COOPERATIVE EXTENSION UNIVERSITY OF CALIFORNIA

from the U. C. APIARIES University of California

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E.U. Restricts Neonics

For many years, beekeepers and environmentally interested individuals have expressed the opinion that the use of neonicotinoid insecticides ("neonics") have interfered with the ability of honey bees and native bees to conduct their life activities properly. Since laboratory studies have detailed the disruptive effect on those insects, it was suggested that the same things were happening in the field. Unanticipated losses of formerly strong honey bee colonies, and easily observable decreases in bumble bee sightings, correlated well with increased use of neonics.

In Europe, registration and use of various pesticides are based on the "precautionary principle." Basically, that

means that a chemical is rated on its innate toxicity to honey bees and other non-targets, similar to the requirements of the U.S. EPA Then, a second component enters the equation: likelihood of honey bees and non-targets to become exposed to the toxicant. This second factor is considered by EPA, but not as strongly as it is in Europe. If the sum of the toxicity and likely exposure is large enough, then the European Commission can restrict or prohibit the product's use. A report published by the European Food Safety Agency (EFSA) concluded that the neonicotinoid pesticides posed a "high acute risk" to pollinators, including honey bees, but that a definitive connection between the chemicals and loss of colonies in the field remained to be established.

The complaint against the neonics was brought to the European Commission a while ago, and the members originally voted that not enough scientific information existed to warrant a ban on the products. In the following appeal, the members voted to allow the Commission to prepare new restrictions concerning the use of the products. The restrictions are intended to accomplish two goals: 1) prevent large-scale environmental contamination by dust from agricultural planting equipment and 2) reduce exposure of honey bees and other flower-visiting insects to residues of neonics in nectars and pollens.

Beginning in December of 2013 or sooner, no more neonic-treated crop seeds will be sold or planted in the E.U. Neonics will be withdrawn from use by the general public. Neonics still may be used on plants that are not attractive to honey bees, or other foraging bee species, as forage plants (such as winter cereals).

What might we expect to see as results from this large-scale experiment? First, if large-scale contamination of the air through which bees are flying, contamination of weeds in agricultural fields, along the borders of the fields, and out in the environment no longer happens, then we would anticipate no longer hearing complaints about honey bees and bee colonies dying shortly after the plantings have taken place. Second, we might anticipate the problems of colony population depletion, sometimes to the point of colony loss, proposed to be due to exposure of bees to residues of neonics in nectars and pollens, would no longer be seen.

However, it is not likely to be that simple. The substantial losses, closely following neonic-coated seed planting, might drop off. But, other colony population problems may not become better for some time. Analyses of residues of pesticides in beeswax, stored pollens, and bees themselves in the U.S. suggest that there are myriad chemicals stored in the hives that are likely to be impacting honey bee physiology negatively already, including a few detections of very low levels of neonics. Since the neonics tend to persist in soil and woody perennials for prolonged periods of time, it is likely that bee exposure at low levels will persist. If the dosage levels of neonics that induce physiological impacts on honey bees are below current levels of detection (LOD), then it will be extremely difficult to determine this effect.

Additionally, removal of neonics from a significant segment of the market suggests that other compounds are likely to be substituted to control pests currently kept subdued by the neonics. Some of the older chemistries that no longer are available were losing their effectiveness against the pests due to selection for resistance, anyway. They are likely to be replaced by newer chemistries that may or may not have detrimental effects on exposed pollinators, including honey bees. The inadequacies in the U.S. to demand definitive, long-term studies on honey bee brood development

and adult longevity, following exposure to sublethal doses of the compounds, means that we may find things will not be a whole lot better when we removed uses of neonics from our registrations. It will be interesting to watch this experiment unfold from a distance.

Lincomix® on the Market

Pharmacia and Upjohn Company, a division of Pfeizer, Inc., has brought to market a formulation of lincomycin hydrochloride (Lincomix) for prevention of American foulbrood disease of honey bees. Use of the antibiotic will be similar to the former use of Terramycin®, except at half the dose of active ingredient. The labeled use is 100 mg per treatment. The label states that three treatments should be administered at weekly intervals. The treatments should not be applied when the bees are producing honey for human consumption or within four weeks of an expected honey flow.

Thus, it is expected that the antibiotic will be used as spring and fall treatments. To dilute Lincomix to hive dosage, thoroughly mix 250 mg of Lincomix soluble powder with 20 g of powdered/icing sugar (that is a 1:80 ratio). Then apply 1 g to each colony, dusted "over the top bars of the brood chamber." I prefer to look to see where the larvae are and apply the dust to the tops of those combs. Just like Terra-mycin, lincomycin is heat labile. The instructions on the bottle state to "Store at controlled room temperature 68 to 77 degrees Fahrenheit." The cab of your pickup will be warmer than that before breakfast, if you don't have the air conditioning turned on. You are wasting your money, and you won't get disease control if you cook your treatment material. Also, you should consider rotating the use of this new antibiotic with tylosin and/or Terramycin. You already know where we ended up using solely Terramycin!

Emergency Response Kits

Inexplicable colony losses are still occurring in far too large numbers across the country. Minnesota beekeeper, whose bees are far removed from known pesticide uses, told me during a recent phone call that for five years she had kept eight colonies of bees very successfully in an apiary in her back yard. Beginning late last year, and through the winter, five of the colonies began to sputter, and then eventually died. Earlier in the season, all five colonies had produced a good honey crop and were headed toward winter in three deep boxes, as normal.

Similar to scientists who are wondering about these aberrant losses and studying the potential causes, some beekeepers would like to have diagnostic analyses conducted on samples of their bees. That opportunity has become available, for a price. It is called an "Emergency Response Kit" (ERK), and a beekeeper can request the items essential to appropriate collection and submission of a sample of bees for diagnosis.

Designed for larger operations, the sample kit is used to sample adult bees from eight colonies that are "apparently healthy" and eight colonies that are definitely going downhill quite rapidly. The live, sampled bees are combined (healthy together, weakening together) in two boxes provided and shipped back to the USDA/ARS Beltsville Bee Lab for virus analysis.

Additionally, there are 16 small bottles of alcohol included in the kit. Individual adult bees from eight of the apparently healthy colonies are placed in

half of the bottles and bees from eight struggling colonies are returned in the other eight bottles. These will be examined at the University of Maryland for varroa and tracheal mites, as well as nosema infections. These basic studies, combined, will cost the submitter $80 with checks made payable to the University of Maryland.

Each basic kit contains: two data sheets; two live bee boxes (complete with sugar candy and water); one scoop for scooping a measured amount of bees; postage labels; metal flashing upon which to shake the bees for bottling; and 16 small alcohol bottles.

If the submitter is interested in determining what pesticide residues may be present in the pollens in the hive, then a request can be made for additional vials into which are placed properly collected pollen samples. Those samples will be forwarded to the USDA Agricultural Marketing Service (AMS) chemistry laboratory in Gastonia, NC, where they examine samples of our food supply for residues of primary agricultural products and their major breakdown products. Pollens collected from the eight hives housing apparently healthy colonies will be blended, as will those from hives containing weakening colonies. This analysis, covering at least 171 (now may be closer to 200) possible residues, will cost an additional $680 (two samples at $340 each). Combined with the virus, parasites and *Nosema* work above, the total cost for the thorough review is $760. This payment still would be made to the University of Maryland.

If you wish to submit pollen samples, an extra two 15-ml tubes and two sampling sticks will be included, a stick and a tube for the apparently healthy and the other for weakening colonies. It takes quite a bit of FRESH pollen to attain the desired 3-gram samples. The suggestion is to collect pollen from four full cells in each of the eight hives from which the sample bees were submitted (a total of 32 cells of pollen). The sampling stick may break through cell walls during the process of sliding the stick down the edge of the cell, then scraping it 360 degrees around the cell to take all the pollen out in a clump. Try not to include beeswax or bee cocoon in the sample. The clump will not fall readily into the tube, so scrape it off down inside the mouth of the tube. Pollen will accumulate and periodically fall further into the tube. Details of all the collecting protocols can be found at the link subtly labeled "HERE" at the end of the first paragraph located at: http://beeinformed.org/2013/02/emergency-response-kits/ .

Once you have made the investment and the effort to submit the samples, what do you do with the results? There is no perfect or easy answer. If you are practicing chemical-free beekeeping, then you probably will decide to seek bees that can better deal with the parasites or diseases that were discovered in your samples. If you are apt to try to alleviate some of the stresses that were determined in the diagnoses, then you have to determine what the correct choices are for your situation. If you are not very experienced in beekeeping, it is best to seek guidance from more than one individual who has been keeping bees for a while. There are plusses and minuses to nearly everything we do to honey bee colonies. It is best to know the trade-offs in advance.

SuperBoost: Before and Now

A number of years ago, bee scientist Dr. Tanya Pankiw developed a reasonably priced formulation that closely mimicked the components of larval honey bee brood pheromone. In theory, that pheromone could be used to stimulate adult honey bees to respond as if there were more larvae in

the hives. It worked, and eventually a company brought what I remember to be called BroodBoost® to market. A number of beekeepers gave the product a try, but were not impressed enough to continue purchasing it. After hearing testimonials of beekeepers finding the product of limited value, the manufacturer, Contech Enterprises Inc., 7572 Progress Way, Delta, BC, Canada V4G 1E9, decided to take a closer look at what should have been a successful product.

In a PowerPoint-like slide show, http://www.uoguelph.ca/canpolin/Publications/BORDEN%20SUPERBOOST%20PPT%20Feb%2012.pdf , The SuperBoost Saga, Chief Scientific Officer John H. Borden describes the changes that had to be made to the non-volatile, 10-component pheromone product to make it functional. The first problem that came to light was that the original storage and application device did not release the pheromone in field colonies as well as as it had in the laboratory. This was due to the polyethylene membrane becoming plugged up during previous storage at room temperature. Also, there were problems with pheromone melting the holders, the holders jammed when inserted between the combs, and the holders pushed up against the comb so that only one side would liberate pheromone. It took 13 iterations of holders to arrive at the currently marketed one.

Now, with proper pheromone dispensing, field studies were conducted in newly installed packages in the Lower Fraser Valley of British Columbia to measure the differences, if any, between colonies that had inserts applied at five-week intervals and control colonies without them. Fifty-eight colonies were started with SuperBoost and 52 were operated as controls beginning April 30, 2009. They were treated with SuperBoost three times at five-week intervals. The study was completed in May of 2010. In order to keep tabs on seasonal honey production, honey crops were harvested eight times over the study period. Periodic records were taken on amounts of bees, brood, and honey that were in the hives, as well as the amount of pollen substitute consumed.

Colonies containing the synthesized pheromone consumed more supplemental food, produced more brood, more bees and better honey crops; had five percent lower colony mortality, and produced more splits the following spring than did the control colonies. The results of this study were published in refereed journal articles that can be found at: http://www.contech-inc.com/products/industrial-products/apiculture/item/superboost under the "Articles" button.

Human Physiology and Bee Pollination

We have spent, and will continue to spend, time and energy trying to convince land managers to do what they can to raise bee forage plants on their properties. Bees, especially our honey bees, require a mix of good pollens to meet their nutritional requirements. But, how about human nutritional requirements? It seems that bees play a very key role in that area, also.

Elisabeth Eilers and a team of researchers from three German and three University of California campuses combined to determine which bee-pollinated crops, worldwide (examined data for 150), were beneficial to the human diet and how much so. Bee-pollinated crops accounted for about 74 percent of our consumable oils and those oils are our primary sources of fat-soluble vitamins. Citrus, other fruits and vegetables provide vitamin C. The B vitamins, however, are found in starchy foods, most of which do not require bee pollination. With crops like grains, most of

the vitamins are lost during processing, so some are replaced by fortifying the flours with B vitamins. The lost folic acid could be regained by eating bee-pollinated beans and dark green leafy vegetables, which produce about 55 percent of the world crops' total.

Nearly all our dietary vitamin A and two primary carotenoids, cryptoxanthin and lycopene, originate in bee-pollinated crops. Vitamin E is found in significant quantities in bee-pollinated crops.

Minerals are also important elements of our diets and bee-pollinated crops contribute about 58 percent of the calcium and 62 percent of the fluoride that we consume, especially fruits and nuts. Iron deficiency seems to be a worldwide problem, but bee-pollinated crops provide 29 percent of the iron in our diets. Although iron is more bioavailable from meat, it is much less efficient and cost effective to produce livestock.

To review the full article please follow the link: PLoS ONE 6(6): e21363. doi:10.1371/ journal.pone.0021363.

Attention on *Varroa*

Researchers throughout the world still consider *Varroa destructor* to be one of the most important stresses on honey bee colonies around the world, continues to have its biology examined by researchers from many places. The following is information on *Varroa* from four different laboratories.

The first study, by researchers in USDA ARS, dealt with the question of whether honey bee stocks that had undergone strong, human-induced selection pressure could still compete in crop pollination with commercial Italian bees (CT) that had been treated twice for mites or (CU) that had not been treated. The highly selected stocks were Russian bees (RB) and outcrossed (50 percent, genetically) stocks of Varroa Sensitive Hygiene (VSH) bees. Coming through the first winter, 57 percent of the VSH stock, 56 percent of the CT stock, 39 percent of the RBs and 34 percent of the untreated Italian colonies (CU) were eight frames of bees or larger, which is recommended for almond pollination. By apple pollination time, all the colonies had built up to acceptable size. Mite counts showed that the treated Italian colonies continued to have the lowest mite populations. Mite population levels in the Russian and VSH colonies were lower than in the Italian colonies that had not been treated at all. This study may be reviewed on the Internet at: DOI: http://dx.doi.org/10.1603/EC11286.

Researchers in Canada have been studying indoor wintering of honey bee colonies for a long time. Two important considerations are temperature and buildup of carbon dioxide. The researchers then wondered if those parameters could be adjusted to the detriment of varroa mites, without harming the bees. Clusters of approximately 300 infested adult honey bees were placed in self-contained glass chambers and incubated at 25 and 10 degrees Centigrade (77 and 50 degrees Fahrenheit, respectively) and with low, medium, and high ventilation. The air in the chambers started at 1-2 percent CO_2. With high ventilation, it remained the same. Ventilation rate did not affect bee mortality at either temperature. There did appear to be an effect on the mites, however.

At the cooler temperature, mite mortality was greatest with the highest ventilation. Medium and low ventilation, losses were about equal. At the warmer temperature, mite mortality was greatest under low ventilation conditions. The

authors concluded that holding groups of bees at 25 degrees C and letting CO_2 build up, might clear them of mites. However, indoor wintering usually is done at 4 degrees C (40 degrees F), so the mites are not too apt to be removed by increased CO_2 levels in winter storage. For further information refer to: DOI: http://dx.doi.org/10.1603/EC08278.

Due to the development of resistance to Apistan® strips (10 percent fluvalinate), researchers in Iran wished to determine how well Apivar®, Bayvarol®, and CheckMite+® controlled *Varroa destructor* in their hives. Each of these products is formulated as a plastic strips with 500 mg amitraz, 0.06 percent flumethrin, and 10 percent coumaphos, respectively.

Scientists conducted a 43-day field trial in the fall of 2009 on 20 colonies containing about 10 frames of bees. Groups of five colonies were treated as follows: 1) two strips of Apivar in brood nest for 6 weeks; 2) four strips of Bayvarol in brood nest for 6 weeks; two strips of CheckMite+ in brood nest for 6 weeks; and 4) untreated control. Pre- and post-treatment percentages of mite infestations were: Apivar – 8.43 and 0.28; Bayvarol – 8.48 and 0.29; CheckMite+ - 9.64 and 0.14; control – 8.98 and 14.61. It is interesting to see how effective chemicals can be for *Varroa* control, when the mites first encounter them. The paper is: The efficacy of Apivar® and Bayvarol® and CheckMite+® in the Control of *Varroa destructor* in Iran, by Reza Shahrouzi. 2009. It can be accessed at: http://www.apiservices.com/articles/us/efficacy_of_bayvarol.pdf .

Finally, from Arabia, researchers studied the effects of Apistan® (fluvalinate), Bayvarol® (flumethrin), Perizin® (amitraz), and "Bee Strips" [CheckMite+®] (coumaphos) for controlling *Varroa* in their colonies in 2003, 2004 and 2005. In 2003 two strips of Apistan left in the hives for 60 days were compared with four strips of Bayvarol for 45 days, two strips of Bayvarol for 45 days, and two strips of Apivar for 42 days. Controls were untreated. In 2004, most treatments were the same, except that the milder Bayvarol treatment was replaced with a Perizin® 50 ml emulsion treatment. The third season, the Apistan and Bayvarol treatments remained the same. This time, two Bee Strips were applied instead of Perizin and left in place for 45 days. Sticky boards were left in the hives throughout the treatment periods. Mites were counted periodically and at the end of the experiments, using either Perizin or Apivar for knockdown.

The first season, four strips of Bayvarol knocked down the highest percentage of mites (96). Apivar (95 percent), two strips of Bayvarol (89 percent) and Apistan (85 percent) followed the leader. Only 25 percent of the control mites fell. The second season Apivar did best (95 percent) with Perizin (94 percent), Bayvarol (80 percent) and Apistan (80 percent) way ahead of the controls (18 percent). In year three, the newcomer, Bee Strips (95 percent), was most effective while Apivar (92 percent), Bayvarol (70 percent), and Apistan (60 percent) followed. Natural mortality this time was 11 percent. Throughout the study, the efficacy of Apistan was dropping. Bayvarol was showing the same trend. Ambient temperatures outside the hives did not impact the results in this study.

At the time of these studies Apivar was very consistent in its effects on varroa mites. Where Apivar has been used in Europe for a long period of time, it still seems highly effective. Let's hope that holds true for Apivar in the United States. This article is titled "Evaluation of the

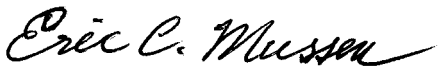
relative efficacy of different acaricides against *Varroa destructor* in *Apis mellifera carnica*" by Ahmad A. Al-Ghamdi. A PDF of this publication may be reviewed at: http://faculty.ksu.edu.sa/alkhazim/Documents/papers/2t.pdf .

Heat Exhaustion, Again

Since summer came before spring out here in California this year, I thought that I should once more remind folks working outdoors of the possibility of dehydration and heat exhaustion. I received a very thoughtful response to my last article on this topic and decided to share the author's information with you.

The suggestion was to pay attention to your ears when you work in the heat and sun. If you can hear your heartbeat exceeding 120 to 140 beats per minute, it is time to back off and cool off. Above 140 beats per minute is dangerous. Secondly, the writer liked to equate this approach to the railroad warning: "Stop, look, and listen." Stop for short rests when sweating, look at the work (to see if you can recall what you were doing and that it is being done properly), and listen for your heartbeat.

Sincerely,



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