March /April 2005

"Beekeeping in California" is On Line

The long out of print (1987) 86-page booklet, Beekeeping in California, is now available to you on the Web. Bill Evans contacted the University of California and received permission to make the publication available electronically, as PDF files, to interested people at the following Web site: www.beeguild.org.

The predecessor to that booklet, Fundamentals of California Beekeeping (Manual 42, 1971), also a UC publication, is at that Web site as well.

Remember that these booklets were published before the tracheal and *Varroa* mites became well established in California, so information on them is lacking.

We're Number Four

After many years as the nation's largest honey producing state, California dropped to fourth place in 2004, producing only 17.55 million pounds. This year, for the first time, California also shared the largest number of honey producing colonies per state (390,000) with another state, North Dakota. But, the colonies in North Dakota averaged 78 pounds of honey while we averaged only 45 pounds. Actually, only six states, Maine (31 pounds), Missouri (41 pounds), New Jersey (27 pounds), New Mexico (44 pounds), North Carolina (40 pounds), and Virginia (38 pounds), produced fewer pounds per colony than we did. Florida and South Dakota were the other states that produced more total honey than we did.

Should we blame the weather or the mites? It certainly wasn't our beekeeping!

Almonds and Honey Bees

The year 2005 was the first year that honey bee colonies were in short enough supply to worry the almond growers. The price per colony nearly doubled, and still we had to import packaged bees from Australia and install them into pollination units.

At the moment, the almond growers have every reason to be optimistic. The past few years have produced about a billion pound crop. The price per pound currently is above $2.50 and in some cases closer to $3. It was just a few years ago that the growers stated they needed to make $1.00 per pound to break even on nut meats, before selling the hulls or shells. It was stated that selling the non-nut meat items covered the cost of pollination.

New plantings are going in as fast as nurseries can provide the trees. Projections are that by 2010, there may be 750,000 acres of almonds in bloom requiring about 1.5 million of colonies of honey bees for pollination. If the USDA is correct (2.4 million colonies in the county), that means that over half of the commercial honey bee colonies in the United States will have to be in California each spring for almond pollination. If we can't keep our colonies more healthy than we did this past season, we may need ALL the U.S. commercial colonies out here in February.

Did we actually lose 40-60% of the U.S. colonies this past season? I don't know. But, I do know that certain individual beekeepers lost nearly all their bees to something. It is easiest to blame *Varroa*, since that parasite is so hard to subdue these days. But, some of the bees that I saw seemed to have perished due to lack of brood rearing during the extremely critical time from August through September, when the bees are rearing their "winter bees." The winter bees are the ones with the expected life span of about six months. They are the bees that are supposed to still be there after the "summer bees," with their expected life spans of six weeks, die off over the winter.

If forage is lacking, if adequate empty space is lacking, if diseases or parasite loads are too severe, then brood rearing is going to be reduced significantly and the resultant bees will not be healthy enough to reach their expected time of death. This amounts to colony populations that just dwindle in numbers continually from October to death before March.

Since *Varroa* mites are blamed for most of this loss, it is obvious the beekeepers must monitor the levels of *Varroa* in their colonies and apply treatments when the numbers of mites are **beginning** to increase, not after the numbers have sky rocketed. The only papers published in the US on treatment threshold levels for mites are those from the southeast. The authors felt that a total mite population around 3,300 was the time to treat. That is about 90-100 *Varroa*, falling naturally per day (trap for three days and use the daily average) from the colony. In experiments that we ran last fall, the mite counts were twice that high and we lost all but 26 out of 110 colonies.

Virus Transmission by *Varroa*

Researchers T. Santillan-Galicia and B. Ball of the Rothamsted Research Station and P. Alderson at the University of Nottingham in England injected pupae with slow paralysis (SPV) and deformed wing viruses (DWV) and let *Varroa* mites feed on them for five days. Then the mites were transferred daily to uninfected pupae to determine how long the mites could inoculate virus into new hosts.

In the first four days, DWV was being transmitted at nearly 90%. But, by ten days, the rate had diminished to around 20%. SPV transmission remained more consistent over the eleven days of testing, varying from 40% at the start to 33% at the end. The high

for SPV was 67% at day four and the low was 20% on days five and six.

Formulating Pollen Supplements

While conducting studies on AFB control at the Beaverlodge research facility in Alberta, Canada, Steve Pernal and Adony Melathopoulos ran a side study on the consumption of pollen substitute and supplements with 10% and 40% pollen by weight. They had been told by beekeepers that the bees ate the supplement better when the pollen was left in pellets, like a chocolate chip cookie, instead of milling the pollen into 0.85 mm or less powder.

It turned out that the bees ate pollen pellets or milled pollen at the same rate. But, it was really evident that the percentage of pollen in the diet made a very large difference in consumption. In thirteen days, the test bees consumed about 20 grams of pollen substitute. They ate a little over 40 grams of pollen supplement containing 10% pollen by weight. They ate about 85 grams of supplement containing 40% pollen by weight. The conclusion was that the bees ate 1.35 times more supplement for each 1% increase in pollen.

Based on prices of $8.25 C per pound of pollen and $30 C for per pound of bees, then the addition of 40% pollen would cost $0.72 in each 100 gram patty and the 200 extra bees that are raised would be worth $2.00, a 280% return on your investment.

The details of this study are printed in the August 2004 (Vol.17, #3) issue of HiveLights, published by the Canadian Honey Council.

Emergency Queen Raising

Most apiculturists believe that the best queen honey bees are reared from queen cells started from one-day-old larvae. However, when an emergency arises, and the bees have to rear another queen to remain a functioning colony, the bees make a different selection.

Researchers A. Tofilski and K. Czekonska from Poland confined queens to single combs for eight days, so that there were all ages of eggs and larvae available on a single comb, then removed the queens from the colonies. The bees reared queen cells from the developing brood.

Unlike our choice, the bees started more cells from three-day-old larvae, with two and four-day-old larvae second in numbers. With that late start, the cells were capped a bit later than is usual for queens started from one-day-old larvae. However, the queens emerged at the normal expected time, meaning that the pupal stage was shortened to make up the difference.

Queen cells were started the first through ninth days after the queens were removed. The average number of cells started was 33. The average number capped was 27. The number of cells emerged per colony averaged 13. Many cells were destroyed before or after capping.

These results suggest that emergency queens, based on worker bee selection of starting larvae, may not be as good as queens that we can purchase and introduce into our colonies.

The details of this study can be reviewed in the May/June 2004 issue of Apidologie (vol. 35, No. 3): 275-282.

Seedy Tangerines

When I was a kid (in ancient times), I used to get a tangerine in the toe of my Christmas stocking. It peeled easily and usually did not have many seeds in it. However, I preferred to eat grapefruit.

Also when I was a kid, and even now, sometimes, mandarin orange sections (from a can or fresh) can be found in salads and desserts. Other than that, I didn't think about them too much.

Now, there is quite a buzz about that citrus product in the San Joaquin Valley. Consumers have matured and prefer to buy their tangerines by specific name: Satsuma, Gold Nugget, Shasta, Tahoe and Yosemite mandarins will not have seeds in them. Clementines and W. Murcott Afourer (Delite) will be seedless only if grown away from each other and away from other citrus that produce compatible pollen.

I have been getting calls from mandarin growers asking me what bee repellents can be used to keep honey bees off their tree blossoms. I am not aware of anything that repels bees that would last for any length of time in the field. If you have an idea, let me know. The citrus growers are ready to outlaw beekeeping in their areas, if they can't find a solution to the bee visitation problem.

Screened Bottoms for Pallets

Having screened bottoms in hives is supposed to be helpful in two respects: 1. *Varroa* mites fall through it and do not get back into the hives and 2. spring build up seems to be accelerated (as long as your colony overwintered in adequate size).

Robert Pflieger, a sideline beekeeper from Shingle Springs, CA, wrote me a letter explaining his complete satisfaction with his transition over to pallets with screens below the hives. I will try to reiterate his method, as I understand it.

Bob used a Skill and saber saw to cut a 11.5 inch wide by 15.5 inch deep rectangle out of the pallet under each hive. The hole is located leaving 1.5 inches at each side and 1.5 inches under the back of the hive. That leaves about 1.75 inches of landing board coming into the front of the hive. Bob says that this is important – bees that land on "open" screen often drop their pollen loads through it.

Besides time to build the special pallets, the screen is a major commitment of money. Bob used 6-mesh, stainless steel screen that he purchased as a 36 inch wide roll from McMaster-Carr, Santa Fe Springs, CA (562) 692-2333. [Stainless steel is about 10X as expensive as galvanized.]

The screens were cut 13.5 X 18 inches. If the screen overlays the landing board, that does not interfere with pollen transportation.

After two years of using the screens and "grease patties", Bob says the following: 1. "The size of the hole did not affect the structural integrity of the pallet and was adequately effective in ridding any falling mites." 2. "The Apistan, though not killing the mites, still 'knocks them down' in very effective quantities." 3. "All the debris falls through and the mites seem to be unable to 'hang on.'" 4. "I have seen no mites in drone larvae for the past two years." 5. "When my hives were brought home from the almonds (2005), they were simply 'busting out all over' and were swarming within days of arriving home."

Bob admits that this is “a huge undertaking for any large beekeeper and is expensive. But, so are colony losses and lost revenue from pollination and honey production.”

If you would like to contact Bob, directly, to ask about his experiences, his e-mail address is: flordeoro@plv1.innercite.com.

Picnic Day Honey Tasting

Each year, on a Saturday in the month of April, the UC Davis campus sponsors an open house, called Picnic Day. Depending upon the weather, 2,000 to 5,000 spectators come to campus to watch the parade, dashound races, chemistry demonstrations (explosions) and the displays set up by various departments.

The Entomology Department has a number of interactive displays, one of which is honey tasting. I will explain how I set up and run this event. It is easy to do and attracts almost as much interest as an observation hive.

I use a six foot banquet table. Two floral table cloths are positioned first. Then, 8.5 X 11" sheets of paper with descriptions of the honeys are placed where the dishes will be located, six flavors per each side of the table. Then a heavy duty, transparent plastic sheet is laid down over everything and either taped (like I used to) or strapped with bungie cords into grommets (like I do now) under the table.

On top of the plastic, at the front end of the table, I have boxes of flat toothpicks and signs instructing each person to take six toothpicks. The participants pass down either side of the table, tasting each of the honeys and placing the use-only-once toothpicks into aluminum baking pans (these fill up and have to be dumped, periodically).

The honey samples are contained in 100 X 20 mm plastic Petri dishes (the only thing that is easy for me to get, but may be difficult for you). I turn the plates bottom side up and print the name of the honey on the bottom, remembering to write with the lettering and words going from right to left. This year’s selections were: CA sage, CA orange, CA starthistle, NV pumpkin, CA alfalfa, and San Jose urban honey. I taste the honeys and try to put the milder ones first, the stronger ones second, and the "different" ones last. That may not induce the participants to leave the tasting with the best recollection of honey, but they surely get the point that all honeys do not taste the same.

I printed and duplicated a very simple fact half-sheet about how bees produce honey, and why honeys taste differently. I also included the Web address to the National Honey Board. There, people can link up with the Honey Locator and find sources of honey from their neighborhoods or regions.

Clean up is pretty straightforward. The used toothpicks and baking pans go into the trash; the sticky honey dishes are thrown away or cleaned up; the unused toothpicks and signage collected. Then the plastic sheet is cleaned up with a large sponge and lots of water. The plastic is removed from the table, the honey signs are collected, the tablecloths folded up and everything is put away, when the plastic sheet has dried thoroughly.

Someone has to keep an eye on the process to avoid "double dipping" and having people take "used" toothpicks from the baking pans for their use. Yes, some people try to scoop up as much honey as possible on

a toothpick. However, not that much is used per sample and a pound of honey usually lasts through nearly two thousand samplings.

This is a worthwhile project to consider at a fair booth or other event where the public has been invited to learn about honey bees. Also, this approach is much less expensive than "honey sticks."

B.t. Corn Pollen and Honey Bees

Studies conducted by Zachary Huang and others at Michigan State University demonstrated that at least two types of transgenic corn pollen, Cry1A(b) and Cry1F, do not pose a threat to larval honey bees when they are fed to the larvae.

After “mapping” the experimental larvae on acetate sheets, the larvae had experimental materials pipetted into their cells. The cells were monitored until the time of emergence, to determine if the bees were removed (died). Various analyses were made on the immature bees and there was no difference in larval mortality, pupal mortality, pupal weight or hemolymph protein concentrations, regardless of diet, with the exception of introduced diazinon that killed over 50% of the immature bees.

Cry1A(b) and Cry1F were introduced into corn to kill caterpillars that feed on the foliage. Using wax moth larvae are test subjects, Cry1A(b) pollen caused no loss of larvae. However, Cry1F killed all the wax moth larvae that were fed pollen from that genetically altered type of corn plant. This suggests that sometimes genetically altered plants have genetically altered pollen and sometimes they don’t. That should be kept in mind when testing genetically altered plants for their impacts on non-target species.

The details of this study were published in the Journal of Apicultural Research 42(4): 77-81, 2003.

More on Oxalic Acid

R. Bahreini, in Iran, studied the effects on *Varroa* and honey bees of spraying or drizzling 5.0 ml of 3.5% oxalic acid dehydrate in 50% sugar syrup on combs of honey bees two times (interval not stated). Outdoor temperatures were 50-60 degrees F when the studies were conducted. So, it sounds like a fall treatment.

He achieved 99.0% and 95.1% mite control with the spray and drizzle treatments, respectively. Nearly all of the mites dropped during the first spray application, while about half of the mites dropped during each of the two drizzle applications. Natural mite fall was 6.8%.

The details of this study can be found in the Journal of Apicultural Research 42(4): 82-83, 2003.

Also in the December 2004 issue of Bee World [Vol. 885 (4)] there is a description of the process that was used to get oxalic acid registered for use in the European Union (EU) for controlling *Varroa*.

The first step was to obtain data to uphold the setting of an MRL (maximum residue limit). After the data was obtained and analyzed, it was decided that oxalic acid could be added to Annex II of the Council Regulation (ECC) 2377/90. Substances on that list do not have specific amounts listed as MRLs. This decision was based on two factors: 1. the level of oxalic acid in honey changes very little with proper oxalic acid treatments and 2. even with daily

consumption of honey, the amount of oxalic acid would not hurt anybody.

There already is a European standard set for maximal amounts of free acids in honey – 50 milliequivalents. If oxalic acid is used improperly, that limit could be exceeded.

Supersedures and Russian Queens

A number of beekeepers have stated their dismay when the Russian queens they purchased seemed to be superseded quite soon after they were introduced into the colonies. Tom Rinderer and Robin Cargel looked into that phenomenon and found something very interesting. Yes, the Russian bees were rearing many queen cells (for much of the season), but they were tearing them down before the new queens emerged. The colonies where this was going on had the same bee populations and production as similar colonies that were not going through this process.

By marking combs, the researchers could keep track of how far advanced the cells were when they were destroyed. Often new cells were being started as older cells were being destroyed. Many of the cells were chewed on from the side and torn down during late larval or early pupal stages. However, about 10% of the cells persisted until a couple days before emergence.

Therefore, beekeepers may have expected their original queen to be superseded, when they saw the queen cells in the hive. However, only one queen in the 61 cells studied actually emerged, and in that case the original queen was failing.

Details can be found in the Journal of Apicultural Research 43(4): 188-190, 2004.

Coming Soon: Mite-Away II®

David VanderDussen, President of NOD Apiary Products, contacted me recently to inform us that their formic acid product has been registered by the EPA. The company will have to get the product registered in each U.S. state before it can be used in that state. They are intending to register from north to south across the country.

According to NOD Apiaries, Mite-Away II "is effective in hives with brood, giving 93.31% *Varroa* control." "Studies have shown no problem with queen loss." "Supers can be put on immediately after treatment period, though no honey can be harvested for two weeks."

A "spacer rim" is required to make this approach work. It is essential to have a "vapor column" above the frames to "distribute an effective concentration of formic acid vapors through the colony." "Beekeepers can modify their covers so the rim is built in."

Loss of brood is typical. However, "… the brood rearing rebounds quickly, all other colony activities remain normal, and no losses in productivity have been documented, when Mite-Away II has been applied according to label."

For all treatments, bottom screens must be closed off and the entrance left open. "For control in the southern States beekeepers can apply two treatments during

the cooler months of the year. Applications could be three to five months apart, depending on temperature and honey flows. Two applications of Mite-Away II should keep Varroa mites at tolerable levels for the year, especially if the stock has some resistance."

Sincerely,

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