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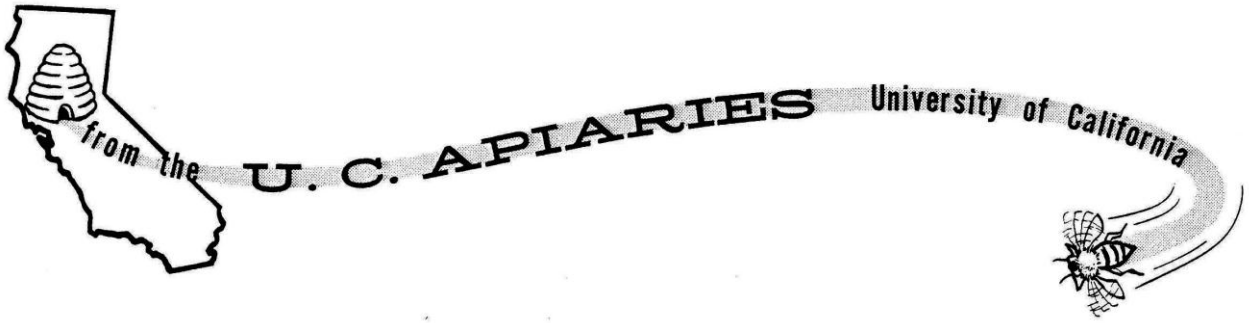

Jan/Feb 2013

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Problems with Almond Bloom Sprays

The on-going saga of honey bee brood disruption, following some applications of fungicides to blooming almond orchards, continues to capture the limelight, especially from the companies selling products that could be used for pest and disease control during that time period.

Over a number of seasons, certain beekeepers have noticed a predictable negative impact on brood, following applications of fungicides during almond bloom. The predictability of the negative effects suggests that something being applied in the orchard, and carried back to the hives, is causing the problem. In an attempt to correlate brood disruption with specific chemicals, we inquired about the pesticides being used in the applications. We were told fungicide and adjuvant. Pollen collected from the field contained fungicide, adjuvant, and an insect growth regulator.

Review of published documents revealed that in carefully controlled experiments, dosage levels of fungicides, adjuvants, and insect growth regulators that negatively impact honey bee colonies are well above the levels expected to be encountered in the field following pesticide applications. However, most of those studies were conducted on small colonies that were not housed in commercial hives, which in the U.S. tend to contain a myriad of pesticide residues with which the bees already have to contend. There is documentation demonstrating that combinations of certain fungicides and pyrethroids are much more toxic to pest insects than either of the ingredients alone. This suggests that the fungicide likely is impacting the biochemical detoxification system of the bee, making it much more vulnerable to the pyrethroid. There also are publications demonstrating synergistic effects between insect growth regulators and insecticides (see references, below).

Scrutiny of California pesticide use reports on almonds from 2010 revealed that in a few cases some really bee-toxic compounds apparently have been applied during bloom. I hope those reports are due to erroneous data submission and not an indication of terribly ill-advised pesticide use.

Since we still do not know what is causing the honey bee problem, I will continue to recommend that growers refrain from applying ANY pesticide applications to almonds during bloom. There are many pre-bloom and post-bloom products that are adequate to resolve pest and disease problems, without subjecting honey bees to exposures to residues of agricultural chemistries.

I also will continue to recommend that if applications MUST be made during the bloom period, then the applications should be delayed in the day until no pollen or pollen-collecting bees can be observed in the orchard. If the pollen is not contaminated, then the bees should not have problems with these chemicals.

Ghoneim, Y.F. 2012. Efficacy of certain insecticides and their mixtures with the tested IGRs against a field strain of the cotton leaf worm, *Spodoptera littoralis* (Boisd.) under laboratory conditions. Australian Journal of Basic and Applied Sciences, 6(6): 300-304.

Mohsen, A. et al. 1983. The joint action of mixtures of insecticides, or of insect growth regulators and insecticides, on susceptible and diflubenzuron-resistant strains of *Spodoptera littoralis* (Boisd). Pesticide Science 14(3): 246-252.

Pilling, E.D. and P.C. Jepson. 1993. Synergism between EBI fungicides and a pyrethroid insecticide in the honeybee (*Apis mellifera*). Pesticide Science 39(4): 293-297.

Sfara, V. 2007. Synergism between cis-permethrin and benzoyl phenyl urea insect growth regulators against *Aedes aegypti* larvae. J Am Mosq Control Assoc. 23(1): 24-28.

Nosema ceranae and Fipronil Exposure

In February of 2012, Jeff Pettis and collaborators published a paper describing the effects of a five-week exposure of honey bee colonies to sublethal doses of imidacloprid, as it related to levels of infection with *Nosema ceranae*. Bees from colonies chronically exposed to low and high levels of imidacloprid had equally higher spore counts (700,000 spores per bee) at 12 days post-inoculation, following laboratory feeding (at 333,333 spores per bee) with *Nosema*, than inoculated bees from control colonies (just under 200,000 spores per bee).

Using a different protocol, researchers in France refined those observations. They inoculated one group of newly emerged bees with *Nosema* first (125,000 spores per bee), then exposed them to a sublethal dose of fipronil seven days later. They exposed a second group to fipronil first, then inoculated them seven days later. The third group was simultaneously dosed and inoculated the first day, and the fourth group was simultaneously dosed and inoculated seven days after emergence.

Graphical results revealed that in all four cases, the worst case scenario was to expose the bees to fipronil and inoculate them on the same day. Just over 80 percent of the control bees survived three weeks. By 21 days only about 15 percent of the simultaneously treated one-day-old bees survived. About 30 percent survived the simultaneous treatment, when it was applied at day seven. Early inoculation reduced survivorship at 21 days to around 65 percent. Later inoculation did not alter survival at 21 days from that of the controls. Fipronil-alone final survivorship was just under 80 percent, whether treated at day one or day seven. However, the mortality increased sharply right after the application was made.

Compared to the Pettis study, the *Nosema* spore counts were significantly higher: 168.5 million for the bees inoculated on day one and dosed on day seven; 151.2 million spores for bees inoculated and dosed on day one; 96.4 million for bees first dosed, then inoculated seven days later; and 86.2 million for bees that were simultaneously inoculated and dosed on day seven. The researchers had some nearby colonies with basically no *Nosema* in them, but they did not include inoculated controls in the study.

The first paper is: Pettis, *et al*. 2012 Pesticide exposure in honey bees results in increased levels of the gut pathogen *Nosema*. Naturwissenschaften 99(2): 153-158. The second paper is: Aufauvre *et al*. 2012 Parasite-insecticide interactions: a case study of *Nosema ceranae* and fipronil synergy on honeybee. Scientific Reports Vol. 2:362 [DOI: 10.1038/srep00326.

Is *Varroa* the Cause of it All?

Beekeepers are keenly aware that when varroa mite population levels become too high in a honey bee colony, there are apt to be severe consequences. Researchers in Italy took a close look at how the presence of *Varroa* can destabilize a honey bee

colony population and theoretically cause the colony to collapse.

Francesco Nazzi is the first author on a collaborative study that was designed to determine what impact the presence of *Varroa* might have in colony demise, beyond simply being a blood-sucking parasite.

The study actually concerns a commonly encountered, positive-strand RNA virus that we have named "deformed wing virus" (DWV). We don't really know how long the virus has been present in U.S. colonies, but it has been associated with honey bees for epochs. The virus is well known to be transmitted vertically from the queen, through her eggs, to her female and male offspring. However, in many cases the virus just remains in the bee in what we call a "latent" or inactive state. It might never be a problem unless it switches to the "patent" or active state. Then the virus replicates, fills and kills its host's cells, and causes eventual bee mortality. This study concerns the mechanism by which the change from latent to patent infection may occur.

It appears that a healthy honey bee can keep a potential active infection under control through cellular products produced in response to activation (up regulation) of a set of immune genes. In this study, there were indications of down regulation of 19 immune genes by DWV. The most pronounced reductions were in the signaling molecules and those involved in self-recognition. Additionally, 6 immune genes were up regulated, producing substitute molecules for those that had been repressed.

A detailed look at this phenomenon revealed that a specific transcription factor, in the NF-κB family, was partially down regulated by DWV. NF-κB is intricately involved with honey bee responses to many environmental challenges. Those reactions include synthesis of antimicrobial peptides, clotting, melanization, and antiviral defenses. This partial down regulation might make it easier for the mother *Varroa* mite to keep the feeding hole open on a parasitized pupa, due to inhibition of wound-healing.

This research suggests that just enough assistance by NF-κB remains available, in otherwise moderately stressed honey bees, to keep DWV under control. In many cases, just the wounding by *Varroa* feeding on a bee is enough to tip the balance and send DWV spiraling out of control. A nice schematic of this complex dynamic is presented in the paper. Basically, DWV has a regulatory role in the virus dynamics in a honey bee population, and it is influenced specifically by the number of *Varroa* mites that are feeding on the bees.

Nazzi, F. *et al*. 2012 PLoS Pathog 8(6): e1002735. doi:10.1371/journal.ppat.1002735.

Uncap by Hand?

Many small scale beekeepers do not feel inclined to invest in a lot of equipment just to extract their honey from a few frames each season. They might find an older reference to a strip of wood with a nail poking up through it, upon which they place a frame while slicing off the cappings.

The disadvantages of that system include paying attention to the nail to prevent accidental punctures, and the frames tend to rock on the nail point.

An entrepreneur from Charlotte, NC, came up with a molded polypropylene plate, about the size of a hive frame that hooks onto the lip of a plastic five gallon bucket. A frame of honey can be inserted, end bar first, into a molded space in the top

of the Combcapper®. That depression holds a shallow, medium, or full depth frame (notched for top bars) at the correct angle, ready to be uncapped. It holds it well enough that you can walk off and leave the comb in position, according to the advertising.

For further information and prices, visit their website at info@combcapper.com or call (980) 216-1505.

Tutorial on Russian Bees

Have you wondered about the Russian bees? They are noted as being less negatively impacted by parasitic mites than are our Italian strains of honey bees. They don't eat as much food during the winter, due to smaller cluster sizes. But, the clusters can be smaller than those desired by almond growers in February, etc.

Dr. David Tarpy and Jeffrey Lee combined to organize a fairly short extension publication on Russian bees, comparing them to Italians. Copies of the three-page article, titled "A Comparison of Russian and Italian Honey Bees," may be obtained, free of charge, at: http://www.cals.ncsu.edu/entomology/apiculture/pdfs/2.16%20copy.pdf.

Corn Pollen as a Honey Bee Food

A number of things have been said about corn pollen as a honey bee food in the past, but now that corn acreage has really increased, many colonies are located near corn. Honey bees are attracted to corn pollen when the plants have tassels. So, what value does corn pollen have for honey bees?

A group of researchers, in Germany, decided to take an in-depth look at a biofuel corn pollen as bee food. It is known that corn is not a particularly good food, nutritionally, for humans since its protein content is quite low and it is lacking some essential amino acids. The corn pollen was collected by hand to prevent contamination with other pollens. Mixed pollens were collected by bees in corn-free areas. Those two feeds were compared to a synthesized diet containing whey, soy flour and brewer's yeast, among other components. To induce the bees to eat the synthesized diet, it was mixed with honeydew honey (no pollen). Honeydew honey also was used to form a paste with the bee-collected and corn pollens.

The pastes were placed in feeding devices on the bottom boards of nuc boxes in which 4,500 bees had to draw combs and rear brood. The nucs were placed in outdoor flight chambers in which a sugar syrup feeder was available. Data was collected on amount of food consumed, amount of brood reared, and longevity of the newly emerging workers. The longevity tests were conducted on 50 bees emerging from brood cells of other colonies, since brood rearing was not very good in the flight chambers. In this case, sucrose syrup was fed to both treatments and only the corn and mixed pollen diets were compared. Additionally, the immunocompetence of the bees was determined by rating antibiotic peptide production after inoculation with *Paenibacillus larvae* (American foulbrood). The bee blood was bioassayed against *Micrococcus flavus* in culture.

The protein content of the diets were: 1) synthesized = 15 percent, 2) mixed pollens = 23 percent, and 3) corn = 26 percent. Of the ten amino acids tested, corn pollen had way more amino acid content, with one exception – histidine. Histidine was very high in the mixed pollen diet; over 10 µmoles per g). Histidine and methionine were pretty similar in amounts (2 µmoles

per g) in corn, but that still was more methionine than in the mixed pollens.

Synthesized pollen substitute did not really do much for the bees (reared 170 bees). Corn pollen (900 bees) and mixed pollens (1,300 bees) were much better. While the newly emerged bees ate more corn pollen than mixed pollens, they still did not live as long. There appeared to be no difference in immune response between the corn pollen-fed (supposedly nutritionally stressed) and mixed pollens-fed bees.

The details of this study can be found in: Höcherl, N. *et al*. 2012. Evaluation of the nutritive value of maize for honey bees. Journal of Insect Physiology 58: 278-285.

Honey Industry Responds

The National Honey Board (NHB) members were as surprised as anyone when lawsuits were instigated against some food retailers for selling consumers honey that contained no pollen. It has been industry practice for a very long time to filter from honey any particulates that might lead to premature crystallization of honey in jars on store shelves. Pollen grains were among many "nuclei" that were filtered out: sugar crystals, bits of wax, bee parts, dust, and air bubbles. According to some, the pollen-less solution was no longer honey.

NHB contracted with Ropa Science Research to conduct studies on honey before and after filtering. Five of 22, 55-gallon, barrels of Canadian honey were blended together at 140^{o}F for 18 hours and then settled at 130^{o}F for 12 hours. Two "Raw" samples were removed before processing. After foam and extraneous solids were removed from the surface of the honey, it was flash-heated to 175^{o}F for seven minutes and then filtered using diatomaceous earth. The honey was flash-cooled to 130^{o}F and held for packaging (typical commercial processing). Two "Filtered" samples were collected and the honey cooled to ambient (70^{o}F).

Covance Labs in Madison, WI, tested for vitamin B_{12}, folic acid (vit. B_9), pyridoxine (vit. B_6), calcium, magnesium, potassium, and hydrophilic and lipophilic antioxidants. The samples were then sent to ABC Labs in Gainesville, FL, for pollen analyses.

Pre-filtered blends of honey (100 g samples) varied a bit in most of the measured components:
1) calcium – 3.44 to 3.5 mg
2) magnesium – 1.33 mg, both
3) potassium – 12.9 to 13.1 mg
4) pyridoxine (vit. B_6) – 0.016 mg, both
5) pollen grains – 62,651 to 79,076 (per 10 g)
6) vitamin B_{12} (cobalamin) – <0.120, both
7) folic acid (vit. B_9) – <6.00, both
8) hydrophilic antioxidants – 1.1 to 1.22 µmol TE/g
9) lipophilic antioxidants – 0.208 to 0.234 µmol TE/g.

Following heating and filtering, similar analysis found the result to be:
1) calcium – 3.52 and 3.62 mg (+0.8%)
2) magnesium – 1.5 mg, both (+8.9%)
3) potassium – 13.9 to 14.8 mg (+14.1%)
4) pyridoxine (vit. B_6) – 0.014 to 0.016 (-9.6%)
5) pollen grains – 0, both, per 10 g
6) vitamin B_{12} – <0.120, both (no change)
7) folic acid (vit. B_9) – <6, both (no change)
8) hydrophyoic antioxidants – 1.2 to 1.25 µmol TE/g (+7.6%)
9) lipophilic antioxidants – 0.212 to 0.218 µmol TE/g (+15.0%)

Examining the results, it is likely that the percent increase in a number of the

components in the filtered samples is due to the fact that some materials (including moisture) may have been lost during filtering, reducing the mass and volume of the honey a bit. But, only the pyridoxine and pollen were noticeably reduced. The gains in antioxidant levels might be attributable to silica residues, which can boost apparent antioxidant readings in certain tests. So, the conclusion was that, for the components tested, pre-filtered and filtered honeys are practically identical, except for the presence or absence of pollen. This suggests that the product was, and remained, "honey" through the processing cycle.

Canadian Bee Imports

The following information comes from the February 2012 issue (Vol. 25, #1) of "Hivelights," the quarterly industry magazine published by the Canadian Honey Council.

Commercial beekeepers in Canada also have been noting greater annual colony losses than in the past. Current losses, an average 29.3 percent during 2010-2011, is about double what used to be the expected loss and 21 percent higher than the 2009-2010 loss (average 21 percent). Thus, Canadian beekeepers are looking to outside sources to purchase queens and packages to restock their hives.

In 2000, Canadian beekeepers purchased around 60,000 queens (at $11.45 per queen) and around $750,000 worth of packages. In 2011, they purchased nearly 200,000 queens (at $18.00 per queen) and over $3 million worth of packages. Federal import records show that 70 to 73 percent of the queens are imported from the U.S. The rest of the queens come from Australia, New Zealand, and Chile. Since packages are not allowed from the U.S., they come from New Zealand, Australia and Chile, too.

Bee Schools

A number of years ago, there were so few beekeeping-related classes being offered, that this heading wasn't even in the newsletter very often. Now, with this burgeoning interest in non-commercial beekeeping, I cannot keep up with all the sessions being offered. Often I am notified about them too late to get them into my newsletter in a timely fashion (up to two months in advance), but here are some that have come to my attention, recently.

Seventh Annual Bee Symposium

This one-day event is being held at the Veterans Building in Sebastopol, CA, on Saturday, March 9, 2013. In addition to being an excellent opportunity to enjoy presentations from experts in honey bee and native bee research, a number of speakers will discuss planting gardens specifically for bee food. Portions of the proceeds will go to "Partners for Sustainable Pollination," a non-profit organization headquartered in the area. The event begins at 8:55 am, takes a break for lunch on your own, then reconvenes at 1:35 pm for an additional 3 hours. Tickets may be purchased at BEEKIND, 921 Gravenstein Hwy. S., in Sebastopol (707) 824-2905 or through www.pfspbees.org/store.

Beginning Beekeeping

Saturday, March 16, 2013, is the date for a class offered by Dan Wheat and Gary McClaughry in the Grass Valley area of Nevada County, CA. Classes are limited to 40 persons, and the fee is $40 per person. The class is in session from 8:30 am through 4:00 pm, at the building "behind the Apple Alley Café, 13469 Colfax Hwy, Grass Valley, CA." (That is on Hwy 174 just south of the split with the southern end of

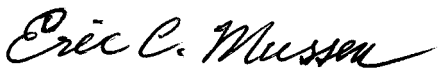
Brunswick.) I would strongly suggest calling Dan or April, at 530-273-6608 (A to Z Hardware Supplies) for more information.

Beekeeping 101

This is an opportunity for beekeepers in an around the San Francisco Bay Area to spend two short days learning about and visiting bees. On Saturday, March 23, a class will be held from 10:00 am to 2:00 pm, introducing bees and beekeeping. On Sunday, March 24, from 11:00 am to 1:00 pm attendees will be visiting honey bee colonies in a local apiary. Protective equipment will be provided.

A second class (Intermediate Bee-keeping) will be held on Saturday, April 20th, from 10:00 am to 2:00 pm. All classes are $40 per person, or $20 for SFBA members. Classes are conducted in the Buckley Room at the Randall Museum, 199 Museum Way, in San Francisco. Enroll at: www.sfbee.org .

Sincerely,



Eric Mussen
Entomology Extension
University of California
Davis, CA 95616
Phone: (530) 752-0472
FAX: (530) 752-1537
E-mail: ecmussen@ucdavis.edu
URL: **entomology.ucdavis.edu/faculty/mussen.cfm**

Eric Mussen
Entomology
University of California
Davis, CA 95616