across the nation. Growers with smaller acreages of crops, who had relied upon feral honey bees for "free" pollination, were desperately seeking beekeepers who could supply bees for their crops.

At this "peak" of mite numbers, commercial beekeepers had to treat their colonies with acaricides as many as three times a year to keep them alive.

Fortunately, there was a time-release treatment available that was quite efficacious and the industry "survived" the first influx of mites. With time, the mite numbers dropped significantly, and the beekeepers were able to settle in to treating one time a year pretty successfully. With a reduced mite load in the environment, feral colonies began to be noted, again, in trees and buildings.

As with any chemical used repeatedly to subdue a pest, the varroa mites eventually became resistant to the first acaricide. This took about ten years. So, a second time-release acaricide was registered for the same use. Unfortunately, resistance developed to the second acaricide much more quickly, with some beekeepers only getting about three years of usefulness from the product. A third, easily applied, time-release product has not come onto the market for mite control.

In many commercial beekeeping operations across the nation, varroa mites are increasing in numbers again and causing significant losses to the beekeepers. Even before the infestations reach lethal levels, the presence of mites causes significant losses of honey yields. The infested (stressed) colonies are more susceptible to diseases and adequate numbers of mites (see the following topic) can generate epidemics of viral diseases that lead to colony death with "Parasitic Mite Syndrome." The two most commonly found viruses in the U.S. collapsing colonies are Acute Paralysis Virus and Deformed Wing Virus. But, Kashmir Bee Virus seems to be causing problems, elsewhere, and we have that virus in the U.S.

The resurgence of varroa mites in commercial beekeeping operations is causing significant economic effects on the costs of maintaining colonies. Beekeepers, again, have to treat their colonies up to four times a year to keep them alive. That increases the costs for treatment chemicals and for the labor involved in the applications.

Since infested colonies do not collect and store as much food as healthy colonies, coupled with a prolonged western U.S. drought, feeding colonies sugar syrup and pollen substitutes raise the costs of operation significantly in terms of feed and labor to apply it to the bees. Colony losses are beginning to rise, again, fairly abruptly. This increases expenses as new bees are purchased to refill empty hives.

Add to that the increases in costs of gasoline, labor costs, workman's comp, etc. and the beekeepers are facing a real uphill battle.

The beekeepers have little control over the prices of honey. They cannot raise prices to their peers, significantly, for queens and bulk bees, so all that is left to help meet the rising costs of doing business is pollination income.

California beekeepers pollinate over 50 commercial crops in California, but the mutual relationship between almond growers and beekeepers is the one that holds the system together. In 2003, colony rentals averaged about $46 apiece. In 2004, the average approached $50. Next year (2005), the beekeepers report that they have to increase prices signifycantly, just to stay in business. Early contracts have been signed for $60 a colony, but that may be the lower end of the scale. Beekeepers watching their "bottom line" carefully say that $75 may be necessary keep them in business. Even at that price, bees may be in short supply for almond pollination, since out-of-state beekeepers are having serious problems with colony health, also. Members of the beekeeping and almond growing communities must remain in constant, meaningful contact to be certain that both industries remain healthy well into the future.

Mathematicians Predict Colony Collapse

It is always interesting to see how experts outside the usual realm of apiculture can apply their expertise to beekeeping topics. In this case, a group of mathematicians built a model to determine what number of varroa mites (vectors) would be needed to cause a virus epidemic in a honey bee colony.

The first chore was to define an epidemic. In simplest terms, it means that the virus is able to persist. But, they and we really wanted to know about serious epidemics that cause problems, such as parasitic mite syndrome.

The mathematical model was pretty complex, since a whole lot of factors are involved in the process – aspects of the life cycle of bees, life cycle of mites, virulence of the chosen virus, etc.

Their general conclusions were: The more virulent the virus (the quicker the infected bee died), the more mites were needed to get an epidemic started. Acute paralysis virus (APV) and Kashmir bee virus (KBV) are virulent types. A less virulent virus, like deformed wing virus (DWV), allows the bees to live a longer time, thus giving many bees and mites a chance to become infected.

So, their predicted numbers of mites to cause serious problems in the summer are 12,289 for the virulent viruses and 2,315 for the less virulent ones. In the fall the numbers of mites needed to cause trouble are reduced, as are the bee and brood numbers. Then, the numbers are 6,830 for virulent viruses and 737 for less virulent ones.

Can our colonies reach these levels of mite loads? It is quite likely. The literature has many articles describing counts above those levels.

Also, the mathematicians' model suggested that the only modifications to the model that impacted the epidemic potential were changes that **reduced mite numbers**. Decreasing numbers of infected bees (resistance or tolerance) or removal of dead or infected brood (hygienic behavior) were not effective, unless the mites were removed as the brood was being removed.

This suggests that we should place the greatest emphasis of our studies on how to reduce the number of mites in a colony. This information sounds similar to malaria, where if there are no mosquitoes (vectors) around, there isn't much of a disease problem.

The complete citation for this article is: Sumpter, D.J.T. and S.J. Martin. 2004. The dynamics of virus epidemics in *Varroa*-infested honey bee colonies. Journal of Animal Ecology 73: 51-63.

In-hive Pollen Transfer

We have known for a long time that pollen foraging honey bees are very specific about their sources. In fact, they are so specific that when Dr. Gloria DeGrandi-Hoffman built a computer model for almond pollination, the pollen had to pass from bee to bee, inside the hive, in order to get to the right places in the field.

An interesting paper in ISHS Acta Horticulturae 561: VIII International Symposium on Pollination describes an experiment in which there is tangible evidence that pollen is transferred in the hive.

Small mango trees were caged. Honey bee colonies were added to the cages. Some of the hives were constructed in such a way that an entrance opened into the cage and an entrance opened to outside the cage.

The mangos are self-fertile, but one of the varieties in the cage was genetically a bit different from the others, so some hybrid embryos were expected.

In cages where bees had to stay home, about 6% crosses were found. In cages where the bees could go outside, 18% hybrids were found. The authors A. Dag, C. Degani, and S. Gazit) believe that the extra 12% crosses were from pollens collected outside the cage, moved from bee to bee, and deposited on the caged flowers.

Tylosin Residue in Honey

In the Journal of Apicultural Research 43(2): 65-68, 2004, Jan Kochansky reports upon his studies of tylosin residues in sugar syrups and honey.

A figure in the text depicts tylosin as a macrocyclic lactone (tylonolide) attached to three sugar molecules. One sugar leaves readily and the "breakdown product" of tylosin is desmycosin. Both the parent product and first breakdown product are effective in controlling AFB. It takes about 130 days for half the tylosin to convert to desmycosin in honey, but it would take 1.5-3 years for the two products to break down further. Tylosin has a half-life of about 75 days in sugar syrup.

Thus, it is obvious that when tylosin becomes available for bees on the U.S. market, it should be used only in powdered sugar (which is how it will be labeled) and not in syrups, where it will persist for months or years.

Honey Refractometers

You may have seen the new type (digital readout – Pocket Honey Refractometer PAL-22S catalog 2004.4.12) of honey refractometer advertised in one of the U.S. beekeeping magazines. The product comes from ATAGO, 13005 NE 126th Place, Kirkland, WA 98034. That type of refractometer is advertised for $330. They also have the old type (HHR-2N, catalog #2522) for about $280. If you wish to contact them, call 1-877-282-4687.

CSBA 2004 Annual Convention

Red Lion Hanalei Hotel
2270 Hotel Circle North
San Diego, CA 92108
(619) 297-1101
November 9-11, 2004

Monday, November 8
3:00 pm Board of Directors

Tuesday, November 9
8:00 am Registration and Commercial Exhibits Open
8:30 Opening Ceremonies and Committee Reports
10:00 Exhibitor's Break
10:20 Exhibitor Introduction and Door Prizes
10:30 "Stanislaus Museum for Bee History" – **Michele Laferty**
11:00 "Sex and the Mandarin Orange" – **Dr. Tracy Kahn**
11:30 "Germplasm Storage" – **Dr. Anita Collins**
12:00 pm Lunch
2:00 American Honey Queen
2:15 "Honey and Your Health" – **Bruce Boynton and Dr. Kathy Beals**
3:15 Exhibitor's Break
3:30 Exhibitor Introduction and Door Prizes
3:45 "Almond Industry Outlook" – **Steve Rothenburg**, Blue Diamond
4:15 "Addressing Almonds' Future Needs" – **Pollinator Panel**
6:30 New Member Reception
7:00 American Honey Queen Reception

Wednesday, November 10
7:00 am Sioux Honey Association Breakfast
8:00 Registration Continues, Exhibits Open
9:00 "Insurance: How Much is Enough?"
9:30 "New Honey Adulterants" – **Bruce Boynton**
10:00 Exhibitor's Break
10:15 Exhibitor Introduction and Door Prizes
10:30 "Sting Therapy" – **Reyah Carlson**
11:15 "New Liquid Pollen Mix Update" – **Dr. Gloria DeGrandi-Hoffman**
12:00 pm – **Research Luncheon** "Queen Rearing and Contaminants" – **Dr. Anita Collins**
FREE AFTERNOON
2:00 "Sting Therapy Workshop" – **Reyah Carlson**
7:00 Research Committee Meeting

Thursday, November 11
8:00 am Registration Continues, Exhibits Open
8:00 "TBA" – **John Miller**, Newcastle, CA.
8:30 "Pesticides" – **Dr. Jerry Bromenshenk**, University of Montana, Missoula.
9:00 "Queen Panel"
10:00 Exhibitor's Break
10:20 Exhibitor Introduction and Door Prizes
10:30 "Current Mite Treatments"
11:00 Ladies Auxiliary Lunch
11:00 "Keeping Bees in an Africanized Bee Area" – **So. Cal Beekeepers**
12:00 pm Lunch
1:30 CSBA Annual Business Meeting
2:00 "Sting Therapy Workshop" – **Reyah Carlson**
3:30 Live Auction
6:30 Social Hour and Silent Auction
7:30 Awards Banquet

Friday, November 12
8:00 am Breakfast Board of Director's Meeting

Convention Registration: Patti Johnson, 7220 E. Grayson Road, Hughson, CA 95326, (209) 667-4590.

<u>Research Snippets</u>

Researchers A. Dodologlu, C. Dülger and F. Genc from Turkey examined the interactions between hive type (wooden or polystyrene) and feeding (syrup and pollen substitute) on colony performance.

Colonies that over-wintered in Styrofoam hives consumed less food, but lost an average of 47% of their bees. Bees wintered in wooden hives lost 37% of their bees. Eight colonies were lost (of 67) in wooden hives and 14 of 60 failed to overwinter in foam hives.

Brood nest areas and adult colony populations in the wooden hives were one to two frames greater than in the foam hives. Not surprisingly, colonies fed syrup and/or pollen substitute produced more bees than colonies not fed.

Interestingly, there was no difference between the honey yields of colonies kept in different types of hives. However, the bees living in the foam boxes were about three times as likely to sting, but their numbers of bees involved in robbing were less.

The details can be found in the Journal of Apicultural Research 43(1): 3-8, 2004.

S. Bogdanov *et al.* sampled honey from retail market shelves in Switzerland to determine if they contained residues of PDB (para-dichlorobenzene). PDB is sold as "moth crystals" in the U.S. and is registered for wax moth control in stored, empty combs in every U.S. state except California.

Of 173 Swiss samples and 287 imported (including North America) samples, they found 30% and 7% with demonstrable levels of PDB, respectively. The range was 2 µg/kg to 112 µg/kg(or parts per billion). Thirteen % of Swiss samples were above the Swiss tolerance level of 10 µg/kg.

A simultaneous study of Swiss beeswax showed PDB levels of 1-60 mg/kg (or parts per million). It was suggested that beekeepers find other means to control their wax moth problems.

The details can be found in the Journal of Apicultural Research 43(1): 14-16, 2004.

R. Siede, R. Büchler and A. Schulz from Germany examined 389 samples of honey to determine if they were contaminated with GM (genetically modified or "transgenic") materials. In particular, they looked for particles of GM-soybean that might have been introduced from soybean based pollen substitutes.

They found 11 of the honey samples and four of 11 pollen substitute samples to contain transgenic materials.

Corn, soybeans, cotton, and rape, among others, have been genetically altered and planted in many countries. Soon, it may be very difficult to avoid GM materials in the foraging ranges of honey bees.

The details can be found in Bee World 84(3):107-111, 2003.

Sincerely,

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