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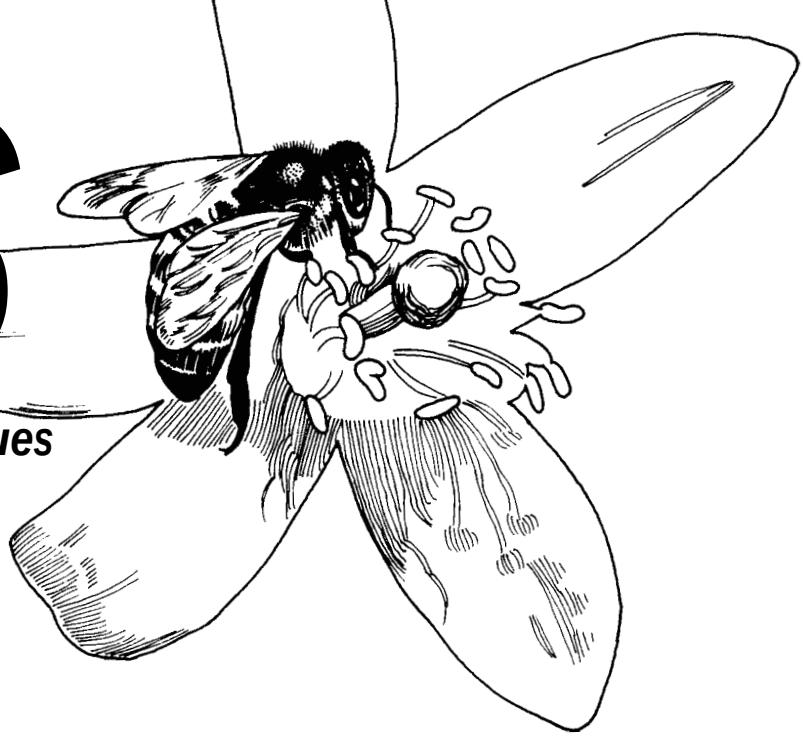

Inside APIS:

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Duping Honey Bees

The Case of Attractants

IN PREVIOUS ARTICLES on the subject of bee attractants (see June 1994 and July 1995 *APIS*), I have tried to provide a balanced perspective on the use of these materials. Bernard Vaissière and André Serpeille, writing in *Bulletin Semence*, organ of the Fédération Nationale des Agriculteurs Multiplicateurs de Semences, Vol. 135 (Spring 1996), pp. 35–37, have produced a literature review on the subject. They believe there is too much doubt yet to declare these substances an unqualified success. Their article on bee attractants ("Attractifs: Les abeilles ne sont pas dupes!") concludes that so far it isn't easy to manipulate foraging behavior within the highly developed social structure of *Apis mellifera.*

As far back as 1965, the authors state, J.B. Free reported that spraying a crop with sugar syrup increased the numbers of foragers on the leaves, but this was detrimental to the flowers, which ended up being less pollinated than those in control plots. Later, A. Wenner's work on odors caused aromatic extracts to be added to the syrup. The use of pheromones to lure bees into fields and flowers has also been examined. In general, scientific experimentation using the above ideas has met with limited success.

ALTHOUGH THERE IS controversy, the bee attractant arena continues to be of great interest to growers and beekeepers who would like to improve crop pollination. As a consequence, a number of commercial products have come to the market place. Most formulas used in these products are trade secrets, according to the authors of the above paper, but they can be placed into two broad categories:

1. Those based on bee foods, sugars and proteins.
2. Those based on pheromones, the chemicals (odors) honey bees use in their communication processes. Of particular interest has been the so-

Continued next page

called Nasonov pheromone, which is used by the insects in several ways. The authors provide the following table showing what they know about the components of commercial products that are presently available:

Name	Nutritional Substances	Pheromones	Others	Company
API-FIX	6% reducing glucose; 25% protein	—	—	CODA (France)
BEELINE	Saccharose, lactose and protein	—	Fatty acids; pollen; vitamins	Custom Chemcid (USA)
BEELURE	39% glucose, 28% maltose 10% maltotriose 22% other sugars	—	Strawberry aroma Red colorant Preservative	Helena Chemical (USA)
BEE-SCENT	42.5% sugars	9.5% Nasanov	48.5% inert ingredients	Yellowstone International (USA)
POLLENAID	Gluconic acid	—	—	Crop King Chem. (USA)
POLLINUS	—	45% Nasanov	—	Calliope (France)

The authors also provide a table showing a very brief summary of the results of scientific study on some of these products:

Product	Crop	Effect	Authors, date
BEELINE	Red Clover	Negative	Burgett & Fisher, 1979
	Soybean	Negative	Sheppard et al., 1979
	Cider apple	Positive	Williams & Jefferies, 1982
	Carrot seed	Negative	Belleti & Zani, 1981
	Féverolle	Negative	Pinzauti & Corsi, 1981
	Cucumber	Negative	Rapp, 1981
	Almond, luzerne Apple	Negative	Mayer & Johnson, 1982
	Cucumber seed	Negative	Margalith et al., 1984
	Gerkin	Negative	Schultheis et al., 1994
BEELURE	Apple	Negative	Rajotte & Fell, 1982
	Apple	Negative	Tew & Ferree, 1984
BEE-SCENT	Cherry, pear, apple, plum	Positive	Mayer et al., 1989
	Kiwi fruit	Negative	Pinzauti, 1990
	Watermelon	Negative	Elmstrom Maynard, 1990
	Gerkin, watermelon	Negative	Schultheis et al., 1994
POLLENAID	Pear, apple	Negative	Mayer & Johnson, 1982
POLLINUS	Almond, melon	?	ACTA 1996

(See February 3, 1997 letter, http://www.ifas.ufl.edu/~mts/apishtm/letters/aix23.htm)

All too often these studies do not show the whole picture, the authors say, and many variables are omitted so that the results cannot be clearly interpreted. For example, all types of foraging behavior needed to achieve a particular type of pollen transfer must be taken into account, such as:

1. Simple visits to hermaphroditic and self-compatible flowers like strawberries;
2. Visits to different flower types (male and female) on monoecious species like cucumber and squash;
3. Visits to different plants in self-incompatible species like white clover and almond or dioecious plants like kiwifruit;
4. Visits to different genetic lines for the production of hybrid seed.

Honey bee visitation is also determined by meterological conditions, and the duration and intensity of flowering. Pollination intensity, that is, the number of pollen grains per stigma as well as percent fruit set and the quantity and quality of resulting fruits and seeds, must be determined to confirm that pollination has indeed been improved. Too many studies, the authors argue, concentrate on bee activity, and ignore one or many of the other necessary measurements.

In France, the authors state, an AMM (l'authorisation de mise sur le marché) requires a demonstration of effectiveness under normal field conditions. None of the above products, however, has been tested rigorously enough in the country at the present time, they conclude, and only one (Pollinus) was granted a temporary permit based on preliminary data on almond and cantaloupes. Since Bee Scent is already being marketed in Italy, however, the authors ask what this might mean for the future of this kind of product when the European Union becomes a reality (see April 1997 *APIS*). ■

Royal Pheromone: Bee Boost Trials in France

ALTHOUGH NOT NECESSARILY apparent in insect population management, there is a quiet revolution taking place. This powerful movement seeks to replace use of broad spectrum insecticides with pheromones that are more focused and, therefore, more environmentally benign. This "pheromonal revolution" is the subject of "European Notebook Number 12," published in several journals dedicated to beekeeping throughout the continent (see April 1997 *APIS*).

According to the Notebook, news of this was carried to Europe by Dr. Mark Winston, now on the faculty of Simon Fraser University, British Columbia. He barnstormed through France invited by ADAPI, INRA and the Mediterranean GRAPP (see October 1995 *APIS*) with the message that apiculture will also be heavily influenced by this turn of events.

Pheromones are chemicals that produce either a behavioral (releaser pheromone) or physiological (primer pheromone) response within the same species. Examples of these in honey bees are found in most beginning text books; in the former, nasanov pheromone promotes orientation, and in the latter, queen pheromone keeps worker bees from fully developing their ovaries.

The first pheromone to be identified was isolated from moths in 1959, the Notebook quotes Dr. Winston. The following year, a royal pheromone called 9 oxo-2-decenoic acid, produced by the mandibular gland, was found in the queen honey bee. Since then over 30 pheromones have been found in honey bees. Like many pheromones, the queen's royal one has been found to have many constituents; as a consequence it is called queen mandibular pheromone (QMP), according to Dr. Winston. It also has several functions, including keeping worker bees from building queen cells and attracting drones during mating.

As a consequence of Dr. Winston's trip, two pheromonal products by a Canadian company (PHEROTECH) have been given attention in the French bee journals. Both have as their basis QMP. They are called Bee Boost® and Fruit Boost®. Canadian studies, according to the Notebook, show evidence that the former product can be used to control the swarming impulse and stablize queenless package bees and mating nuclei. The latter is an attractant to improve pollination (see other article in this issue).

Bee Boost® is now being given experimental trials *continued next page*

Revolt in the Beehive: Genetic Rebellion

THE CONTROL OF WORKERS by the queen through royal pheromones may not be as complete as many textbooks would have us believe. This is not surprising. Any apiculturist knows that exceptions are the rule by which honey bees and beekeepers must live. *Sciences et Avenir*, Number 603, May 1997, published in Paris, carries an article that appears to show this all too well. Called "Revolt in the Hive," the article describes research done in Melbourne, Australia, by B. Oldroyd, J.-M. Cornuet and A. Smolenski (full reference not cited) that surprises and delights.

It seems a rebellion is carried on by worker honey bees in some colonies in the quest to make their own genetic contribution to the species. In spite of the queen's royal pheromonal control, the article says, DNA study confirms that workers continually lay eggs in colonies that have many drones. This gives credence to Dr. Winston's doubts expressed elsewhere in this issue concerning inhibition of worker ovarial development.

To avoid detection by their sisters, these rebellious egg-layers have covered up their deeds by ensuring their eggs are marked with royal pheromone, the article says. The authors further suggest that some workers have even compounded their crime by replacing royal eggs with their own! Such anarchy, the article concludes, carries a virus of its own perpetuation, the production of drones that pass the tendency on to other colonies through queens they mate with. ■

here in southern France. Many here anxiously await the results of these to confirm if the pheromonal revolution in honey bees, as described by the European Notebook, is for real.

[Editor's note: Via e-mail, Dr. Winston says he is not quite ready to characterize the use of pheromones in beekeeping as a true revolution. Instead, he takes a lower-key approach, suggesting this use is simply a management tool with possibilities in some situations. He also says there is evidence QMP does not inhibit worker ovarial development, but rather brood pheromone is responsible.] ■

Extension Apiculturist Activities in France

THE APIS-L electronic mailing list now has almost 600 subscribers worldwide. I continue reporting my activities from France while on sabbatical through this medium. Those without Internet access can view my letters as excerpted in Mr. Troy Fore's publication, *The Speedy Bee*. My last two reports include:

1. Account of a visit to one of Europe's unique queen-rearing sites on the Ile D'yeu (http://www.ifas.ufl.edu/~mts/apishtm/letters/aix5_30.htm).
2. Account of a visit to the Alpine beekeeping region of France (http://www.ifas.ufl.edu/~mts/apishtm/letters/aix6_2.htm).

To see an index of letters published during my stay in France, point your browser to http://www.ifas.ufl.edu/~mts/apishtm/letters/aixind.htm. ■

Acacia: A New-World French Connection

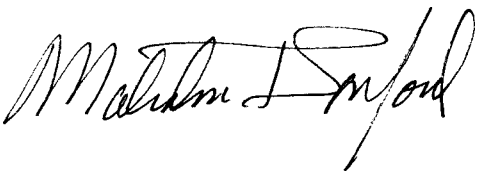
THE ACACIA FLOW is finished here in southern France. As is done each year, beekeepers are now estimating how good the final crop will be. This is one of the finest of Provençal honeys, and commands a premium price in most markets. The plant is grown all across Europe as well. I remember the Hungarian Apimondia meeting in 1983, when participants were given a tour of the acacia groves there. It was the only time I have ever seen a program designed to systematically improve nectar production in a plant. At that time, Hungarians were attempting to increase both nectar secretion and timber quality from this important plant. Thus, I was pleased to see my plant friend again when I came to France. The story of this plant is admirably told in the 1978 edition of the *Bulletin Technique Apicole*, published by OPIDA (L'office pour L'information et la Documentation en Apiculture). It is "Fiche Technique," found in Volume 5 (No. 4), pp. 33-40, authored by J. Albisetti.

Imagine the surprise of a newcomer here from the United States, therefore, upon discovering this plant isn't acacia at all. It's really false acacia, *Robinia pseudacacia*, and wonder of wonders, was originally transported around the world from its native habitat in the Allegheny and Appalachian mountains. The king's gardener, J. Robin, introduced the plant to France in 1601. It is in fact known as black locust in its native regions, I was informed by Steve Taber, who recently left France to return to his southern roots. It is the same plant I remember growing on the high banks of the Ohio River where the old National Road crosses that waterway at Wheeling, West Virginia.

The *robiniers*, as they are called here in France, are in the rose order and legume family. Three species of the 20 that exist worldwide have been naturalized in the country. In general, they are not well-exploited by bees because of their early and short flowering time. I remember the black locust flow as notoriously unpredictable and tempermental on the banks of the Ohio. The later it flowers in France, the more nectar-collecting possibilities occur, about 7.5 percent increase per day delayed, according to the article. The French are also aware of the history of their Hungarian cousins in culturing the acacia, and data show that a silvo-apicultural program is possible here too, the article concludes.

The honey bee's yearly gathering of *Robinia pseudacacia* honey in Europe is just one of many interesting results of human intervention in the biology of planet Earth. The French-American relationship is filled with these as well. It ranges from American root stock in French vineyards to the fine Franco-grape varieties now grown in California. Beekeeping in southern France really has few monofloral crops to look forward to; prospects would be much poorer without this American vegetational heritage. For that matter, where would U.S. beekeeping be without introduction of that most ubiquitous of Old World insects, *Apis mellifera*? ■

Sincerely,



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