

MODERN BEEKEEPING TECHNOLOGIES : Mr. R. BANKER's COMMERCIAL APIARY, MINNESOTA

The beekeeping in Minnesota State deservedly ranks among the first in North America.

When I participated in the Convention of the beekeepers of the central and northern states of the United States, held at Brainerd in July 1975, I had the pleasure to talk with numerous beekeepers, and have also visited the apiaries of some of them. Undoubtedly, the most pleasant and interesting was that paid to the BANKER family, in Cannon Falls, 87 km south of Minneapolis.

Mr. Robert BANKER, Vice-President of APIMONDIA, Secretary of the American Beekeepers' Federation, owner of the Bankers' Honey Incorporated, and Mr. Harland PRINK, Mr. BANKER's son in law and associate, most kindly provided me with every information about beekeeping in Minnesota, and the management methods and equipment used in their enterprise.

In order to better understand how the activity of beekeepers in Minnesota proceeds, a brief account of the main characteristics of beekeeping there is necessary.

It is situated in the central region, on the northern border of the United States, between parallels 43° and 49° , has an extreme continental climate — with temperature in winters going down to 40° C below zero and with abundant snow (about 2m thick), and with very hot summers with temperatures high up 38° C.

Honey flow sources are both crop plants — such as soy bean, white and red clover, sweet clover, sunflower and buckwheat, and the timber woods stretching over a large area in the State.

Of the honey flows provided by these woods, acacia holds prime of place, with the wild forest plants and hayfields rounding off the picture of the local honey sources.

According to statistics, the average yield per colony is of about 38 kg of honey, with an annual increase of 1.2% in the last 25 years.

Also in the last 25 years, an annual decline in the number of bee colonies of 1.8% was recorded, with their total number in 1973 being 137 thousand, which means 0.6 colonies per sq km.

Very significant is the distribution of these colonies per categories of apiaries and beekeepers. While 65% of the registered beekeepers have up to 10 colonies each representing 4% of the total member of bee colonies, 6% of beekeepers own 30% of the total number — in apiaries of between 200 and 1,000 colonies each, and 3% of beekeepers — 53% of the total bee stock — in apiaries exceeding 1,000 colonies. In order words, an important weight in the beekeeping craft in Minnesota is carried by the commercial industry which handles 83% of the total number of bees colonies.

The management methods used at Banker's Honey Incorporated seemed to me the best, and therefore I shall try a general outline.

Mr. BANKER's apiary, with 3,000 colonies, is located at Sogn close to Cannon Falls, and managed by himself with the assistance of Mr. PRINK. Actually, the work does not cease all the year round.

In winter they make new equipment, repair the old one, and do other odd jobs in the honey house. In February they start feeding syrup, candy, and pollen substitutes or pollen, after checking the colonies.

In April, following stimulative feeding, 3—4 brood frames would already exist in the colonies. As weather allows it, hives would be unpacked — taking off the cardboard, black raper, and chaff tray, and be checked for food again and for making sure they have 4 frames of honey. Also, after checking for queen, if it is not there, they would introduce a new queen.

Late in April, package bees are installed. They are brought by air mail and in trucks with thorough ventilation. When package bees arrive, they are immediately fed sugar syrup and kept in a dark room for about 24 hours. Before being installed in the hive, package bees are sprayed with water to prevent them from flying. 3—4 central frames are taken out from the hive, then the caged queen in the package is introduced into the hive between two frames, after which the bees are shaken into the interval left by taking out the 3—4 central frames. Then the hive is covered, with the entrance being left open. After 4—5 days, queen acceptance would be checked, as well as her egg-laying, and sugar syrup supplied. Two weeks later, they would check again the hives, and stimulate development by syrup. In supplying food to package bees, at least 1/2 kg of honey should be assured for one frame — which means 9—14 kg in all. After installing the package bees, the brood nest would be necessarily restricted, so that the queen should be able to use the comb crowded by bees for laying eggs. About 5 weeks later, a super would be added, with 2 honey frames.

According to Mr. BANKER's and some other beekeepers' experience, package bees usually yield less honey than overwintered colonies. Moreover, in the last two years package bees were increasingly

difficult to obtain and at quite high prices, which entailed a slight decline in their use.

A most challenging aspect of the management in Mr. BANKER's apiary is the 2-queen system, method which he has perfected in the last few years, being now widely used by the beekeepers in the northern states. By this method, highest possible honey yields per colony are obtained, and half of Mr. BANKER's stock is kept in two-queen hives.

In describing the two-queen system, Mr. BANKER pointed out that two major stages are distinguished.

The first, stage, starting early in March — about 4—5 weeks before pollen collection, includes stimulative feeding of the normal two-storey colonies with pollen substitutes or mixtures comprising 10 to 20% pollen collected in the previous year. Feeding, of course, consists of sugar syrup and candy.

In the second stage, about two weeks later, pollen cakes and sugar syrup or candy are supplied again to colonies, and queens are checked to see if they are laying. At this time, normal colonies must have at least 1 kg of bees and about 2 brood (eggs and larvae) frames. The weaker colonies are unified.

The third stage starts early in April, about one month before the dandelion flow or other major flow occurs. Now bees are unpacked, brood checked, drone-laying queens replaced, and weak colonies strengthened with brood taken from stronger colonies.



The honey house of the Banker's Honey Incorporated

Concomitantly, the drugs necessary for preventing diseases are supplied.

In the fourth stage, immediately after all colonies have been unpacked, a thorough inspection is made of all colonies — to see their health condition, amount and quality of brood, quality of the queen, and the food available. Failing queens are replaced, and stimulative food is supplied again. The newly emerged queens are marked, and their wings clipped.

If during the third stage a number of weaker colonies are restricted to one super, at this moment they must be strong enough so as to need the second super. If not, they must be strengthened again until they reach the desired strength. Drugs are also administered.

The fifth stage is the formation of the two-queen — in a separate nucleus ; this takes place when dandelion or other abundant flow starts.

This is done as follows :

The queen of the initial colony is located, and left in lower hive body. 2—3 brood frames are put in a separate super. It is desirable to have one frame of unsealed brood, and to introduce it with all the bees on it. One or two frames with honey and bee bread are added in the nucleus. To populate the nucleus, bees from other 3—4 frames are shaken. Although, as is natural, part of the bees will return to the initial colony, enough bees will remain to make up to new colony.



At one of the out apiaries of the Banker's Honey Incorporated honey supers are loaded onto the truck to be carried to the honey house for extraction

The hive bodies of the initial colony (overwintered) are reversed, and a super with dark combs is put in them, next a screen, and on top — the nucleus. The cage with the queen in it is placed on top or between the brood frames, making a hole in the candy — with a thin needle, to enable the bees to take out the queen in 3—4 days. One feeder frame — with syrup in it is placed outside the frames in the nucleus. It is better to plug the hive entrance with grass to prevent bees from making the access free, for about 3—4 hours. The beekeeper must pay special attention to preventing robbing because even the slightest robbery may lead to a substantial decline of the capacity of queen acceptance.

From the 7th to the 25 th day since the formation of these nuclei — the sixth stage — queen acceptance is checked, and where queen was not accepted, or she failed, or is drone laying — a new queen is introduced. Also syrup is added. The hive bodies of the initial colony are re-stacked, and two extra supers are added. One shallow super is added to the nucleus. The combs in the three supers added should be of light colour (new ones).

The seventh stage starts about 10—15 days later, according to the beginning of the flow ; colonies are checked for the honey collected both in shallow and deep supers.

With the beginning of the flow, the eighth stage starts ; the two-queen colony is formed now ; the shallow super in the nucleus must be at least $\frac{2}{3}$ full of honey, and the brood laid by its own queen must be hatching.

The two-queen colonies are formed as follows : the two brood chambers of the initial colony are taken apart, and the nucleus super is put between them. A piece of paper is inserted between them, with small holes made by the hive tool, to make their unification easier. On top of these three deep supers, the shallow supers are added. The bees will gnaw the paper and pass from one deep super to another, unification being thus a natural process. In most cases, the two queens co-exist with one another in the three brood chambers. In any case, the young queen will be the one accepted by the whole colony.

During the next 14 days — the ninth stage — the colonies are checked for the nectar collected and stored. Because colonies are very strong, they have an intensive foraging activity and are able to fill up the supers in an unbelievable short time. In autumn, after honey extraction, the colonies are again restricted to two brood chambers and prepared for winter. This is made very easily by a blower which forces the bees from the upper supers down to the bottom ones.

The advantages of this method devised by Mr. R. BANKER include:

— In autumn colonies have a new queen, of the best ones, purchased from the queen rearing apiaries in the Southern United States.

When making up the divisions, the bee colonies are automatically brought to almost the same strength. The development of nuclei is very fast, each of them having already 8 brood frames in 25 days. Colonies with a maximum population are thus obtained for the peak of the flow, with no danger of swarming.

With this method, the low-productive colonies are eliminated.

— In autumn, the colonies are thoroughly prepared in order to overwinter well. The overwintered colonies are thus automatically re-queened. Currently, the honey yield per colony increases by at least 20 kg and usually by more than 50 kg. The current rate of queen acceptance is very good — 88—96%.

A few disadvantages exist: more labour is required, and the carrying out of the operations described above in a very short time and at precise time.

About the 1st of August, preparations for honey extraction begin in Mr. BANKER's apiary, which last for 6 weeks.

Taking off of honey supers from 30—40 colonies of a bee yard and their loading on the truck last for about one hour and a half, and proceeds as follows:

After taking off the hive cover, a board painted with a chemical

is inserted on top, which drives the bees down through the supers into the bottom brood nest. In 3—5 minutes, the bees leave the top supers and reach that below it. The super is taken off and the board is moved on top of the next super. The few bees remaining between combs are eliminated by a bee blower. Honey supers are put on pallets — 8—10 on each — and loaded onto trucks; when the truck, full with supers from several locations — reaches the honey house, supers are unloaded and put in a hot room where they are kept for 1—3 days. Then extraction begins. The operational line includes an automatic uncapper with revolving knives, 3 centrifugal extractors — two holding 72 frames each, and one 50 frames. Each extractor is run by a motor which shifts it from one to three speeds automatically. The extractors rotate for 15 minutes to get the honey out. They are put into motion by a common



A beekeeper is chasing, with a bee blower, the remaining bees from the honey combs

electric motor, and stop automatically after 15 minutes. Honey flows into the wax separator which is a spinner. When it passes through wire screens thinnest wax particles are spun apart. Honey is then pumped into a 45-ton tank, 7m high and 3.30m in diameter. The cappings wax spun apart is melted down into 18—22 kg square tubs. Then wax is extracted from these tubs, put in sacks and shipped to obtain foundation or for selling.

Inside the honey house, honey supers and barrels are transported by hand or motor carts.

The appliances necessary for various repair work in preparing the beekeeping equipment are kept in the honey house.

Most of the equipment used at Mr. BANKER's apiary (supers, pallets, bottom boards, covers and inner covers) is manufactured in this shop in the honey house.

Also in the honey house is the appliance for preparation of the spring stimulative food; it is a drill used for mixing honey, sugar, soy bean flour, skimmed milk and pollen, this mixture, being then dumped into a tank and put manually into plastic bags of about 1 kg each.

Mr. BANKER told me that they have only experimentally used a variety of types of foundation including plain foundation, wired foundation, aluminium core foundation, and plastic base foundation.

They found the aluminium core foundation entirely unsatisfactory because it was most difficult to get queens to lay, and because the aluminium base is such a poor conductor of heat that in the winter and spring divides the cluster in two small clusters.

The plastic foundation is better, although bees would gnaw the base, or, if the combs are very warm when they are extracted, the comb and beeswax will become loose from the plastic core.

As to wired foundation, Mr. BANKER said that they had some problems with wired foundation when the flow would cease suddenly.

At present, following improvement of production methods and of fixing foundation by means of metal wedges at the top and bottom, the plastic base foundation is excessively used at his apiary.

In connection with the handling of the extracted honey, Mr. BANKER pointed out the significant labour-saving improvement obtained by the bulk handling system which eliminates filling and handling of barrels. From the tank in the honey house the honey is transferred in the transport tank by means of air pressure. About 20 tons of honey — at the usual temperature, are transferred into the transport tank in one and a half hour.

The transportation of hives either to various flows or for pollination is mostly made by trucks, with the loading and unloading systems differing from one beekeeper to another. Three essential methods are

distinguished in this respect: loading of one hive at a time by hand or power single-carts, loading of hives by boom type hoists mounted on the trucks themselves, or by means of pallets — 2,4 or 6 hives on each at a time loaded onto the truck by various type fork lifts. A trailer is also necessary, to carry the fork lift.

In regions of hills and rolling countryside, easy loaders are used, with which it is relatively easy to pick up a pallet holding 10—12 single-storey colonies, or 6 two-storey colonies — on a double pallet.

Of the 3,000 colonies at Mr. BANKER's apiary about half are currently overwintered. The other half is recovered by making divisions next spring.

Preparations for wintering are started about mid of September, immediately after honey has been extracted.

Half of the colonies — with the most prolific queens and honey stores of 34—35 kg — are selected for wintering.

Colonies are wintered in two deep supers, with 9—14 kg honey in the bottom one, and 22—27 kg in the top super.

Under these conditions, in normal winters, losses in spring do not exceed 5—10%.

The rest of colonies are killed in October. The empty hives are brought into the honey house, cleaned, and prepared for brood chambers for the next spring — 3—4 frames of honey, 2—3 empty combs, and a feeder are put in them.



Loading of honey supers onto the truck

To accelerate the development of the colonies to be used for divisions, they are carried to Texas, where flow is available starting with February — March. Making of divisions — after carrying back the colonies to Minnesota, takes place early in May, concomitantly with the installation of the package bees purchased.

In Texas, 5—6 divisions can be made of one colony.

Because of the more difficult economic conditoin in the last few years, migratory beekeeping has been declining, which has of course caused a decrease in the amount of honey obtained.

Migratory beekeeping has also been limited by the extension of the field under soy bean — which although does not produce an excellent honey is however an important honey source.

As bees stock, Mr. BANKER has used many bee races — including Italian and Caucasian — purchased from various bee breeders. In the last 10—12 years, Starline hybrids from Dadant & Sons breeding apiary were exclusively used.