

Jan./Feb. 2004

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"Hard Copy Newsletters"

Currently there are about 120 copies of this newsletter being printed and mailed to individuals within the state, around the country and around the world. Many of those mailings have been "complimentary" since the time that I took over the newsletter, over 27 years ago.

Support funding for my extension program in this and next fiscal year has been slashed severely. Complimentary subscriptions (no termination date on the mailing label) will have to be converted to paid subscriptions this year in order to keep the newsletters coming.

The annual subscription rate has to be increased to

\$15.00 (U.S.). If you wish to continue receiving a mailed copy of the newsletter, please send a check, made payable to the **Regents of U.C.**, to me at the **new** address on this issue and I will be sure to keep the newsletter coming. The other option, available to many, is to visit my Web site and read the newsletters for free.

Thanks.

The Month of Meetings

January, 2004, was the most "on the go" month that I have experienced in this position. However, the travel time gave me an opportunity to read a very interesting paperback book on **Molecular Mechanisms of Disease Tolerance in Honeybees**. This is

a Proceedings of the Euroconference on MOMEDITO held on this subject in Kralupy near Prague, in the Czech Republic in 2002. The publisher is the Bee Research Institute in Dol. The Proceedings were published in 2001.

I was intimidated by the title, because I do not consider myself a molecular biologist. However, the articles turned out to be reviews and research reports on studies conducted at a level that we all can understand. The truly valuable aspect of the text is that it summarizes the studies of hundreds of European laboratories, especially in the areas of *Varroa* mites, which they have been fighting much longer than we have.

I will share a few of their insights in the following briefs.

Biology of *Varroa*

This is the title of Stefan Fuchs review of what is known about the life and death of *Varroa* mites gleaned from 100 research papers mostly from Europe.

Problems with *Varroa* began to be seen in Japan in the 60's and Russia in the 70's. The mites were found in Germany (Fuchs' country) in 1977. Studies of *Apis cerana* and *Varroa* mtDNA showed a lot of similarities, suggesting that they had been around each other for a long time. *A. mellifera* and *A. cerana* do not show those

similarities and *A. mellifera* has a very difficult time surviving with the mite.

Fuchs states that mite reproduction and immigration lead to increasing mite populations, while death and emigration reduce the population. Fuchs feels that we have only studied mite reproduction in detail and there is much more to be learned in the other three areas.

In his review it is stated that newly emerged, "phoretic," *Varroa* mites switch from one adult bee to another quite often. They are most likely found on nurse bees, not on newly emerged bees, when they are out of the cells in the hive. Brood nest temperature and chemoreception may be involved. If brood is available, the phoretic mites will return to the brood in about six days. Otherwise, they can remain on adults bees for months. Apparently, the mites can sense bees and brood with a cluster of sensilla in a pit at the tip of their first pair of legs.

There appears to be non-random distribution of mites in the cells - they tend to clump in certain areas. I mentioned that before when discussing "sticky boards." The boards have to cover the whole bottom of the hive in order to prevent missing hot spots along the edges of the brood nest.

How often do the mites go from one cell to another for reproductive reasons? Observations in hives suggest two or

three times, but in the lab, they can produce brood very well in seven consecutive cells.

Emerging mites seem to be less than rugged. One researcher estimated that 30% of emergent mites drop from worker cells and 20% from drone cells. Hygienic behavior (of bees) is said to increase this effect.

The death rate of mites has been calculated as 0.032. Thus, 30 mites should drop from a population of 1000 mites, daily. However, studies usually produce ten. It is estimated that four may be lost in the phoretic stage on bees outside the hive. Where did the other six go?

European researchers have noticed the same immigration peak that we saw at Bee Biology. A big increase in mites at the end of the nectar flow. We still don't know whether this is due to drifting or robbing. But, an interesting tidbit is that a study showed a higher level of infestation on foragers leaving a hive than on foragers returning to the same hive. Did the infested workers not return to "save the colony" or did they dump their parasites on a neighboring colony? We just don't know.

Inhibiting Mite Reproduction

A team of researchers in Italy noticed that dual infestation of brood cells led to less than 2X production of mite offspring. Thinking that this might be a chemical response,

they extracted chemicals from infested brood cells, isolated the compounds, and found one in particular that interfered with mite reproduction.

Due to patent considerations, the chemical wasn't specified.

Deformed Wing Virus

A close look at deformed wing virus revealed the following: 1. DWV is not a rapid colony killer. It can be detected in bees where no signs of disease are noticed. 2. Adult bees can carry the virus and not die. 3. Mites transmit the virus to pupae and nurse bees. 4. If the host bee shows deformed wings, any mite feeding on that pupa is viruliferous. But a mite feeding on an asymptomatic, DWF infected host does not necessarily pick up the virus. Also, infected mites do not always transmit the virus.

Acute Paralysis Virus

We usually blame colony collapse on deformed wing virus when *Varroa* mites are involved. But, a study conducted in Poland determined that DWV was nowhere to be found, while colonies died in large numbers. Samples of dead bees, sent to England for analysis, revealed that the bees had very high titers of acute paralysis virus.

There was some APV found in late summer colonies that showed no signs of disease, but they had little or no *Varroa* mites in

them. So, it is apparent that Varroa mites can move at least two very important bee viruses among honey bee populations.

Musings on American Foulbrood

Numerous articles on American Foulbrood are included in MOMEDITO. One article compared the changes in intestinal cells when larvae were killed by ingestion of foulbrood spores, amitraz or oxytetracycline. Briefly, the bacteria killed the cells by "necrosis." They fell apart. The two chemicals, on the other hand, killed the cells by "programmed cell death" (apoptosis).

AFB - Biology and Control is the title of a 23 page review of the topic by Henrik Hansen & Camilla J. Brodsgaard from Denmark. First described in 1769, AFB was the disease that demanded the most scientific attention until the arrival of exotic parasitic mites. The article has 132 references and is extremely comprehensive.

A number of researchers have found that the statement of Dr. Roger Morse that all colonies have foulbrood spores in them may have been more accurate than some of us thought.

Researchers from Slovakia reared highly susceptible and somewhat resistant lines to AFB for three years. They conducted their tests by inoculating drone larvae in combs and placing them in nucs to determine how much brood survived for seven days. Their tests resulted in 32.3%

survival in the susceptible line and 61.5% in the resistant line.

Other researchers, from the Slovak Republic, extracted the heads, thoraces and royal jellies from various lines of bees, trying to find antibacterial peptides active against *Paenibacillus larvae*, the bacterium that causes AFB. They found two bands by electrophoresis that seemed to work. One has been found previously (royalinsin), so it is likely that they will investigate the properties of the "minor" components next. Royalinsin is a honey bee specific "defensin," (a category of naturally occurring defensive chemicals in insects) that are active against Gram-positive, but not Gram-negative bacteria. Also, all royal jelly is not created equal. Royalinsin levels differ from bee stock to bee stock.

Other researchers in the Slovak Republic regard royalinsin as MRJP1. They have also isolated MRJP2-5. They think that MRJP1 is nutritional, and that the antibiotic activity resides in one or more of the other four proteins.

Dr. Marla Spivak has an extremely well written and illustrated 21 page review article on the Mechanisms of American foulbrood resistance and current research on hygienic behavior. In her article she relates the results of her studies to those who authored 41 other papers on the subject.

There is much more in the text, such as comparing media

for growing chalkbrood in the laboratory and studies on *Tropilaelaps clareae*. This is an excellent reference text that everyone in honey bees should consider purchasing.

Your Own Honey Straws

Did you ever wish that you could fill your own honey straws and not have to worry about minimum sized orders, etc.? Well, the machine is available to you. Called the Personal Bench-Top Honey Straw Machine, you simply attach a pail of honey, turn on the machine and let it do the rest. The honey is heated automatically, the straws filled and sealed, and the machine shuts itself off when any supply runs out. If you wish to learn more about this \$2,500 machine, you can visit the Web site www.busybeefarm.com/Stickyflyer2-01-02.htm or call toll free 1-866-HNY-STYX (469-7889), or email: Kate@BusyBeeFarm.com. The mailing address is Busy Bee Farm, 140 Langford Road, Raymond, NH 03077.

Honey Board Tidbits

The honey research papers of Dr. Jonathan White are now available to you in Penn State University's Archives at its Special Collections Library. For information, contact Penn State's Special Collections Library at (814) 865-7931 or through Jackie R. Esposito, jxe2@psu.edu. You can view the collection at: www.libraries.psu.edu/crsweb/special/FindingAids/white.html.

Want some help keeping kids fit and happy? The National Honey Board developed a five-panel brochure that includes cartoons and tips and trivia on how kids can stay fit and healthy with exercise and good nutrition. The brochure includes recipes for high energy snacks such as "Jumpin' Orange Juicer," "Honey Granola Bars," and "Rookie Rangers." Copies are available free to kids, educators and dietitians who teach nutrition to kids. They can be purchased from the honey board at \$0.12 a copy. Contact the Honey Board at: (800) 553-7162.

Another new NHB publication worthy of note is called Keeping Food Safe. The title might be a little misleading. The content is about the Public Health, Security and Bioterrorism Preparedness and Response Act of 2002. The Act makes it necessary for a number of honey producers and packers to register their facility with the federal government and do a lot more paper work. This six-page brochure attempts to answer many of the most commonly asked questions about how the Act relates to honey handling. Again, the NHB telephone number is (800) 553-7162.

Lastly, the NHB is conducting quite a bit of research on the potential positive health aspects of honey. If you haven't noticed, grapes (in the form of red wines), blueberries, etc. have been building quite a reputation for their antioxidants. In the case of honey, the current target is "non-

peroxide antibacterial" properties.

Studies at Cornell University demonstrated the variation of antibiotic effects of honeys. Some honeys are much more potent than others. That potency can vary with the same type of honey. Also, specific honeys seem to work best on specific bacteria.

Instead of targeting human diseases directly, the studies are directed toward the possible use of honey to keep pathogenic bacterial growth subdued in prepared foods. The amount of bacteria already present and the chemical makeup of the foods impact the results. For more information, visit: www.nhb.org/research/.

Honey Analysis

Honey refractometers (for moisture content) are pretty easy to find, but not Pfund Graders (for honey color), probably because of the expense and expertise needed to use one well.

That has changed. Hanna Instruments, Agricultural Division, is producing the C 221 Honey Color Analyzer. It is a portable microprocessor analyzer. It measures light transmittance of honey compared to analytical grade glycerol. It has a digital readout that shows the color scale in mm, which is the basis of the Pfund scale. It has a range of 0 to 150 mm, a resolution of 1 mm, and a precision of 2 mm. You

simply place the glycerol in a cuvette, calibrate the machine, then put in a different cuvette of honey and read the results.

In case you need a honey refractometer, they have those, too, that can read moisture contents of 12-27%. For more information, contact Hanna: (877) 694-2662, or e-mail to: agriculture@hannainst.com. They have a Web site at www.hannainst.com.

Sucrose Octanoate

Synthetic sugar esters, also known as acyl sugars or polyol esters, are a relatively new class of insecticidal compounds. They are combinations of sugars and fatty acids. A paper by Gary Puterka *et al.* (2003) *J. Econ. Entomol.* 96(3):636-644 describes some tests that they ran with many related sugar esters. Sucrose octanoate, being sold by the Dadant & Sons beekeeping supply company, turned out to be the most effective against phytophagous mites. It has a detergent or soap like effect, so it was compared to M-Pede (equivalent to a 2X dose of Safer Soap). The sucrose octanoate won the contest. That ester already is used in human food preparation, so it is likely considered GRAS (**Generally Regarded As Safe**) around food. If you have the time and the patience, apparently spraying the chemical on combs of bees does a very good job of controlling exposed *Varroa* mites.

Onion Attractiveness

Researchers E.M. Silva and Bill B. Dean (200) published a paper on attractiveness of onion nectars to honey bees (J. Econ. Entomol. 93(4): 1216-1221. They studied nine inbred lines of onions. Potassium content and sugar concentrations of the nectars did not seem too important. However, the volume of the nectar in the florets made a big difference - the more the better. They suggest breeding for more nectar if pollination is a problem.

Biopesticides

One of our Davis micro-industry entrepreneurs, Pam Marrone, wrote an article about biopesticides for the May 2001 issue of Nut Grower Magazine. Pam describes biopesticides as naturally based microbial and biochemical plant pest and disease controls.

Potential advantages of biopesticides are: 1. very effective against target organisms, 2. safe for humans to work around, 3. small amounts effective and don't hurt non-target organisms, 4. low chance of developing resistance, and 5. can be approved for organic gardening.

Since this is not genetic engineering, finding the naturally occurring organisms, or their byproducts, takes quite a bit of time. However, with luck some of the 20 or so biopesticide companies will get products on the market to the benefit of honey bees.

Roundup-Ready Alfalfa

In the April 2003 edition of AG BRIEFS, published by Imperial County Cooperative Extension, there was an article on genetically modified alfalfa coming this way, written by Herman Meister. As GM hay, this won't impact us much because the hay is cut before there is much of any bloom. But here is what was written about pollen transfer and development of resistance in weeds being sprayed.

"The subject of pollen transfer is an issue when Roundup-Ready alfalfa hay fields have bloom next to non-Roundup-Ready alfalfa seed fields. Every attempt will be made to encourage farmers to cut the alfalfa before bloom develops in any case. For seed made on Roundup-Ready varieties, there will be some hay-to-seed distance requirements to provide adequate isolation. Volunteer alfalfa along edges of fields and roads can also act as a "bridge" to transfer pollen to non-Roundup-Ready varieties. Also the IPM technique of "strip cutting" alfalfa will have implications involving pollen transfer depending on the situation.

The other long-term issue is resistance of weeds to Roundup, due to the increased use of the product on a wide spectrum of weeds several times a year. This is another reason that Roundup-Ready alfalfa should be considered as another tool in the arsenal to control weeds and not a panacea for all our weed problems."

2nd Organic Beekeeping
Conference

Gunther Hauk (Pfeiffer Center), Thomas Radetzki (Germany), and Dr. Medhat Nasr (Alberta, Canada) will be presenting the latest methods and research in organic beekeeping at the Second International Organic Beekeeping Conference held in Chestnut Ridge, NY. The venue is The Pfeiffer Center for Biodynamics, 260 Hungry Hollow Road, Chestnut Ridge, NY 10977. Registration fee is \$185, including meals, for the 2.5 day course starting

on Friday, March 5th at 4:00 PM.
Call (845) 352-5020 Ext. 20 for
more information.

Sincerely,

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