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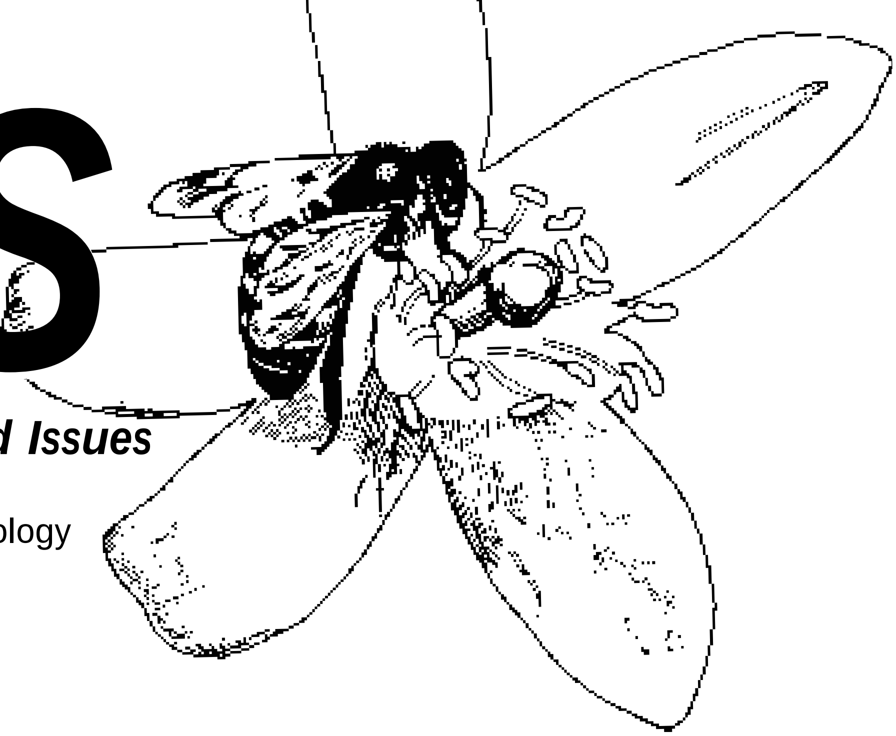

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Small Hive Beetle Update

THE ENVIRONMENTAL PROTECTION AGENCY sent a letter dated May 28, 1999, to the Florida Department of Agriculture and Consumer Services (FDACS) amending the Section 18 exemption for use of coumaphos-impregnated plastic strips. It increases the number of Bayer Bee Strips (CheckMite +) that can be sold to 700,000 and increases the number of days from seven to 45 for controlling small hive beetle. The rest of the provisions as found in the January *APIS* remain the same[1]. This document plus the label and the letter written by EPA to FDACS dated January 6, 1999, must be in the hands of the applicator when treating honey bee colonies.

Reports of small hive beetle activity this spring have been mixed. As winter in Florida drew to a close, few adults could be detected, but later larvae started appearing again in honey houses. The beetle also began to be spread around. Infestations in Ohio, New Jersey and Pennsylvania have been linked to bee shipments from the southeast. The insect also has been reported in Minnesota, where Mr. Cutts, Florida's chief bee inspector, says it appears to have overwintered successfully in 1998.

The major risk of this insect now appears to be when honey is pulled for extraction. Disruption of colonies including moving, manipulating frames or supers, and removing supers prior to extraction stimulates beetle egg laying, according to Mr. Cutts. Larvae quickly hatch from these numerous eggs. Since there are no adult bees in supers removed for extraction, larvae have free rein and can cause major problems. In addition, they infest cappings and other bits of wax or frass found around the honey house. Healthy colonies "stacked" with infested supers, however, continue to be at risk, and this traditional technique to deal with weak colonies probably should be eliminated in beetle country.

The first line of defense for small hive beetle is sanitation in the bee yard and honey house. Dr. Lundie, who wrote the landmark 1940 study on this insect, says that the principal time beekeepers have trouble in South Africa is when combs of honey stand for long periods in the honey house prior to extraction, especially those that contain pollen. Cappings set aside during the extracting process may become "wormy." Honey left over bee escapes for a period is also at risk. ■

[1] http://www.ifas.ufl.edu/~mts/apishtm/apis99/apjan99.htm#1

Sanitation in the Honey House:
Importance to the Food Manufacturer

HONEY is a forgiving product. Even that found in sunken Greek ships after centuries of storage in pots at the bottom of the Mediterranean Sea, though dark and strong, is not spoiled and very edible. Indeed, this attribute is one of the prime reasons there are so many successful backyard and kitchen honey packers. Thus, beekeepers have traditionally had the luxury of producing a prime product often under marginal conditions, something impossible to accomplish for most other foods. Because of the inherent flexibility in processing this forgiving product, there was often less necessity to keep either the honey house or other extracting areas scrupulously clean. Food inspectors realized this. It is the reason they have left beekeepers largely to their own devices, while at the same time increasing efforts in most other food-producing industries.

Florida law regulates honey house sanitation because packing and processing honey also comes under food processing. Specifics are found in the Florida Food, Drug and Cosmetic Law, Chapter 55, Florida Statutes, 1979. Florida Statute 500.12, Section 1(a) requires permits to manufacture, process or pack honey as any other food[2]. Permits can be obtained by application and are issued annually on or before January 1. A fee is charged for the permit. Issuance of a permit provides access to the honey packing facility by food inspectors to ensure compliance with the permit's conditions. Regulations ss 5E-6.08 of the above law govern the manufacture, processing or handling of honey[3]. Many of these regulations are the result of common sense and experience, and most beekeepers adhere to them as a matter of course. As a consequence; they have not been rigorously pursued and enforced by inspectors[4]. With the advent of the small hive beetle, however, beekeepers must tighten up sanitation or risk being overwhelmed by an army of larvae bent on destruction of brood and honey.

Other considerations also point to the fact that increased attention to detail in producing a cleaner product will be more important than in the past. Dr. Jill Snowden of SGA Associates has written an in-depth article on the microbiology of honey on behalf of the National Honey Board, recently published in the *American Bee Journal*, Vol. 139, No. 1, January, pp. 51–60. According to Dr. Snowden, there is increased interest in the number and types of microbes (also called microorganisms) in honey because it is increasingly being used as a food, drug or cosmetic ingredient. These affect not only the shelf life, but the safety of the final product. Although purchasing specifications include microbe count, we know little about many of these microbes, according to Dr. Snowden, and the need for knowledge is likely to increase as manufacturers contemplate including honey in a variety of products.

Fortunately, honey is a product with minimal types and levels of microbes, according to Dr. Snowden, because of its natural properties and control measures employed by the honey industry. However, the sweet can carry spores of yeast, mold and bacteria. In addition, it can be inadvertently inoculated with other undesirable microbes. Although these microbes cannot grow in honey, with the possible exception of some molds and yeasts, they do persist in honey and, therefore, may be introduced when honey is used as an ingredient in another product.

MICROBIAL SPORES are present everywhere, Dr. Snowden concludes. They are found in honey in the hive and could come from primary sources such as pollen, the digestive tracts of honey bees, and nectar. Environmental contamination is also a possibility[5]. It is difficult and often impractical to control these sources. There are no good technologies to regulate the quality of air, dust, earth, flowers or other materials carried into the hive by bees. In addition, there is no information on how conditions in the hive influence the microbial composition of honey. Good beekeeping practice probably keeps the background level of microbes low in honey. Ironically, the good hygienic environment of a bee colony appears to be responsible for the failure of certain microbes introduced to control the Varroa mite.

Fundamental ways to control microbial introduction in honey, according to Dr.

> "Microbes affect not only the shelf life, but the safety of the final product."

Snowden, include avoiding inoculation of the product with undesirable organisms, and processing, handling and storing honey to minimize or eliminate microbes in the final product. Easiest microbes to control, and perhaps the most prevalent, are those that occur in conjunction with humans and domestic animals. The most common sources of these are human skin and nasal infections, and feces. These are controlled by routinely washing hands, employing other routine sanitation procedures and keeping animals out of honey processing facilities. Soil can also become contaminated, and particles of this might come in contact with honey.

Fortunately, microbes causing disease in humans (as opposed to bees), according to Dr. Snowden, have never been found to occur naturally in honey. Although most don't survive very long in honey at 68 degrees Fahrenheit, they can persist for long periods if the sweet is stored below 50 F. Spores are a different story; they can persist for long periods, ready to germinate when conditions are right.

Beekeepers have most control, according to Dr. Snowden, over postharvest procedures. Many kinds of microbes, especially those in the vegetative state as opposed to spore form, could be added at any time after honey is harvested. Postharvest sources of microbes include air, food handlers, equipment and even buildings. Fortunately, contamination from most of these sources can be minimized by good manufacturing processes (e.g., honey house sanitation). References on the subject available to honey processors, Dr. Snowden says, make specific recommendations to minimize risk in this area. These include fastidious practices during ripening of honey to avoid a high moisture content, strict cleanliness at the time of extraction, limiting exposure of honey to the atmosphere, removing traces of the sweet from equipment when extraction is completed, drying equipment thoroughly after washing, and using vessels containing no microorganisms. For other suggestions, see the U.S. Food and Drug Administration guidelines[6].

Current honey processing recommendations are designed to reduce the number of microbes in honey, Dr. Snowden says. Heating honey to 145 F (63 C) for 30 minutes will destroy most yeasts. Different times and temperatures may be required for other organisms, Dr. Snowden says, but there is little good information on this topic. High velocity electrons, gamma radiation, ultraviolet rays and ultrafiltration are possiblities as well.

Honey stored by the bees in honey comb serves as perhaps the best example of how to prevent postharvest microbial growth, according to Dr. Snowden. The bees produce a food that is resistant to microbial degradation by removing water and creating an oxygen barrier. These practices can be incorporated into the human–processor's repertoire, such as packaging the product to exclude air and preventing cycles of water vaporization and condensation that dilutes honey. Controlling temperature and moisture in stored honey is important as well. Fermentation can be prevented by storing honey at 50 F (10 C) or below with relative humidity below 50 percent. Honey with more than 19 percent moisture is very likely to ferment. Unfortunately, the advantages of using the above techniques vanish when honey is diluted or used as an ingredient.

Even if beekeepers believe that their own honey house sanitation is adequate and needs no further attention, Dr. Snowden says it is likely to be dictated to them by consumers. Microbiological tests, for example, may be required by manufacturers in purchasing specifications to indicate general sanitation, measure spoilage organisms and detect microbes of specific interest. Although few of these exist now specifically for honey, standard techniques will probably be adopted in the future. Much more investigation is needed in this particular area, Dr. Snowden concludes. Having a better understanding of the microbiology of honey will help honey producers better meet the needs of the manufacturing customer[7]. ■

More on Protein Feeding (Management)

ADDED EVIDENCE that protein helps bee colonies was presented in a letter to the editor of the *American Bee Journal*, published in the June 1999 (Vol. 139, No. 6) issue, pp. 417–418. The author, I believe, is Patrick Henry, although the letter is not clear on this point. Mr. Henry says information that "got the wheels turning" in his head came from various sources, which he lists at the end of his letter. He begins with the question, do you know what percent of dry weight protein your bees are? This is followed by a discussion of the importance of protein to a bee colony. Unfortunately, Mr. Henry doesn't specifically state his source for the following facts:

A. The percent protein in honey bees can vary from 26 to 70 percent.
B. A healthy bee must be above 40 percent dry weight body protein.
C. When the body protein of a bee drops below 40 percent during the honey flow or brood rearing, the life span decreases to 20 to 26 days.
D. All pollen protein percentages are not the same, with varying ratios of amino acids (protein) and in the percent of total protein.
E. A bee's source of protein (pollen or supplement) must be at 24 percent protein or above to maintain a healthy hive.
F. A bee's body protein percent will increase when ample protein is available and the bee will cannibalize its body for protein during periods when protein is not available.
G. Bees with higher body protein percentages give greater precentages of cell acceptance, larger queen cells, and produce larger queens with higher mating percentage. This really shows up toward the end of the queen-rearing season when bees are under the greatest stress.

Mr. Henry goes on to say that he and colleagues have developed a supplementary bee diet based on balanced amino acids fed in conjunction with corn syrup. One advantage of such a diet is that it can be fed in a single visit as a liquid, rather than as a patty, saving labor costs. A next step would be to intensively study such a preparation using the protocol suggested by Dr. DeJong and colleagues in Brazil as reported in the March 1999 *APIS*[8].

The alert observer might quibble with some of Mr. Henry's information, and it would materially add to his letter if we better knew the specific sources of his facts. In addition, it is abundantly clear that he and his colleagues are selling a product. However, for the purposes of this article, general conclusions one might draw from the details adds to a growing body of contemporary evidence that proactive protein management in colonies cannot be ignored. For further information on this important topic, one should consult "Honey Bee Nutrition," *The Hive and the Honey Bee*, Dadant and Sons, Inc., 1992 edition. ■

Varroa Control: Bottom Boards and Breeding

IN DECEMBER of last year, I reported on implementation of an anti-Varroa bottom board as reported on the French Internet discussion list, *Abeilles*[9]. In that article, the investigations of Kerry Clark, apiculture specialist in British Columbia were discussed. His first report was published in the Canadian Honey Council's *Hive Lights* (Vol. 12, No. 2, p. 17, May 1999). Results for 1998 were not conclusive, principally due to adverse weather conditions, but his observations showed reason for optimism. He will again be conducting trials this year.

Meanwhile, Drs. J. Pettis and H. Shimanuki of the USDA-ARS Bee Research Lab have published their results using especially designed bottom boards to reduce Varroa populations (*American Bee Journal*, Vol. 139, No. 6, pp.471–473, June 1999). The good news is that in the 30 colonies fitted with modified bottom

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[2] http://www.leg.state.fl.us/citizen/documents/statutes/1998/ch0500/titl0500.htm
[3] http://edis.ifas.ufl.edu/scripts/htmlgen.exe?DOCUMENT_AA156
[4] http://www.ifas.ufl.edu/~mts/apishtm/apis94/apaug94.htm#1
[5] http://www.ifas.ufl.edu/~mts/apishtm/apis94/apmay94.htm#3
[6] http://www.fda.gov/opacom/backgrounders/foodteam.html
[7] http://nhb.org/download/factsht/index.html#Microbiology
[8] http://www.ifas.ufl.edu/~mts/apishtm/apis99/apmar99.htm#5
[9] http://www.ifas.ufl.edu/~mts/apishtm/apis98/apdec98.htm#6

boards, there was an approximately 14 and 28 percent lower mite fall when compared with normal bottom boards in June and July. The bad news is that the results were not statistically significant, and by September mite levels in all colonies (experimental and controls) reached damaging levels. Thus, it appears that the modified bottom boards slowed Varroa population development, but cannot be relied on as a single, effective treatment for these mites. The authors remain optimistic that physically separating the bee nest from the hive floor by use of a wire mesh (#8 hardware cloth) used in conjunction with resistant stock, smoke, dusts or other control agents should provide a more integrated approach to Varroa control, reducing use of conventional pesticides in the bargain.

The above conclusions coincide with those of Troy Hart and Dr. R. Nabors at the University of Missouri, who studied pollen traps to control Varroa (*American Bee Journal*, Vol. 139, No. 5, pp. 366–367, May 1999). The principal is the same. The bee's nest is separated from the trapped pollen by a screen mesh.

A byproduct of Drs. Pettis and Shimanuki's investigation was that colonies on modified bottom boards produced significantly more brood seven weeks after being established with packages than those with conventional bottom boards. The authors state that this result appears to correlate with those obtained using a slatted rack. In the same issue of *American Bee Journal*, pp. 747–476, Dr. Keith Dela-plane at the University of Georgia reports on a three-year study using the slatted rack. In this investigation, the modification did produce more brood near the hive entrance, but did not result in a general brood production increase when compared to the controls.

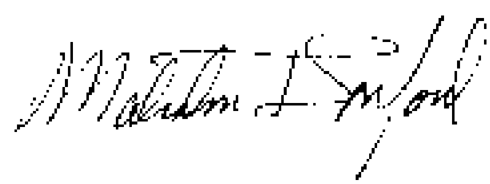
Evidence that breeding may be increasing the tolerance of *Apis mellifera* to *Varroa Jacobsoni* in Europe was published in the May 1999 *American Bee Journal* (Vol. 139, No. 5, pp. 369–373). Erik Osterlund of Sweden believes he is seeing positive evidence of Varroa tolerance in both the Baltic region and Israel using a strain called Elgon. There are several possibilities for this, according to Mr. Osterlund, including better cleaning behavior, increased queen pheromone level and improved nutritional status. He believes that the only way to determine tolerance is to employ the "ultimate test." This technique eliminates use of any chemical control. His guidelines for breeding more–Varroa-tolerant bees include establishing an isolated apiary with colonies thought to be tolerant and susceptible, and breeding bees from the tolerant ones left after the susceptible ones have died.

Mr. Osterlund is not touting his Elgon stock as Varroa tolerant. Colonies led by these queens vary in this trait. He also hypothesizes that Varroa itself is not responsible for colony collapse. Rather secondary infections, specifically viruses, associated with mites are what finally kill colonies. Tolerance to these organisms, therefore, must also be built into the equation.

The approach described above reminds me of that employed by the late Brother Adam at Buckfast Abbey. Buckfast bees have gained a reputation as being tolerant to tracheal mites. Brother Adam used Mr. Osterlund's ultimate test. He bred from colonies that were able to overwinter successfully (survive) with no treatment and, therefore, were proclaimed tolerant to tracheal mites, the most prevalent problem in the area at the time. In the final analysis, however, Brother Adam did not necessarily produce tracheal mite tolerance, but bees that survived in spite of tracheal mites and other stresses in the Buckfast Abbey environment.

The ultimate test mirrors nature as only the fittest that survive are allowed to reproduce, no matter the conditions in a certain geographic region. This appears to have worked elsewhere besides Europe. Survivor colonies in Mexico and Brazil, for example, that have never been treated for Varroa mites are now proclaimed tolerant to these pests. Unfortunately, for many beekeepers this technique is not practical, and other means (chemical and physical controls) are thus deemed necessary to balance both biologic and economic reality. ■

Sincerely,



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