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2006 CSBA Convention Review

Small Hive Beetle	*CA Almond Outlook*	*Brood Food Production*
Mite Resistant Queens	*Pollen Substitute Feeding*	*Quick Pitch for WAS*
Honey Bee Viruses	*Keeping EHB in AHB Areas*	*Beekeeper of the Year*

Highlights of the 2006 CSBA Convention

Once, again, we cheated winter and had only a little rain water on the highway as nearly 300 beekeepers and related individuals traveled up the mountains to the 117th Annual Convention of the California State Beekeepers' Association. The venue for the convention was the Mont Bleu (formerly Caesar's) in Stateline, NV. Minor renovations featured a lot of new, blue lighting and paint.

Small Hive Beetle

Following the opening ceremonies and committee reports, Keynote Speaker, Dr. Jamie Ellis, from the University of Florida, Gainesville, shared with us information he has gleaned and developed from studying the small hive beetle (SHB) in the US and also in its native South Africa.

Jamie presented a world map showing the known distribution of the SHB. The map indicates much of the US, a few areas around Brisbane and Sydney, Australia, and nearly all of Africa south of the equator, as well as seven countries north of the equator, including Egypt.

Jamie described the major negative impacts on infested European honey bee (EHB) colonies and infested colonies of African honey bees. While honey production didn't seem to suffer much with either race of bees, only the amount of stored pollen seemed to be reduced with African bees. In addition to reduced pollen stores, EHBs had reduced brood areas, reduced numbers of adult bees, and reduced flight activity.

Then Jamie discussed the beetle's life cycle. Although the beetles prefer and will select honey bee stored products and immature bees as their food source, we were shown photos of the beetles completing their life cycle in fruit. It is possible that the first introduction of the beetle into the US was from fruit, but that isn't too likely. For one thing SHB does not reproduce nearly as well on a fruit diet as it does when eating hive contents. A diet of only honey did not lead to beetle reproduction, but they survived longer on honey than on any other food in the studies.

Although there are no data indicating the proportions of distribution that occur by the following methods, they all are believed to be involved: 1. adult beetle flight, 2. swarms, 3. absconding, and 4. beekeeper-assisted colony migration.

The behavior of the beetles was the next topic. When they follow the odor of the colony to the hive entrance, the beetles do not enter unobserved. The bees chase them around in the hive, and soon the beetles are herded into nooks and crannies. The beetles are basically held captive by the bees. However, from time to time the beetles approach their captors and "beg" for food by stroking the mouthparts of the bees with their antennae. Usually this doesn't work, but every so often, a bee gives in and feeds the beetle. So, they survive in the colony without causing much damage. Eventually, however, things happen and the prisoners escape. They lay eggs in the brood nest, especially through the cappings and side walls of cells containing developing larvae and pre-pupae. The eggs hatch quickly and the beetle larvae consume the bee larvae. Eggs laid in other areas of the hive hatch and the beetle larvae eat the pollen, cocoons, and other organic material, similar to wax moth larvae. While dining on the various food items, the beetles inoculate their food with microbes. The food breaks down quickly by fermentation and subsequent bacterial decay. The partially eaten food turns into a terrible smelling slime. About that time, the honey bees abscond. The combs can be reused by forcefully washing off the slime and letting the combs dry out.

Probably, the portion of the presentation most interesting to the beekeepers was that dealing with control. Beginning with chemicals, Jamie described the uses of the two registered insecticides, coumaphos (in the form of CheckMite+® strips) and permethrin (in the liquid formulation called GardStar®).

A single CheckMite+ strip is cut in two crosswise. The pieces are stapled among the corrugations of a piece of cardboard with the sheet of paper pulled off one side or a plastic strip with corrugations molded in. These traps are placed, strip down, on the bottom board. When the beetles arrive at the entrance and meet resistance from the bees, they crawl under the corrugations and contact the coumaphos. Until the beetles become resistant to coumaphos, this method will help a lot.

The GardStar is used as a soil application on the ground surrounding the hives. Fully fed beetle larvae crawl out of the hives at night, trailing a stream of slime, and burrow into the ground to pupate. They don't penetrate dry ground well, at all. But, they can crawl long distances if necessary, and will get to areas of soil moistened by irrigation, even in the desert west agricultural areas. Until resistance develops, the larvae will be killed when burrowing into permethrin treated soil.

Jamie reported on other control methods that are under study. Dr. Mike Hood has developed a plastic trap that fastens onto the bottom bar of a frame in a hole cut out of the comb. It has a sloping, one-way trough at the top and contains cider vinegar that acts as an attractant and drowns the beetles that fall in. Mike also has developed a large jar trap the hangs below a substantial hole in the bottom board of a hive. Again, filled with cider vinegar it acts as an attractant, but also appears to be a place to run into for shelter, when the bees are chasing them.

Among the other approaches that Jamie mentioned was closing the normal hive entrance and fitting a piece of pvc pipe into a hole drilled below the handhold of the box. Unfortunately, the bees often failed to go back into the hive when they returned from foraging and formed a substantial cluster on the front of the hive. Perhaps this is because the intake/exhaust ventilation system, that bees use to orient into the hive, was not functioning well through the tube.

But, the best suggestion that Jamie had for keeping beetles from becoming a problem was to maintain very populous colonies and nucs, so that the bees could keep the beetles bottled up and prevent a brood nest invasion. Jamie cited brood diseases and infestations of tracheal or varroa mites as problems that are likely to lead to greater problems with SHB.

Jamie hopes that the previous efforts directed toward selecting for highly hygienic stocks of bees will help with the SHB problem. If the bees are stimulated to remove brood that is in the early stages of infestation, then the beetles will not reproduce nearly as well and may not become overwhelming.

Along the lines of biological control, not much has been found that attacks SHB eggs or adults. However, larvae and pupae are susceptible to at least a couple species of entomopathogenic nematodes that have been tested in the laboratory. *Heterorhabditis indica* and *Steinernema riobrave* killed about 75-80% of the beetle larvae exposed to the juvenile nematodes.

The next, important, undetermined factor in avoiding economic damage by the SHB is knowing the level of beetle numbers that can be tolerated without causing damage. Jamie and his cooperators are trying to determine that level for colonies in the warm, humid, southeastern US. Whether or not his estimate will be applicable to the western states or the whole country remains to be seen.

CA Almond Outlook

Steve Rothenberg, Field Supervisor for Blue Diamond, reported on the current shape and potential future of the almond market. From a growers' point of view, the 2005 crop was excellent. The crop was just less than 1 billion pounds and the prices held pretty well ($2.65-$3.31) until weakening later in the year. There was a temporary $2.00 drop in prices, but they have rebounded recently. Total shipments are around record levels.

The "objective estimate" of the 2006 crop is 1.05 billion pounds. Individual nuts were a bit smaller this year, but there were a lot of them. In 2005 the US produced about 78% of the world crop. In 2006 the estimate is 77%. The Spanish crop will increase from 9% to 11% of the total. Italy (1%) will be down significantly this year, while Greece (1%), Turkey (2%), Australia (3%) and others (6%) will remain the same as the previous year.

World consumption and world production run parallel each year. In 2006 the world production is about 1.4 billion pounds, and humans will consume 1.3 billion. "Carry-in" (left over from the previous year) has fluctuated from 81 to 162 million pounds over the last five years.

California data follow the world trend very closely. This year we expect to have 1.1 billion pounds available for sale and we will move 975 million pounds.

The discussion then turned to the condition of the orchards. There are 140,000 acres that were planted before or during 1987. Twenty years is a long time for an almond tree to be kept. However, recent prices for nuts have made operating the old orchards more valuable than pulling them out and starting over. New annual plantings were around 20,000 acres in the early 1990's. From 1994 to 1999, new trees planted nearly doubled. Then things settled back down to the 20,000 acres until 2004. In 2004 records show that 32,786 acres were planted. Then 50,000 acres were planted in both 2005 and 2006.

It is hard to tell whether or not old trees will be removed at increasing rates. If not, the bearing acres of almonds are antici-

pated to rise to 755,000 by 2010. We are going to need a lot of bees!

Production of Brood Food

Eric Mussen presented an in detail account of the production of brood food – glandular secretions from the glands in the head of a worker bee. The explanation included some anatomy and physiology of the bee. The flow of nutrients from pollens to secretions of a clear, high protein substance from the hypopharyngeal glands, and a white, high lipid substance from the mandibular glands, was described.

The uses of the brood food and modified brood foods were explained. It was emphasized that abundant brood food can be produced only by so-called "nurse bees" that are 9-12 days old, or winter bees that have not yet fed brood. After feeding bees for a week or so, the glands shrink down and become essentially useless for that purpose.

Then Eric discussed factors that can limit the amount of brood food produced in the colony. Basically, if abundant nurse bees are not available, or if abundant pollens aren't available, brood food production is going to be reduced and so is brood rearing. This can be critically import in August, September and early October when the bees being reared are the "winter bees" that should have life expectancies of six months. Those are going to be the lion's share of the "almond bees."

Besides lack of pollens (protein food source), infection by *Nosema apis*, or infestation with tracheal mites (*Acarapis woodi*) and/or varroa mites (*Varroa destructor*) will inhibit the ability of worker bees to produce brood food. Healthy bees and abundant food (two difficult demands in California) result in the best wintering bees.

Mite Resistant Queens

Tom Glenn, a commercial bee breeder from Fallbrook, CA, shared with the beekeepers his opinions on rigorous bee selection and controlled mating in developing bees better able to handle the parasites and diseases that are causing problems today. Hygienic bees were emphasized.

Tom listed the costs to the beekeeper of using such a program as: 1. hygienic bees remove brood when they remove mites, 2. bees spend time removing brood and mites, and 3. the beekeeper spends a good deal of time developing the stocks. The benefits of such a program include: 1. savings on cost of acaricides, 2. less mite control labor, 3. avoiding side effects of chemicals, 4. avoiding chemical residues and contamination, 5. no risk to beekeeper health, and 6. could be a permanent solution.

Tom explained that good ideas seem to be implemented slowly. However, when he checked the bee journals, he found 30 ads for resistant stocks while 21 didn't mention resistance in their ads. He also feels that if everyone starts using resistant queens, their drones will distribute the genes to other hived and feral colonies, for a slow change towards resistance. Since Tom considers California to be the "center of the bee universe," he hopes that the breeding efforts in our state will eventually affect the country's bees for the better.

Pollen Substitute Feeding

Dr. Frank Eischen has been experimenting with colonies brought to CA for almond pollination for a number of years. He has seen real strong colonies and real weak ones. But, it doesn't appear logical that such differences should exist. So, Frank has been trying to determine what practices are really important to having better bees.

He captured bees from various operations and checked for *Nosema apis*.

He found about 1/3 of the samples contained levels of infection above the treatment threshold of 1 million spores per bee. A couple samples were above 10 million spores per bee. Obviously, some of these colonies could have benefited from a treatment with fumagillin.

In the protein level survey, Frank took samples from 916 colonies chosen at random from the thousands that were around Bakersfield in almonds. On average, nurse bees contained about 27.2 mg of protein. The bees that they were rearing emerged with about 20.7 mg in their bodies. This compared to data taken in Minnesota long ago – 13% (a new bee weighs about 110 mg) – and taken more recently in Australia – 45% protein.

The researchers spent a huge number of hours "crunching data." They found that in some cases, the amount of protein in the nurse bees and in the brood matched up pretty well. In other cases, the nurse bees could be real low and the emerging bees were fine. In other cases, the nurse bees could be high in protein but rearing brood with substantially reduced protein levels. These variations currently defy explanation.

No reliable information could be determined from comparing the levels of varroa mite infestation with protein levels in the bees, because the mite levels had been depressed, significantly, by acaricides.

Next Frank compared colonies that were fed pollen, BeePro®, and BeePro plus 20 and 37% pollen, and BeePro plus 37% pollen plus honey, to the control that was left unfed. Data was collected over a three month period (Jan-March) in southern Texas.

Adult bee populations increased in BeePro, BeePro plus 37% pollen and BeePro, pollen and honey diets. The bee population fell in the control, the pollen treatment, and the BeePro plus 20% pollen. The brood nests expanded in all treatments, the least with BeePro plus pollen plus honey (3.8X) and the most with pollen, only (9.0X).

Diet consumed over the period was greatest with pollen only, followed closely by BeePro plus pollen plus honey. Straight BeePro was consumed the least. The weight of emerging bees was very similar. The protein levels in emerging bees were higher for all treatments in February than in March and the treatments were very similar. There was a positive correlation between the size of the colony at the end of the study and the size at the beginning and how much food they consumed. Protein content of the adult bees and growth of the brood nests also were correlated, but differences were a colony to colony variation, not dependent upon feeding.

Quick Pitch for WAS

Dr. Adrian Wenner briefly compared the similarities and differences between the CSBA and the Western Apicultural Society (WAS). There were a lot more similarities. However, CSBA did get a 111 year head start on WAS. WAS holds meetings throughout the western region of North America. Meeting speakers come out of the same pool of researchers. Dues are considerably lower in WAS.

Adrian sees CSBA and WAS as partners, not as competitors. He is aware that holding its annual conference in the summer makes it difficult for many comercial beekeepers to attend the WAS meeting, but those few commercial beekeepers who have attended really enjoyed the laid back (no political topics can be discussed) nature of the meetings and the information provided by the speakers. Attending commercial beekeepers say that they sure they are going to attend the next year, but normally that doesn't happen.

World Honey Market

Ron Phipps, from CPNA International, Ltd., reviewed the current and likely future of the world honey market. A very thorough article on this topic was published in the November issue of the American Bee Journal, starting on page 909. I refer you to that article for the complete story.

Honey Bee Viruses

Dr. Judy Chen, researcher at the USDA/ARS bee lab in Beltsville, gave the first comprehensive presentation on honey bee viruses that I have attended since I used to give that presentation when I was working with sacbrood disease. That was "ages" ago and much more information now is available.

Judy listed nine well studied virus diseases of honey bees. Then she showed us a multicolored pie chart that was carved up into double and single stranded DNA viruses and double and single stranded RNA viruses. Single stranded RNA viruses can be either + or – strands. For this presentation, we considered only the ssRNA(+) viruses. Acute bee paralysis virus (ABPV), black queen cell virus (BQCV), and Kashmir bee virus (KBV) are in the subgroup with separated genetic areas for non-structural and capsid proteins on the RNA. Sacbrood virus (SBV) and deformed wing virus (DWV) are in a subgroup where the nonstructural and capsid information reside adjacent to each other on the RNA strand.

Some extremely closely related viruses we have heard about are hepatitis A, polio, the common cold and foot-and-mouth disease.

There was a pretty detailed discussion of ssRNA virus replication, but the important thing mentioned is that RNA is not a very stable molecule to be used as a template for directing the host cell to build more viruses. So, a lot of variants (or mutations) are formed. That is why is it so hard for a mammalian immune system to overcome diseases caused by these viruses.

A honey bee doesn't have our type of immune system, so it must fight virus infections by not getting sick in the first place. These RNA bee viruses are interesting in that a bee can have the RNA strand in its body, but not have an active infection. That is called a "latent" infection. Until something changes biochemically in the bee, the virus just stays there and causes no trouble. In the case of honey bees, poor nutrition really reduces the bees' ability to avoid active infection. Additionally, varroa mites have been shown to move the virus between bees when it feeds on an infected bee, first. We call that "horizontal" transmission.

Judy's group of researchers pried deeper to find how else the virus could be moved around in the bees. Expanding on the horizontal transmission idea, they checked for virus contaminated food in the combs and they tried to determine if drones could infect queens through mating.

A number of viruses showed up in stored pollen, honey and royal jelly. How long the virus stays infective in foods was not determined.

Viruses were found in various tissues of the queen, including her ovaries. BQCV and DWV were found in feces of queens collected from filter papers on which they had defecated in Petri dishes. Drones also were determined to be infected, including the semen. Queens had viruses in their spermathecae.

Of the six viruses known to be associated with parasitic mite syndrome (colony collapse) DWV is the only one to be definitely determine to be transmitted by *Varroa*. There is pretty good data that KBV can be

transmitted, also. Interestingly, the studies showed that the probability of the host pupa becoming infected with KBV increased linearly, from a little over 20% when one infected mite was added to a healthy pupa, to over 90% when four infected mites were added. More interestingly, as the number of "clean" mites moved to an infected pupa increased, the probability that they would become infected increased more than linearly.

The last tests were conducted to see if the queen passed the virus through eggs, to larvae, to pupae, etc. ("vertical" transmission). The answer is, "Yes." But, was the virus inside the egg ("transovarial" transmission) or on the outside ("transom-vum" transmission)? The viruses were still there after a rinse in Clorox®, so they must have been inside.

More in-depth studies, especially if someone could get honey bee cells to grow in tissue culture, could provide a lot more information on these viruses, but that may be of limited value. Why? Because we do not have any medicines that can prevent or cure infections with these viruses. Endoglucin or interleukin-2 might be effective but they are way too expensive to be used with honey bees. So, Judy concludes that beekeepers just keep doing the things they are doing the best that they can. Try to keep the bees well fed and keep mite levels suppressed. She also expressed her gratitude for the CSBA grant that helped fund these studies.

Keeping EHBs Around AHBs

Dr. Gloria DeGrandi-Hoffman, from the USDA/ARS bee lab in Tucson, explained why, over time, EHBs just "disappear" in areas where AHBs have moved in. CSBA funds were used in these studies.

If things were "even," you would expect to find AHBs, EHBs, and hybrids. But, hybrids really aren't "fit." The hybrids do not last long under our environmental conditions. So, why do the colonies change over to AHBs?

The mechanisms are varied. 1. AHB queens and hybrid queens complete their life cycles faster than EHB queens started at the same time. Reared in the same colonies AHBs won 83% of the time. 2. African mini-swarms invade and usurp EHB colonies that are queenless (especially), weak, or that have changed queens recently, either naturally (supersedure) or by the beekeeper (requeening). 3. While equal for a short while, more AHB sperm leave the spermatheca than EHB sperm, after the queen has been inseminated with 50-50 blends of semen.

Can Africanized honey bee colonies be successfully requeened with EHB queens? It appears that this is a qualified "Yes." However, gas chromatographic studies suggest that the queens' "smell" has a lot to do with it. If levels of certain aromatic chemicals are high, the new queens do pretty well. If the pheromones are lower, she won't be queen of the colony very long.

Looking for seasonal effects, the researchers got 13% early (one week) rejection of new EHB queens into EHB colonies in the spring. That dropped to next to none in summer and fall. Six weeks later, nothing changed in the spring group, but about 13% of the summer requeened colonies decided to change leadership. It looked like the fall requeened colonies were going to stay that way.

AHBs, on the other hand, rejected the EHB queens at a 25% level, initially in spring. Six weeks after introduction, the AHBs had not made further changes in their new spring queens. Summer had a bit better initial acceptance, at 13% rejection. But the summer-requeened colonies superseded around 30% of the EHB queens. In the fall, acceptance was pretty good. Although, about 6% of the EHB queens didn't make it

to the end of the study in AHB colonies. So, requeening may work, but don't be surprised if you have to keep doing it.

Beekeeper of the Year

This year, Extension Apiculturist Eric Mussen was selected to receive the most prestigious award offered by the CSBA, the Beekeeper of the Year Award. Eric was recognized for many different contributions that he has made over the last three decades to the beekeeping industry, within the state, around the region and the nation.

Sincerely,

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