

November/December 1996

Renewal Time
Almonds Without Bees?
Never Predict!

Mega Meeting
20-Year Review (cont.)

Renewal Time

I have strategically located a subscription renewal form on the bottom half of page 7. If you cut it off and send it back, your address is already on it (your mailing label). The label shows the year through which your subscription is paid until December 31. A quick glance at my mailing list shows a few 1997 subscriptions, lots of 1996 subscriptions, and a surprising number of 1995 subscriptions. I will be eliminating all 1995 subscriptions, if I do not receive payment before the January/February 1997 issue is ready to be mailed. I'll be a bit more lenient with those who have paid through 1996. You will have until May to renew your subscriptions, or you won't receive the May/June 1997 issue. Thank you for spending the few minutes required to send your checks back to our office.

Almonds Without Bees?

In the December 1996 issue (Vol. 16, No. 12) of *Nut Grower* magazine, the caption beside a photo of seedlings in a greenhouse states: "Within a decade, almond growers may have access to a self-compatible variety [of almond] that offers nonpareil-type characteristics with less reliance on bees for pollination."

The article in the issue, titled "Seeking Self-Fertile Nonpareil," describes efforts by UCD pomologists to develop one or more almond varieties that would produce a crop without a visit from a pollinator. Other considerations for these varieties include: nut meats must equal or exceed quality of nonpareil; bloom times and crop maturity must be predictable; trees must be tolerant or resistant to pests and diseases, and bud-failure has to be eliminated.

How is the work progressing? According to Dr. Tom Gradziel, UCD pomologist, the emphasis on self-compatibility is progressing

well. With self-compatible varieties, an orchard could be planted as a solid block of a single variety. Pollinators would still be needed to move pollen between flower parts, but the concern about "nicking" (having the right, compatible pollen available when nonpareil is in bloom) would be eliminated. Also, bees working up and down a row of trees would be pollinating whatever stigmas they visit. Researchers hope these varieties will be ready in five years.

The next advancements will be tougher to achieve, but the goal is to have trees available in ten years (using molecular genetics) having the following traits:

1. self-fertile - reproductive parts of self-compatible flowers will rub together, providing pollination without pollinators
2. late blooming - avoids frost (reduced chilling requirement, too?)
3. resistance - introduction of *B.t.*-like genes to confer natural resistance against insect pests of the trees
4. production - must maintain nut quality and nut yield, while making all the other changes.

Dr. Gradziel says that there is a 10-15-year lag between the time that UC releases a variety and it shows up in production fields. Thus, honey bee pollination will still be an important factor in almond production for years to come.

Never Predict!

Also, in the December 1996 issue of *Nut Grower* is an article based on a 'phone interview with me in late November. The topic was availability of honey bee colonies for 1997 almond pollination.

Ever the optimist, I said that things looked good. Beekeepers were having less of a problem with mites, increased honey prices had allowed investments in delayed maintenance, and colony numbers had rebounded fairly well, following last winter's severe losses.

Then, it started raining!

There has been a lot of media coverage on the flooding in the Sacramento and San Joaquin valleys. There was even at least one quick shot of a beekeeper moving bees to drier ground. But, what was lost?

The first figures I heard were related to Washington State Apiarist, Jim Bach, from Washington beekeepers who had moved colonies into the state before the rains started. Some individuals lost 1,500 colonies to the waters. Jim's early estimates were close to 10,000 colonies of Washington state bees lost.

Mega Meeting

A couple weeks ago, I devoted three days to attending a combined meeting of the American Association of Professional Apiculturists, American Bee Research Conference, Apiary

Inspectors of America, and American Honey Producers Association. Because of concurrent programming, I only visited with apiary inspectors at meal time. But, I heard quite a number of presentations, the contents of which I would like to share.

Jim Doyle, from the U.S. Dept. of Commerce/Import Administration, related the efforts they have taken to be sure that the "suspension agreement," related to honey importations, is being followed. Reports of "circumvention" led to a number of actions:

1. visited ports of entry to be certain that customs personnel knew exactly what to look for

2. sent a team to China (through Ministry of Foreign Trade and Economic Cooperation) to explain that any Chinese honey found sneaked into the U.S. would be subtracted from the quota allowance and implicated smugglers would be disciplined

3. currently demand records of Chinese honey export sales to Canada and Hong Kong, with other Asian countries to be added

4. analyzing numerous samples of honey from China to find trace minerals, etc., that will be used for detection of Chinese honey blends.

U.S. Customs is the regulatory agency involved with policing imports and circumvention.

All this effort is being conducted without infusion of industry "anti-dumping" funds.

If you have any reason to believe that the suspension agreement is being violated, please contact Jim Doyle at (202)482-0172. Be prepared to describe exactly what you believe the problem is, and Jim's staff will conduct a thorough investigation.

A second federal government representative, Bob Flanders from USDA/APHIS Risk Assessment-Organism Permitting, attended the meeting to tell us that changes are likely in the federal "Bee Act." The current act is basically a prohibition to importing anything involving live bees and reproductive products into the U.S. USDA researchers and their cooperators were the only exceptions.

The GATT agreements are forcing the issue, because they require open trade unless there is a demonstrable threat from an imported item. New Zealand, Australia, and other European countries have been knocking on our door for years to allow their stocks to come here. Obviously, this will not be a reciprocal agreement with countries that do not have tracheal or *Varroa* mites.

Apparently, the new approach (under the Federal Advisory Committee Act) will involve the formulation of a Technical Advisory Group (TAG) that would decide who is allowed to import what, and from where.

This still would open the borders only for "research" imports. Exotic queen and/or semen importations would have to arrive through an approved quarantine facility, be reared

under close scrutiny, then released following acceptable review of data by the TAG.

Additionally, the importations would have to be done in compliance with the National Environmental Policy Act, which requires acceptable Environmental Assessment and Environmental Impact Statements. Violators would receive more than a slap on the hand - a \$10,000 per queen fine is being discussed.

Commercial stock importations from the previously mentioned countries, plus Canada and Mexico, would be allowed through a permit system. Using the FAO guidelines (Risk Assessment Process), the country of origin would be assessed. If no threat is perceived, and the importer adequately justifies the need for importation, the permit would be issued.

If you would like to share your opinions on this subject with Bob, don't wait around. Bob intends to formulate and have reviewed the new regulations in half a year, publish them in the Federal Register (for comment) in August, and implemented as a new law by the end of 1997. Frequently, what is published in the Federal Register is what persists to law. So contact Bob, now, if you wish to share your ideas on this topic: (301) 734-8896 [FAX (301) 734-8700] or PPQ Permit Unit, 4700 River Road, Unit 133, Riverdale, MD 20737-1228.

Many research papers were presented with heavy emphasis on mite control. But, other papers of interest included an economic comparison of beekeeping over the

last decade. The study was conducted by Roger Hoopingarner, at Michigan State University. Roger noted trends in increased sizes of commercial operations and more involvement in crop pollination. The sudden doubling of the wholesale price for bulk honey would have been expected to vastly improve the profit line, but inflation has bumped up the cost of beekeeping supplies and equipment, significantly. Expenses for queens and packaged bees increased dramatically as mites induced significant colony losses. The punch line - beekeeping is just barely profitable, despite better honey prices.

Jeff Pettis reported on studies he conducted to determine if bees rear the best possible queens following emergency queen loss. Jeff's definition of "best" is biggest and heaviest. (There is documentation that such queens have more ovaries and lay more eggs than their less endowed sisters, but this may not necessarily be best for the colony.)

Jeff removed queens from functioning colonies and allowed them to rear emergency cells. Ten days later, he collected all the cells and sorted them by developmental stage: 1. tanned (close to emergence - likely to rule); 2. light tan; 3. purple eye; 4. pink eye; 5. still white. The light tan were heaviest (supposedly best) but, conducted in this manner, we cannot determine whether or not the bees would have allowed the second best (by weight), earliest, emerging queens to take over. Jeff stated that these results suggest that we should select for

the biggest queens and those colonies with the greatest royal jelly production.

Another interesting presentation, by Dr. Anita Collins, reviewed the obstacles involved in trying to freeze honey bee eggs for short and long term gene storage. Thawed out, these eggs could be hatched, given to queenless colonies, and a new queen of the desired stock would be reared. What's the problem? Water forms ice crystals as it freezes. The crystals cut up the cells in the embryonic tissues in the egg.

The methods to avoid this damage are interesting:

1. determine the egg stage that freezes best (about 21 hours for *Drosophila* and 17 for a mosquito)

2. use Chlorox or something to "dechorinate" the eggs (partially dissolve the egg shell)

3. treat egg with something like hexane to make cells more permeable

4. attach eggs to membrane, so they become more manageable

5. soak eggs in 8.5 to 9 molar ethylene glycol

6. plunge eggs into liquid nitrogen (rapid freezing hopefully leads to cellular water freezing in a matrix other than sharp crystals)

7. thawing has to be done rapidly, too, so that ice

crystals don't form during the thawing process.

With meticulous care, researchers can get about 60-65% of frozen *Drosophila* eggs to hatch and 40% of those to keep growing (25% viability over all). You can imagine how many research hours it has taken to discover all this. So, don't expect us to be freezing bee eggs tomorrow.

Those of you interested in the effects of Medfly control on honey bees will be interested in a report by Bill Wilson, who went to Mexico to study the effect of Sure dye on honey bees. Sure dye is a mixture of red dye #28, fructose, and some corn extract that is being proposed as a substitute for malathion in the bait spray program.

Red dye #28 causes severe toxicity to insects if it is photoactivated in their bodies. Small insects like Medflies are transparent enough to have photoactivation take place in their intestinal tracts, if sunlight hits them. Neither adult honey bees nor brood were affected when Sure dye bait was sprayed right on the blossoms that the bees were foraging.

Honey bees are being considered more often as a directed transportation system for crop enhancement substances. With a "dispenser" at the hive entrance, outgoing bees carry pollen to various crops, *Bacillus thuringiensis* (*B.t.*) to sunflower heads to kill headmoths, antibiotics to blossoms to prevent blight and, now, biological competitors to prevent frost damage and fungal infections.

Dr. Mike Hood, from Clemson University, described trials conducted with a fungus that shows promise in controlling *Botrytis* rot of strawberries. Weekly sprays of fungal inoculant were as effective as Captan in preventing disease, but weekly spraying is uneconomical. In Mike's studies, the bees emptied the dispenser in 2-3 hours, but they flew out of the strawberry fields and protected their preferred foraging plants, instead.

Dr. Cynthia Scott-Dupree, from the University of Guelph, compared the susceptibilities of workers from four queens of Canadian origin, five Buckfast, and one Carniolan to *Nosema* disease. Nine hundred newly emerging bees were collected and individually identified. Each was inoculated with 700 *Nosema* spores and incubated in hives, as individuals in screened cells, or as groups in cages.

The Buckfast bees had fewer spores in them later, but the results were barely significant (0.035). If *Nosema* is a problem, fumagillin still seems to be the solution.

Dr. Greg Hunt, who used to be in Rob Page's lab, moved to Purdue University, where he is still very much involved in prying into the genes of honey bees. The goal is to try to determine which genes are involved in defensive behavior. Then those genes can be extracted, analyzed, and identified. With luck, we may be able to predict (within reason) the behavior of a bee from its

genetic fingerprint [too bad this wasn't available for O.J.; we could have saved a lot of court time].

Evidence is building that combinations of pyrethroids with other pesticides or "inert ingredients" leads to synergism. Synergism is a more toxic effect than individual components would suggest. Dr. Marion Ellis reported that azole-fungicides tend to synergize pyrethroids, as does thiodan. But he is concerned about reports that sesame oil makes fluvalinate toxic to otherwise nonsusceptible insects. Are some of the oils, or even our "grease patties," that are in the hives for mite control, synergizing the effects of fluvalinate on bees? He's intending to find out. Field studies already show that bifenthrin becomes more toxic to bees when fluvalinate is around. Implications of these findings are very important to beekeepers.

Two observations were reported on AHBs. Dr. Frank Eischen suspended drone traps containing queen substance in drone congregation areas and used to catch about 1000 drones in 10 minutes in Texas. Now he catches many fewer. By protein analysis, Frank compared those drones to workers from colonies in the area. They matched very well, suggesting that taking a drone sample is a quick and easy way to determine the percentage Africanization in any area.

Dr. Gerry Loper gave up trying to trap drones in the air outside of Tucson. *Varroa* arrived, and drones disappeared. So, Gerry now sends out virgin

queens to find the drones and analyzes their offspring.

Matings appear to have about 19.5% AHB drones near Tucson, and 15 and 27.1% at a couple of locations about 60 miles from town. Even at the 15% level, there is noticeable change in worker bee behaviors and detectable increase in defensive behavior.

Nearly the whole rest of the meetings were centered around *Varroa*. I'm only going to mention, briefly, a few of these presentations, because the abstracts of all the presentations will be printed in the American Bee Journal in February or March.

Dr. Frank Eischen has tested the smoke of 30 materials burned in a smoker to see what effect they have on *Varroa* mites and bees. Dried creosote bush is still the most potent on *Varroa*. A 60-second exposure to the smoke (similar to tobacco) knocks down the mites and lots of the bees. The bees recover and live out normal life expectancies. About 70% of the tracheal mites are killed, too. Grapefruit leaf smoke makes *Varroa* detach immediately, but they are still very lively when they fall off. Is this similar to reports of *Varroa* falling off bees at the smell of honey bee alarm pheromone? Puffed into a hive, the best mite knockdown has been 30% with creosote smoke.

Dr. Keith Delaplane, in Georgia, monitored the buildup of *Varroa* populations over a season, then treated with Apistan in June, August, and October. In

December, he sacrificed the colonies (*Varroa* killed all the controls) and counted the mites. The August-treated colonies were largest going into winter. At treatment time, they had about 3,000 mites. By October, the mite population had doubled. "Collapsing" colonies were removed to prevent influxes of mites into nearby colonies. The June treatments were too early in the season and resulted in fall mite counts that were quite high.

20-Year Review (cont.)

1990 - In response to suggestions that pesticide use and use reporting in California were too lax, CDFA implemented a new reporting system. Each beekeeper using any product listed as an agricultural pesticide had to obtain an "operator's identification number" from the agricultural commissioner of each county in which the chemicals were used. A monthly use report had to be filed in each county where pesticides were used. Extender patties were being touted as a possible tracheal mite suppressor. The Yogo bees were brought to an isolation island off the coast of Louisiana. The entirely nylon bee suit, "Bee Alls," was advertised by Custom Bee Gear, Logan, Utah. A more robust "totally ventilated beekeeper suit" was offered by Gold Bee Products, Metairie, Louisiana. The three-layered suit was claimed to be

sting proof and air conditioned. The National Honey Board introduced the "What's Buzzin'" video that is still being purchased and used in schools nationwide. A program called WEATHERBRIEF brought to your computer all sorts of data for \$169 access fee and \$0.15 per minute on line (probably free now for net surfers). Dr. Rob Page hired researchers and began studies on AHBs. The CCC required that honey shipped under loan program must be "unitized" (stretch-wrapped on pallets). In mid year, Miticur strips failed to obtain EPA registration; more residue data was required. A southern Mexico beekeeper reported how they were coping with AHBs. Researchers in Rob Page's lab began collecting samples of bees from feral colonies around California. Thirteen-year-old Timothy McGuire from Camarillo won the American Beekeeping Federation essay contest. California beekeepers failed to

convince members of the Senate Agriculture and Water Committee to extend the apiary assessment, so it will end December 31, 1990. A radio-controlled cradle for a bee truck boom was offered by Tele-Images in San Diego. Reflective paints made a big splash. A text/reference book titled *The African Honey Bees* became available. It is still the most comprehensive text on AHBs. Researchers at Auburn University discovered that the propellants in the spray cans were more important in bee and wasp knock down than the active ingredients or synergists. Sprays that made the insects cold worked best. "Designer bees" may be found, or made, that can tolerate exposure to specific, otherwise toxic, insecticides. A British Columbia researcher found bees with enzymes that detoxified diazinon, propoxur, and carbaryl.

1991 - CDFA announced the end of enforcement of restrictions of *Varroa* and AFB requirements on arriving colonies of bees. The Pesticide Enforcement Branch also stated that beekeeper 'phones had to be available seven days a week for pesticide application notification calls. Dr. Tom Sanford described what is now called Honey Bee Parasitic Mite Syndrome in colonies from Florida's panhandle.

Sincerely,

Eric Mussen
Entomology Extension
University of California
Davis, CA 95616 [(916) 752-0472]
[FAX (916) 752-1537]
INTERNET:ECMUSSEN@UCDAVIS.EDU

Eric Mussen
Entomology Extension
University of California
Davis, CA 95616