APIS

Apicultural Information and Issues

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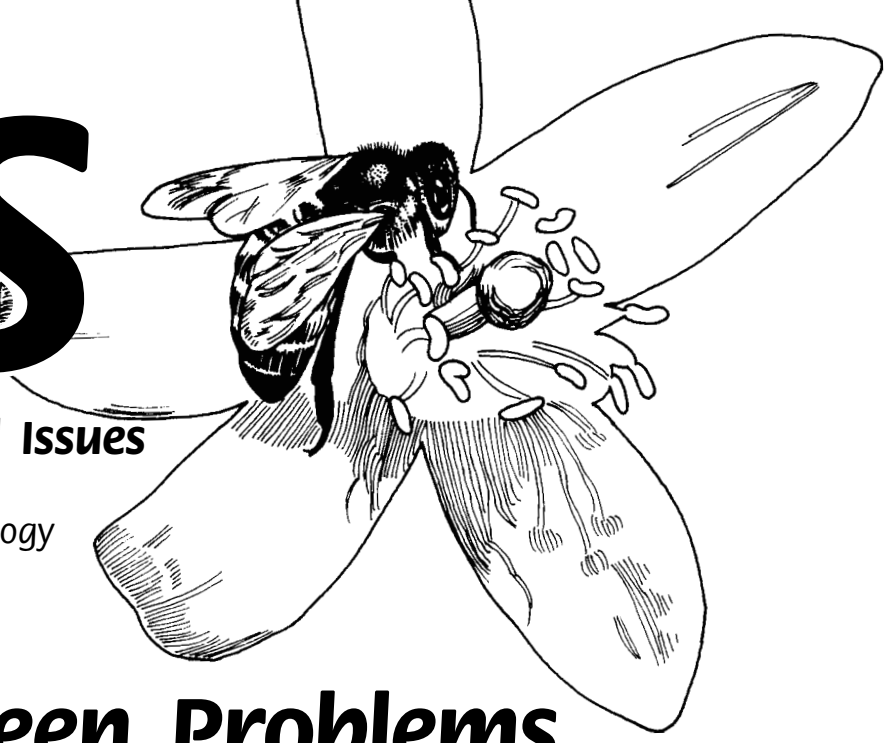

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Queen Problems

EACH YEAR IT SEEMS there are concerns about replacement queens. Beyond traditional complaints, more noticeable this year was a greater-than-normal percentage of drone layers showing up in operations. I have no way of determining whether this is in fact the case, and there are little scientific data to support such a conclusion, but that doesn't mean there is no problem. All this brings to mind the symposium on queen issues held at the Colorado meeting of the American Beekeeping Federation in 1997.

In a brainstorming session following formal presentations, participants attending the symposium were able to develop a long list of possibilities that could have resulted in problems with queens. Generally they related to climate, malnutrition, unhealthy environments, and diseases and pests. Specific ones concerning queen acceptance and retention were those that caused stress during production, including queen handling, lack of drones and queen banking[1].

Queen producers at the symposium pointed out that the condition of recipient colonies was also extremely important. If old queens were not removed (two in a colony may be more common than supposed), introduction techniques were substandard and/or recipient colonies were under a lot of stress (disease, mites), the chances of them retaining introduced queens was minimal.

In a presentation on biological considerations, Dr. Marla Spivak quoted the late Dr. C.L. Farrar, "Poorly reared queens of productive stock will be inferior to well reared queens of less productive stock." She also said that nosema control was most important in mating nuclei, as well as control of both tracheal and Varroa mites. Finally, Dr. Spivak concluded that drone production must be more emphasized, especially now that Varroa preference for males and the lack of feral colonies appears to be narrowing the potential genetic base[2]. She closed with an exhortation to producers to always rear more drones that they think necessary.

A comment from Dr. Roger Hoopingarner, now retired from Michigan State University, got some attention. Many of the symptoms of the problems being described, he said, were reminiscent of those found by investigators looking at the effects of sublethal doses of fluvalinate on colonies. Long-term exposure to fluvalinate has been associated with a reduction in honey yield[3]. The fact that this pesticide was bioaccumulating in the wax, Dr. Hoopingarner said, means that there continues to be more and more of the material in the bee's environment[4] This may be more relevant today with coumaphos, which is considered much more of a bioaccumulation risk than fluvalinate[5]. *Continued next page*

[1] http://www.ifas.ufl.edu/~mts/apishtm/apis97/apsep97.htm#2
[2] http://www.ifas.ufl.edu/~mts/apishtm/apis97/apoct97.htm#4
[3] http://www.ifas.ufl.edu/~mts/apishtm/apis92/apapr92.htm#4
[4] http://www.ifas.ufl.edu/~mts/apishtm/apis96/apaug96.htm#1
[5] http://www.ifas.ufl.edu/~mts/apishtm/apis99/apjan99.htm#1

A Diagnostic Service at Last:
Determining Tracheal Mite Resistance

BACK IN 1989, I suggested in the pages of this newsletter that the time had come to put more emphasis on diagnostics in detecting bee mites[6]. "Honey Bees Mite Breathe Easier" *Agricultural Research* magazine, March 2000, describes an initiative by the U.S. Department of Agriculture to do this for tracheal mites. The service would go beyond diagnostics, however. Entomologists at the Baton Rouge, Louisiana Bee Laboratory[7] are providing a trainee beekeeper with the expertise necessary to conduct mite-resistance testing as a commercial service. Thus, based on the results of this service, a client could decide to cull a susceptible queen breeder colony or further propagate those whose progeny fare well against the mites. A similar service that operated in Ontario, Canada for a period of years helped the industry reduce the mite-to-bee ratio from 13 mites per bee to 1.5.

In the May 2000 issue of the *American Bee Journal* (Vol. 140, No. 5, pp. 405 – 407), R.G. Danka and J. Villa published results of a survey characterizing mite-resistance levels in 83 breeder colonies by eight commercial queen producers in California, Hawaii, Louisiana, Texas, and Virginia[8]. Specifically, they tested young worker bees from the breeder colonies and compared them to bees from colonies known to be resistant or susceptible. Of the surveyed colonies, two-thirds proved resistant, while one-fourth were very susceptible. The conclusion was that a remarkable variation in resistance to tracheal mites is found in the breeding pool. The idea for a commercial testing service was then raised at a bee breeders' conference held in January 2000 in Fort Worth, Texas. Edwin R. Holcombe of Backwood Apiaries, a queen breeder since 1973, was selected for training under USDA-ARS supervision. Once certified, it is expected that the service can handle at least 15 colonies from as many as 10 queen-breeder clientele, on a first-come, first-served basis[9].

This experiment in commercial diagnostics is exciting because it combines both bee diagnostics and subsequent breeding efforts. Only time will tell, however, whether it will become something the beekeeping industry will find not only useful, but economically viable. ■

> "A remarkable variation in resistance to tracheal mites is found in the breeding pool."

Honey Locator: Online Guide to Honeys

THE NATIONAL HONEY BOARD is developing its honey locator, an online database of honeys and their floral sources. The Board is asking for anyone with information on varietal honeys to pass on the information. This includes photographs, scientific names, herbarium plates, and descriptions of climate zones. A long list of potential floral sources includes Brazilian pepper, orange blossom, palmetto, and tupelo in Florida, as well as others in specific geographic locations. A sample main search page that will be the final product is shown on the Board's Web site[10]. For further information, contact Michael Sherwin, 390 Lashley St., Longmont, CO 80501-60454, ph 800-553-7162, e-mail: locator@nhb.org.

In addition, the Board is also developing a list of honey marketers, also to be made available on the World Wide Web. According to Dr. E. Mussen (*From the UC Apiaries*, March/April 2001)[11], listings are "free" for those who have already paid at least $60 in assessments in fiscal year 2000. The four-page listing request is thorough, asking possible participants to state products, type and sizes of packs, and floral varieties. For a listing form, call 888-421-2977 and press 5 at the prompt. If you haven't paid the $60, Dr. Mussen says, you can call 800-553-7162 for more information. ■

Queen Problems continued Some I've talked to have concluded that this pesticide is in fact responsible for the problems seen, although again, I know of no scientific evidence that this is the case.

Dr. Jeff Pettis of the USDA Beltsville Bee Laboratory discussed supersedure biology. He said that a problem with current-day queen production is that producers are constantly asked to get the product out earlier. This can result in shortcuts and stress. Acceleration of expectations may also bleed over into the bee yard, according to Danny Weaver of Navasota, Texas, who asked users not to "over manage" colonies by pushing them too hard. This was added to by Pat Heitkam of Orland, California, who said more observations, more management and more movement could equal more perceived problems. More easygoing beekeepers, he concluded, let the bees solve some of the problems themselves.

Another thread of conversation during the symposium had to do with innovations in queen production. There is little good information about what effects there might be from using plastic cups and cages (different sizes) or battery boxes. In particular queen cages were described as smaller and, therefore, not able to hold the quantity of candy more traditional ones could. Finally, there was the great unknown called the U.S. Postal Service, which also is continually changing its guidelines and procedures, sometimes without informing either producer or customer.

Most participants at the symposium agreed that there is a lack of basic information on a great many of the issues associated with modern queen rearing, shipping and introduction. Thus, although the problems do not appear to be new, many of the methods employed by queen producer and user alike are. Meanwhile, scientific research in these areas continues to languish as funds are generally directed to more pressing issues. ■

SMRD Honey Bees: Breakthrough in Varroa Tolerance

Dr. Jeff Harris of the USDA Honey Bee Breeding Lab in Baton Rouge, Louisiana provided some exciting information at the latest meeting of the South Alabama Beekeepers' Association in Mobile. It seems that suppression of mite reproduction is a genetically inherited trait that results in Varroa-tolerant bees. This characteristic, called SMR, is just one of several found in Africanized honey bees that have potential use in selection programs[12]. Fortunately, the trait is widespread in the U.S. honey bee population and so is readily available in the present gene pool. However, in order to begin a selection program, there must be a technology to measure the trait. A full description of the work done by Dr. Harris along with Dr. John Harbo appears in the May 2001 issue of *Bee Culture* (Vol. 129, No. 5, pp. 34 – 39) and on the ARS Web site[13].

According to the authors, all female Varroa in a bee colony do not attempt to reproduce at the same time. Generally one-third of the mites can be found on adult bees and the rest in the brood cells. And some 15 to 25 percent of mites that enter brood cells do not in fact reproduce. These individuals may be mites that die before laying eggs, live but do not lay eggs, produce only a male and no females, and/or produce progeny too late to mature before bee emergence. One or all of these categories may be found in any one honey bee colony.

The number of non-reproducing mites in a colony is measured by examining about 30 singly infested brood cells and recording the reproductive success of each female found there. Several environmental variables affect the percentage of non-reproducing (NR) mites. These include temperature and humidity (increase NR), season (higher NR in summer) and climate (larger NR in the tropics). NR mites also often have no sperm (have not been mated) and in some cases, dead mites are found "entrapped by the pupal cocoon."

Over 50 percent of mites in colonies selected for NR have been found so entrapped. Of passing interest is the fact that non-reproducing mites deposit their feces on the bee pupae rather than beside it.

It takes about six weeks after requeening a colony with an SMR queen to see results. This is called by the authors "delayed mite suppression," or SMRd. Mite suppression also occurs immediately in some populations, and is called SMRi. To show how SMR queens affect change in a colony, the authors performed several queen exchanges between control and SMR colonies, and found that mite populations became more or less reproductive based on the queen received. They conclude: "We are confident that honey bees will become resistant to Varroa mites." More encouragingly, they say that in the future, "Bees will need fewer chemical treatments to control mites. Eventually they will need none." ■

The Varroa Species Complex: New Strategies to Control *Varroa Destructor*

An article titled "The Varroa Species Complex: Identifying *Varroa destructor* and New Strategies for Control" in *American Bee Journal* (Vol. 141, No. 3, pp. 194-196) by Susan Cobey[14] at the Ohio State University discusses in some detail the implications surrounding renaming *Varroa jacobsoni* to *Varroa destructor*[15]. A key finding, according to Ms. Cobey, is that the former mite reproduces only on the original Varroa host, *Apis cerana*, while *Varroa destructor* infests and reproduces on *Apis mellifera*. Thus, they are reproductively isolated.

It is instructive to look at reproductive variability within the context of the Varroa species complex. Many questions arise. Is it possible, for example, that the SMR characteristic only functions with one or a few haplotypes of the mite? If so, does this mean it is in fact a haplotype dependent trait? What happens should other haplotypes be introduced into this complex equation? There is no answer to these yet, according to Dr. Harris, but fortunately DNA study appears to confirm that the haplotypes found in Louisiana are presently susceptible to SMR honey bees.

Ms. Cobey concludes: "New discoveries are encouraging and lead us closer to the goal of being able to naturally maintain mites at insignificant levels. The focus must be on selective breeding. We now have the knowledge to move forward in this direction (editor's note: SMR bees described above is one of the most hopeful signs). To select and maintain mite resistant honey bee stocks is the beekeeper's biggest challenge, ever. This will require the combined efforts of scientists and beekeepers. Beekeepers must then take the responsibility to establish selective breeding programs and apply this knowledge in the field. As we discover new strategies and achieve this goal, we must also remember not to become complacent. Selective breeding is an ongoing endeavor and subject to constant change. ■

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[6] http://www.ifas.ufl.edu/~mts/apishtm/apis89/apfeb89.htm#1
[7] http://msa.ars.usda.gov/area/mis-bio/hbbgpr/ms_hbb.htm
[8] http://msa.ars.usda.gov/la/btn/hbb/rgd/survey.htm
[9] http://www.ars.usda.gov/is/AR/archive/mar01/mite0301.htm
[10] http://www.nhb.org/floral/locator.html
[11] http://entomology.ucdavis.edu/faculty/mussen/3-4-01.pdf
[12] http://www.ifas.ufl.edu/~mts/apishtm/apis97/apmay97.htm#2
[13] http://msa.ars.usda.gov/la/btn/hbb/jwh/SMRD/SMRD.htm
[14] http://iris.biosci.ohio-state.edu/honeybee/personnel/Sue.html
[15] http://www.ifas.ufl.edu/~mts/apishtm/apis_2000/apjul_2000.htm#3
[16] http://www.ifas.ufl.edu/~mts/apishtm/apis95/apjan95.htm#BP
[17] http://www.internode.net/HoneyBee/Misc/hygienic.htm
[18] http://biology.dbs.umt.edu/bees/default.htm
[19] http://bee.airoot.com/beeculture/book/chap9/cotton.html
[20] http://www.ifas.ufl.edu/~mts/apishtm/apis_2001/apmar_2001.htm#4

Are Non-hygienic Queens Now Passé?

I WROTE BACK IN SEPTEMBER 1998 that Drs. Spivak and Gilliam, who coauthored an article on the subject in *Bee World*, have concluded that hygienic behavior is eminently inheritable and thus it can be selected for. Commercially available lines of hygienic stock would help many beekeepers overcome a multitude of problems, especially those associated with mites and disease. This would reduce operating costs by minimizing use of chemicals, with their concomitant possibilities of bee, colony and product contamination. Finally, standard queen rearing and breeding techniques can be used to produce many hygienic queens from a few mothers using any race of honey bees[16].

At the time I wrote the article referenced above, I asked why this trait was not more widely used in breeding programs. Mr. Allen Dick in Canada now says in no uncertain terms: "Non-hygienic queens are now passé." He stated this in a May 19, 2001, post to the Bee-L discussion list, concluding that nowadays nobody should have to put up with queens that lack this essential characteristic and the consequent economic losses that result from AFB and chalkbrood. (Editor's note: The trait also appears to affect mites and small hive beetle). The hygienic characteristic, he says, can be easily selected in any strain of bees in only a few generations. Mr. Dick urges beekeepers to demand hygienic queens from suppliers, and "don't take no for an answer."

In an effort to show how one might employ this technology, Mr. Dick has put up an article with many illustrations describing in great detail both the basis behind hygienic behavior and how to test for it[17]. Originally developed by Steve Taber, the technique has been modified using liquid nitrogen to effectively kill a patch of brood, an innovation of Dr. Jerry Bromenshenk at the University of Montana[18]. It facilitates the process because brood comb does not have to be physically removed from a frame and then be reincorporated back into it as the original technique demanded. It will now be up to beekeepers to take or leave Mr. Dick's advice. ■

New Turkish Bee Journal

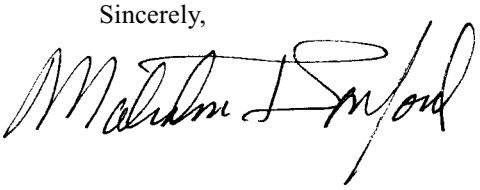
MELLIFERA IS THE NAME of a brand new apicultural journal published in Turkey. The editor, Associate Professor Kadriye Sorkun, Hacettepe University, Department of Biology, Beytepe, Ankara, says it is an outgrowth of the Development Foundation of Turkey (TKV), which has published the magazine *Technical Beekeeping* since 1985, with a subscription list of over 5,000 loyal readers. *Mellifera* seeks to publish fresh scientific articles produced in Turkey or elsewhere and present them to the scientific world, according to Professor Sorkun. The first issue (Vol. 1, No. 1, 2001) contains 64 pages. Most articles are in Turkish, but three (almost half the volume) are in English. They describe pollen analyses from several regions in Turkey, honey as an antioxidant, pollen analyses in Nepal and characterization of propolis from Bulgaria. A subscription costs $20. For more information, contact Yazibama Adresi, ph (+90) (312) 483-33-36 and fax (+90) (312) 483-59 78 or e-mail: mellifera@ktg.com.tr. ■

More on Honey Types and Standards

THE ARTICLE in last month's issue on honey types proliferating in Brazil brought a comment from Dr. Bernard Vaissiere that the nectar potential of a plant may be more associated with its pollination situation than its botanical classification. Thus, there are many dicots, which do not produce nectar (wind-pollinated species like pigweed and lamb's-quarter for example). At the same time, many monocots are important honey plants (banana *Musa* spp.; palm trees, including *Cocos nucifera*, the coconut; lilies, irises and orchids). A major honey plant in Florida is in fact the state tree, the sabal or cabbage palm (*Sabal palmetto*). Another interesting situation is cotton. According to S.E. McGregor's book *Insect Pollination of Cultivated Crop Plants*[19], "Nectar is normally produced in five different areas on the cotton plant, although the reason why the nectar is secreted is not clear."

Thus, the thesis from last month's *APIS* that the standards for many honeys in all probability will have to be based on separate sets of criteria becomes even more compelling[20]. ■

Sincerely,



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