May/June 2007

Newsletter by E-mail

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Think Winter, Now

We just barely have passed June 21st, the longest day of the summer. Honey bee colony populations should be at or near their peak for the year. If this is going to be a good honey year, the flow should be going strong in most parts of the country. And, it should continue for another month or more.

However, by the end of July the colony population will begin to decline, because egg laying began to be reduced after June 21st, the longest day of the year. Also around the end of July, the summer bees begin to alter the diet of the brood to produce the physiologically different winter bees. Winter bees will be reared through August, September and perhaps into October. Those winter bees are supposed to survive until late winter (up to March) of next year. And, beginning in late December and picking up the pace in January and February, winter bees are supposed to rear the overlapping generation of summer bees for the next season.

Thus, the most important time of the year, for the survival of your colonies, is rapidly approaching. Have you planned for this set of events?

In order to get the best quantity and quality of winter bees, there are some important things to consider. In brief, they are 1. food, 2. nurse bees, 3. comb space, 4. lack of parasites, and 5. lack of disease.

Food – The natural foods of honey bees are water, nectar and pollens. Only pollens will be discussed, here, since water and nectar are pretty easy to replace if they are lacking. Honey bees rely, almost totally, on pollens for their "health foods." While some pollens, collected by honey bees, are

quite nutritious for them, others are not. So, a mix is best. Think about it, now. Where are your bees going to be located in August and September? Are there going to be a number of wildflowers, weeds, or comercial crops available to provide a good mix of pollens (don't count on corn for anything except fiber)? Although it may be too early to predict the future two or three months from now, is it likely that the soil moisture will be adequate to produce nectar for the bees? Will the moisture be adequate to produce pollens? Unless I miss my guess, both the perennials and fall annuals in many portions of California are going to remain under drought conditions and will be of reduced value to our bees this fall.

When pollens are not available in adequate amounts or mixtures, the beekeeper has to supplement the bees' diet with non-pollen feed. What feed is best? Currently, researchers from the USDA bee labs are conducting comparative studies of the various commercially available pollen substitutes and supplements. Interestingly, such studies have led to quite different results with the same product. It appears as though the bees will consume and benefit from any of the commercial products available, but it depends more on what nature is providing at the time, or has provided earlier, than on the formulation of the product.

When some pollens are available, the results of supplemental feeding of honey bees are usually beneficial. When pollens are not being collected, sometimes the bees won't even eat the supplemental feed. Other times, they will consume the feed, but the brood rearing is pretty meager. That is because the feeds really only do a reasonable job of providing protein. While protein is critical for brood rearing, it is only a portion of all the nutrients required to raise a healthy bee and not do it at the expense of the body reserves of nurse bees. Even if there is stored pollen in the hive, brood rearing is not as good as when fresh pollens are available. Also, if protein supplements are required by the bees, be sure to feed a sugar syrup, as well. Bees do not do a very good job of digging into stored honey for late brood production.

In the 1970's and 80's Graham Kleinschmidt and his research team in Australia conducted numerous studies on honey bee nutrition and supplemental feeding. Unfortunately, many of their results were reported, verbally, at meetings or published only in government reports and not in academic journals, so it is hard to obtain a complete set. (Anyone going to the Apimondia meeting in Australia should keep his or her eyes open, in case they can find a way to obtain the reports). In the papers that I have seen, Kleinschmidt reported that well fed honey bees should contain about 60% crude protein. They will continue to maintain that level, while feeding brood, if adequate pollens are available. Without adequate pollens, the bees will mobilize their stored body reserves to feed the brood. If the body reserves are depleted to 40%, it will take about 4 weeks to build them back up, when food levels return to adequate. However, the bees may continue to feed brood until their reserves drop to 20%. In that case, it takes 14 weeks for the bees to recover when food becomes available. If those are summer bees, they won't live that long. If those are early winter bees, fresh pollens will not be available to them for months, in many locations. They are apt to remain physiologically weak for good.

So, what can a beekeeper do when it appears that late summer/fall feed is not going to be adequate? Beginning in July and continuing through early October, if necessary, the beekeeper will have to feed pollen substitute or supplement (substitute containing pollen). An interesting document from research conducted by Tom Rinderer's group at the Baton Rouge lab stated that a mix of year old brewers yeast and soy flour (protein breaks down relatively quickly in

storage) was just about as good for rearing brood as the relatively fresh pollen that they had available. Protein, as previously mentioned, should be fine. So should vitamins.

However, the one sterol that is critically important to bees will not be found in that mix – 24-methylene cholesterol. Compliments of the Web, we find that the fore-mentioned chemical can come in two forms: 24R (campesterol) or 24S (dihydro-brassicasterol). Apparently, the 24S one will work as a precursor for cholesterol in honey bees. The bees' cholesterol is further converted to ecdysteroids involved in embryonic and larval development of honey bees. Those hormones are essential. So, where do we get that precursor to those steroids? It is said to be very high in canola oil (and nearly lacking in soy bean oil). There also is a little data suggesting that probiotics (live microbial cocktails), working on the food in the digestive tract, can contribute extra nutrients of value to honey bees, as well as other animals. If you are going to be doing quite a bit of feeding this year, it might be worth the investment to add a bit of the extra nutrient sources to help round out the diet. Just be sure to watch out for salt – keep below 2%. If the salt were not quite so high, algae (seaweed) would be a good source of 24-methylene cholesterol.

Note – There are no suggestions, here, for trying to get your winter bees into a brood rearing mode before that would normally happen in the last week of December. Feeding bees to promote brood rearing after September will put pressure on the winter bees to get started about three months early. Although I haven't seen data on this topic, I would assume that once the winter bees start using their bodies for brood rearing, they are on their way to a predictable end of life, and it won't take months. It appears possible that a beekeeper can prematurely end the life of a colony by forcing it to rear brood too soon in the season, unless there are nectar and pollen producing plants in significant amounts in the area.

Nurse bees – Actually, bees of many ages can produce some brood food from their hypopharyngeal glands, but the bees best able to produce large amounts are the nurse bees, that are 9-12 days post emergence. To have those bees available in August and September, they have to have been reared a month earlier (21 days egg to adult; nine days to nurse age). Thus, a beekeeper should try to have abundant food and adequate brood rearing space available in July. For many beekeepers the honey flow will still be on, so space is the more important concern.

A second very important consideration for nurse bees is their health. A nurse bee infected by *Nosema*, infested with tracheal mites, or fed upon by one or more varroa mites as a pupa, will not produce enough brood food from her head glands to be of any value to the colony population.

Comb space – If your bees are located in an area where the nectar plants are plentiful, ground moisture is adequate, temperatures approach uncomfortably high levels, and flight weather is good, you should get a good crop of honey in your hives. But, where did the bees put it? Given unlimited space (empty boxes of drawn comb), the text books state that the honey will be stored above the brood nest. That tends to be true. We used to get five pounds of honey on either a full-depth comb, spaced nine to the box, or a medium-depth comb, spaced eight to the box, in Minnesota.

Before that ripened honey (13-18% moisture content, depending upon typical relative humidity) was sealed in the combs, it took up much more space as low solids nectar. Thus, there has to be more available comb space than you expect the bees to fill with honey, if the bees are going to keep their nectar and honey out of the brood nest

area. There are a number of reasons why there may not be adequate space in the hive for honey production and brood rearing, such as: lack of more empty supers; too many apiaries too far apart to keep checking on bees and adding supers, if needed; desire not to handle (harvest, uncap, extract and containerize) any more honey than necessary, or other reasons. But, lack of space in the brood nest for rearing winter bees is going to result in smaller colonies going into and coming out of winter. If almond pollination fees are really important to your "bottom line," then this is not the time to hold your bees back.

Almond growers desire at least eight frames of bees, if they can get them. Approximately 2,000 adult bees cover both sides of a full-depth comb. So, an eight-frame colony would have about 16,000 bees that have to be reared in August and September, or an average of nearly 267 bees per day for 60 days. But, that is not the way the bees do it. Brood rearing is tapering off for the winter. The 1,000 eggs a day oviposittion rate is going down. In early August, many more eggs will be laid than in the second half of September. Thus, adequate space for brood rearing is most critical during August. Have you planned to examine your colonies in early August to be certain that adequate brood rearing space is available? Or are you going to let "nature take its course?"

Lack of parasites – This will undoubtedly be the most difficult aspect of managing your colonies this year, and probably for many years to come. The best formulations of mite control products are those that can be applied in the hive with little or no concern about the weather influencing results. That was pretty much the case with Apistan® and CheckMite+®. The strips could be used at any time of the year, as long as their use was curtailed, as recommended, when honey was being produced. Sucrocide® can be used when the bees can handle being wetted for a while without becoming chilled. But, subsequently registered control products are formulated to control mites partially, or fully, by fumigation. Ambient temperature and relative humidity have strong effects on their efficacy in mite control and disruption of brood, queens, and the adult bee population when using these fumigant products.

To obtain the least damaged winter bee population, parasite numbers should be reduced as low as possible by the end of July. Bees reared in August or September should not be fed upon by varroa mites as pupae, if they are expected to have a six month life expectancy. Am I aware of a registered chemical application that can be made, safely for the bees, in the heat of July in California beehives, other than Sucrocide, that perhaps could make a dent in the mite population? NO!

What about some little used alternatives? If you were to place a medium-depth frame in the brood nest of a full-depth super, the bees will draw out drone comb and rear drones in it, unless they are on pollen-short locations, like commercial crop pollination. Once filled with capped drone cells, the partial comb can be cut out and thrown away. For each worker brood cell that is infested by one varroa mite, it is less than 50% likely that two mites will come out. For each drone brood cell that is infested with one varroa mite, it is nearly 100% likely that four mites will come out. Removing drone brood takes a lot of mites out of the colony. If you think that your colonies will be rearing drones over the next month, this might be a useful approach to think about.

According to Randy Oliver, dusting with powdered sugar at timely intervals seems to be very helpful. He has a series of articles on this and other approaches to mite control in the last few issues of the American Bee Journal. Although this treatment

probably only causes mites to fall from the bees for less than a day after treatment, there can be quite a few mites on the nurse bees. When the newly mated daughter mites come out of the cells, they tend to hang around on the nurse bees ("phoretic" stage) for up to nine days. Even though the mother mite goes right back into a cell to continue reproducing, the daughters are there to be treated. Treating three times at eight day intervals would seem to knock off many new mites generated from the workers and the drones. Randy is trying to use this method of mite control within a commercial beekeeping operation, so it will be interesting to hear his end of the year report.

Keep one thing in mind, if trying the powdered sugar method – the sugar will kill neither bees nor mites. The mites simply are knocked off the bees' bodies. The mites must fall through a screen (8-mesh is good) at the bottom board and either onto the ground (where they usually are carted off by ants) or onto a sticky board. Otherwise, the dusty, white mites simply wait on the bottom board to climb onto a passing worker or drone and get right back into the brood nest area.

Lack of disease – Given our increasing knowledge of honey bee diseases, we may not be able to find any honey bee colonies that do not have one or more virus diseases in the population. That fact likely has been true for eons. Recently, some virologists have noted that the genomes (all the genes from an organism) from animals seem to have virus sequences in them at various locations. Thus, they believe that viruses played a large role in speciation at various times in history. Other virologists have just determined that humans are relatively well set up to fight off most viruses that attack us, but we don't do well at all against HIV (AIDS). If I interpreted the article correctly, that is because the genes that fight off HIV, in other primates, have been modified ever so slightly in humans. Our bodies cannot attack HIV virus and the other primates have a very difficult time with human viruses.

Knowing that potentially lethal viruses appear to be part of everyday beekeeping, beekeepers must do everything they can to keep their bees in their best physiological condition. When at their best, the bees do a pretty good job of resisting infections in the first place. Factors that put stress on the bees tend to reduce the natural tendency to resist infections. Most of the stresses have been covered, above.

We have medications for use with American foulbrood (AFB) and infections with nosema disease (regardless of which species: *N. apis* or *N. ceranae*). Attentive beekeepers take a good look in the brood nests whenever they get a chance, so that they can spot AFB before it gets ahead of them. Conscientious beekeepers also collect and mail March samples of bees from their colonies to an identification laboratory to determine *Nosema* levels. Well over half of U.S. apiaries have the disease in them. It is a matter of how severe it has become.

There is one stress that sometimes gets overlooked that can lead to trouble. Most beekeepers go out of their way to be sure that their "loads" of bees are sprinkled with water one or more times during transit on hot nights. But, once they get to that new location, the bees have very few minutes the next morning to find new water sources before the sun hits the hives and the day turns hot. Without water for evaporative cooling, the bees will not be able to regulate the temperature of the brood nest, or perhaps in the rest of the hive. Heat easily drives bees out of nucs, and the same thing can happen to full sized colonies. If the bees already have learned that water exists in those barrels that are around the apiary location, they can find the barrels at the new site very quickly. Otherwise, significant losses of bees, immediately after moves, can be attributed to failure of the beekeeper to

supply water and failure of the bees to find another source.

Hive Humming, Again

Following a two year stretch of near dormancy, the activity at the Dr. Harry H. Laidlaw Jr. Honey Bee Research Facility has picked up, considerably. In May, Susan Cobey joined the staff. Even before she arrived, she had Eric out installing queens in splits so that she would have some newly requeened colonies with which to operate. She also arrived at Bee Biology with two short courses scheduled for early June: queen rearing and instrumental insemination (II). Unpacking and setting up the facility for those courses in a short period of time took real effort. For the II course, she did not have time to rear virgin queens, so she relied upon her close contacts with the bee breeders in the area to provide the queens.

The Facility had been accumulating residuals of scientific studies since it was built in the 1960's. Nearly every nook and cranny had been filled with gadgets and left over supplies from all sort of laboratory and field experiments. Sue took one look and asked if all "that stuff" needed to be kept. One view point is, "It could be used again, sometime." But, Eric said, "Not necessarily." So, a big clean out began.

There were so many useless combs and supers that Sue requested an extremely large dumpster for hauling off the boxes. The dumpster looked huge, but was filled in a very short time. It barely made a dent! So, Sue enlisted the help of some bee breeders, members of the Dean's office, and a local bee club. On the big clean out day, the place was humming. Eventually, five dumpster loads left the building. Thousands of combs were shrink wrapped, put on pallets, and taken away to be rendered. Storage shelves were emptied, swept or vacuumed. Floors were swept. The place looks "empty."

Once empty, the effects of years of deferred maintenance became obvious. We expect to have hundreds of visitors at the Facility in January, when the Joint Meeting (American Beekeeping Federation, American Honey Producers' Association, American Association of Professional Apiculturists, Apiary Inspectors of America, and other industry groups) converges on Sacramento. There are plans for a "re-dedication" of the Facility, followed by a really large dinner, with entertainment, on the campus. So, there still is some patching and painting to do, but things look much, much better. I sincerely thank all the extra helpers who volunteered their time, travel expenses, and sweat labor for helping us turn a mountain into a mole hill.

Now, we have to prepare for the arrival of a new pollination biologist. With luck, he or she may be aboard before the end of the year.

Fledgling Honey Organization

At the November convention of the California State Beekeepers' Association, a group of optimistic industry-related individuals brainstormed over an approach to improve the market for US honey. Eventually, the discussion led to the formation of the "Committee for the Promotion of Honey and Health in America." Ron Phipps and Ron Fessenden, MD, are co-chairmen of the group.

The proposed **Mission Statement** of the organization is as follows. 1. **Create and promote a positive Honey and Health agenda** that will result in greater consumer appreciation and demand for honey nationwide and enhance the already favorable image of honey by advancing sound scientific information that underscores its healthful benefits. 2. **Support and promote the development of quality standards from within the industry**, and promote an educational campaign that reinforces the

need for good science to be applied in the promulgation and establishment of standards, including realistic tolerance and testing limits.

Their tentative initial action plan is very extensive, including nine major efforts, one with ten sub topics and another with three. The topic of greatest interest for next January is a desire to hold the **First International Symposium on Honey and Health** just prior to the combined ABF, AHPA, AAPA, AIA convention in Sacramento. The intent of the Committee is to sponsor a symposium for bee-related individuals and for media contacts to inform them of science-based information on the beneficial effects of daily consumption of honey. Specifically, the goals are to: 1. Highlight and promote the healthful benefits of honey. 2. Inform/educate beekeepers, honey packers, industrial honey users, and the general public of the healthful benefits of honey. 3. Provide a public forum for the presentation of research, original articles, and scientific data relating to the growing knowledge base with regard to the healthful benefits of honey. 4. Generate local, national, and international publicity that will enhance among consumers the favorable image now enjoyed by honey. 5. Stimulate further scientific research on honey and health and encourage research and product development based upon the advanced science of honey's healthful attributes. 6. Focus a spotlight on the need for promulgation of, and support for, quality standards based on good science that have international perspective.

The Executive Committee members and their e-mail contacts follow.
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Older Queens Accepted Better

Australian honey bee researchers John Rhodes, Douglas Somerville and Steven Harden studied the ramifications of trying to introduce new, mated queens, ranging from 7 to 35 days post emergence into established (queens removed) colonies.

The youngest queens had not yet mated, and their introduction success was lowest (about 15-30%). Introduction success increased with age of the queens at introduction. Queens left in mating nucs for 14 days were accepted at levels from around 50-70%. This trend did not taper off until the queens from the mating nucs were 28 days old. Holding them longer helped, but queens at 28 days had an 85-95% success rate.

The second question was, "How long did they last?" This determination was made 15 weeks after installation. Actually, the results and curves look pretty similar for two of the three years. If the queens were accepted, they persisted quite well. In the second and third years of their study; queen acceptance was pretty normal. But, in the first year of their studies, queen acceptance started normally. Then, persistence of the queens dropped by about 20%, compared to the next two years. That difference was not explained.

The conclusion of the authors was to suggest that customers purchase only queens that are left for 28 days in their mating nuclei. As I remember it, that timing does not coincide with the bee breeding practices of California Bee Breeders. None of the bee breeders remove their queens before they have been in the mating nuclei for 14 days.

I believe that 14, 17 and 21 days are most common. Expanding the time in the nucs to 28 days would reduce total queen production between 1/3 and 1/2. That would equate to a reduced number of nearly 170,000-250,000 queens each spring in California. That is unlikely to be acceptable to either the producers or their customers.

The researchers went on to state that 17 day old queens, taken out of the nucs and put into queen banks until 24-31 days old, were accepted and persisted about as well as they did if left in the nucs. That would be a lot of queen banks for bee breeders producing 1,000-2,000 queens per day!

Sincerely,

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