

## Israel: Land of Milk and Honey

By

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"A land flowing with milk and honey", is a Biblical reference to the agricultural abundance of the land of Israel. It first appears in Exodus 3:8 associated with Moses' vision of the burning bush. Since this phrase was used, the land has been changed by centuries of human activities. This was evident as I visited the country as a guest of Professor Emeritus Yaacov Lensky, Hebrew University of Jerusalem, Faculty of Agriculture. I found that all agricultural sectors of the economy, including beekeeping, are under great stress due to two principal reasons, rapid urbanization and lack of water.<sup>1</sup>

Israel is a thoroughly modern country with a large metropolitan center, serviced by a gleaming new airport. It has a number of great universities supporting an increasingly important high technology sector of startup businesses, one in the field of bee viruses and colony health. In the process of modernizing, however, the country risks losing its agricultural roots based on cooperative systems that still exist, the kibbutz, and related moshav. The former is the better-known movement, established in 1909 by a group of pioneers on land acquired by the Jewish National Fund. These communities played a dominant role in the establishment and building of the state of Israel. The Moshav is a latter development, not considered as "radical" as the kibbutz, especially in the area of cooperative child rearing. It is a more "privatized" model of cooperation, and thus more attractive to later immigrants from Asia and Europe.

I was able to visit beekeeping operations that were part of both kibbutz's and moshav's. There are also plenty of individual beekeepers as well. Honey commands a fairly high price (\$1.66 a pound) making beekeeping quite popular in this small country. Too popular some might say as finding appropriate locations is becoming more and more difficult. There are 500 beekeepers in the nation who manage 100,000 colonies. Sixty four percent run less than 100 colonies, 25% manage 101 to 500 colonies, and 11% have operations over 500 hives. The production of 3200 metric tons of honey returns about \$15 million to the economy. There's also a vibrant commercial pollination sector employing 120,000 colonies, estimated to provide thirty times their honey production value. This all takes place in an area of 7000 square kilometers, roughly one quarter the size of the state of Florida.

Like in a honey bee colony, the physical lack of space and resources in Israel calls for a good deal of cooperation among beekeepers. I realized this when I was told at a meeting in the Ministry of Agriculture that Israeli beekeepers had their mites under control, and, there has been no appearance of coumaphos resistance in spite of over a decade of use of CheckMite+®. Israel is, therefore, one of the few countries where almost total Varroa control is feasible, principally because all beekeepers treat their colonies at the same

time. They also have the means to routinely check to see how effective treatment is via actively-engaged beekeeping extension workers.

The forgoing practices mean that potential of re-infestation from untreated colonies, the principal way mites are spread in most of the beekeeping world, is extremely low. Again, this is possible only because a huge degree of regulation is built into Israeli beekeeping. All beekeepers are registered and pay a certain fee to an entity called the Honey Marketing Board.<sup>2</sup> It determines who gets locations and where. The rule of thumb is that bee yards of twenty colonies can be no further apart than 1.5 kilometers (less than a mile). The Honey Marketing Board keeps detailed maps of all locations and tells any beekeeper that might be too close to another to move. This is not a recommendation; it has the full weight of the law behind it. Another entity adding weight to the Marketing Board is the Israeli Beekeepers Organization. It holds a convention every year around the Jewish holiday called Hannukah, and publishes a slick journal, delivered to all registered beekeepers.

Varroa control is also possible because there are two full-time beekeeping extension workers employed by the Ministry of Agriculture, who attempt to visit every beekeeper and actively help them with their mite treatments. This again is only possible because the area they serve is small. Both men split up the nation into southern (Haim Efrat) and northern (Yossi Slabezki) regions. They are well trained and now have three decades of loyal service to the beekeeping industry. An issue that beekeepers and others are concerned about is the possible retirement of one or both of these dedicated extension workers. There is currently no one being trained as a replacement, and recent experience reveals that the Ministry may well drag its heels, if not eliminate those positions entirely, should they become available.

There is some reason to be optimistic. Both bee inspectors have helped the Ministry develop a team of high-powered scientists to look at problems the beekeeping industry is facing, including an insect virologist, chemical ecologist, and residue chemist. This team is extremely interested in the colony collapse disorder (CCD) scenario that it has heard about in the U.S. The more engaged this team becomes, the more chance there will be replacements for extension workers in the offing if needed.

I was privileged to travel with both Mr. Efrat and Mr. Slabezki to see the Lin Bee Farm<sup>3</sup> in Moshav Bilu, near Rehovot, one of the largest beekeepers in the country, running some 3,500 hives. We had a conversation with the President, Yuval Lin, in his office. His major concern is nutrition of bees and he asked me where to get more information on this important topic. The firm is dabbling in various bee products, including something that contains honey, propolis and royal jelly together. Beyond beekeeping, the moshav is also involved in other activities, including agrotourism.

I also visited Kibbutz Ein Harod Meuhad<sup>4</sup> fully conversant with ISO9000 and HACCEP technologies in processing and packing honey. The outfit runs a couple of thousand colonies, and like many large-scale beekeepers, moves several times a year, including at least one stop for a commercial pollination contract. The firm is producing a honey substitute made for diabetics, and also importing honey from the U.S. Israel, like the U.S., is hard pressed to satisfy the population's demand for honey and so imports the

sweet, but there often is a high import duty. One of the biggest problems this operation faces is theft of colonies. A look at the landscape reveals that there are few places to hide a beehive. Many, therefore, are actually locked in place with metal cage-like contraptions.

Near the Sea of Galilee, I visited Kibbutz Dan.<sup>5</sup> A beekeeper there who has produced honey since the 1960s told tales of being driven out several times by military action from the nearby Golan Heights. Each time he lost the bees, but returned to begin anew. It was in this area at another kibbutz called Ayelet Hashakhar that my host, Dr. Yaacov Lensky, did his pioneering research on swarming. He also supervised the research of Mr. Slabezki on the same subject during his study towards an MSc Degree. The influence of the Hebrew University of Jerusalem's Faculty of Agriculture on the beekeeping of Israel cannot be overstated. From its beginnings in the 1950s when Professor Lensky finished his PhD thesis supervised by Prof. Z. Avidov to his appointment as director of the Triwaks Bee Research Center, this program has trained countless students and provided ground-breaking research in honey bee biology and subtropical beekeeping management still in use throughout the country.<sup>6</sup> With the retirement of Professor Lensky in 1997, the Center is now managed by Professor Sharoni Shafir, who is continuing work on basic bee biology.

Beyond the Faculty of Agriculture in Rehovot, several other institutions of higher learning have also been involved in studying honey bees and assisting the beekeeping industry. One program is run by Professor Abraham Hefetz of the University of Tel Aviv's Department of Entomology. His lab is full of fresh-faced students, mostly studying ants. However, work is also progressing with reference to *Apis florea*, recently detected in southern Israel. Known to be present in Oman, the bee was recently detected in the town of Eilat on the Gulf of Aqaba. It appears to be only a matter of time before it will spread across the Negev Desert into the rest of Israel, probably aided by humans (roads, trucks, etc.). There is debate in scientific circles about what to do with reference to this Asian species, often called the "little or dwarf honey bee."

Professor Hefetz says that DNA analysis confirms all nests so far found appear to be descended from a single *Apis florea* queen. Some believe the invasion can be stopped because of this. Others are not so optimistic and see the spread as inevitable. As a "natural invader" in fact, its pollination potential might be beneficial to the country as it is in Thailand and the Far East. There is the chance, however, that this bee might be the source exotic pests or diseases. Its cousin, *Apis cerana*, is the source of the Varroa mite and a new form of Nosema, *Nosema ceranae*, that plagues beekeepers of *Apis mellifera* worldwide. Finally, the Israeli beekeeping industry remains extremely concerned because of the dwarf bee's potential to compete for nectar sources with managed colonies in a land where these are continuing to literally dry up.

Nectar sources in Israel have long been studied by Professor Dan Eisikowitch, recently retired from the Department of Plant Science, University of Tel Aviv. The fruits of that are now being enjoyed by beekeepers in the country as soon the millionth *Eucalyptus erythrocorys* will be put in the ground. This project had as its base a search for *Eucalyptus* species that have been established in the country for a long time, not by bringing in new material from Australia.<sup>6</sup> It turns out a hybrid between two types, often

found in conjunction with graves of British officers, produces the most nectar. Prof. Eisikowitch says the project is now "out of his hands," as many nurseries in Israel are now propagating the hybrid, which breeds true.

Prof. Eisikowitch has a long resume of interdisciplinary work with many different researchers in a wide variety of fields. One of his passions is pollination ecology. He pioneered the principle of electrostatic pollen transfer currently being used in pistachio pollination in California. The pollen is given a negative charge as it is blown out of a machine that looks like a leaf blower. The pollen grains are attracted by the positively-charged stigma. This is now being used in date pollination in Israel as well. He has also worked on the use of pollen inserts, which some beekeepers use to inoculate honey bees with specialized pollen as they exit the hive. These have also been employed to deliver biological control agents for plant diseases in some growing situations. He is working now on projects to determine whether the honey bee's branched hairs might have other functions besides picking up pollen grains, and identifying what signals insectivorous bee eaters (*Merops sp.*) might give honey bees warning them of imminent danger.

The native honey bee ecotype in Israel is the subspecies *Apis mellifera syriaca*. This "Syrian bee" is known for its defensive behavior, which many claim can even surpass that of the Africanized honey bee of the Americas. The pure, native ecotype Syrian bee it seems is not highly defensive, however, first generation crosses between it and other races are "hot," but its the second generation hybrids that Dr. Lensky calls "really mean bees." The bee was brought to the United States in the 1800s, but was quickly abandoned because of its defensiveness, and the fact that it was found to be somewhat less productive than other European bees. The Syrian bee has been eliminated from Israeli beekeeping for the same reasons. In its place now exists a mixture of other races imported from elsewhere, encompassing Italian, Carniolan and Caucasian strains, making Israeli bees similar to those currently found in the U.S.

Israeli beekeepers re-queen annually. This is based on research showing that young queens reduce swarming, have more brood in the nest, and therefore, produce 20% more honey. A predominant bee in the country is derived from Brother Adam's famed Buckfast stock. At least two breeders in Israel in fact continue to actively import this genetic material from Belgium and are selling it across the country.

Two critters affecting Israeli beekeeping that U.S. beekeepers don't have to deal with are the native wasp, *Vespa orientalis*, and various species of insectivorous bee eaters, *Merops sp.* Fortunately, a wasp trap has been devised, which catches those insects effectively, and honey bees quickly learn to remain in their hives if bee eaters are in the area. The bee eaters are a seasonal problem; they are present only a limited time during migration to and from Africa. Those rearing queens in Israel have learned to shut this activity down during bee-eater-season.

Although one can find traditional beekeeping in Israel that resembles that of ancient Egypt, there has been precious little evidence of this kind of apiculture as originating in

the country. However, a recent archeological find has turned this notion on its head as a cache of ancient mud tubes has been unearthed. .

Mr. Slabezki and I visited the Tel Rehov dig , which is part of the Beth-Shean Valley Archaeological Project.<sup>7</sup> A recent find of ancient bee hives is the result of eight seasons of excavation at this site. An article on the subject concludes: "The discovery of an apiary of an industrial nature in an Iron Age IIA context (Area C) at Tel Rehov constitutes a unique and extraordinary discovery that, in fact, revolutionizes our knowledge of this economic endeavor in general and in ancient Israel in particular." In addition, it says, "The average calibrated date that fell within the range of high probability (68 percent) was 960 to 870 bce, with the highest probability within this range being the last quarter of the tenth century bce."

By the estimation of most, Israel is still a land of honey and now commercial pollination potential. It will take more innovation no doubt to manage the current challenges posed by urbanization and water shortages. Fortunately, Israelis have been quite inventive in developing agricultural technologies from drip irrigation to minimal use of pesticides for Varroa control, and now a novel implementation of RNA interference (RNAi) for virus treatment. We all should look forward to their continued successes, as the results have benefitted the global beekeeping community in myriad ways over many years.

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