COOPERATIVE EXTENSION UNIVERSITY OF CALIFORNIA

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Newsletter E-mailed to You

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More on Retail Honey Labeling

Max and Jane Eggman wrote me that I missed a bit of important information in my honey container labeling article in the previous newsletter. Max was warned by a Kern County (CA) food inspector that his labels were out of compliance. The reason for that is extremely well covered by a write- up from the National Honey Board. It reads as follows:

Net Weight
The net weight of your product (excluding packaging), both in pounds/ounces and in metric weight (g) must be included in the lower third of your front label panel in easy-to-read type. (i.e. Net Wt. 16 oz. (454 g). When determining net weight, use the government conversion factor of 1 ounce (oz) = 28.3495 grams or 1 pound (lb.) = 453.592 grams. Round after making the calculation – not before. Use no more than three digits after the decimal point on the package. One may round down the final weight to avoid overstating the contents. When rounding, use typical mathematical rounding rules.

Progress on UCD Apiculturist

As of March 3, the UC Davis Department of Entomology faculty have reviewed the submissions of many candidates, narrowed down the number to five, and prioritized the top candidates for the position.

The priority list was moved on to Dr. Neal Van Alfen, Dean of the College of Agricultural and Environmental Sciences for concurrence. When we hear from the Dean, the leading candidate will be invited to join the faculty.

Topics Discussed at Winter Meetings

The following information will seem to be a bit disjointed, but that is what happens when I try to take feverish notes in the sessions, then dash back and forth between concurrent sessions of large beekeeping meetings.

While the gist of the summaries should be pretty close to what was presented, please do not expect that the data I quote is exactly what was presented. I did note a number of digital cameras capturing slides from the screen. I may have to try that approach.

Nosema ceranae

Dr. Ingemar Fries, of Sweden, gave an overview of what we know and don't know about *Nosema ceranae* at the January Mega-Meeting in Galveston, TX. Even though *N. ceranae* arrived in Sweden in 2007, the predominant nosema species is still *N. apis*, but why? In other locations, *N. ceranae* has displaced *N. apis*. With inoculations containing mixed spores, *N. ceranae* produces spores in about four days, while *N. apis* takes about six. Maximum numbers of spores are pretty similar. Caged bee experiments show little difference in virulence.

Susceptibility of spores to cold was quite different between the temperate zone *N. apis* and tropical zone *N. ceranae*. Refrigeration and freezing killed *N. ceranae* spores. Freezing to minus 80 degrees Fahrenheit did not kill *N. apis* spores. In fact, cold treatments "primed" *N. apis* spores to germinate better.

In the bees, *N. ceranae* could develop over a wider temperature range than could *N. apis*. There are still questions about strain differences and whether or not pesticides and virus pressures will impact nosema development.

Brenna Traver, Virginia Polytechnic Institute, reported that researchers in Virginia found *N. ceranae* in 70 percent of colony samples and only 2.5 percent *N. apis*. They found *N. ceranae* in brood food taken from worker cells.

Taking a closer look at drones, they found that drones began drifting at the age of six or seven days. Drifting increases with age until the drones reach 15 days. Then, they settle down and hang around home. Using PCR (analyzes for nosema DNA), they found peak levels of infections in workers and drones from March through June. Levels were highest in hive drones in June, but highest in flying drones in July. In a small number of instances, PCR suggested that pupae can become infected before emerging from their cells.

Grace Mulholland, also from Virginia Tech, examined bees for nosema infections using spore counts and PCR. She found that spore counts miss about 50 percent of low-level infections. In three different 100 individual bee samples, she found 82, 18, and 44 percent of the bees infected by PCR. By spore count, those same bees were 60, 8, and 4 percent infected, respectively. Can this be a reason why we tend not to get nosema treatments applied in a timely fashion, using spore count criteria? Could this be the reason that colonies in Spain collapse completely by the time that spores can be found in the brood nest workers?

Paul Rhodes and cooperating researchers at the University of Tennessee also found, using inoculation studies, that numbers of spores do not necessarily reflect the physiological condition of the bees. The researchers fed Nosevit®, thymol, Honey B Healthy®, and fumagillin to young, spore-free worker bees.

The caged bees were inoculated with 40,000 spores per bee. The bees remained on medicated syrup from day three to the end of the 23-day study. Dead bees were removed from the cages daily, and some bees were sacrificed for spore counts.

At 23 days, the mortality, life spans, etc. for the *N. ceranae* -fed and *N. apis*-fed bees were the same. Thymol and Honey Bee Healthy were best at extending lives, with fumagillin next, and Nosevit of little value.

Spore counts were way up in the controls and Honey Bee Healthy treatments (180 million spores per bee). They were reduced, somewhat, by thymol and Nosevit, but fumagillin knocked the counts way down. Since bees consuming Honey Bee Healthy lived longest with highest spore loads, the product is having a positive effect on the bees other than interfering with nosema propagation.

<u>Queen Quality</u>

Dr. David Tarpy, North Carolina State University, shared more data from the studies he has been conducting on drones and commercial queens produced in northern California. Dave believes that queens should be mated by at least 12 drones to get the necessary mix of paternal genes to get all the colony jobs done properly. His analysis of the study queens demonstrated average matings of at least 15 drones per queen.

They actually caught a significant number of drones in the congregation areas that were too young to mate. When they collected semen from drones inside the hives and drones at the congregation areas, the hive drones averaged about 75 percent sperm viability. That dropped off a bit, to about 68 percent viability in flying drones which matches a similar rate of viability in the queens' spermathecae. These values actually varied quite a bit from colony to colony and queen breeder to queen breeder.

To examine the queen longevity problem, they set up 160 packages with cohort queens (10 queens produced weekly over the year). They noted a common trend. Sperm in the spermathecae started at about 90 percent viable (they have to swim into the spermatheca) in May. By October, viability had dropped gradually, over six months, to 81 percent viable. That is still adequate for good brood production.

It did not appear to Dave that the genetics of the queens and drones were a problem. He will be extracting more information about that in future months.

Dave also does not think that early queen losses are related to mating issues. He thinks that something, before mating or after installation in the hives, is the problem.

A quick look at the effects of coumaphos, fluvalinate and Api-Life VAR® divulged that coumaphos is pretty toxic to sperm in drones. But those sperm would never get into the spermatheca. It appeared, though, that Api-Life VAR may be toxic to sperm in the spermatheca.

Dr. Marion Ellis, University of Nebraska, also is working with varroacides and queens. This is part of his effort to determine the toxicity of pesticide residues to queens. He reported on 484 queens that were reared in contaminant-free plastic cell cups. They were banked individually for four days, then put into nucleus queen banks.

We already knew that fluvalinate and coumaphos are harmful to queens, but Marion anticipated that queens would be more susceptible to chemical residues than workers. To determine this, 15 queens and workers were given topical applications of serially diluted pesticides in an attempt to determine their LD_{50}s. Over a period of six weeks, queens were determined to be 16 times more resistant to thymol, 10 times more resistant to fluvalinate, a bit more susceptible to amitraz, over 80 times more resistant to coumaphos, and 92 times more resistant to Hivastan®. There was a sublethal effect of loss of brood for a couple weeks following the amitraz treatments.

<u>Moving Colonies</u>

Dr. Zachary Huang, Michigan State University, looked at colony performance following various disruptions to normal routines. When bees are placed on a truck and bounced around for awhile, this interferes with their ability to keep the temperature correct in the brood nest. Food glands shrink after a move. This is especially noticeable in bees that are bounced around at the age of one or two days. Their glands remain shrunken for up to two weeks.

<u>Pesticides and Foraging Behavior</u>

Zachary Huang also tried to determine what effect exposure to acetone, imidacloprid, fluvalinate, and a mix of imidacloprid and fluvalinate had on bee foraging. The first day after being treated, the acetone bees were best at getting home when released very close to the apiary. But, even then a bunch of bees were lost. Fluvalinate, alone, caused the worst losses, with imidacloprid and the fluvalinate/imidacloprid mix a bit better.

The same bees were taken further away, a few days later, and only 75 percent of the acetone bees, 78 percent of the imidacloprid bees, 74 percent of the fluvalinate bees, and 60 percent of the fluvalinate/ imidacloprid-treated bees made it back home. Obviously, contact with sublethal doses of pesticides – even those acaricides we have put into the hives – is interfering with the normal routine of the bees.

<u>Emphasis on Varroa destructor</u>

Maria Kirrane, University College in Cork, Ireland, reported on a study what impact hygienic behavior has on mite reproduction. She stated that bee-removed mites can be removed from the colony by the bees, become phoretic on adult bees, or go back into a brood cell. Researchers compared the results of infesting capped brood with phoretic and extricated mites. After nine days in the combs, hygienic bees had removed about 50% of them. Only mites that had been placed in the capped cells when the bee was in the sealed larval stage of development reproduced properly. If mites were introduced into cells of pupae, the mites failed to produce the male mites. Apparently, there is something special about the contact with late larval stages for successful mite reproduction. In the cells where mite reproduction was failing, the mite fecal deposits were placed way in the back of the cell, not up on the top, where successfully reproducing mites position their preferred defecation location.

Pesticides and Honey Bees

Josephine Johnson, University of Maryland School of Medicine, took samples of water from various places around the state to determine imidacloprid residues. In her work, she considered 200 ppb to be the LD_{50} for adult worker bees. She considered 7-131 ppb to be sublethal, but causing significant changes in the bees.

Many places were sampled, including nursery pavement puddles, golf course water hazards, puddles on the streets after it rained, and many more. In most cases (80%), no residues were found. In no case were breakdown products detected. At nine sites, there were trace quantities detected, but at such low levels that they could not be quantified.

When re-sampled four to five months later, nearly all the residues were gone. The only exception was golf courses, where even previously "not detected" sites became contaminated.

Bethany Teeters, University of Nebraska, followed honey bee activity after exposure to sublethal doses of pesticides. With fluvalinate adult workers were treated topically with 1.0 or 0.005 µl of fluvalinate in acetone. Other bees were fed 0.05 and 0.5 ppm in sugar syrup. Two treated bees were placed in screen-divided Petri dishes with a sucrose feeder, and their movements were recorded digitally. Control bees moved about 50 meters. As the fluvalinate treatments increased in dosage, honey bee movement decreased by 50% or more.

The bees treated with imidacloprid increased movement compared to controls at the beginning of the sessions, but then slowed way down by the end of the session. Low dose fluvalinate-treated bees seem to spend about twice as long at the feeder than control bees. The highest number of bees that stayed near the feeder were the imidacloprid-treated bees. They appeared to simply stop moving.

Wanyi Zhu, Penn State University, related some of the information researchers have gleaned concerning synergisms between various agricultural chemicals. Synergism appears to be the reason why a number of pesticides, that we think should be safe to use around the bees, seem to be causing problems.

Wanyi reported that chlorothalonil, a frequently used fungicide, does not seem to have any negative effects on adult honey bees. However, it appears to be 40X more toxic to honey bee brood through its food. Chlorpyriphos is pretty hard on adult bees, but it appears as though bee brood is not as susceptible. One of the so-called "inert ingredients" in the fungicide formulation is n-methyl-2-pyrrolidone (NMP). That chemical turns out to be very toxic to honey bee brood.

In further studies, the researchers determined the toxicities of fluvalinate and chlorothalonil, individually, to honey bee brood. They found that when mixed together, the combination was 8X more toxic than either of the chemicals alone.

Phenology of Bee Forage Plants

Wayne Esaias of NASA Earth Sciences has been tracking the blooming dates of honey bee plants using a hive scale to determine when the weights start going up. His data suggest that the bees have been starting up ½ day earlier every year since 1970. That equates to about a three-week head start since 1970. Wayne notes that this phenomenon seems to be more pronounced in the northeastern sates of the U.S, but not so much so in the deep southeast. Wayne also noted that a sudden loss of three pounds or more on the hive scale meant the colony just swarmed.

Interestingly, a professor, Dr. Alec Hodson, of the Entomology Department, University of Minnesota, had been keeping similar records from the 1950s to the 1980s. He, too, noticed earlier and earlier blooms on trees and early season weeds, 50 years ago. The trend seems to be constant, but nobody talked about global warming 50 years ago.

Brood Pheromone as a Foraging Stimulant

Years ago, Drs. Rob Page and Tanya Pankiw extracted external chemicals from developing larvae and added them to other colonies. Temporarily, the treatment colonies increased their pollen foraging. Eventually, this “brood pheromone” was synthesized by Tanya using reasonably priced chemicals and is marketed as SuperBoost® by Mann Lake Ltd.

One might think that if a little is good, then a lot is much better. However, a number of folks have not been impressed with this approach, and perhaps there is a good reason for that.

Dr. Ramesh Sagili, Oregon State University, tested various concentrations of brood pheromone in hives and monitored the foraging activities. At low additional pheromone doses, the bees collected more pollen than without the treatments. Workers changed from house bees to foragers at younger ages, a greater proportion of the population collected pollen, pollen pellets were increased in size, and colony populations grew faster.

At higher doses, the beneficial effects were not stimulated. The colonies just plugged along as normal. Dr. Sagili hypothesized that, at too high a level, a threshold may be reached where the pheromone induces a feedback mechanism preventing increased foraging. The bees may be stimulated to remain at home to take care of all the extra, non-existent brood.

This, like many other studies, is demonstrating to us that honey bee colonies are much more complex than readily meets the eye. If you wish to review this study, access the Internet at:http://dx.plos.org/10.1371/journal.pone.0016785.

Limited Reprieve for Diesel Vehicles

A recent notice in *Ag Alert*, the news publication of the California Farm Bureau Federation, stated that the regulations for “agricultural trucks” were being relaxed a bit when it came to signing up and reporting diesel vehicles. You have until March 31, 2011 to get aboard, a year after the original date.

If you have a diesel vehicle that you have owned since 2009, you can put off engine modification or replacement until Jan.1, 2017, if your vehicle meets one of the following criteria:

1. with an engine dated 2006 or newer, driving 25,000 miles or less a year, or
2. with an engine dated 1996 through 2005, driving 20,000 miles a year or less, or
3. with an engine dating earlier than 1996, driving 15,000 miles a year or less.

If you drive the vehicle less than 10,000 miles per year, you can delay compliance until Jan. 1, 2023.

If you have been ignoring this diesel mandate, adopted by the Air Resources Board in 2008, I suggest that you start at the California Farm Bureau Federation website for a straight-forward explanation of what is going on. Then you can go to the Air Resources Board site and find the specific details, forms to fill out, etc.

To find the Farm Bureau information, go to: **www.cfbf.com**; click on Action Center; click on Current Issues; click on Air Quality; then under Diesel Engine Requirements, click on Truck and Bus Regulation.

To find the Air Resources Board information, go to: **www.arb.ca.gov/homepage.htm**. Click on Diesel Programs and Activities and you're right into the thick of things.

Costs of Almond Production

In the March edition of *Outlook*, the official newsletter of the Almond Board of California, the lead story is about the escalating costs of producing almonds. Dr. Karen Klonski of the UC Davis' Agricultural and Resource Economics Department has released these studies periodically for quite a while. The total cost of producing an acre of almonds now averages $3,897. The cultural (in-field) costs were listed as:

1. water and fertilizer	- $530	(30%)
2. insects/gopher control	- $325	(19%)
3. bee rental	- $280	(16%)
4. pruning	- $183	(10%)
5. weed control	- $165	(9%)
6. disease control	- $150	(9%)
7. field vehicles	- $119	(7%)

At a selling price of $2 a pound, which is reached only in good times for premium varieties, the growers would have to produce about 2,000 pounds per acre to break even. With almonds, like with bees, breaking even is not good enough.

Bee Schools

The **San Mateo** Bee Guild will hold its annual, free Beginning Beekeeping Course on Saturday, March 5, 2011. For more information or to make a reservation, please contact Jill Baxter, at: bzswax@gmail.com.

Franklin Carrier will be instructing two, one-day classes in beekeeping at 601 South Baywood Avenue (at Moorpark) in **San Jose** on Saturday, March 26 and Saturday, April 30, 2011. The classes begin at 10 am and end around 5 pm. Each class costs $50 and does not include lunch.

Mr. Carrier does not have an e-mail address, so to register either stop by the address given above (a beekeeping supply outlet) or phone him at (408) 296-6100.

One of the **Sacramento** Area Beekeepers' Association-sponsored beginning beekeeping classes is being conducted by Randy Oliver, Sunday, March 20, 2011. The full-day class (bring your lunch or tour the neighborhood at lunch time) begins at 8:30 am in the University of California Extension Building at 4145 Branch Center Road (off Keifer at Bradshaw), well east of downtown. The cost is $45 for non-SABA members, or $35 for members.

Registration is being handled by Tom Mock, 1421 Elsdon Circle, Carmichael, CA 95608. Contact Tom at sabaclassbees@gmail.com. Be sure to supply the name of the class and the date. Checks should be made payable to SABA and mailed at least 30 days in advance, unless you coordinate otherwise with Tom.

Sincerely,

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