COOPERATIVE EXTENSION UNIVERSITY OF CALIFORNIA

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HopGuard® II Revisited

Every time I talk to beekeepers here in CA, I hear: "Boy do I wish we had more options for treating *Varroa*." Well, the good news is that this February, California has re-approved Section 18 emergency use of HopGuard® II. Eric Mussen has briefly written about this product in the past, but a couple of papers that came out last year prompted me to revisit this topic. HopGuard® II is basically an "old" product developed by BetaTec Hop Products, Inc., but it has an improved delivery system. The active ingredient is the potassium salt of hop beta acids at 16 %, and yes these are the same hops you would use for making beer.

HopGuard® II can be applied to both packages and colonies and since it can't reach the mites on brood, the suggested timing of the treatment is when there is minimal brood in the hive so the mites can't "hide". It sounds to me like packaged bees might be an ideal time to treat. If your bees are already in a hive try to treat early in the season when the brood is just building up or late in the fall when brood starts tapering off (BUT don't wait too long as you don't want your colonies to succumb to *Varroa*).

2- or 3-lb packages should be treated by attaching 3 half strips inside a package so they hang from the top and should remain in the package (with bees, of course) for at least 48 hrs. Hives need to be treated at a rate of 1strip per 5 frames covered with bees and the treatment should only be applied in a BROOD CHAMBER. The strips are easy to apply, just hang them over a frame in the middle of the brood box. If using 2 strips, the other strip should be placed on a neighboring frame but 4 inches away from the first one.

Now just a couple of cautionary notes. Even though the product is safe to use during nectar flow DO NOT apply it in the honey supers. And please don't be tempted to use honey or wax that is in the brood chamber! If the bees do not remove strips after 30 days you should remove them from the hives. HopGuard® II can be used up to 3 times per years but it shouldn't exceed a total of 6 strips per year per colony (including package and hive application). You need to wear chemical-resistant gloves when you're working with the strips and since the material is pretty sticky you'd probably want to wear them anyway.

So how do all these recommendations fare in the real world? A study by DeGrandi-Hoffman and colleagues (2014) investigated the effect of HopGuard® on *Varroa* counts in commercial colonies established from packages or splits. They used a mathematical model to determine the timing of HopGuard® applications and at the end they compared *Varroa* counts predicted by the model and what they actually found.

To show the timing of the applications I thought it would be best to do this in a table, so here you go:

Tables from/based on DeGrandi-Hoffman et al. 2014

Application times to colonies started from packages or splits

Packages

Group	Package	22-Jun	4-Aug	11-Oct
1	X	X		
2	X	X	X	X
3	X		X	X
4	X			
5 (no-treatment control)				

Splits

Group	April	12-Sep	1 week post 12-Sept	2 weeks post 12-Sept
1A	X	X		
1B	X	X	X	X
2A (control)				
2B (control)		X	X	X

All of the mite counts were done with a sugar-shake method and reported as # mites/100 bees. For packaged bees, the final mite counts were done after the October treatment and significantly lowest mite counts were recorded for groups 2 and 3. For colonies made from splits, the lowest mite counts in November were recorded in groups 1B and 2B.

Interestingly, the model predicted a much more effective mite knockdown by the fall than what was actually seen in the field. The authors hypothesize that these differences might have been due to various other factors not taken into account by the model or various model parameters not following what was recorded in the literature, underestimation of initial mite population numbers, and/or a suboptimal mite removal during sugar-shakes.

So it seems that the most effective mite knock-down was in colonies that received 3 or 4 treatments during the year and particularly important were the late season applications. I do want to remind you that the California regulation for HopGuard® II states that no more than 6 strips per colony per year may be used. Because of this you might want to stick with one initial application earlier in the season and two later in the season if starting from packages, or, if you are splitting your colonies, you should be able to get away with 3 consecutive applications towards the tail end of the season. Although, I would have liked to see the authors take another mite count the following spring and record colony mortality.

The results of this paper also highlight the importance of using the product when there is no or little brood or for 3 consecutive weeks to cover the entire brood cycle. Drift between colonies might play a role in increasing mite numbers in a particular hive. And while you can't control what your neighbor does, you should make sure you treat all of your colonies that need the treatment.

Another word of caution – you don't want to wait until your mite populations absolutely explode in the hives in order to treat. A possibility would be to follow an IPM approach by applying a different miticide around HopGuard® II or, if you have fewer colonies, try utilizing physical or mechanical control such as use of screened bottom boards, drone comb removal or creating a break in brood cycle by caging the queen or splitting your colonies. Going with *Varroa* resistant/tolerant honey bee stock is yet another possibility so think about it when you're purchasing your next batch of queens.

The last thing I wanted to mention is a study by Vandervalk and colleagues (2014) that found HopGuard® to be ineffective for varroa mite control for hives in western Canada. It is important to note that the studies used a markedly different treatment schedule which could have been an important factor leading to differences in the results. Vandervalk et al. did a single application in the fall and three consecutive applications in the spring, the opposite of DeGrandi-Hoffman et al. They also applied HopGuard® when brood was present in the spring but did do three consecutive treatments at this time. I would be very curious to see what would have happened if the application methods followed those of DeGrandi-Hoffman et al. which would tell us if the differences might have been due to

environmental conditions that the hives were exposed to.

HopGuard® II section 18 expires on December 31, 2015 so you better get to treatin', but DON'T forget to apply for a permit from your county agricultural commissioner's office first (the Restricted Material Permit Program chemical number is 60711). And if you don't use all of the product by the end of the year, you need to return it to the seller or dispose of it according to Resource Conservation and Recovery Act regulations. If you would like to learn more about this product go to http://www.betatechopproducts.com/products/varroa-mite-control.php or if you'd like to see a video of the application process see https://www.youtube.com/watch?v=T2y4rndPhlo

Disclaimer: We are not promoting the use of this or any other specific products.

Full references for the papers discussed: DeGrandi-Hoffman et al. (2014) Exp Appl Acarol 64:171–186. http://link.springer.com/article/10.1007%2Fs10493-014-9821-z; Vandervalk et al. (2014) J Econ Entom, 107(6):2030-2036. http://jee.oxfordjournals.org/content/jee/107/6/2030.full.pdf.

Avocado Pollination

This month I was invited by Ben Faber **(**UCCE Subtropical Advisor, Ventura County**)** and Mary Bianchi (San Luis Obispo) to the Avocado Seminar Series to talk about honey bees with the avocado growers in San Louis Obispo, Ventura and Fallbrook. I am also grateful to the California Avocado Society (http://www.californiaavocadosociety.org/) and the California Avocado Commission (http://www.californiaavocado.com/) for supporting these seminars. The growers were a wonderful and a very engaging group and were very interested in honey bees. This event also provided me with an opportunity to learn quite a bit about avocados.

Avocado (*Persea americana*) is native to Central America. In its native range there are many pollinators associated with avocados, with stingless bees and honey wasps being thought of as primary contributors to pollination. In the non-native range, including California, honey bees are placed in avocado groves to facilitate pollination.

Majority of the growers I talked to had hives in their groves and those who didn't said that they will be placing them there soon. Now, avocado nectar, is not exactly the favorite of honey bees and Afik and colleagues (2009) suggest this is possibly due to the high mineral content in the nectar. But because of their large numbers honey bees are still making a substantial contribution to avocado pollination.

Interestingly enough there seem to be subspecies and even individual colony differences in preferences for avocado nectar (at least in Israel; Dag et al. 2003). These differences were tracked and used to create "high" and "low" lines of bees where high lines had a much higher perseitol content in their stored honey suggesting greater foraging on avocado nectar (Afik et al. 2010). This means that nectar preferences might be heritable and honey bees could be bred for better pollination of specific crops. Wouldn't that be useful!

Undoubtedly, there are many other visitors to avocado groves that are contributing to avocado pollination as the growers themselves told me they regularly see flies and other bees working the trees. However, what is really needed is a good survey of native pollinators in avocados and Ben Faber and Gordon Frankie (UC Berkley) are working towards getting some data to satisfy their and our curiosity. So stay tuned! And like with almonds and sunflowers, honey bees and other native pollinators might be working the avocado flowers together improving the fruit set.

Another thing that struck me as noteworthy is that the avocado growers and beekeepers have found a way to collaborate so that both groups benefit. Avocado growers get pollination services and the beekeepers get a satisfying home for their bees. By the way, the growers asked me if I knew of any beekeepers interested in sending their bees to avocados. If you are one of those beekeepers you might want to contact the Avocado Society and see if they know of interested growers.

Full references for the papers discussed: Afik et al. (2009) Israel J Plant Sci 57: 253-261 http://www.tandfonline.com/doi/abs/10.1560/IJPS.57.3.253#.VOzE1vnF9kg; Afik et al. (2010) J Econ Entomol 103(2):228-233 http://www.bioone.org/doi/abs/10.1603/EC09235; Dag et al. (2003) Apidologie 34:299-309 file:///C:/Users/elnino/Downloads/Dag,%20Fetscher,%20et%20al.%202003%20(1).pdf.

A Note on Flupyradifurone

You might have heard that EPA will be registering flupyradifurone, a new insecticide that should be a safer alternative to some of the previous products. Bayer CropScience petitioned for the registration of this product which will be sold under the trade name Sivanto™.

Flupyradifurone is an agonist of acetylcholine, a neurotransmitter in the insect nervous system. It interacts with the acetylcholine receptor, but unlike acetylcholine it cannot be degraded so it is "stuck" causing the insect nervous system to malfunction leading to death. This is a systemic insecticide (meaning it "circulates" through the entire plant) and it is being recommended for pest control in various crops through foliar and soil application. However, it has not being recommended for use in almonds.

The EPA Registration Decision states that the product was extensively tested and reviewed under the new Pollinator Risk Assessment Guidelines adopted by EPA and it has been found to be safe for honey bees. The document does indicate that while there doesn't seem to be an acute contact toxicity, oral toxicity is a potential issue for adult honey bees. This means that if a bee feeds on pollen or nectar containing this insecticide at high enough levels it might cause mortality. Flupyradifurone and its metabolites have been detected in both nectar and pollen of various treated crop plants and at various levels.

Colony-level data showed no long-term effects on colony performance and overwintering in comparison to control. However, the product admittedly caused a temporary increase in individual forager mortality. It is also worth noting that these observations were made after multiple applications in the same area the last of

which was done at bloom. While flupyradifurone might indeed be a safer alternative for honey bees (and other pollinators) it seems that, as with many other pesticides, there are still a few question marks. For my own edification I will certainly be following up on this insecticide and since the CA DPR comment period is likely coming up soon you might want to do some more reading yourself.

To learn more about the product go to http://www.sivanto.com/doc/Technical-Information-SIVANTO.pdf. For the EPA Registration Decision go here http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2013-0226-0044 and for the EPA Risk Assessment report for flupyradifurone visit this website http://www.noticeandcomment.com/Environmental-Fate-and-Ecological-Risk-Assessment-for-Foliar-Soil-Drench-andSeed-Treatment-Uses-of-the-fn-230951.aspx. For more discussion on flupyradifurone and honey bees visit http://pollinatorstewardship.org/?p=2908. And if you are curious about the Pollinator Risk Assessment Guidelines here they are http://www2.epa.gov/pollinator-protection/pollinator-risk-assessment-guidance.

Kids' Corner: 'How do honey bees collect nectar?'

Usually after about three weeks of life as a house bee, all healthy honey bees in a normal, healthy colony become foragers. They start every morning by going out into the world looking for the best sources of sugary nectar and protein-rich pollen. Some of them even collect water. Now, I'm sure you've seen these friendly ladies just buzzing along visiting flowers in your back yard. By the way, just a reminder, forager bees will not attack unless they feel threatened so just make sure you don't bother them and you should be fine (and tell your friends too!). But have you ever closely watched a forager honey bee collect nectar from the flowers?

Honey bees are very small so you know it wasn't easy to figure out how they do it. But the scientists did it anyway. Shaoze Yan and colleagues from Tsinghua University in China used a special camera to film and observe forager honey bees in action. Turns out honey bees can make a sort of a straw through which they stick out their hairy tongues (glossa) to collect nectar. Amazing!

Elizabeth Preston (writing for Discover Magazine) describes it like this: "When the bee's tongue extends, the hairs snap outward. First those at the base of the tongue stand on end, then the middle hairs, and finally the ones on the tip. Then they flatten again as the bee withdraws its tongue, slurping up the sweet nectar caught in its bristles." It reminds me of doing the wave at a sporting event, but without sitting back down right away. The nectar then goes into a special carrying pouch called a honey stomach or a crop.

And there you have it! The bee is now ready to take the nectar back to her hive where it will be turned into the delicious honey we all love to enjoy. And remember, as Eric Mussen likes to point out, honey is not actually bee vomit as it never goes through a digestion (breakdown) process in the digestive tract of a honey bee.

To read more and see a video visit: http://blogs.discovermagazine.com/inkfish/2015/01/13/bees-drink-with-expandable-mop-

tongues/. The original research article: Wu et al. (2015), J Exp Bio, doi: 10.1242/jeb.111013 http://jeb.biologists.org/content/early/2015/01/07/jeb.111013.abstract

In Memoriam

In the past 2 months we said our last good bye to two more beloved experts of the honey bee world.

Dr. John Ambrose passed away on January 8, 2015. He joined the Dept. of Entomology faculty at NCSU in 1975 where he studied honey bees, taught many generations of undergraduates and served the beekeeping community. In 2000 he moved into an administrative position within the College of Ag and Life Sciences. While I did not have the pleasure of meeting Dr. Ambrose personally, over the years I heard about his great impact on the beekeeping industry and was very saddened by the news of his passing.

Please read more about Dr. Ambrose's lifetime achievements at http://www.cals.ncsu.edu/agcomm/news-center/perspectives/avid-apiculture-students-master-beekeepers-are-among-late-professors-legacies/.

Dr. Peter Teal passed away on February 11, 2015. At the time he was a research leader in the USDA-ARS Chemistry Research Unit in Gainesville, FL.

He is probably best known in the beekeeping world for studying the use of semiochemicals to control various hive pests. I was lucky enough to have the opportunity to work with Dr. Teal and I will always remember him as a brilliant scientist and a wonderful man. http://www.legacy.com/obituaries/gainesville/obituary.aspx?n=peter-edmund-allan-teal&pid=174208962

Upcoming Events

1.) **The Häagen-Dazs Honey Bee Haven Fifth Anniversary Celebration (**Dept. of Entomology and nematology, UC Davis)

Come and learn about our garden and its many beneficial inhabitants!

When: May 2, 2015
Where: UC Davis, Bee Biology Road

To learn more about this **free** event visit: http://hhbhgarden.ucdavis.edu/welcome.

2.) **Bee Symposium: Keeping Bees Healthy** (Honey and Pollination Center at the RMI and the Dept. of Entomology and Nematology, UC Davis)

Come and learn more about the peril of honey bees and what you can do to help!

When: May 9, 2015
Where: UC Davis, RMI
Who: Marla Spivak (keynote speaker) and many others.

This educational program is designed for beekeepers of all experience levels and we especially welcome students of all ages.

To learn more and to register visit: http://honey.ucdavis.edu/events/events_items/bee-symposium-keeping-bees-healthy.

3.) **California's Native Bees: Biology, Ecology, and Identification** (Jepson Herbarium workshop, UC Berkeley)

If you are intrigued by other bees that might be pollinating away in your back yard - this is the course for you!

When: June 3-7, 2015
Where: Hastings Reserve, Carmel Valley
Who: Gordon Frankie, Sara Leon Guerrero, Jaime Pawelek, and Robbin Thorp (the instructors)

This course provides basics about native bee biology and ecology with a specific focus on identification.

To learn more about the course and to register visit: http://ucjeps.berkeley.edu/workshops/2015/index.html.

Sincerely,

Elina L. Niño

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