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**Chapter 6 Colony manipulation: honey and beeswax harvesting and extraction**

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**Brood-nest control**

In order to obtain a good crop of honey and beeswax, the beekeeper must ensure that his colonies are functioning well. He must be sure that

- Every colony has a good laying queen,
- every colony is protected from extremes of weather,
- every hive is sited in a strategic location where the insects can collect abundant food, and
- every colony is fully protected from diseases and natural enemies.

***The seasonal cycle***

Tropical bees work all year round. There is no need to overwinter them or keep them indoors and then to get them working again as in temperate regions. In contrast to temperate-zone bees which swarm once a year, the tropical bee has two main swarming seasons: one in December/February and the other in June! November. It is during these two swarming seasons that the beekeeper should get bees in his hives.

A good swarm is always headed by an energetic queen. An average swarm weighs between two and three kg and contains between 7000 and 9000 bees. Absconding colonies are, however, larger than this, sometimes numbering over 50 000 bees. The day they arrive at a hive, most of them hang themselves in festoons and build combs to enable the queen to start laying. At this stage, only very few bees forage. Four to eight top-bars may be occupied; within two weeks, one or two combs will be completed, while others remain incomplete. All these foundation combs contain worker cells only. If a new swarm begins with drone cells, this is an indication that the swarm has no queen. An absconded or prime swarm builds very quickly to enable the old queen, who needs no impregnation, to start laying, while a secondary swarm consisting of fewer bees and a young queen, works rather slowly. Laying in a queen-right colony may start as little as four days after arrival, depending on the availability of comb cells and the maturity of the queen.

The presence of young brood in the new hive is always signaled by foragers sending pollen into the hive.

At the early stages of colonization, the beekeeper should test the weight of the hive by lifting it. He should also see whether combs have been constructed correctly along the top-bars. He should continue to check the weight by feeling it every fortnight because some colonies produce very quickly and may take the honey away if they issue a swarm. A colony may spend only 15 days producing well, and then over 80% of the bees may depart, leaving only a few behind to start all over again.

***The brood-rearing cycle***

Brood-rearing takes place after the main rainfall season, when flowers begin to bloom. In forest and high savannah areas, brood-rearing occurs between August and early October and from March to April. This stage is characterized by intense activity in the colony. Food is usually abundant. Comb builders need to work fast to enable the queen to lay; nursing bees must feed the young brood; pollen, nectar and propolis must be collected; Water must be carried to dilute brood food; and all repair work at the security gate must also be performed. Workers fly out early in the morning, and after barely ten minutes the first consignment of pollen arrives. With sunshine, the entry gate becomes overcrowded. The flight path leading to the gate becomes busy with traffic.

At the peak of the brood-rearing stage, a good queen may lay over 2 000 eggs a day, a load heavier than her own weight. The population of the hive increases rapidly, and sometimes the workers cannot supply enough empty cells to enable the queen to lay more eggs. When this situation occurs, the colony may prepare to swarm. Queen and drone cells will be constructed, the queen will lay drone eggs, and queens will be raised in preparation for the swarms.

The bees' output of work is greater if there is abundant sunshine and longer days, aided, of course, by abundant flowering nectariferous plants. The interior of the hive becomes warmer than ever. Panning bees gather at the entrance and empty sides of the hive, and fan their wings to generate air to cool the hive and to help honey cure rapidly, because the new swarms that will issue must take honey away.

But by good management, swarming can be delayed. The beekeeper can intervene by providing empty worker combs which will afford the queen more space to lay her eggs. Unless the beekeeper raises queen bees and who needs drones to mate with his queens, drone combs are useless for commercial honey producers and should be removed and melted down for wax.

**Honey harvesting and what to look for**

When the first honey crop can be harvested depends on when the hive was colonized by bees. Once a parent colony is capping honey, so will the offspring colony, probably because nectar is available at the same time. If the locality has been experiencing some degree of drought, honey must be stored for use during the dearth season, when bee food will be scarce in the field. Young colonies from the coastal scrublands and the transition forest zones have already demonstrated that honey can be ready in less than two months. In that time, 20 kg of surplus honey were harvested in one of several Kenyan top-bar hives in Kintampo (Ghana) and 15 kg were realized in Accra within six weeks.

But the K.T.B.H. is a small hive and must be harvested regularly to afford space for the next honey crop. The user of the frame hive will be well off if he drains the honey and inserts empty combs which will be refilled with matured honey in two weeks. Some colonies are so slow that they need more than six months to produce enough honey to be worth harvesting. In good beekeeping areas, three months may be enough, but the quantity of honey will always depend on the strength of the individual colony.

Observing the behaviour of the local flowering plants can be very useful in determining when honey can be harvested with maximum results: it is when most of the flowers drop that the bees have capped most of the honey in their nest. As an example, the best harvesting time in vest Africa occurs during the peak of the dry season, just before the arrival of the dry harmattan wind. The beekeeper should not wait to harvest until the windy nights and first rains drive the bees to load their honey and fly off with it. West Africa begins to harvest honey in the latter part of October and may continue until June. Indeed, some areas with plants such as coconut that flower all year round can have honey throughout the year.

In any particular area, the best way the beekeeper has of knowing that his honey crop is at the maximum is to observe that his colonies are getting ready to swarm. Brood-rearing ceases, and this is characterized by foraging bees sending little or no pollen into the hive. Pew bees are seen at the entrance during the day; the bees seem to become lazy, as foraging activity in general seems to have come to an end, but most of the bees continue buzzing and ventilate the hive at night. The honey cells are capped. The hive smells of honey when it is approached. The guards at the entrance become more aggressive than ever and send out patrols to attack any potential intruder loitering in the vicinity. The population of the hive is now at its peak. The brood nest is overcrowded. There is congestion at the entrance. During the night, the bees form a large cluster there, waiting for the cool wind, because they cannot cope with the heat in the hive. All these signs that the colony is getting ready to swarm are also signs that its honey reserves are maximum.

But not every colony will be at this point at the same time, and therefore the beekeeper should weigh his hives during his inspection. The heavier hives may be ready for harvesting, while others will have to wait a little longer.

***How to harvest honey***

As we have already seen (p. 66), the general rules for brood-nest control and honey-harvesting are the same, and they therefore do not need to be repeated here in detail.

Wear protective clothes. Never forget to take along a good knife or hive tool, brush or quill and a good container for honey. The honey container may be made of earthenware, stainless steel, plate or plastic, but it should always be rust-proof. Smoke the hive and open it as described on p. 66. Then remove the combs one by one (giving a puff of smoke before removing each one) and look at them carefully.

Empty combs, brood combs, and combs containing both brood and honey or uncapped honey should all be returned to the hive (see Fig. 11). Only full combs of ripe honey (see Fig. 10) should be taken. When such a comb is found, brush any bees on it into the hive and use a knife to cut the comb honey away as shown in Fig. 12. Leave about one centimetre of comb on the top-bar to guide the bees to work the next honey crop. Carry on with the harvest until a dark comb is reached. This comb usually contains both honey at the top and brood below. Stop here.

Some combs may not be easy to remove because the bees may have attached them to each other. This usually happens when the beekeeper has left space between his top-bars. Use a knife to separate them.

If the hive entrance is in the mid-section, there will be honey at both sides. Replace all top-bars and treat the other side in the same manner, but be sure to leave ten combs in the middle. The bees will then work faster to produce the next honey crop than if all honeycombs were taken away.

After removing the surplus honey, rearrange the top-bars carefully in the same manner as before. If bees are rushing out between top-bars, drive them back with smoke, but avoid crushing them unnecessarily. Then close the hive carefully, making sure the lid is firmly placed on the hive. Cork the smoker after work is done. Do not throw left-over fuel into the bush -- it can cause bush fires.

***Honey harvesting at night***

In practice, the aggressiveness of the African honeybee makes it impossible for most beekeepers and wild-honey tappers to approach their hives or harvest their honeycombs in broad daylight. Comb moving and most related jobs, such as brood-nest control, are best performed late in the afternoon or delayed until night or early morning, when bees are less aggressive. On two occasions near Atebubu, a rich beekeeping area in Ghana, some hives were opened at about 10:00 a.m. by beekeepers wearing protective clothes. On returning to the village more than a kilometre away, they discovered that the inhabitants had all deserted their homes and taken refuge in the nearby bushes. The harassment by bees continued until 5:00 p.m., when the villagers were able to return to their homes. This explains why most honey tappers work at night.

However, it is not easy to work well in the dark. Light must therefore be provided, and this definitely requires an extra hand to assist in the operations. Flashlights, which are ideal for use in the job, are usually beyond the reach of the average honey-tapper, especially since, in many tropical countries, batteries for them cannot be obtained on the market. When lanterns or hive torches are used, many bees, attracted to the fire, are burned to death. If the lanterns are shaded to avoid this, bees will cluster around the shades and shut out most of the light.

Under such circumstances, the job cannot be carried out efficiently, and precious bees and comb may well be crushed in the process.

Another problem with night harvesting is that many beekeepers, especially beginners, find it difficult in the dark to distinguish between brood combs and honeycomb, and all are harvested together. In this way, valuable brood is lost, and good honey is polluted with crushed brood.

Finally, crushing of bees between top-bars cannot be avoided in the dark. As a result, the last top-bar may not fit, and the beekeeper will then have to remove and rearrange all the top-bars, and even then the problem may not be solved. If the beekeeper then decides to leave the last top-bar out of the hive, the bees will fill up the gap with propolis or extra comb, wasting time that could be better spent collecting nectar, and making the next control and harvesting operations all the more difficult.

It is clear, then, that the beekeeper will do well to work out a method for carrying out his harvesting and control operations during the daylight hours, even if some danger may be involved.

***Honey harvesting in daylight***

One simple and effective system for harvesting honey or controlling the brood nest with little or no danger, even during the hottest hours of the day, makes use of the fact that foraging bees always return to the site of their hive, even if the hive is no longer there.

1. The beekeeper brings with him to the site an empty hive and a container with a lid for carrying the harvested honey.

2. He smokes the hive heavily from the outside to force the "security guards" and any other bees of the colony who are waiting outside the hive to return to it. It is important to continue smoking until the bees have lost all their aggressivity.

3. The hive is then carried away from the site, in the direction opposite to the flight runway, and placed on a platform (or on the ground) at least 50 metres from the nearest hive in the apiary. The empty hive is left at the hive site to serve as a temporary home for any returning foragers or for any bees that escape from the moved hive.

4. Working as quickly as possible in order to avoid robber bees, which can otherwise cause trouble, the beekeeper carries out his harvesting or control operations in the normal manner.

5. When the work is completed, the hive is closed and carried back to its original position, and the empty hive is removed. Any bees in it, or members of the colony waiting outside, will then rejoin the hive.

The economy of this system is obvious. Daylight is utilized to ensure proper execution and efficient harvest or brood-nest control without attacking bees chasing nearby inhabitants. Diseases can easily be detected, and hive predators can be found and eliminated. Crushing of combs and bees between top-bars is avoided or minimized. Top-bars can be restored to their proper position. Work can be done throughout the day in a pleasant atmosphere without rushing.

To take advantage of this process, it is suggested that beehives be sited on platforms to facilitate easy moving instead of hanging them on trees or nailing them to a table.

**Honey and beeswax extraction**

***Traditional methods***

The traditional methods of extracting honey and beeswax are unsuitable and unhygienic. Extraction of honey by squeezing with the hand seems to be the quickest method for the average honey-tapper, who cannot afford a centrifugal honey extractor or solar wax-melter. However, the hand contaminates the honey, and unripe honey ferments within a few days after extraction. (Fermentation of honey is more a problem in coastal areas than inland.) Neem and coconut honeys are light in consistency and ferment more quickly than honeys produced from other plants.

The combs, including brood, unripe and capped honeycombs, are collected at night. They are all stacked on a wire mesh and a container is put underneath the pile of combs. Live embers are placed on the pile. The fire begins to consume the combs, and honey and wax trickle down into the container until all combs are completely consumed by the fire. The material collected is left untouched until the next morning. The beeswax which has hardened at the top of the honey is removed, and the honey is poured into bottles of about one kilogram.

The disadvantage here is that honey loses nutritional value and quality when exposed to high temperatures. In addition, the smoky fire employed is full of ashes, charcoal, dust and gravel which contaminate the honey. Such honey tastes bitter and smoky. The brood combs also add water to the honey, and such honey cannot be stored for long nor enter international markets.

***The solar vex-melter***

This is a simple device and can be made by local craftsmen. The melter is made of wood, lined with a galvanized metal plate and has a glass or clear plastic cover. The base is airtight. The melter can be painted black to absorb more heat.

On a sunny day, the wax extractor is capable of generating a temperature of 61°C, enough to melt down a bee comb so that both honey and beeswax flow into a container inside the box.

***Hot bath method***

In the absence of a wax-melter, the hot-water bath process now in use by some African beekeepers may be adopted. This is the quickest method of obtaining the wax, but it can only be employed after the combs have been crushed and the honey removed.

Equipment:

- a cooking pot
- sackcloth or a sack (preferably jute)
- string or twine (2-3 metres)
- a stick or a discarded top-bar
- a large spoon or ladle
- a mould for the wax

Procedure:

1. Put water (amount depending on the quantity of bee combs) into the cooking pot and heat over a fire.
2. Wash crushed bee combs to remove dirt and honey and place in the sack.
3. Make a good package by tightening the string around the sack.
4. By now the water should be quite warm. Put the package into the pot and use the stick to push it down to the bottom.
5. When it reaches a temperature of about 59°C, the wax begins to melt and a waxy scum begins to form on top of the water.
6. Use the stick to press the package. More wax will float to the top of the Water.
7. Use the ladle to skim off the melted wax and pour it into a mould. Continue this process until wax no longer rises to the surface.

*Note*: Do not subject beeswax to high temperatures. Prevent the water from boiling by reducing heat.

***Extraction of honey and beeswax by Ocloo's method***

This method, suggested by a beekeeper from Accra, Ghana, is published here for its simplicity, cheapness and efficiency. The method works on the same principle as the solar wax melter, employing the sun's heat to melt down the combs.

Equipment

- a large container
- a sheet of nylon mosquito mesh
- a strong nylon cord and a needle
- a plastic or polyethylene cover

Procedure:

1. Fasten the mosquito mesh over the container with the nylon cord.
2. Place honeycombs on the wire mesh so that honey can trickle into the container.
3. Cover the honeycombs and container with plastic and secure it fast to the container with another cord.
4. Leave the honey and container in the sun. Both honey and wax will seep down into the container. The vex will harden above the honey and can be removed when the money cools down to be decanted and bottled.

***Moulding beeswax***

Beeswax collected should be moulded in the following manner:

1. Use a container with a rounded bottom and a mouth wider than the bottom with a very smooth inner surface. Many plastic containers are suitable.

2. Place a small quantity of water (about a tablespoonful) in a cooking pot and put on the fire. Do not melt beeswax in a dry container. It should not be exposed to fire because it burns easily and can be damaged by too much heat. Melt beeswax and all bee combs outdoors.

3. Add all the beeswax and watch carefully as wax melts down. Remove it from the fire immediately after the last lump of wax has melted.

4. Pour melted beeswax into the mould and place in a cool, dry place to cool.

5. Remove the cakes of beeswax next morning.

6. The dark material collected at the bottom can be removed with a knife and can be sold to a shoemaker. The clean raw beeswax is ready for the market.

**Some facts about honey**

Honey is classified by the source from which the bees gathered the nectar, because the source influences the honey's flavour, colour and viscosity (thickness). For example, honey collected between October and December may have an orange flavour, showing that the bees collected most of the nectar from citrus trees. The following table shows some plants, with the colour and viscosity of the honey they produce.

|  |  |  |
| --- | --- | --- |
| **Plant**  | **Colour**  | **Viscosity**  |
| Orange  | Light, yellowish  | High |
| Neem  | Light, amber  | Very low (runs  |
|   |   | like water) |
| Coconut | Dark | Moderate |

In general, honey of high viscosity flows slowly. The harmattan wind has a great influence on honeys collected between December and March in West Africa, causing them to thicken. The coastal areas are less influenced by the harmattan and therefore produce honeys of lower viscosity. Heat is applied to force honey to flow; however, the beekeeper must not subject honey to higher temperatures than 30°C.

Uses of honey

• As human food:

- in certain alcoholic beverages sugar substitute in cooking and baking
- in child feeding
- for athletic and strenuous activities diabetics

• As an ingredient in drugs:

- for hay fever; in cough syrup; as sweetening agent in drugs, especially for children

• For animal feeding:

- dairy cows (to increase milk production)
- donkeys and racehorses poultry mash and feed for fish farms

• In veterinary medicine:

- in the treatment of acetonemia (a disease of the cow)

• In cosmetics:

- as a facial cleanser and an ingredient in hand lotion

• In mice- and rat-repellent compounds