BEEKEEPING

Güner KAYRAL

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PART 1

BEE COLONY

CHARACTERISTICS IN THE LIFE OF HONEYBEES

Bees live collectively. Those that remain separate from their communities cannot survive, and they eventually die. There is an extremely organised division of labour among the castes of bee which make up a community. They are devoted to their nest. Never losing their flying ability even during a severe storm, hail or rain fall, or fire, they always go back to their shelter in the evening.

Bees are allowed to stay in their hive as long as they remain healthy and serve their community by working. Those that are losing their working ability due to overworking, aging or diseases as well as those that are born weak, sickly or disabled, and therefore obviously cannot serve their community, are mercilessly thrown out of the hive and left to die. There is no such thing as favouritism, nepotism or tolerance in a bee community. Bees will not show the slightest hesitation in immediately killing and throwing out even the queen bee, the most precious being in a hive, if she loses her working ability for such reasons as aging, disability or diseases, lays fewer and fewer eggs, and consequently fails to perform her duty. However, they will not eliminate her without first having assured the continuation of their community; that is, until they have brought up a young, healthy, active and dynamic successor. Bees have an extremely keen sense of smell, and sharp eyes that enable them to detect a flower in a bush from long distances. In comparison to the delicate and elegant structure of its body, the bee has a tongue which is a natural wonder of superior strength

that is still not fully explainable, with a powerful sensitivity and the capability of unfolding, extending and folding back to pull and absorb honey. Leading an orderly and peaceful life with these abilities of survival, this community is a close-knit one like a family, or a civilised nation, whose members see eye to eye with, know, help and guide one another.

BEE COLONY

A bee community which lives collectively, shares the above-mentioned characteristics and has a strict, stable division of labour is called a bee colony.

A bee colony consists of 10 to 100 thousand bees, depending on the season, the course of weather, and the availability of nectar and pollen sources.

Bee colonies live collectively within hives. Each cast of bee has a specific duty to perform. Each bee performs that duty by taking turns, without requiring any warning to do so. A bee colony is rated on the basis of the number of bees in the hive. A hive is rated on the basis of the number of worker bees in it.

At late spring, early summer

a- A "very strong" hive consists of 60 to 150 thousand (or more) worker bees

b- A "strong" hive consists of 40 to 60 thousand worker bees

c- A "moderately strong" hive consists of 20 to 40 thousand worker bees

d- A "weak" hive consists of less than 20 thousand worker bees

Each bee colony has a specific scent of its own. Each outgoing bee returns to its own hive. A bee wanting to enter another hive is not allowed by the guards at that hive's

entrance, identifying the stranger by its scent. If they fail to frighten the stranger away by fighting, they kill it. In some cases, and rather rarely, they may choose to allow entry when the stranger arrives with nectar and pollen in its honey sac. Not all of the castes of bee which make up a bee colony are of the same nature and characteristics.

Consequently, in order to be able to succeed in modern beekeeping, it is required to know each of these castes and learn about their characteristics and functions in the colony. Noticing any irregularities in a hive full of bees, and rapidly and easily eliminating such irregularities can only be possible by learning about the characteristics and lives of these castes well.

THE CASTES OF BEE WHICH MAKE UP A COLONY

1- Queen Bee
2- Worker Bees
3- Male Bees (Drones)

1- QUEEN BEE

There is only one queen bee in a hive. She is relatively taller than the other bees, and more graceful and shapely, with a brigher colour. All of the bees in a hive are born of the eggs she lays into the comb cells. She lives for maximum 5 years. She lays relatively more eggs until the age of two, keeping the colony stronger and healthier. When the queen bee dies, or when the colony is about to swarm, or when the queen bee is aging or disabled, the bees feed the young worker bee larvae in the comb cells for straight five days with the royal jelly that they have prepared in their honey sacs, and turn the comb cell that will produce the queen bee into a queen-cell cup by enlarging and extending it. The queen bee will be born of that queen-cell cup on the fifteenth day, having been in the form of an egg in the

comb cell for the first three days, then in the form of a larva being fed with royal jelly in her special cell for five days, and lastly in the phase of transforming into a winged insect in the capped cell for the remaining seven days. Once born, she starts to explore the hive and look for any other queen-cell cup in it. If she finds one, she attempts to kill such candidate even before this rival is out of the cup. Shouldering all kinds of work in the hive, the worker bees will sometimes stop and sometimes assist her in this action, depending on the current situation as well as the future of the colony. About 3-5 days, or sometimes 7-10 days later if the weather is not favourable, the queen bee goes out for the purpose of memorising the hive location, and for the mating flight afterwards. She will mate outside, in the sky, with one or more of the drones. She then returns to the hive after this magical wedding flight. About 4-5 days later, she begins to lay eggs, which she will continue for the rest of her life. The queen bee has a sting, but she does not sting humans. She uses it to kill other queen bees that are her rivals.

2-WORKER BEES

These are the smallest in size, but the largest in number within the hive. There are 5 to 80 thousand of them in a hive. They come out of the eggs, laid by the queen bee into the small cells in the comb, every 21st day. They are the ones that do all of the work, and make honey, in the hive. Once out of the comb cell, they will perform the following functions in the order given below.

Their first job is to build broodnests for the broods that will be born after themselves. Then they begin feeding the newly born broods. Afterwards, they feed the queen bee, enabling her to lay eggs. They clean and wax the comb cells where the queen bee will be laying her eggs. They secrete wax and make combs. Later on, they will be serving for the ventilation of the hive, as well as the defense of it right behind the flight entrance. All of

the above are a worker bee's in-hive duties which last for 15-20 days. Following this 15-20 day-period of internal duties, they first perform a flight out to memorise the hive location and then begin to carry water, pollen and nectar. These are the worker bee's external duties which last for 20-35 days.

Consequently, a worker bee's life during spring and summer does not go beyond 50-60 days. The reason why they have such a short life is the fact that they work without breaks. They can live up to 3-5 months until spring, as they remain sluggish inside the hive due to not working outside during winter months. Worker bees have stings; they are the ones that mercilessly sting humans.

3-MALE BEES (DRONES)

There are 50-300 of them in a hive. They come out of the eggs, laid by the queen bee into the large cells in the comb, every 24th day during spring and summer. They are larger in size and darker in colour than worker bees, with a rather noisy flight. Drones have no particular duties in the hive. They fly and roam about, and return to the hive only to consume the honey there that the hard-working worker bees have made. They also make it hard for the worker bees to work and to enter or leave the hive. Their sole duty consists of several of them serving as a husband to the virgin queen bee that goes out of the hive for the purpose of mating. When they have performed this duty, they immediately die of exhaustion. They will be thrown out of the hive by worker bees during the summer months when the nectar sources around diminish. These are the dead bees that can be seen infront of hives during late summer. Consequently, they do not live longer than a few months. The term "saka" ("water-bearer") bees used for drones in colloquial speech is actually far from the truth. They are by nature not suitable to carry water. Drones have no stings, and can be caught like flies.

REPRODUCTION IN BEES

Starting from February, the queen bee will be laying eggs into each one of the comb cells in the hive. These eggs crack after three days and larvae come out, which will be fed by the worker bees for 5-6 days. Once the feeding period is finished, the worker bees will cover the broods by using a brown seal. Bees grow from these capped brood cells at the 12th-14th day.

As the worker bees go out of the hive and gather plenty of nectar and pollen during spring, they are able to feed the queen bee much better. The queen bee will then lay 300-3000 eggs a day, depending on the strength of the hive. Consequently, the number of bees in the hive reaches 40-50 thousand until the months of greater honey harvest.

THE PERIODS:

	QUEEN BEE	WORKER BEE	DRONE
	DAY	DAY	DAY
In egg	3	3	3
Larva	5	5	6
Sealed	7	12	14
Out of comb	15th day	21st day	24th day

PART 2

BEE PRODUCTS

1-HONEY

A vital source of health for our diet and wellness, honey comes to first to mind when talking about bee products. The bee, having turned all those sweet essences gathered from thousands of flowers into honey by mixing them with the secretions in its honey sac, places that honey into the comb cells previously built, again, by its own secretions. The essence of the comb cells is the substance we call "beeswax". The bee secretes this wax after having eaten the honey and pollen in the hive, takes the small flakes of wax in its abdominal segments into its mouth, and starts, like an engineer, to build comb cells.

The annual honey yield by a bee colony in modern framed hives as an average of years and hives is 20-30 kilogrammes. Migratory beekeepers obtain no less than 35-40 kilogrammes on average. Beekeepers with a good deal of knowledgeable about Technical Beekeeping can receive 50-60 kg, and even up to 80-100 kg honey per hive in some productive years.

The amount yielded by such hives as wooden hives, skeps, carved log hives or earthen hives is, on the other hand, 5-15 kg.

2-POLLEN

The male gametes found in the center of a flower is called "pollen". Visible only under a microscope, these cells are capable of lasting for 10 years; they bear all of the plant's genetic properties, and ensure the continuation of its generation by enabling pollination.

The jelly, which is placed into the cells to feed the bees that are in the form of broods, are actually prepared by mixing honey and pollen. In spring, one can observe that bees carry pollen (the size of a pin's head) inside the tiny baskets found on their hind legs. Pollen is the main food for broods; it is what meat means to us humans in terms of nutrition. In recent years, however, man turned his hand to pollen as well, since its medicinal effect, especially in certain intestinal, prostate and nutritional disorders, was discovered.

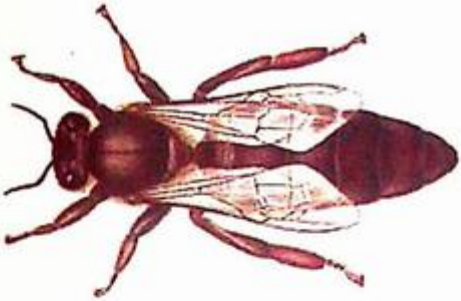
That is because pollen contains high amounts of proteins, carbohydrates, minerals, organic and free amino acids, nucleid acids, enzymes, vitamin carotenoids, flavinoids, and growth regulators. This precious bee product is widely utilised also in human diet and nutrition.

Consequently, beekeepers now place screened traps at hive entrance and hive bottom board. As the bee flies through this trap, the pollen pellet on its hind legs gets caught in the trap and falls down. This way, it is possible to obtain 15-20 kg pollen per hive. In fact, the amount of pollen brought into the hive is 50-60 kg a season.

Its medicinal, nutritional value is incomparably stronger than any other substance. This value is, for instance, 7 times stronger than pure royal jelly and 60 times stronger than honey.

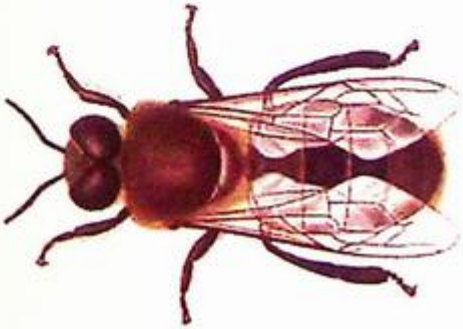
3-ROYAL JELLY

In hives that are left queenless, young bees will store in the queen-cell cup a substance which is a secretion of their pharyngeal glands and has the thickness and colour of a pudding for the purpose of feeding the larvae, due to the instinct of the continuation of colony generations. This wonderful food is gathered from queen-cell cups by man by means of a wooden spoon. It is found in abundance also in those hives that are about to swarm. Depending on the methods used and the



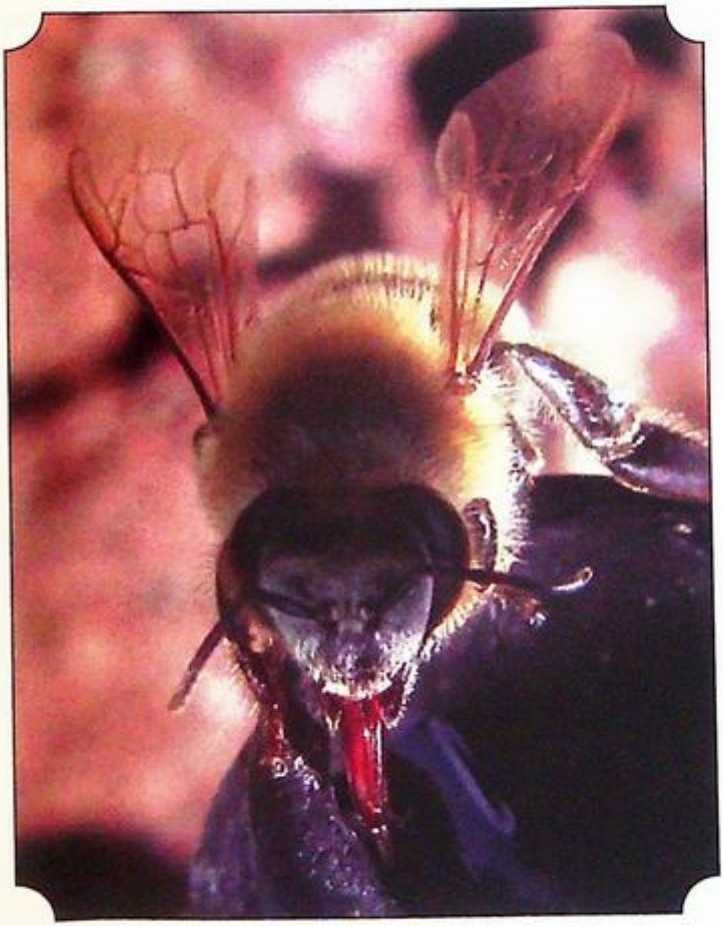
Queen Bee

Worker Bee



Male Bees

Queen Bee



Worker Bee

Male Bees

beekeeper's own ability, it is possible to obtain 20-400 g royal jelly from a hive.

This brood food, which we call royal jelly, is secreted by 5-15 day old worker bees, which have not yet started with their external duties, for the purpose of feeding the broods. This secretion is generated by the pharyngeal glands, which are made up of a large number of tiny tubes and found in the form of two coils on a worker bee's head. It is a liquid that has the look of condensed milk. This food is fed to the larvae for the first three days, and to the queen bee for the rest of her life. Royal jelly is obtained solely from queen-cell cups.

It has a very complex structure, composed of plenty of tissue -building proteins, energy-producing carbohydrates and fats, as well as vitamins, water, and several other substances not yet identified. The composition of royal jelly remains consistent and unchanged only in those which are obtained from queen-cell cups.

Royal jelly is a very valuable substance utilised also in medicine and human diet. It is highly in demand, and sold for significant prices, both in Turkey and abroad.

4-BEESWAX

Another very important bee product is the beeswax. In demand by many branches of industry, beeswax is used mostly to produce foundation in modern beekeeping. It is as valuable as gold in beekeeping. Its rate of production is 1% of the honey obtained from hives. It is possible to obtain 100-150 g beeswax by thoroughly cleaning a Dadant or Langstroth hive frame. A larger amount can be obtained from honeyless combs in traditional hives. 1 kg beeswax is worth approximately 1-2 kg plateau honey. Beeswax is traded as a valuable raw material of industry in all stock exchanges. It is utilised in cosmetics, dentistry, show adhesives, mining and machinery industries, paper and nail industries, cleaning agents, and moulding.

5-PROPOLIS

Propolis is a resinous, somewhat bitter material with a sharp aroma and brown or yellow colour. Bees collect it from the buds of fresh trees, store it, just like pollen, in the tiny baskets on their hind legs to bring it into their hives. When mixed with beeswax and dried out, it turns into quite a hard pulp. Worker bees use this pulp also as some sort of cement to protect the hive from humidity and cold. Especially if a snail, mouse or a foreign winged insect enters the hive at a higher temperature than 10 degrees when the bees are active, worker bees kill and throw these uninvited guests out, while sealing those in propolis (i.e. mummifying) which are too heavy to carry out of the hive. This way, the carcass that might otherwise cause infections and diseases in the hive is protected from putrefaction thanks to the antibacterial and antifungal properties of propolis. Propolis has also a psychological effect on bees, and influences their movements inside the hive.

For the same purpose, bees also collect any fresh and soft dye or putty, and even tar adhesives or sealing materials from asphalt roads, located in the vicinity of the apiary. However, propolis collected by bees in forests, gardens or anywhere away from asphalt roads and residential areas will doubtlessly be cleaner as well as more suitable for the purpose, since it will be collected solely from trees. While normally solid, propolis becomes soft and sticky at excessively warm temperatures. As the collecting and carrying of propolis is an exhausting task for bees, those bees which perform this task will rest the following day, and the unloading will be carried out by others. Propolis contains wax, resin, balsam, aromatic and ethereal oils, pollen and other organic substances, as well. It is stated that propolis collected from poplar buds has the highest active antibiotics content and antifungal properties.

6-BEE VENOM

Bee venom is another medicinal product of bees. It is very helpful against certain rheumatic diseases, in particular such joint rheumatisms as Arthritis. Some bee farms in Germany, the USA, and Canada were built exclusively to obtain bee venom. Found out to be very helpful against such diseases as high blood pressure, neuralgia and sciatica, and widely used in medicine abroad, bee venom is unfortunately neither produced professionally nor consumed in Turkey. Bee venom is utilised as a rheumatism drug under the name Forapin in Germany, Imini in Bulgaria, Apitriv in Russia, and Apikon in France.

7-SWARM BEES

A bee colony can swarm 1 or 2 times, and even up to 5-6 times with proper care and feeding. Swarms produced in a productive year may further swarm as Afterswarms in that same year. In modern beekeeping, it is also possible to obtain artificial swarms from strong hives.

The beekeeper can make an income by selling the swarms he or she has obtained more than needed. As we will discuss in the section related to swarms, the beekeeper can also operate exclusively in swarm beekeeping and make swarm sales throughout the country, thereby contributing both to him or herself and humanity, as well.

LEASING OF HONEYBEES FOR CROP POLLINATION PURPOSES

Studies conducted in Europe and the USA show that the benefit brought by bees via crop pollination in agriculture is 7 times more valuable than the yield of honey and beeswax.

As bees visit one flower after another in order to collect nectar and pollen, they cause the pollination of trees, vegetables

and many other plants, thereby enabling fructification, by planting into other flowers the pollen which they store on their legs and which stick to their bodies. The role of bees in crop pollination can be better understood if we consider the facts that it takes an average of 1500 flowers to fill a bee's honey sac with nectar at a time and that the bee has to fill up and unload the sac for 600 times to make a thimbleful of honey (i.e. it has to visit 90,000 flowers for that).

When compared to other wild life insects, a bee's most significant characteristic in terms of the controlling of flowers is the fact that the bee continuously visits the same flowers. Once a bee starts to collect nectar and pollen from a certain type of flower in the morning, it will continue visiting that same type of flower until the evening of the same day.

According to the studies by Zander, 75% of the insects that visit trees are honeybees; based on the results, if the value of honey is "1", then the benefit brought by bees by pollinating the fruit trees' flowers is "10".

This very clearly shows that introducing bees into fruit orchards is always to the advantage of the fruit grower, which is strongly needed in fruit growing.

PART 3
FOUNDATION

WHAT IS FOUNDATION?

If we take in our hand an empty, dry piece of comb with no honey, pollen or brood on it and peel off the cells on both of its sides by using a knife, we obtain a sheet that contains the foundation of the cells just peeled off. This sheet is called a "foundation".

Foundations used in modern hives are fitted by the insertion of thin, galvanised wires in 3-4 rows (right across) into the frames, and secured with the help of a spur embedder, melted beeswax, or small wax granules (bigger than a lentil and smaller than a chickpea).

THE IMPORTANCE AND ADVANTAGE OF USING FOUNDATION

Unless foundations are fitted into the frames of modern hives, bees will be building combs the way they choose, in which case the frames can no longer be removed from the hive. Removing, inspecting and replacing the frames, all of which constitute the fundamentals of modern beekeeping, will no longer be possible. This would be an even worse, harder and much less productive kind of beekeeping than traditional beekeeping. When a foundation is inserted into a frame, however, bees will be drawing out combs on the impressions on that foundation, in which case the frame can easily be removed and replaced during all kinds of maintenance, inspection and honey harvest.

HOW MANY FOUNDATIONS ARE NEEDED IN A HIVE?

As one sheet of foundation is needed for each frame in the hive, the quantity is calculated according to the number of frames in your hive. Later, the quantity missing in the brood chamber section of the hive and the quantity to be used for the honey super are calculated. Foundations to be used for the brood chamber are always full foundations. If needed, a half or a quarter of a foundation, or a narrower starter strip can be used for the honey super. Foundations are sold in kilogrammes. The quantity of foundations may vary depending on dimensions, as well as on thinness or thickness. The beekeeper should calculate that quantity as 8-12 for a 27x42 Dadant frame and 12-17 for a Langstroth frame, on average.

IS BEEKEEPING USING FRAMED HIVES WITHOUT FOUNDATIONS POSSIBLE?

Foundations are the most important and integral element of modern beekeeping. However, those who tend to dislike extracted honey and prefer natural honeycomb honey instead, as well as some European producers who opt to produce honey in framed hives (instead of traditional hives) without foundations and wires and sell that honey for high prices to their distinguished customers manipulate the bees by building hives with narrow and deep frames, with a starter strip of a couple of millimetres on the frame top bar. They do not fit wires to the frames. As the bees fit their combs to the side bars of these narrow and deep frames when building combs from top to bottom, the honey combs do not extend and break due to the lack of sufficient weight from top to bottom. These producers claim that bees spend the winter much more safely in this kind of deep hives, just like in cone-shaped skeps. Like in conic-shaped skeps, the colony gradually moves away from the flight entrance up to the warmth above as the weather gets colder.

The Danzenbecker-type flat hives with 10-20 frames, 42 cm depth and 16.5 cm width, which are widely used in the USA, are an example. The only drawbacks of hives with narrow and deep frames are that it is a bit more difficult to remove the frames from the hive for inspection purposes, slightly greater care is required in the construction of the side bars, and they need to be made of such solid and nonflexible timber as dried beechwood or pitch pine.

PART 4

STARTING BEEKEEPING

HOW DO WE START BEEKEEPING?

We start beekeeping either by purchasing bees in a traditional hive and then moving them into a modern hive, or by waiting for the bees to swarm and then shaking them into a hive the frames of which are fitted with foundations, or simply by purchasing bees in a modern hive. If there is a swarm bee vendor near you, you can also purchase a swarm from them and then move it into a modern hive. Without a doubt, the easiest and shortest way is to purchase a bee colony in a modern hive, which is marketed almost every season of the year. It is also easy enough to start beekeeping by purchasing an artificial swarm on 4-6 frames. You can choose to either have a modern hive filled with a natural or artificial swarm by a beekeeper, or purchase a colony of 4-6 frames in May-June from vendors who sell bees in Nucleus hives, in which case you can also obtain breeding-bees. By caring and feeding in accordance with the technique, you can strengthen them and ensure that they are fit for collecting honey. Still, the most reliable way is to purchase a modern hive that has bees already covering 6-7 frames and brood-filled combs on 3-4 frames before late April in spring. In that same year, it is possible to obtain honey, and even a natural or artificial swarm. One should start beekeeping with a few yet strong bee colonies. The number of bees can then be increased by reading relevant publications and learning from experienced modern beekeepers.

CONDITIONS REQUIRED FOR APIARY LOCATION

Bees prefer to work in places that are as quiet and uncrowded as possible. While this does not matter much for recreational beekeepers working with only a small amount of bees, the following information should be taken into account by those who will be engaged in commercial beekeeping, prior to setting up their apiaries.

1- Bees kept along busy road sides may die by running against the travelling vehicles. They should be kept about 50-100 metres away from roads, especially from main roads, as much as possible. In case they have to be kept alongside such busy roads; the side that is close to the bee pasture, which will provide the main benefit to the bees, should be chosen instead of the side that is close to the sea or sand, so that they will not have to cross the road in order to fly to the area where they will be collecting honey.

2- Apiaries should not be set up along road sides where sheep or cattle herds pass by in the morning and evening.

3- Apiaries should not be in the vicinity of foundation factories, sugar factories, workshops that use sugar for manufacturing, dyeing facilities, aluminium facilities, facilities that deal with acids or similar materials, or facilities that generate toxic wastes.

4- Any place where dairy wastes are disposed of, or anywhere in the vicinity of village/town/city sewers is not suitable.

5- Apiaries should be away, or behind a minimum 150 cm high wall, from village by-roads and main roads and from roads where wedding convoys or tractors pass by.

6- In case of prevailing winds in the area, apiaries should be set up in secluded locations protected against such continuous winds.

7-Those who wish to set up a private and closed apiary should arrange its direction and elevation in a way that the hives will be receiving 3-4 hours of sunlight from sunrise on, yet will not be exposed to the sun after this period up until the following day.

8-Slight slopes that face south or southeast and do not retain water, and any location with grapevines or trees that provide shady spots, with an open front of at least 4 metres, are ideal for those who wish to set up a large-scale apiary.

9-The climate and flora conditions of the area in which the apiary is to be set up should also be taken into account, and this area should include a bee pasture that flowers every season of the year. These conditions are relatively more important for stationary beekeepers than for migratory beekeepers.

10- The number of bees in the area should also be taken into account when selecting the apiary site. Similarly, maximum 100-150 hives in an area with a radius of 3 kilometres is desirable. However, the number of hives will be insignificant if there is a large number of trees in the area which secrete honeydew and balsam.

WHEN TO TRANSFER BEES FROM TRADITIONAL HIVES TO MODERN HIVES

For a dedicated and determined beekeeper, the transfer from traditional hives to modern hives can be performed almost anytime, any season, even indoors in winter. The transfer is not as difficult as those who are not sufficiently knowledgeable about it anticipate it to be.

Naturally, it will be much easier and successful if carried out during a period when the bee population and especially the number of honey-filled combs inside the hive are at minimums, yet with widespread brooding. Evening hours when it is rela-

tively cooler are the most suitable time as this will also minimise the threat of robbing.

The job is even easier with those traditional hives that have produced their prime and second swarms: in this case, the amount of bees and honey has been quite reduced, there is no more the possibility of harming the queen in the process, and the other bees are all sealed in capped cells even though spread out widely in the hive.

To give a certain time, the period of April when cherry trees have blossomed is the most favourable one. During that season, any stinging old bees have already been replaced by the new generation. Bee population is at a normal level, and there is no widespread brooding yet. There is less honey, plenty of nectar-pollen sources, and the cold days that prevent bees from flying out of the hive are over.

STARTING BEEKEEPING BY PURCHASING SWARM BEES

This is the easiest option to start modern beekeeping. However, the swarms will have to be very strong. A good swarm is no lighter than 1,5 - 2 kg, and no smaller than human head. A swarm which is the size of a foal's head or a cow's head, weighing 4-5 kg, is invaluable.

As much as possible, one should purchase the swarms that are produced in April and May. A strong, early swarm will be profitable enough for a beekeeper even in that same year. Swarms produced after solstice are of no value. Especially in Anatolia with its dry summers, most of the late swarms cannot even provide their own winter food or build combs to make nests, let alone make honey. There is even an old Turkish saying, which argues "No good comes from grain planted in bush, from bees swarming after solstice (June 22), and from a wife rising later than her husband". Still, with proper care and

syrup-feeding, even a weak, late swarm can turn into good breeding-bees as a start. Many private and public organisations sell swarms now, making the purchasing of bees easier also in Turkey.

STARTING BEEKEEPING BY PURCHASING MODERN HIVES WITH BEES

It is possible to look inside a modern hive when purchasing it, to check for the presence and age of its queen bee and the strength and value of the entire hive. If a modern hive that is purchased prior to late April contains 5-6 frames covered by bees, with broods on a minimum of 3 frames, such a colony is considered to be strong as well as excellent breeding-bees. You should also consider whether the frames of the modern hive with bees, which you wish to purchase, are compatible with the desired type of modern hive. In case they are not compatible, you should bargain for the bees and the frames, and not purchase the hive, if possible.

If you are going to purchase a hive after bees have already started to fly around in spring, you should purchase that hive from a vendor who is located at least 5 km away from that particular area. The bees in charge of external duties of a hive purchased from a closer vendor will not be visiting their new area but the old one that they are used to, which will lead to the weakening of that hive. The hives you purchase should be transferred in the evening or early in the morning. Except for the hours when the bees are out, the hive should be kept closed. The flight entrance, and even the top or rear section of the hive should be covered by a wire mesh, so that the bees will not suffocate from lack of fresh air inside the hive, the honeycombs will not decompose by softening, and the bees or broods will not be killed by the heat inside the hive and the decomposition of the honeycombs.

COMMON MISTAKES BY BEGINNERS IN BEEKEEPING

It will be useful for beginners to learn about the common mistakes made by those who have just acquired some theoretical knowledge and a hive with a few frames, and then started beekeeping. Let us sum a few of these up.

They immediately attempt to increase the number of hives, without having learned about the delicacies and secrets of modern beekeeping first. While trying to increase the number of hives, they do not place any emphasis on the many points that they should learn by practice. Since beekeeping is primarily related to the flora of the particular area in which they will be engaged in beekeeping, they should in fact explore the beekeeping aspect of their surroundings by observation. As the flora, as well as the secretion of nectar by flowers, is very closely related to weather conditions in Turkey, the first aspect to learn about should be how much rain the area receives. One should not forget that the conditions for honey collection in those areas which receive less than 400 mm rain during crop growth period will be poor. Beginners usually desire to quickly receive a high amount of natural or artificial swarms from their bees. However, even under the best conditions, receiving more than 1-2 swarms will only limit the beekeeper's chance of success. Beginners also believe that bees bring honey into hives even when they are about to starve, while the truth is that the honey collection period in an area lasts only for a few weeks. The beekeeper should previously have made all of the required preparations for the bees to be able to carry a large amount of nectar into the hive during such honey collection period. They should therefore confirm the greater honey collection period of the area, and ensure a large number of bees in their hives, such as 40-50 thousand, goes out to forage during that period. Beginners also get discouraged by certain incidents, such as a die-off of a

number of bees in winter or spring, or a number of bees abandoning the hive due to bee moths in summer or autumn. The beekeeper should not lose hope because of such incidents that result from a rather unfortunate or abnormal season. Beginners should refrain from such mistakes as syrup-feeding in the day time, causing robbing, not appreciating the value of worker bee larvae and the related honeycombs, not removing the drone larvae and the related honeycombs out of the hive or not considering to utilise these in another way. In addition, beginners should not work with hives that have frames of different sizes. They should get in contact with more experienced and knowledgeable beekeepers around them, select the most suitable hive for the frames on hand, and continue to work with that type of hive at all times.

PART 5

SWARMS

SWARMING OF HIVES

When the conditions in a particular year are favourable for the reproduction of bees, the number of bees in the hive will rapidly increase during spring, leading to a very strong colony. In that case, the hive will be overcrowded, causing the bees to start preparations for swarming, due to the instinct of ensuring the continuation of generations. For that purpose, they begin to build queen-cell cups at the lower and lateral parts of the combs in order to raise queens in these cups, as discussed earlier in the section related to queen bees. A few days prior to the birth of the new queen after these cups are capped, the old queen in the hive goes out together with an entourage of bees of all ages and roams, puzzled and hesitant, in the air for 2-5 minutes, like a cloud bank. The entire cluster then gathers around the queen, on the branch of tree, eaves or wall that she chooses to land on, like a bunch of grapes. This is called "swarming".

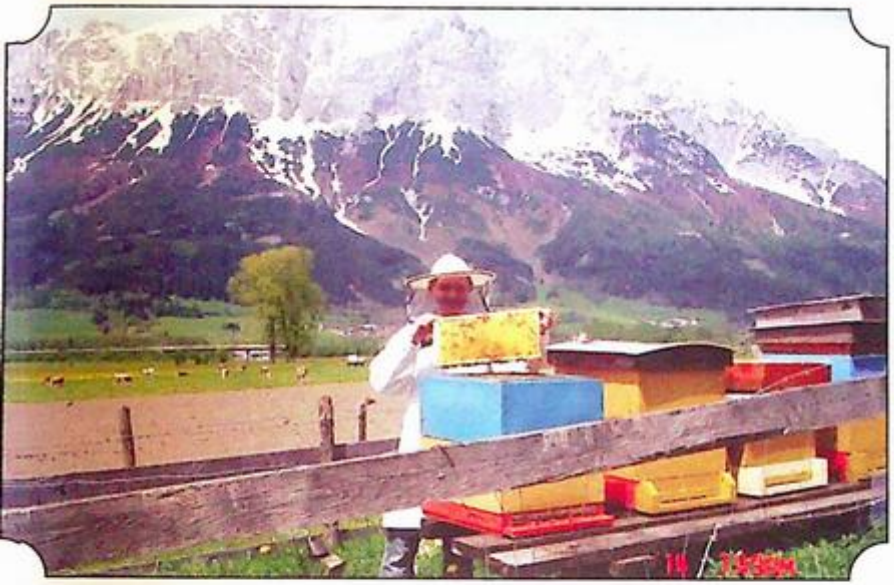
The first swarm is called "prime swarm". A second swarm may emerge 7-8 days after the prime swarm. If the colony is strong enough, a third swarm may come out 3-5 days after the second swarm, and even a fourth and fifth several days apart. The first and second swarms are strong, in the form of a cluster the size of a human head or even a horse's head. The ones after those two will be fewer. The first and second swarms that emerge during April and May before summer are very valuable. That year, they will produce plenty of honey, and even an afterswarm if the seasonal conditions are favourable enough.

HOW TO FORESEE A SWARM

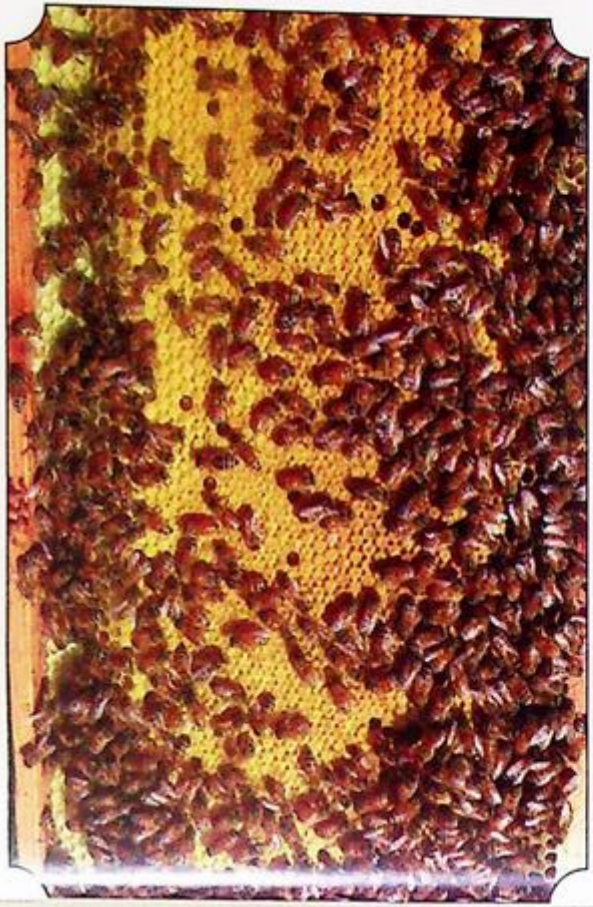
The queen-cell cups seen at the lower and lateral parts of the combs when the hive is opened are the most distinctive indication of an imminent swarm. A hive that is about to swarm will have bees piled up infront of the hive, on the hive body or under the flight board. However, this can be observed sometimes during extremely hot and humid summer months, as well; so, it should not be immediately perceived as an imminent swarm. When we listen to the hive for a few minutes in the evening, we can hear a rather deep, distinctive sound like a duck's quack from inside. This is the sound of the queens of the hive that is about to swarm. There is no need to be afraid of being stung by swarm bees; they will hardly attempt to sting since they have filled up their sacs with honey as they leave the hive. This storage of honey will enable them to immediately start building combs in their new nests which they are placed into after having been caught. A strong hive can draw out an entire frame of foundation overnight, and the old queen that was impregnated during the prime swarm can lay eggs into these combs cells even that same night.

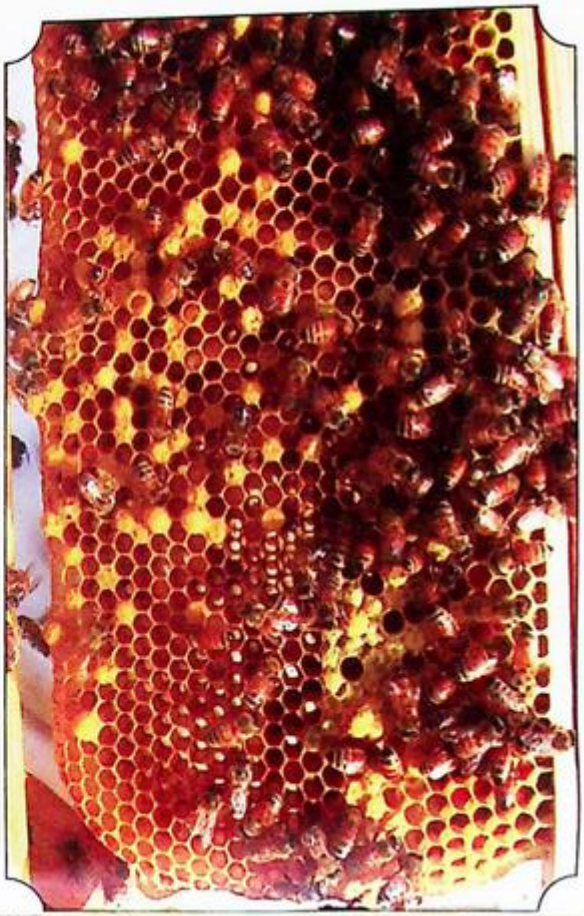
HOW TO PLACE SWARMS INTO MODERN HIVES

Since the queen of the prime swarm is an old one, she will usually not venture too far away. Instead, she will land on a spot within a radius of 5-20 metres from the hive location. The queens of the afterswarms, on the other hand, will be young and light in weight, so they may abscond farther. Therefore, you can do the following before the swarm is still roaming in a puzzled and hesitant state above the apiary and has not yet chosen a certain direction to fly away to: if you have some bee balm around your apiary, crush and rub the leaves in your palm to attract the swarm, or purchase a commercial product that attracts swarms and sprinkle it towards a suitable spot, like a



Inspection of Bees





Bees ventilating the bee hive.

Swarm

branch of tree, or even into the air. Nine out of ten cases, this will ensure that the swarm lands on a nearby place.

Some people try to generate a clinking noise using tin containers, or to throw earth, in order to attract the swarm's attention, but none of these will have an effect on the bees. The best way is to spray water, or throw water into the air by using a pitcher, in order to simulate an imminent rainfall. While previously clipping 1/3 of one of the wings of the queen will prevent her from flying far away, this is not recommended due to the possibility that she may fall down on the ground in the process. A swarm that has lost its queen for some reason will return to its old hive. Swarms are usually cast between the hours 08:00 and 15 or 16:00 on a calm and windless day with a fine weather. They may also be cast between the hours 07:00 and 18:00 under hot and humid weather conditions.

WHAT IS AN ARTIFICIAL SWARM?

An artificial swarm is the swarm collected by the beekeeper him/herself any time he or she chooses to do so, without waiting for the colony to produce a natural swarm.

HOW TO COLLECT AN ARTIFICIAL SWARM

There are many methods available. An artificial swarm can be collected from one strong hive as well as two or more hives. What is essential is to obtain a small hive of 4-6 frames, full of bees and broods of all ages. If an artificial swarm is to be collected from a 10-frame hive: five frames, together with their bees, are removed and placed into the other hive in the evening. If the swarm is to be moved far away, it will be useful to shake another frame of bees into the hive. To prevent field bees to go back to their old hive, their artificial swarms should be taken at least 5 km away from that area for a period of 10-15 days. If you are going to use two hives for the collection, you should take

only the bees from one hive, and only the brood/honey/pollen-filled frame from the other. When collecting artificial swarms, one of the colonies will naturally be left queenless. The following four options are considered for queening a queenless colony: a)To introduce a queen already available, b) To introduce a frame of eggs and day-old larvae, c) To unite the hive with a weak hive that has a queen, d) To introduce queen-cell cups that are capped.

The hive, from which an artificial swarm is to be collected, should be housing a good genus of bees, preferably among the beekeeper's favourite colonies in the apiary. This colony should have a queen that lays plenty of eggs. It should also have bees of a calm disposition, with a high capacity to collect and store honey, and should not cast too many swarms too often. You should never collect an artificial swarm from hives with less than 8-10 frames, which contain agressive and stinging type of bees that are keen on robbing. Artificial swarms can be obtained by considering the above points, and taking only the bees from traditional hives.

BENEFITS OF AN ARTIFICIAL SWARM

We know that swarming, in the sense of a swarm leaving its hive and landing on another place, takes place in as short a time as 2-3 minutes. In case we fail to notice the swarm in that short time, we may miss the swarm we have been looking forward to for months. Such an upsetting possibility will be eliminated if we collect artificial swarms.

We can obtain artificial swarms from our strong hives during the most flower-rich periods, such as the second half of April and then May, which will yield plenty of products from swarm bees in that year.

We can obtain an artificial swarm at any time we wish, such as a weekend when we are not busy with anything else; a

natural swarm cast on an unexpected day, however, may catch us off-guard. Our hives, or frames fitted with foundations may not be ready, or we may decide against collecting a swarm due to another important job that day. Therefore, it will be more beneficial to collect artificial swarms.

We can also increase the number of our hives by collecting artificial swarms, without waiting for our bees to cast natural swarms.

DISADVANTAGES OF NATURAL SWARMS

Natural swarms compel the beekeeper to wait in the apiary from 8 o'clock in the morning until 16:00 in the afternoon during swarming season. The swarms will abscond unless the beekeeper waits during that period.

A natural swarm considerably decreases the honey yield of a hive, as well as prepares the most suitable environment for bee moths to cause destruction in the hive, condemning the queen bee to die off.

A natural swarm may sometimes land on such inconvenient spots that collecting it may become very difficult or even impossible.

At times, several natural swarms land too close to one another, or even on top of one another, making the job of the beekeeper very difficult.

10 days prior to the casting of a natural swarm, the colony becomes less and less active and all work in the hive slows down. Furthermore, the beekeeper will incur a great loss in case the natural swarm happens to be cast during the greater honey collection period of the region.

PART 6

HONEY PRODUCTION

INTRODUCING NEW COMBS INTO DEVELOPING COLONIES

As a colony develops and becomes stronger, combs with foundation, or drawn-out extracted combs from the previous year, are added 1-2 at a time. To do this, all of the existing frames in the hive, particularly those farthest to the rear and sides, should be covered by bees. If the frame that is located farthest to the side contains broods, the new frame is inserted right behind it. If the said frame does not contain broods but honey or pollen, or is covered by bees, it is placed to be farthest away and the new frame is inserted right before it. It will be wrong to insert the new frames into the middle of the colony. When all (or minus one) of the frames in the lower storey are full and new white combs are observed on the upper side of the frames in the brood chamber, we place a second storey (called a "super") on the hive body, again with all of its frames full. We then place an inner cover on top of this super, and a top cover on top of the inner cover.

It will be useful to insert 1-2 frames of honey-filled or brood-filled combs into the super, as well as keep the super top warm, so that the bees can easily move up to the second storey.

ADDING A SUPER

When all (or minus one) of the frames in the lower storey are full and new white combs are observed on the upper side of the frames in the brood chamber, we add a second storey, called

a "super", to the hive body. No division board is used for a super. The box is entirely filled with frames of combs. When placing the super, the inner cover is removed from the lower story and placed on top of the upper storey. To make the bees work in the super: if the hive is a standard Langstroth, we remove one or two honey-filled or brood-filled frames from the lower storey and put these into the upper storey. Then we insert the empty frames in the top storey into the spaces of the frames we have just removed from the lower storey. This way, we force to the bees to work in the top storey as well as help prevent a swarm of this hive, thereby also allowing a new space for the queen to lay eggs. With honey-producing hives, it is essential to extinguish the swarming drive as much as possible. To make the bees (of a hive with shallow box) work in the upper storey: either a frame of brood-filled combs is removed from the lower storey and fitted to the super frames, or the super is left in the lower storey and the brood chamber in the upper storey for a while. However, none of these will be necessary with a well-timed supering in strong hives.

HONEY HARVEST

In modern beekeeping, honey can be harvested 2-3 times a year. We can collect the fully ripened honey found in the super or to the sides of the brood chamber when we need it. These honey-filled frames are replaced either with foundations or with drawn-out extracted combs. If the conditions of the season are favourable enough, the bees will easily fill these combs with honey once again.

When the super is full, it is separated from the hive body and placed somewhere around the hive. The inner cover on top of the super is not removed. Either a spare inner cover or a piece of sack cloth is placed on the hive body, and the top cover is replaced. Then, the inner cover on the super is removed and the honey-filled frames are moved, one by one, to the hive door,

where the bees on them will be shaken off. After any remaining bees are brushed towards the front of the hive by using a feather or bee brush, these honey-filled frames are taken into a closed box or room. Once the frames are removed from the super, again the inner cover should be immediately replaced.

HOW TO RECOGNISE RIPENED HONEY

Honey has ripened if all or at least more than 2/3 of the honey-filled cells on a frame are capped. Bees begin to cap a honeycomb from top to bottom. Honey on an uncapped frame has not ripened; and unripened honey will turn sour and go to waste. To enable a quick ripening, an excellent ventilation should be ensured inside the hive by expanding the flight entrance and opening the feeding hole. This is why bees flap their wings infront of the hive door, while facing the hive, during evening and nighttime; it enables any excess water in the honey to evaporate, thereby helping the ripening process. If the frames are full, their honey has ripened, yet there are still a few centimetres of uncapped sections towards the lower parts, you can help the bees to cap those sections by giving them syrup. Sale of comb honey that is not fully sealed is against Foodstuffs Law. Such sales can always be prohibited by the authorities concerned.

EXTRACTION OF HONEY

While there are those who extract honey by exposing it to sunlight or fire, this is not a good method. The best way is to extract it by using an Extractor. This machine is like a stove with a closed bottom and an open top, and a vertical iron bar fitted right into its centre. Surrounding this iron bar are 2-14 frame baskets of wire mesh, into which honey-filled frames are inserted. The baskets are turned by rotating a gearset with a handle, which is fitted on top of the iron bar. The honey on the frame that has previously been uncapped by an uncapping knife or uncapping fork will be flung off the frame as a result of this

high-speed rotation, will hit the inner wall of this galvanised extractor made of nickel sheet, and run down to finally pool at the bottom. The extracted honey is then collected by opening the tap that is located at the lower part of the extractor. The extractor should be sped up gradually. It should be stopped to turn over the other side of the frame before the honey on one side of the frame has completely run out; otherwise, the pressure applied by the honey on the other side will damage the wax. When the other side is completely finished, you can turn over the side that was left unfinished and run the machine until all honey has been extracted. Foreign objects such as crumbs of wax will surface if the extracted honey is left to rest in deep containers.

RE-INTRODUCING EXTRACTED COMBS INTO HIVES

Empty frames removed from the extractor during the last harvesting season should be re-introduced into the hive by arranging them in the super, so that the small amount of honey on them will not go to waste and the empty combs will be easily stored in a clean state until the following year. The bees will then clear up any leftovers that have remained in the comb cells as well as fix these combs.

STORING EMPTY FRAMES UNTIL FOLLOWING YEAR

Considering the fact that drawn-out combs are a beekeeper's most valuable asset and that bees have to consume a minimum of 10 kg honey to be able to produce a honeycomb of 1 kg, any drawn-out combs should be properly preserved to remain unspoiled until the following year. Empty combs are stored either in fully enclosed boxes or cabinets, or in empty super and brood chamber boxes with tightly closed tops and bottoms.

The main threat to empty combs is the wax moth. Combs stored below 10 degrees will not attract moths.

PART 7

TOOLS AND EQUIPMENT USED IN BEEKEEPING

BEE VEIL

There are many types of veils, such as 'Hooded Veil' which is put over the head and tied around the neck, 'Pullover-type Veil' which protects both the upper body and the arms, or 'Coverall-type Veil' which covers the entire body.

Veils can be made from nettle cloth, calico, or thicker cloths such as gabardine with a variety of colours, meshwork made of metal, plastic or tulle, which will allow plenty of air without preventing the beekeeper from seeing the broods and eggs. Tulle and wire meshwork should be dark-coloured instead of white, so that the eggs and larvae in the comb cells can be easily seen. On the other hand, dark-coloured clothing made of velvet or wool is not advisable. Instead of such materials, or dark colours in general, which annoy bees, it is better to use white or light-coloured fabric. Veils should allow plenty of air inside so that the beekeeper will not get exhausted from heat and sweat when dealing with bees, working more comfortably, enjoyably and easily.

BEE SMOKER

Bee smokers may be large, medium or small in size, and are made of galvanised, stainless steel, and leather, instead of vinyl, for greater durability. They can be used for long years, provided that their interior is well cleaned after use and that they are not left in wet, damp places. Bee smokers are first filled with cinder or ember, and then fed with such smoke-producing materials as pieces of clover, tinder, dry corn cobs, or cardboard. The resulting smoke is then blown by manually pressing the bee smoker.

Alarmed at the smoke, bees will first head to the combs in order to swallow plenty of honey. As their stomach will be filled with honey, they will calm down and will neither sting nor fly away. The bee smoker is used particularly during honey harvest, as well as during transfer, sometimes in uniting the colonies, in case of robbing, and also to be able to easily remove the frames by driving the bees away from frame lugs. Firstly, light waves of smoke are applied 2-3 times through the flight entrance when opening the hive, and again when removing the inner covers. Applying heavy waves of smoke and causing flames and sparks is wrong as this will only serve to further irritate the bees, making them more aggressive.

BEEKEEPER GLOVES

There are specially designed beekeeper gloves with long sleeves up to the elbow. These are made of leather and vinyl. The part between the wrist and the elbow is made of cloth, and the edge is tightened by rubber. While there are also various types of rubber gloves in the market, the thin material cannot prevent stings as well as causes a lot of sweating.

HIVE TOOL

This is a piece of iron/steel made of flat iron/steel with a width of 3 cm and length of 25 cm; both of its edges are as thin as a knife's edge, with 2-3 cm of one of them bent at an angle of up to 90 degrees. 5-6 cm of its central part is filed and trimmed at both sides for comfortable handling. The bent edge is inserted inbetween two frames in order to separate them from one another, while the flat edge is inserted under the frame top bar in order to lift the frame up.

BEE BRUSH

Bee brush is useful for sweeping any remaining bees off the frames during honey harvest, for driving any swarm bees that have landed on a tree trunk or a wall towards the box, and for

transfer operations. A bee brush will remain serviceable for a long time if kept dry in a nylon bag after its hairs are thoroughly cleaned, removing any honey stuck on them. If you do not have a bee brush in your apiary, you can use the feathers of a duck, turkey or eagle, or the straws of a broom, or a bunch of plants instead.

SPUR EMBEDDER

This is a simple tool, with its tip fitted with a wheel that has grooves, and is used to embed frame wires into foundation. For this purpose, we take a well-sandpapered, smooth, 12 mm thick piece of moulded wood made to fit into frame size. After securing the foundation to the frame top bar groove, we lay the waxed frame down on this wood, making sure that the wires remain on top. We gently press its tip onto the wires in order to embed them into the foundation.

If the weather is cool, it will be useful to slightly heat the tip in warm water or near fire. Overheating it or pressing it hard onto the wires will cause the foundation to break off. If the temperature is 20-25 degrees in the room or outdoors, the wires can be easily embedded without requiring any heating beforehand. Unless the surface of the moulded wood is polished, the foundation may stick to the wood. To prevent this, you can simply place the sheet of the foundation onto the moulded wood.

BEE FEEDERS

There are many types of feeders. Feeders are used to feed and strengthen bee colonies during spring and autumn. The fundamental point to consider here is to ensure that the bees can receive the syrup easily and in small doses in a closed container, without causing any robbing in the process. Feeders are made of galvanised sheet, plastic and wood. Since it is

important to prevent the syrup from quickly cooling down, feeders provided from under the top cover of the hive find widespread use and are more convenient. There are also plastic feeders with one edge designed to enter through the flight entrance. These are used mostly during extremely hot seasons so that the syrup will not quickly cool down. At cold nights, bees cannot move down to take the feed, in which case the feed will also become cold. There may be danger of robbing unless the feeder is removed from the flight entrance during the day. Frame-type feeders can also be used; however, in that case, the bees may catch a chill since it will be necessary to open the inner cover in order to feed them. An opening in the centre of the feeder top frame bar or feeding via a funnel through a hole in the inner cover will prevent such possibility. This is the feeder type that is used by migratory beekeepers the most. Box-type feeders that are placed under the hive cover can also be used by inserting empty supers. The only disadvantage of this type of feeder is the inconvenience of having to open and then close the hive covers each time. Such inconvenience will be eliminated with feeders provided through the flight entrance. Feeders made by fitting bars to the sides and the centre of the inner cover are also inexpensive and convenient.

UNCAPPING KNIFE

Uncapping knives are made of nickel-plated steel of good quality; the rear surface of the 20-25 cm-long blade is flat while the front surface slightly slopes down to both sides, with a very comfortable handle. They are used to uncap the honey-filled frames to be placed into the honey extractor, as well as during honey harvest in traditional hives and during transfer to modern hives. The knives should be first heated in hot water so that they can easily peel off the sealed honey, without damaging the comb cells. There are also electrically heated uncapping knives in the market.

UNCAPPING FORK

Just like uncapping knives, uncapping forks are used in uncapping comb cells, but they are relatively more convenient to use. Uncapping forks do have a disadvantage of possibly causing slight tear on the comb cells; however, unlike the knives, they do not have the inconvenience of having to be heated before use or causing some water to leak into honey during uncapping. Consequently, honey obtained by using uncapping forks is considered better and more desirable. Uncapping knives or forks are tools required to be used in order to be able to remove the honey in the comb cells through centrifugal force; attempting to perform this operation by using conventional knives will cause more trouble than any benefit.

QUEEN EXCLUDER

Queen excluders are made of zinc sheets cut out lengthwise with 4,2 mm spacing or of round-shaped hard wires arranged side by side with the same spacing. There are also plastic excluders with the same dimensions. Those made of zinc are considered not desirable despite their ease of use, since they damage the bees' wings. Their main advantage is that, when inserted between two storeys, they easily fit in place and do not leave any clearance at the sides. To compensate for that, wire excluders have a support of bars run around the grid. Queen excluders block the passage of queen bees and drones, allowing only worker bees to pass through. Therefore, they are used mostly by those beekeepers who intend to sell comb honey or obtain section honey; without the excluder, the queen will cause a darkening of the brood cells when she lays eggs into comb cells, as will the drones when they remain on the combs.

QUEEN CAGE

A queen cage is used to introduce a queen into queenless hives, as well as keep the queen inside for a temporary period or

ship her to another location. The use of a queen cage for introducing a queen into a queenless hive aims to prevent the colony in the hive from killing this new queen, by making sure that the new queen acquires the colony's specific scent. There are various types of queen cages, such as those in the form of a large matchbox fitted inbetween two frames, or those fitted directly onto honeycombs and confining a queen and several worker bees inside. They can also be made by bending the sides of hard screen wires.

POLLEN TRAP

Fitted infront of the hive flight entrance or infront of an opening inbetween two hive bodies, this small wooden box has a plastic sheet that can be inserted all the way through it.

The pollen carried inside the tiny baskets found on the hind legs of incoming bees will be trapped as the bees enter such opening, and will be falling down onto collection boxes of plastic which are installed underneath a wire screen mesh with a spacing of 3 mm.

In recent years, modern hives may also have pollen traps fixed on the bottom board.

The beekeeper should collect the pollen every day, place them on special dryer tools or clean wood without waiting for more than 1-2 days, have them dry to contain maximum 5% water in the shade, and then keep them in tightly closed jars or plastic bags. They can also be consumed fresh, mixed in honey. In that case, they must be preserved in a refrigerator.

FRAME WIRE

0,26 mm galvanised wires are available in coils of various weights, as well as in wooden or plastic rollers of various sizes. The wires must be extremely durable so as to prevent any break

or loosening when they are stretched across a frame. Wires that are not sturdy enough are not likely to be tied as firm and taut as a stringed instrument's wires. When honey- and comb-filled frames are processed by a honey extractor, any frame that is not wired properly may crack open at its centre, damaging the combs and causing the beekeeper to lose his or her most valuable asset: the drawn-out combs. To prevent oxidation of these wires, which a beekeeper should always have spares of, they should be kept inside air-tight paper or plastic bags in a dry place. Using copper wires out of electric wires will be wrong.

HONEY EXTRACTOR

Honey extractor is a mechanical machine consisting of a cauldron made of galvanised sheet and stainless steel with 2-6 frame baskets to hold the frames in and a spindle at its centre, and a gear assembly to rotate these frame baskets.

Honey extractor in modern beekeeping is a very valuable and expensive device that is a must-have for extracted-honey producers. The frame baskets are typically manufactured to easily hold Dadant frames (30x44) or Langstroth frames (25x44) inside.

After having been uncapped by using uncapping knives or forks, honeycombs are placed into the frame baskets of the honey extractor. The honey inside the comb cells held by the drum, which is rotated by turning the handle attached to the gear wheels, will be flung off by centrifugal force towards the cauldron's inner wall. Running down the inner wall and pooling down at the bottom of the cauldron, the honey is then collected through the special taps at the lower part of the machine.

These machines have also electrical versions that can hold 40-60 frames, which are called "Radial extractors".

PART 8

BEE HIVES

ADVANTAGES OF MODERN HIVES OVER TRADITIONAL HIVES

Following the below brief list of the advantages of modern hives over traditional hives, the means with which to obtain these advantages will also be shortly explained.

Whereas we cannot open a traditional hive whenever we need to check what is going on inside or to find the queen bee, we can easily open a modern hive and intervene as required: for example, we can replace the old queen with a young one.

We can conveniently take honey from the hive without harming the bees.

In modern hives, we can strengthen the colonies by uniting the weak colonies and consequently obtain strong bees to forage for plenty of honey during the honey collection season.

We can prevent any excess reproduction of drones, which actually do nothing but eat the honey in the hive.

We can easily move modern hives to flower-rich areas, without losing a single bee during the transportation.

We can obtain swarms from any strong modern hive we choose.

We can easily prevent the hive from swarming in order to receive plenty of honey.

We can strengthen the colony by feeding the bees during spring. Similarly, we can feed them syrup during autumn in dry years and save the hive from a possible die-off in winter.

We can obtain clean swarm honey by placing a queen excluder inbetween the brood chamber and the super.

We can prevent our bees from dying from cold in winter.

We can save our hives from the harm caused by bee-moths.

We can guide the bees to produce honey instead of wax, by introducing ready-made foundations into the hives.

We can prevent swarm bees from absconding far away, by clipping one of the wings of the queen bee.

TYPES OF MODERN HIVES

1-Langstroth hives
2-Dadant hives

The differences between these two types of hives are as follows.

A Langstroth hive's frame inner dimensions are 22x42 cm, while this is 27x42 cm in a Dadant hive; so, Dadant hive frames are 5 cm deeper than Langstroth's.

A Langstroth hive holds 10 frames, while a Dadant hive holds 12 frames in one storey.

The brood chamber in the lower storey and the supers in the upper storeys are all of the same size in a Langstroth hive, while Dadant hives have shallow boxes: their frame dimensions are 17x42, i.e. not the same as the lower storey.

Whereas Langstroth hives are made of 2,5 cm thick wood, Dadant hives are made of at least 3 cm thich wood.

DADANT HIVES OR LANGSTROTH HIVES FOR STARTING OUT BEEKEEPING?

While working with Dadant hives in flower-rich areas with high altitude and tough weather conditions will be more

productive and beneficial, it is relatively more difficult to manage Dadant hives. In addition to the fact that their lower and upper frames are not of the standard dimensions, they are also heavier. The weight of a full frame in a Langstroth brood chamber or super is around 3 kg, while that is no less than 4,5 kg in a Dadant hive. Dadant hives offer higher productivity, but they are also more costly. It is easily possible to convert a Langstroth hive's brood chamber into a 10-frame Dadant by raising it up with a wooden support of 5 cm width, it is relatively more difficult to convert a Dadant into a Langstroth.

WHAT ARE THE COMPONENTS OF A BEE HIVE?

Bottom Board: the floor of the hive body.

Brood Chamber: a box in the shape of a drum with an open top and bottom.

Super: a box with no top or bottom, similar to the brood chamber.

Inner Cover: can be made of several pieces of wood, cloth or thick glass.

Top Cover: a hingeless cover for weather protection for the hive.

Frames: Upper bar: has a width and thickness of 24 mm. Cut at half-width, leaving a rim of 18 mm at both ends. 47,5 cm long.

Side bars: upper side is 36-38 cm long. Lower sides from 9 cm on have a width of 2 cm and a thickness of 1 cm.

Standard length is 24 cm.

Lower bar: 42 cm long, 2 cm wide and 1 cm thick.

DIMENSIONS TO CONSIDER WHEN BUILDING A BEE HIVE

The fundamental characteristic of a modern hive is the ease of removing and replacing the frames on which the bees will be living and producing honey and brood. If you use narrower sizes than the ones given below, the bees with their propolis will cause the frame to stick to the hive; similarly, if you use wider sizes, the bees will build combs inbetween, disrupting the entire order.

Therefore, it is highly important to consider the simple dimensions given below, regardless of the type and shape of your hive.

The clearance between the hive bottom board and the frame lower bar should be between 1.5 – 3 cm. The standard clearance is 2.5 cm. If it is less than 1 cm, the hive will be neither ventilated properly nor saved from the harm to be caused by bee moths.

In addition, the clearance between the frame side bar and the hive inner surface should be 6-7.5 mm.

Furthermore, the clearance between the hive top bar and the inner cover should be 8-10 mm.

The clearance from the centre of one frame to the centre of an adjacent frame should be 36-38 mm. If not, you must ensure this 36-38 mm clearance by using your fingers to create the space.

The key to building a modern hive is to ensure this accuracy in dimensions. Amateur beekeepers should adjust their frames according to the above dimensions if they are going to build a hive without destroying their boxes (the size of two empty tin containers) they keep at their homes.

HIVE FLIGHT ENTRANCE

Hive flight entrance is left to be 1 cm high and 20 cm long. Dormice may enter the hive in winter if the flight entrance is made higher. It is also possible to open 3-5 flight entrances in the shape of conic triangles at the front of the hive by using a handsaw. This is a common practice in England, where it is believed that this provides much better air circulation.

The flight board should be at least 5 cm wide. This is fixed. There are also hinged versions used for the purpose of fitting more hives into trucks and easily closing the flight entrance during transportation.

PART 9

DISEASES, PESTS, AND ABNORMAL CONDITIONS IN HONEYBEES

AMERICAN FOUL BROOD

This disease causes great problems for bees and beekeepers throughout the world. Its agent is the Gram-positive, spore-forming Paenibacillus larvae with flagella. It is Catalase-negative, and does not cause disease in adult bees. It can survive for long years by forming spores under unfavourable ambient conditions.

INFECTION

Infection typically occurs for such reasons as using previously-infected hives or unsterilised tools and equipment, uniting diseased and weak colonies with health colonies, or feeding the bees with honey of unknown sources. In addition, the spores of the disease are carried over into healthy hives during a robbing of an already weakened hive by other bees. Broods dying from this disease will putrefy and remain inside their cells. Worker bees infect other cells through the spores they themselves get infected with while throwing such dead broods out of the hive.

LIFE CYCLE

Infection in bee larvae takes place via oral intake of spore-infected food. Worker bee and drone larvae do not get infected since they are fed with royal jelly for the first three days. However, they get infected later when they begin to be fed with pollen and honey. Intake of the spore form of the bacteria is required for the disease to develop. The larvae orally receive

the spores, together with their food, into their digestive system. A day after entering the system of a larva, the spores move down into the intestines and take the form of bacillus bacteria. The bacillus form then moves into the haemolymph and begins to multiply. This is the stage where the intensity of the disease grows. The bacilli spread inside the body by completely eating out the intestinal walls of the larva that has entered the prepupal or pupal stage. The broods die 9-10 days after that. Dead broods take on a jellified form with a dark brown colour. Uncleaned comb cells will be a dangerous source of infection.

SYMPTOMS

Cells containing the broods that have died from the disease cannot be cleaned easily. In that case the brood-filled area will have a disorganised look, since the queen bee will not be laying eggs there until the area is clean enough.

The bees that have died from the disease take on a liquid, soft, jellified form inside the cells. If a matchstick is inserted into an affected cell and then withdrawn, a 6-8 cm long "rope" is pulled out with the stick. This is a defining characteristic of American Foul Brood. However, such "rope" does not necessarily indicate this disease. Various other bacteria may also cause the formation of such "rope" in certain other diseases, such as European Foul Brood.

In AFB, a sour, glue-like smell caused by putrid broods is noticed when the hive is opened.

The rate of growth of the affected colony will decrease, with a significant drop in the number of adult bees and broods. Pollen and nectar collection activities by the bees will be reduced.

The colour of the larvae turns yellowish, and eventually brown.

The deaths usually occur in capped cells.

Dying larvae will be watery and sticky, and will stick to the cell floor. It is quite difficult to throw the sticky mass out and

clean the cell. The mass will dry up over time and cover the cell floor in the form of a layer of millions of spores.

If the brood has died in its pupal stage, its tongue will harden and puncture the comb cell. This is not the case with European Foul Brood as deaths in EFB usually occur during the larval stage.

DIAGNOSIS

It is easy for an experienced beekeeper to diagnose the disease simply by observing its symptoms. However, no matter how experienced you are, there is still the risk of confusing this disease with certain other diseases. Therefore, a sample of the suspected hive should be taken and sent to a laboratory. Diagnosis of the disease will come out following laboratory examinations also including all symptoms.

The Holst milk test is based on the proteolytic enzymes produced by the sporulating bacteria. 3-4 ml of 1% powdered skim milk is put into a a glass vial. A matchstick is inserted into a diseased cell, and the mass that comes out is dipped into the solution inside the glass vial. The vial is then kept at 36°C for 15-20 minutes. If P. Larvae spores present, the smear in the solution will clear. No proteolytic enzymes are produced in European Foul Brood or Sacbrood. There will be no clearing since the milk protein cannot be splitted in that case. A Catalase test will be conducted, as well.

PROTECTION

There is no specific treatment method related to this disease. While there are beekeepers in Turkey who still attempt to treat the disease by using antibiotics with their bees despite the fact that this is prohibited, such an attempt will only cause the disease to recur since antibiotics do not affect the spores. Therefore, the most important point here is protection.

Diseased hives should never be transported.

Certain operations such as uniting weak colonies or reinforcing with brood-filled frames should be carried out after the inspections.

All beekeeping-related equipment should be disinfected and kept clean.

Remnants of comb or honey should not be left around.

Hives should be strengthened, and fed with vitamin-containing syrup and bee candy whenever required, thereby ensuring increased resistance and minimum susceptibility against the disease.

Honey, swarms or colonies of unknown sources should not be allowed into the apiary, and any drifting should be prevented.

Control against other bee diseases and parasites should also be carried out.

If the disease is at a rather advanced state, the bees should be destroyed by burning, together with the frames, excluding the hive body.

This disease is included in the notifiable diseases, and cannot be treated using any chemical medication. The best way of protection is to take protective measures.

Potassium hypochlorite and formaldehyde (2%) can be used in the disinfection of infected equipment and combs. However, one should be careful when applying these, especially formaldeyhde, because honey will absorb the formalin which can be a deadly solution for bees. Any honey or comb which has absorbed formalin should be destroyed, and not given to bees.

Lye: If no potassium hypochlorite is available, metal bee-keeping equipment can be disinfected also by boiling them in 1% lye for an hour. Other than these, you can use zephiran (benzalkonium chloride), hydrogen peroxide, and chloramine, as well.

EUROPEAN FOUL BROOD

Its agent is Melissococcus plutonius. However, usually Bacterium eurydice, Bacillus alvei and Bacillus laterasporus may also be present in the environment when this disease occurs. As particularly the presence of Bacillus alvei causes putrefaction and "rope" formation in dead broods, the disease may easily be confused with American Foul Brood.

INFECTION

Infection typically occurs for such reasons as using previously-infected hives or unsterilised tools and equipment, uniting diseased and weak colonies with health colonies, or feeding the bees with honey of unknown sources. In addition, the spores of the disease are carried over into healthy hives during a robbing of an already weakened hive by other bees.

LIFE CYCLE

The larvae receive the bacteria into their digestive system through the food brought by the nurse bees. The disease then develops inside the stomach and the intestines. After the larva has entered its pupal stage, the agent is thrown out of the intestines into the comb cell by excretion. These wastes in the comb cell is taken and thrown out by worker bees during cleaning. However, the other larvae are also transmitting the bacteria in the meanwhile.

Since the patogenic bacteria will rapidly consume the broods' food and intestinal content, the larvae enter the pupal stage in a very weak state or simply die during this stage. The deaths increase as other pathogens kick in at the opportunity.

SYMPTOMS

o The brood-filled area of the comb looks disorganised, with the capped and uncapped cells in a disorderly arrangement.

o Deaths are observed usually in uncapped cells during larval stage (90%). If death occurs after the cell is capped, i.e. during pupal stage, then the cell cap is punctured and its colour becomes lighter.

The larva turns yellowish first, then brown, and eventually black.

o Dead larvae are watery and soft.

o The rate of growth of the affected colony will decrease, with a significant drop in the number of adult bees and broods. Pollen and nectar collection activities by the bees will be reduced.

o The colour of the capping on the capped comb cell becomes dull, and the capping sinks inwards.

o Dead larvae become watery and soft at first, and then take on a hardened pulp-like form.

o Dead larvae do not adhere to cell floor.

o The hive reeks of putrid flesh.

o The larvae of each caste of bee will be infected by this disease.

o Since the diseased larvae will usually be thrown out by the nurse bees, the disease may go unnoticed in strong hives for a long time. However, in case of too many deaths and weak hives, the larvae cannot be thrown out and begin to putrefy inside the comb cells.

o Dying larvae curl up in the shape of "C" on the cell floor. They do not adhere to the cell floor and can be easily removed by inserting a matchstick into the cell.

o When a matchstick is inserted into such cell and then withdrawn, a 2-4 cm long "rope" is pulled out with the stick.

PROTECTION

Protection should be emphasised here, as there is no specific medication for the control of this disease.

- Since the mode of infection and spread of the disease is quite similar to that of American Foul Brood, the protection and control methods are generally the same as those for AFB.

- Diseased colonies should not be moved elsewhere or united with other colonies.

- The colonies should be strengthened via syrup and bee candy.

- The tools and equipment in use should be clean.

- The foundations, pollen etc. in use should be clean.

- Control against other bee diseases and parasites, particularly varroa, should also be carried out.

- Robbing and drifting should be prevented.

- Infected honey, pollen, syrup or candy should not be used in feeding.

- The queen bee should be replaced with young queens.

DISPOSAL OF BEES IN FOUL BROOD

It becomes hardly possible to prevent AFB via medication when the disease has reached its advanced stages. In that case, the entire colony and the frames (together with the combs) should be destroyed by burning these. The bees should be destroyed first, during evening. To do this, firstly the hive flight entrance is closed; bees are killed by applying calcium cyanide, ethyl acetate or any other insecticide onto the frames. After digging a hole in the ground, the frames (together with the combs) and the dead bees are gathered together and burnt by pouring gasoline etc. on them. Following the completion of the

burning operation, the hole should be covered by earth. All these operations should be performed at a safe distance from the apiary. A heat-resistant hive and its components including the hive body, cover and bottom board, as well as all of the equipment used in beekeeping operations, can only be re-used after having been disinfected by appropriate disinfectants, with their surfaces thoroughly scraped off and then burned by a blowtorch. Styrofoam hives, on the other hand, can be re-used after having been cleaned by bleach and then left to dry for 2 days under sunlight. Submission of pathological material to laboratory requires properly-diagnosed samples in any bee disease. A comb sample should be approximately 10x10 cm in size, containing (if possible) discoloured and dead larvae. The sample should contain either a very small amount of honey or none at all. It should be loosely packaged, without using such materials as plastic bags, aluminium foil, wax paper, tin or glass as these materials render a final diagnosis impossible. The sample should be shipped in wooden or thick cardboard boxes. In case it is not possible to send a portion of the comb, a comb cell that contains an adequate amount of material for testing may also suffice.

IMPORTANT DIFFERENCES BETWEEN AMERICAN FOUL BROOD AND EUROPEAN FOUL BROOD

Among the symptoms of these two diseases, three symptoms are very important. These are:

1- Dying larvae curling up in the shape of "C" on the cell floor. Since deaths in AFB occur in capped cells during larval/pupal stage, no dead larvae that are curled up in the shape of "C" are observed.

2- Dying larvae not adhering to the cell floor. Dead larvae in AFB adhere to the cell floor because of putrefaction.

3- The degree of putrefaction of the brood, observed when a matchstick is inserted into a cell that contains dead brood. In European Foul Brood, this is relatively smaller, which also causes a relatively shorter "rope" formation (2-4 cm).

CHRONIC BEE PARALYSIS

The disease agent is a virus in RNA form. It was observed in all of Turkey's geographical regions in 1991. The outbreak usually occurs during June and July, lessening in autumn. Many beekeepers confuse this disease with certain intoxications that arise from various pesticides. The optimum incubation temperature for the virus is 35°C. While the mode of infection is not known for certain yet, it is believed to take place via exchange of honey among bees.

The most important symptom of the disease involves affected bees not being able to fly when they are exposed to smoke, with constantly trembling legs and wings. They have bloated abdomens, as in the case of nosema, since the fluids in the honey sac cannot be discharged. As diseased bees lose their body hairs, they take on a shiny appearance, with their abdomen looking as if smaller than normal. The body surfaces turn a dark colour. Diseased bees die within 2-4 weeks after infection.

Brood development in the colony is negatively affected by the drop in the number of field bees due to the disease. Consequently, a decrease is observed in the number of young bees in the colony. The colony's organisation is disrupted as a result of the decrease in the number of the nurse bees.

The SBP virus destroys the nervous system of the adult bees. It spreads inside the nerve cells, causing uncontrollable contractions.

DYSENTERY

Dysentery is a non-contagious disease, where adult bees will have diarrhoea as a result of digestive disorders. This disease may occur for many reasons, such as fermented food stocks, feeding watery syrup in autumn, feeding contaminated syrup, humidity, keeping bees confined for long periods, or feeding sugar-candy, molasses, Turkish Delight or raw sugar.

SYMPTOMS

Sluggish bees with bloated abdoments, or hives smeared with yellowish to brown faeces. Unless in an advanced state, the disease does not do much harm to the colony; however, in case of accompanying nosema, it will speed up the spread of nosema. If the disease takes a severe course, mass deaths begin and the colony may die off.

CHALKBROOD

The disease agent is Ascosphaera apis, a fungus that simply uses the opportunity. A.apis spores cause disease only in bee larvae. Reproduction takes place by sporulation. Mycelia of both sexes are required to be present for sporulation.

CAUSES

In-hive humidity is naturally the most important cause of this fungal disease. If the in-hive humidity is higher than normal, the disease will spread rapidly.

There is an antagonism between bacteria and fungi. Heavy use of antibiotics to kill bacteria will create a suitable environment for this fungus, causing it to spread rapidly.

Stress (Unfavourable conditions, Hunger)

Other diseases and pests.

Unsuitable, used black combs.

Insufficient cleaning of hives by bees. Cleaning instincts are not too well-developed in certain bee races. In that case, it becomes easy for the disease to spread inside the hive that has not been cleaned properly.

Colonies susceptible to the disease.

INFECTION AND LIFE CYCLE

Fungal spores may be present in soil, plants, water sources, or among the body hairs of field bees that forage for pollen and honey.

The fungus does not cause disease in adult bees; larvae are infected via food by worker bees. Infection does not occur in the first three-day period, where they are fed with royal jelly; it occurs when bee larvae become 4-5 days old in uncapped brood cells. With time, the risk of catching the disease diminishes for the larvae. Deaths occur usually during late larval or pupal stage.

Infecting the bee larva via food, the fungal spores develop in the larva's midgut and form mycelia here. Developed mycelia then spread into the abdominal cavity by piercing through the intestinal walls, while some of the mycelia come out by piercing through the larva's exoderm. During this period, the larva's growth stops and deaths are observed. Spreading out of the larva's skin, the fungal mycelia form white clusters on the body surface. The larva gradually hardens and takes on a mummified appearance.

The resulting mummy looks white if the larva is covered by the mycelia of a single sex. That is why this disease is called "chalkbrood". If the fungal mycelia belong to both sexes, black spots or dark grey dots are observed on the mummified larva.

SYMPTOMS

As a result of a decrease in the number of bees in a colony, the optimum temperature needed for the development of drone

larvae, which are found at the outer edges of brood-filled frames, cannot be provided. If the fungal spores become active at that time, the first symptoms of the disease are observed in the drone cells located at the edges of brood-filled frames. In advanced stages of the disease, it is possible to see mummies also at the central parts of the frames. Nurse bees will remove the mummies in the capped or uncapped cells and leave these onto the hive bottom board or flight board.

Dried mummy larvae do not adhere to comb cells.

PROTECTION

The main cause of the disease is humidity. Fungi show an extremely fast development in humid environments. The fundamental protection is to lower the level of humidity.

The hive bottom board should not be placed on wet soil as the disease-causing spores will develop faster in cold and humid air.

In case of wintering indoors, any rise of humidity in the hive should be prevented, and hygroscopic cover materials should be used.

Frames filled with young bees should be introduced into the colonies weakened by the disease.

The colony should be protected from factors that cause stress, such as hunger, excess use of antibiotics, or other diseases.

The queen bee of an infected colony must be replaced.

Working with colonies that are susceptible to the disease should be avoided.

Certain agents such as brewer's yeast, powder milk or soybean flour, which are added into bee cakes for the purpose of satisfying the protein requirements of bees, alkalify the bee's

digestive system environment and magnify the development of bacteria and fungi due to their high protein content.

An effective control via medication against this disease is yet to be developed. However, there are certain applications where 0,7% thymol solution or 4% formaldehyde is sprayed onto combs.

Due to its heterotallic nature, this fungus has only a small chance of spreading even if it has infected a colony, and the bees can overcome the disease on their own.

NOSEMA

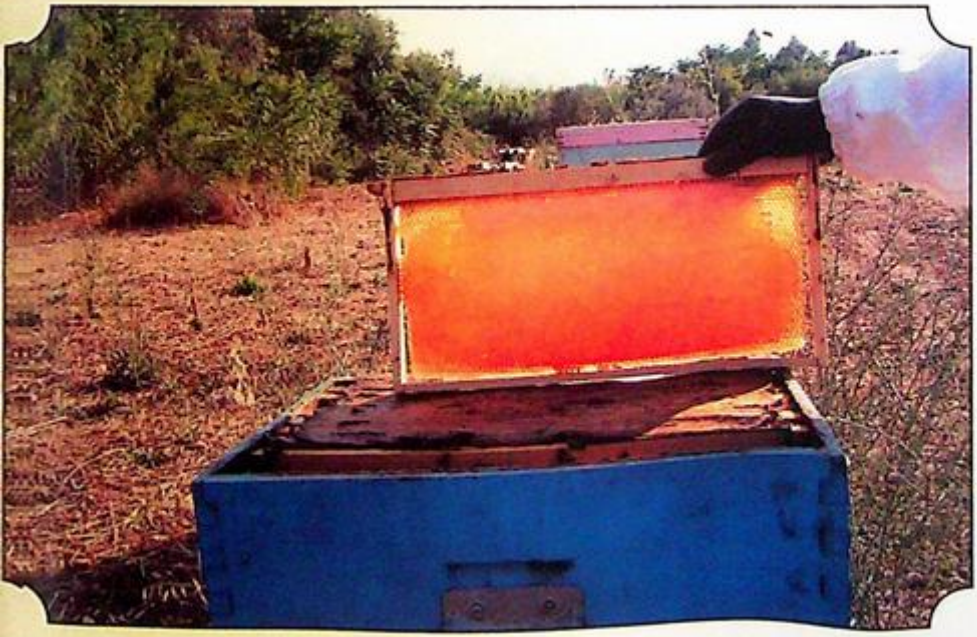
The disease agent is a protozoan called Nosema apis, which reproduces by forming spores. This is an adult-bee disease that can be observed in all castes of bee. In the while N.apis is causing diarrhoea in the bees, many other bacteria and amoebas also develop in parallel with this reproduction, causing the disease to become even more severe.

LIFE CYCLE

Nosema apis spores enter the digestive system of adult honeybees via infected food or water. Shortly after the intake, they move on to the ventriculus epithelial cells and begin to multiply here.

Having multiplied in the intestinal epithelium, the spores then destroy the cell and fall into the lumen of the intestine. Here they enter in separate epithelial cells and infect these, as well. Many epithelial cells are destroyed this way. Consequently, the functioning of the digestive system is disrupted since digestive juices can no longer be secreted.

Nosema spores are found in the faeces of an infected bee. They smear and infect the honey, pollen, combs and the bottom board of the hive. In case of extended periods of cold and rainy

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weather, the bees will not fly out of the hive and will be forced to drop their faeces into the hive, which then causes the diseases to spread very quickly.

SYMPTOMS

It is usually too late for diagnosis and treatment as the symptoms are hardly marked during the early stages of the disease, and only surface shortly before death.

In the chronic stage, restlessness, thirstiness, watery faeces, and trembling during rest are observed. The stinging reflex is also lost.

The increase of the quantity of undigested solid food accumulated in the intestines causes a bloating of the abdomen of the infected bee. Consequently, the tracheal sacs are squeezed due to the pressure applied by the bloated intestines, preventing a healthy circulation of blood. Therefore, the body cannot be provided with enough oxygen.

Due to the lack of oxygen, the bees cannot fly; they walk as if crawling, with the body and wings trembling. Such symptoms as contraction and paralysis are observed. The wings are spread.

The symptoms surface during brood development in spring, are suppressed in summer, and re-surface during October and November in autumn.

Affected by the spores, the normally reddish brown intestines take on a greyish white colour and a bloated appearance.

The underlying cause of the harmful effects of nosema is the destroyed intestinal cells.

Food cannot be fully digested as the functioning of the intestinal cells is prevented. Since the protoplasms of the epithelial cells are consumed, the amount of digestive enzymes

decreases, leading to a reduced degree of benefiting from food. The colony is weakened; brood care lessens and honey yield drops. If the queen is also infected, her capacity to lay eggs diminishes.

DIAGNOSIS

Symptoms are very important for the diagnosis. Final diagnosis, however, can only be made after examination of the protozoan spores under a microscope.

Microscopic examination is one of the methods of diagnosis. Extracted with the help of a pincer, the intestine is placed on a microscope slide in order to apply a drop of distilled water and a drop of nigrosine on it. It is then covered by a coverslip, pressing gently, and checked under the microscope. Nosema spores appear in a bright, oval form on dark ground.

PROTECTION

Taking protective measures is more important than treatment in nosema. To do this:

Apiaries should be protected from humidity;

Infected colonies should be placed into disinfected hives after treatment;

Colonies should be strengthened during spring and autumn;

Brood development should not be allowed to stop in late summer, and the number of young bees should be increased via care and feeding during these periods.

TREATMENT

An effective precaution is to give fumagillin-containing syrup to bee colonies during spring and autumn as a protection against the disease.

A syrup with a content rate of 2:1 and 1:1 is prepared in autumn and spring, respectively. A medication with an active ingredient of 25 g Fumagillin (Fumidil-B) should be added into and mixed with 25 l syrup, which should be heated first, after the syrup has cooled down. 4 l of the prepared mix should be given to each colony.

Infected hives and combs are sterilised at 49°C. For this purpose, hives and combs which do not contain bees are kept at 49°C for 24 hours, thereby neutralising the spores. For the fumigation of infected equipment, in early spring 125 cc of acetic acid (80%) is applied on an absorbent which is then placed on the frames of each hive that does not contain bees. Hive bodies are are placed on top of one another, covering any clearance with the help of tapes, and are fumigated for 1 week in this position. They are re-used after a minimum 2-day ventilation following the fumigation.

SEPTICAEMIA

The disease agent is the bacteria identified as Pseudomonas apiseptica. The disease is also known as blood poisoning. This is a non-sporulating, Gram-negative bacterium.

INFECTION AND SPREADING

The disease-causing bacterium is found in wet soil, slack waters, swamps, and plants. It enters the bee's tracheal system by various means, then moves into the blood fluid and causes disease here. The disease is encountered particularly in colonies with insufficient ventilation and high humidity. It also emerges in bees that are fed intensely with artificial food.

SYMPTOMS

Bees infected with this disease die rapidly. Normally pale yellowish in healthy bees, the colour of the blood turns chalk-

white from light brown in infected ones. Infected bees rapidly incur a loss of reflex in muscles, become flightless, stop food consumption, all of which leading to a weakening of the colony. The highest mortality rate is observed 20-36 hours after the infection. When the dead bees are placed into one's palm, certain body parts such as wings and legs are immediately detached. Putrefaction is also observed in the dead bees.

PROTECTION AND CONTROL

Colonies should be kept in apiaries that receive enough sunlight and air current. The apiary site should not be humid, and no humidity should build up inside the hives. Any applications that might cause stress to the bees should be avoided. Varroa and nosema should be controlled. Intense use of artificial feeds should be avoided.

PICKLED BROOD (SACBROOD)

The disease agent is Morator aetatulas.

This is a virus that cannot be seen under a normal microscope. The disease is called Sacbrood, as well. While it is yet to be observed in Turkey, the infection has already broken out in certain neighbouring countries such as Greece, Armenia, Iran and Georgia.

LIFE CYCLE

Larvae receive this virus through infected secretions from the brood-food glands of worker bees. The incubation period is 6-7 days. Diseased larvae die shortly after the brood cells are capped, just before pupation. Since the virus disrupts the larva's regular moulting, the old skin cannot detach from the head, which leads to an accumulation of an amount of fluid inbetween the two skin layers. Consequently, the head swells and curls up, with the body taking on a sac-like appearance.

- Drifting drones play an important role in the spread of this disease.

- Infection is mostly observed at the beginning of a season, i.e. during brood period, and then it disappears.

- The disease may completely disappear during summer, without any intervention by the beekeeper. In winter, however, the virus may continue reproduction in infected colonies, even during brood-less periods.

SYMPTOMS

- The disease symptoms are not observed in adult bees that carry the virus. However, infected colonies will be weakened and the honey yield will drop.

- Infected larvae die before pupation.

- Deaths occur relatively more in the capped cells than in the uncapped ones.

- Dead larvae can be easily removed since they do not adhere to comb cells.

- There is a clear, greenish fluid between the larval case and the body.

- The larva has a white colour at the beginning. This turns pale yellowish and then grey as the disease progresses. Dead larvae are greyish black. Later, the body dries up and hardens inside the cell, taking on an "L" shape there.

PROTECTION AND CONTROL

- There is no medical treatment against this disease as it is a viral infection. Colonies can easily overcome the disease.

- Incubation may be stopped, albeit for a short period, by replacing the queen bee. This gives the worker bees the opportunity to clean out the diseased larvae in the meanwhile.

STONEBROOD

The disease agents are Aspergillus flavus, Aspergillus fumigatus, and other types of fungi.

- This is a zoonotic disease. It can cause upper respiratory infections in humans.

- The toxin, which forms as a result of aspergillosis, is an aflatoxin of hepatotoxic nature.

INFECTION AND SPREADING

While commonly found in soil, these fungi cause harmful effects also to honeybees, other insects, mammals, and birds. In its early stages, the disease is quite difficult to identify, and it develops very rapidly in the larvae. In its advanced stages, a whitish yellow ring is observed near the back of the head of the infected larva. After the death, the larva hardens and becomes difficult to crush. That is why the disease is named as Stonebrood. The fungus will eventually break through the integument of the larva and form a false outer covering. In this stage, the larvae may be covered with green fungal spores. While cleaning the cells, nurse bees cause the disease to spread further in the colony by infecting other larvae with these spores. Stonebrood can be mostly identified by observing the symptoms in the larvae; final diagnosis, however, requires culturing.

PROTECTION

Hives should be properly ventilated.

Surplus combs received from hives during spring should be properly preserved.

Any remaining food waste on combs will create a highly suitable environment for the disease agents to reproduce during storage.

Combs kept in the storing place should be sterilised via an effective fumigation method (formalin, ethylene oxide etc.).

Honey obtained from infected hives should be burnt up, and used neither in human nutrition nor in feeding any bees.

AMOEBIASIS

This disease is caused by an amoeba which settles and reproduces in the Malpighi tubes of the bee. In addition to its own damage, it causes also diarrhoea with a very unpleasant odour. The disease is transmitted mostly by such reasons as using various types of feeds, poor wintering, and slack waters. The causes, rather than treatment, should be considered primarily here.

PARALYSIS

This disease dulls the senses of the bees. When one blows on the infected bees, they will slightly move and buzz, and then stay motionless once again. Sometimes they may thrash or roll about almost epileptically. Such infected bees will either throw themselves out of the hive, or get thrown out by other bees, eventually falling prey to ants.

MAY SICKNESS

Occurring mostly in May and in young bees, this disease affects and eventually kills young bees which consume excessive amounts of pollen (including also the mouldy ones) for the purpose of producing royal jelly for the broods. Some beekeepers attempt to clean the existing combs by putting them into the hives, in which case any mouldy pollen present in their cells will play an important role in the outbreak of this disease.

Affected bees fly around the hive as if looking for something, fall down after a while, and cannot fly again. Their

wings tremble, their abdomen looks bloated, full of pollen inside. A part of the bees are found dead infront of the flight entrance, and another part farther away. Since May Sickness causes death particularly in young bees, the hive will soon be weakened, and sometimes completely die off, unless the necessary measures are taken on time.

The best way to protect the bees from this disease is to prevent them from consuming mouldy pollen. As humidity will cause mould formation in existing pollen inside stuffy hives, May Sickness may often be encountered in such hives, as well. Therefore, as soon as the season allows, hive ventilation operations should not be neglected.

It is very useful to remove any mouldy combs once they are noticed, regularly give lukewarm water to the bees during May, as well as add ½ tea spoon full of salt in 1 litre of water into their water containers, or feed the bees with honey water or syrup for a few days in case of an outbreak of the disease and add two tablets of Aspirin in one litre into such honey water or syrup, during that season.

ACARIOSIS

The respiratory organs of bees are in the form of tubules which are called tracheas. Acarinas settle in and damage the two tubules in the chest. They are observed especially in these tubules, and rarely in others. Some researchers state that these acarinas penetrate all the way into the deepest parts of the bee's respiratory organ and settle there. In the very early stage of the disease, the shape of the trachea does not change much. In later stages, however, a microscopic examination will reveal a substantial change in the shape of the trachea, with a darkened colour.

A trachea infested with the parasite becomes hard and brittle. Wastes produced by the parasite accumulate inside the trachea, causing the trachea to lose its elasticity. Acarapis feeds

off the bee's watery blood that it sucks. As the amount of blood will diminish, the bee's health deterioriates. Furthermore, the secretions of the acarinas also cause a kind of poisoning, which leads to such symptoms as partial paralysis and flightlessness in the bee. Trembling and shuddering, the bee cannot fly and starts crawling. These symptoms are similar to nosema in certain ways, and the two diseases are sometimes mistaken for one another. Microscopic examination is required for final diagnosis for this disease.

Acariosis spreads relatively slowly by being transmitted from bee to bee. Therefore, the spread and persistance of the disease in a bee colony may last for two years. Acariosis is considered as one of the most important hazards that threaten beekeeping. It can spread from one hive to the other, and sometimes even become an epidemic. It is argued that weather conditions and bee races have an effect on the outbreak and spread of this disease as well as the destruction it causes.

Deadly subtances in vapour form, which are used to control acariosis, are often harmful to the bees themselves. Experiments have been made with sulphur and chloropicrin, as well.

PESTS OF THE HONEYBEE

VARROA

It has been found out that this mite, formerly known as Varroa jacobsoni only, has actually another different type called Varroa destructor. Of the approximately 30 types of mite identified in colonies, only a few are harmful to bees and important for beekeeping. Varroa destructor is one of these few. It is one of the biggest problems for bees and beekeepers. Males of this mite cannot suck haemolymph, only the females can.

INFECTION

The most important cause for the rapid spread of varroa in the world is migratory beekeeping. Having infected the bees taken to varroa-infested areas, the varroa then move to other areas. Their infection and spread can be generally summed up as follows.

a) Transfer of brood and young worker bees from infected colonies to healthy colonies

b) Uncontrolled uniting of colonies and creating new hives via artificial swarming

c) Infected bees, particularly drones, drifting from their hives and entering other hives

d) Taking insufficient measures for swarm control, swarms absconding when left unchecked

e) Frequent robbing within and between apiaries as a result of weakened colonies

f) Failing to obtain positive results from pest control due to employing ineffective methods

g) Uninspected purchases of package bees, queens or bee colonies from countries known to be infested

h) Insufficient supervision of migratory beekeeping

i) Failing to emphasise mass control of the pest

LIFE CYCLE

The adult female mite has a dark brown colour, with a crosswise oval shape of 1,10 mm in length and 1,57 mm in width on average. The body is coated by a chitinous layer. Its oral components and its legs are not visible when viewed from above. Its body is covered by hairs called ketom. The function of these hairs is to enable the varroa to stick tighter to the bee in order to prevent the mite from falling off. Male Varroa have a greyish/whitish yellow colour, with a width of 0,8-1 mm. Since male varroa do not have a boring-sucking oral structure, they cannot suck the haemolymph and therefore cannot survive on the bees. Their sole function is to inseminate the female varroa found inside the cells. Varroa activity begin during the period when the queen bee starts to lay eggs, and continues until the end of the incubation period in autumn. Varroa enter the comb cells that contain 5-6 day-old developing larvae 1-2 days prior to the capping of these cells. 2-3 days after the capping of the cells, the female mite begins to lay eggs. She prefers drone, female and queen bee cells to lay eggs in, respectively. Under optimum conditions, six-legged larvae emerge 24 hours after the laying of eggs, which then take on the eight-legged protonymph form after 48 hours. This is the period in which they begin to suck the haemolymph of the bee. The period that follows is the deutonymph stage. The females move from the protonymph stage to the deutonymph stage in 5 days, the males in 3-4 days. Adult mites form after the deutonymph stage.

The young female mite forms in 8-10 days, the male in 6-8 days. Once in the adult form, they immediately copulate, after

which the adult male dies inside the cell. That is why no male mites are observed on the bees.

EFFECTS ON THE COLONY

These mites suck the haemolymph shortly but frequently, with the bee losing approximately 0,1% of its body weight each time.

Varroa puncture the chitinous layer of the bee; other harmful microorganisms enter the bee's body through these wounds. As a result of the sucking of the haemolymph, the bees keep losing protein, in which case they will be susceptible to all kinds of microbic infections. Microbic infections and protein loss shorten the bee's life.

Disturbed, the colonies can neither form winter clusters nor protect the queen from cold.

Larvae with 6-10 mites on them cannot develop and will eventually die. Those that have less than 5 mites on them do complete their development; however, they will show an abnormal development, with one wing or no wings, or no legs.

The number of drones drops considerably.

Varroa infect bees with microorganisms, which they carry inside their digestive system, during sucking the bee after puncturing its chitionous layer.

In addition, they slow down the bees' activities by weighing down on them.

Brood nursing by worker bees weakens, consequently leading to reduced egg-laying capacity of the queen.

In case of high quantities of dead larvae in honeycomb cells, the bees fail to throw these out. Larvae thus drying up in the cells show symptoms similar to European Foul Brood.

Colonies weakened by the mite can be easily robbed. Unless the necessary precautions are taken, 10% of the infected colonies will die in the first year, 20-30% in the second year, and all of them in the third and fourth years of infection.

CONTROL

The most important biological characteristic of varroa is that their developing forms and young females are found in capped brood cells. Therefore, it is essential that any medication to be used is applied during broodless periods in order to increase its effectiveness as well as its chances of success against the parasite. The most suitable periods for the control are early spring and late autumn, which are the periods with minimum brood rearing activity and minimum number of capped brood cells in colonies. Medications should be applied excluding the period between nectar flow and honey harvest so that they do not leave any residues in honey.

Protection should be prioritised. One should remember that most of the chemicals to be used will leave residues in honey, causing a drop in the quality of the honey. Therefore, protection should be emphasised over controlling varroa.

Robbing should be prevented by narrowing the hive flight entrance.

Preventive measures should be taken against drifting.

Hives exposed to heavy infestation should be burnt up.

Hives should be prevented from swarming.

Hives should be positioned at least 50 cm higher than the ground, at a location that receives constant sunlight.

Medications to be selected for chemical control should be used at the right time and in correct doses. Otherwise, a resistance against a particular medication will develop, or the

medication will have no effect, at all. Since medications will have no effect on the mites that develop in capped brood cells, they should be applied in early spring or late autumn, which are the periods with the minimum number of capped brood cells. This will also eliminate the issue of residues in honey because there will be no honey in the hive during said seasons. For this purpose, one can also use organic medications with an active ingredient of thymol, or such organic acids as oxalic acid and formic acid which do not leave residues, in addition to chemicals such as Formiset and Perizin. The objective of chemical control should not be to completely eliminate of varroa but to keep their number within acceptable limits.

In addition to control via medication, it is possible to control varroa by various other methods, as well. Physical control, for example, utilises high temperatures. It has been observed that varroa abandon the bees when the hive temperature is raised to 46-48°C in specially designed storage places for hives. When plastic foundations with a wide cell floor are used, worker bees complete their development in 18-19 days, forming adult female bees. Varroa die inside the combs as they cannot complete their own development within that period. Another attempt is to ensure the control of varroa by expanding the hive flight entrance during winter and reducing the bees' brood rearing activities.

One other method involves biological control. Varroa primarily prefer drone cells for laying their eggs. If a frame that holds half drawn-out drone cells is inserted into the middle of the hive, the bees will complete this frame themselves. The queen bee will lay unfertilised eggs here and varroa will enter these cells in order to lay their own eggs before the cells are capped. These frames will then be removed, and burnt up.

WAX MOTHS

Larvae of the greater wax moth (Galleria mellonella) feed on honey and stored pollen, causing heavy economic losses. In a healthy colony, the damage caused by G.mellonella can be effectively controlled by worker bees. In a weak colony, however, it will lead to considerable losses. Larvae of this moth cause particularly huge yield losses in those hives and honey-filled or extracted frames which are kept in heated storage places with insufficient ventilation. The main reason for such a yield loss is the highly active periods of larvae. The larvae tunnel through beeswax by feeding on it, damaging the comb structure. The moths lay their eggs into gaps and holes that are not accessible by the honeybees. Under normal conditions (24-26°C), the larvae emerge in 5-8 days from those eggs. The newly emerged larva begins to move through a silky tunnel down towards the comb floor. Depending on the temperature and the food supply, it can keep growing for 1-5 months. By the end of such period, its length has gone up from 1 mm to 22 mm. This is the period in which it causes the greatest damage to the combs. The larvae feed on the bee larval case and faeces, as well, in addition to pollen. Those that feed on only beeswax cannot complete their development. 29-35°C is the most suitable temperature range for the larvae to develop. At 4-5°C, however, the development stops completely. Their damage is greater in low-altitude regions of Turkey, and even more so along the coastal strips with warm and mild climate.

CONTROL

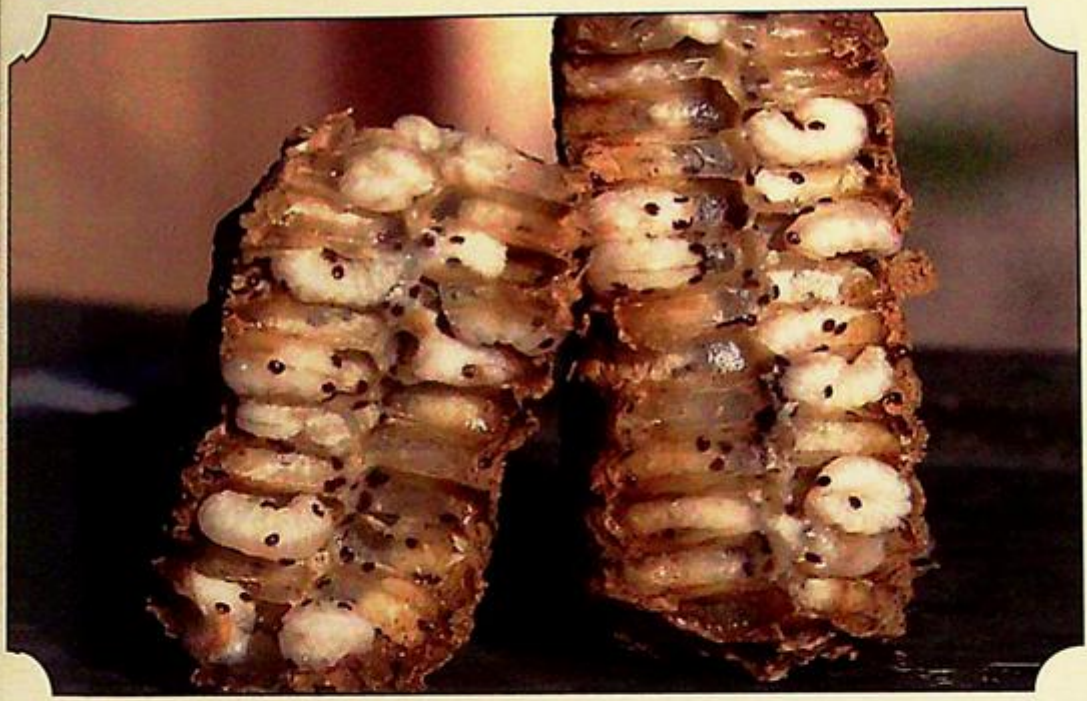
Many chemical, biological and physical methods of control are available. All periods of development of the pest are made ineffective by low-heat applications of 2 hours at -15°C and 3 hours at -12°C. Furthermore, any adult larvae hiding inside beeswax can be killed by a 40-minute heating application at 49°C. Any chemicals to be used leave residues in honey and

beeswax, and cooling or heating techniques are costly. B. thuringiensis bacteria can be used for biological control. These are marketed in commercially-prepared powder or suspension form. G. Melonella will die when exposed to even a small amount of this material. Bees are the most effective enemy of beeswax moths. Therefore, it is very important to keep the colonies strong enough. In strong colonies, bees will save themselves from any harmful effects of wax-moth larvae by moving these out of the hive.

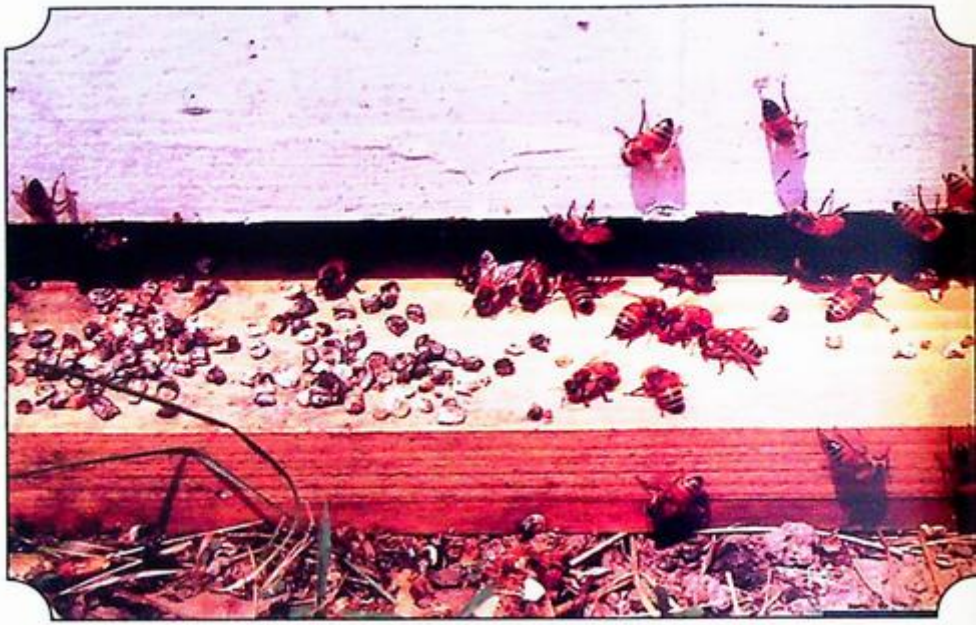
ANTS

Various types of ants are among the annoying enemies of bees. They cause great damage to the hive particularly when they attack in an organised manner. They usually consume the honey and syrup in weak hives. Sometimes they also harm the broods, albeit rarely. They may even gnaw into old bees' chests and eat the lal juice in these bees' stomachs. The mere disturbance they cause to the bees can be considered harm enough. Sometimes weak hives leave their nests assaulted by ants.

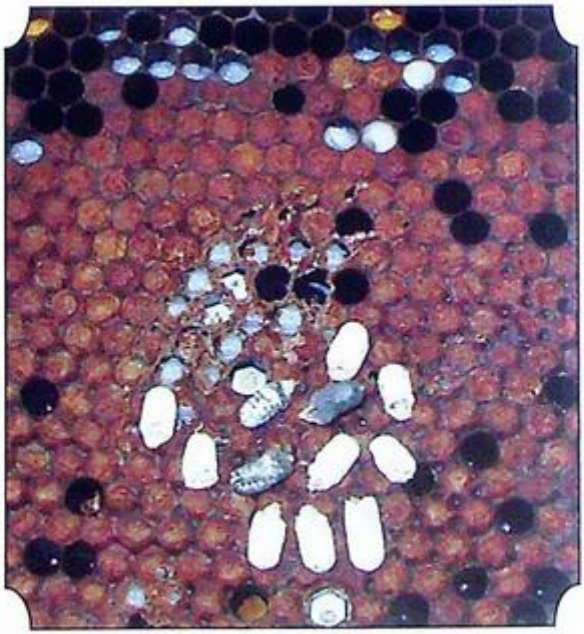
Locating the ant nests and destroying these by using hot water or gasoline at night is a good way to protect the bees from damages caused by ants. The control is carried out by destroying ants by means of poisonous or deceptive materials, as well. For example; placing small boxes with grids at their entrances, which contain poison syrup inside, or rubbing the hive surface by using onions, or putting salt onto the bottom of the box are means that will unsettle ants. The control can also be performed by placing the hive box legs onto containers filled with water or gasoline. Many beekeepers pour a tea cup of gas oil into the ants nests they have located. Ants are sometimes observed to lay thousands of eggs inbetween the inner covers under the hive top cover. These are removed with the help of a broom, paint brush or bee brush.



Varroa



Chalkbrood



Nosema

Foul Brood

Bee Moth

BEE EATERS

Certain birds such as bee eaters, swallows and magbies feed on bees. Bee eaters in particular cause high damages as they eat large numbers of bees.

This is a very beautiful bird with soft and bright green, blue and yellow feathers. Its beak is typically long and black, and its feet are red. In summer, bee eaters come out in large numbers and enter apiaries, where they will catch and eat bees either in the air or infront of the hives.

The greatest damage the bee eater causes is that it hunts down the queen bee which is out for the mating flight during swarming season. This means that that colony will be dying off. Therefore, the beekeeper must check with new swarms whether the queen bee has started laying eggs.

Sometimes certain physical precautions such as blowing a whistle or putting up a scarecrow in the apiary are attempted to control bee eaters. It is prohibited to hunt bee eaters as they are an important type of bird in controlling harmful insects.

WASPS

Wasps are a type of bee, which are larger and stronger than honeybees, with a slender body. They catch and kill honeybees in the air, infront of the hive entrance or even inside the hive. They rip off the wings and heads of the honeybees they kill, and carry the remains all the way to their own nests. Wasps also eat the honey in the hives they manage to enter. They are especially dangerous during dry years, even to the extent of causing hive populations to die off.

Various methods of destruction are applied in controlling wasps. The control should particularly involve the destruction of their nests which they build in tree hollows, below eaves, abandoned houses or inside bushes. Wasp traps may also be

placed around the apiary. Smelling the piece of meat or liver inside one of these traps, the wasp will enter the trap and will not be able to get out. Another practical method involves bottles filled with molasses or similar sweets, which are then hung at various spots in the apiary. Once inside the bottle, the wasp will not be able to get out again.

BEARS

Typically leading a natural life, bears cause destruction in those apiaries which are located far away from human settlements, even to the extent of destroying an entire apiary. Bears love eating bees, bee larvae and honey. They not only eat these, but also make them physically useless by throwing around the hives all over the place.

In many places, it is prohibited to hunt bears; the best way to control them is to take physical precautions to prevent them from entering an apiary. Turning the lights on in the apiary throughout the night will scare bears off.

There are also certain electrical systems, which electrify the wires surrounding the apiary, in order to prevent large wild animals like bears from entering apiaries. Once exposed to a small amount of electrical shock, the bear will not come close to the apiary site again.

MICE

Mice cause damages by piercing through hives (or, in the case of small mice, by entering through the hive flight entrance) and gnawing into combs and eating bees or broods during winter periods when bees are sluggish.

To prevent such damages, especially the entrances of the hives kept indoors during winter should be narrowed by using metal sheets or poisonous feeds or mouse traps should be placed at mouse holes.

BEE LICE

Unlike the blood-sucking varroa, bee lice are almost like uninvited guests at a bee's dining table in that they consume the food typically eaten by bees.

A bee louse has a dark brown colour, with a body structure of approximately 1,5 mm in length and 1 mm in width. They are not observed on bee broods, but at the head and back of adult bees. They weaken the colony by consuming bee food. They have three pairs of legs. They especially bother the queen bee. Sometimes 2-5 or even up to 15-20 of them can be seen on one queen. Mostly encountered in weak hives, these lice are controlled in the following ways.

To remove the lice on the queen bee, the queen bee is taken into the palm of the hand. After blowing cigarette smoke onto it, the palm is then kept closed for a while until the lice abandon the queen and fall down onto the palm. The queen is then replaced into the hive without any delay. This is one way to remove the lice on the queen bee. Another way is to dip a matchstick or toothpick, thinned at one edge, into honey. Holding the wings of the queen bee between the thumb and the index finger of the left hand, the honeyed edge of the stick is slightly touched on the lice found on her. The lice sticking to the honey are then easily removed off the queen.

OTHER ABNORMAL CONDITIONS IN THE LIVES OF HONEYBEES,
AND INCORRECT INTERVENTIONS

LAYING WORKERS

"Laying workers" refers to a situation where worker bees lay eggs in those colonies which have remained queenless for three weeks or longer. In colonies with laying workers, broods are scattered around in drone cells (or even in worker bee cells) in a disorderly manner. This situation should not be confused with the case where, due to lack of enough space, the queen sometimes lays two fertilised eggs into each cell. Even when the queen lays two eggs into one cell, there is a certain order and organisation in the way she goes about it. Laying workers, on the other hand, leave even up to 3-8 eggs; and at the cell side walls, not on the cell floor.

In colonies with laying workers, tiny drones emerge from unfertilised eggs laid by worker bees into worker bee cells. After these eggs have developed and have been sealed, they take on almost the shape of the hump of a camel, relatively larger than other cells. Unlike normal broods, these abnormal broods cover their area in a rather disorderly manner.

When frames filled with fertilised eggs are introduced into a colony with laying workers, these frames will still be removed by the bees even if the bees build queen cells on them. Unless a queen is introduced without using a queen cage, the bees will kill that queen. In addition to all of the above, they even attempt to rear queens from their own unfertilised eggs. However, those cells will still be producing drones.

It is impossible to tell the laying workers apart because they have the same shape and size as other bees. To prevent this abnormal situation, bee broods should be inspected once a week during spring. If the situation is still controllable, a queen in a queen cage can be introduced; otherwise, the colony should be united with another or its frames should be distributed (in 2-3 frames) among neighbouring colonies. In the latter case, laying workers introduced into normal colonies will diseappear quickly.

To save a colony with uncontrollable laying workers from its abnormal condition, firstly plenty of syrup should be given for a few times for the colony to settle down. Then, a frame with adult broods should be introduced. In parallel with the operations carried out, a caged queen bee or a mature queen-cell cup is introduced into the colony the day the bees emerge from their cells on the brood-filled frame. Syrup-feeding is continued without disturbing the peace of the colony (i.e. without annoying or agitating the bees). Two days later, the queen cage cap is removed and the cage is replaced. The bees will take the queen out themselves.

Laying workers may be observed, even if a queen exists, in those hives which have been enlargened by adding supers but also introduced a queen excluder inbetween these. Similarly, laying workers are also observed during unproductive years (in terms of nectar collection), merely because of queen excluders.

There are many other ways to save bees from laying workers, which can be listed as follows.

The weak colony with laying workers is united with a strong colony by. This colony should not be touched for about a week. It has been observed that the queens are killed in such hives unless this one-week period is respected.

Some beekeepers use another precautionary method, where the colony with laying workers is exposed to plenty of smoke first and then an unmated queen is introduced in a cage.

The laying workers will disappear after the queen comes out of her cage and starts to lay eggs after mating. In case a queen introduced into a queenless colony remains in her cage for too long or cannot mate for such reasons as adverse weather conditions etc., laying workers may reappear in such colonies.

Another way of introducing a queen into a hive with laying workers is the following: The hive with laying workers is put aside during busy flight hours, and replaced with a hive that has a queen in the cage. The following evening, the queen is removed from her cage. Meanwhile, a sufficient number of worker bees from the hive with laying workers will have already filled up this new hive. If all bees in the new hive are strong enough to defend the queen, one frame of the hive with laying workers is brushed and removed each day. The bees on those frames will go back to their old places. The bees that have accepted the new queen will defend her against these newcomers. This way, the bees from the hive with laying workers will have moved into this new hive within 5-10 days, and they will not be attacking the queen anymore, either. In that case, the bees that arrive gradually from the other hive will never touch the queen; and if they do touch her, she will be defended by those which have already accepted her.

ROBBING

Robbing refers to the event in which strong colonies attack weak, queenless, diseased etc. colonies, largely due to negligence on beekeeper's part, during autumn (prior to the greater nectar collection period) or during nectarless summer days (after the nectar collection period) or during warm weather in winter (i.e. after the nectar collection period is completely over).

If the bees of one apiary attack the bees of another, the owner of the robbed apiary is to blame, and not the owner of the apiary the bees of which have done the robbing.

After the nectar collection period is over, robber bees will descend on a hive the top cover of which has been opened incautiously. They attempt to enter the hive from the sides, corners, or from the top and through the frames for the purpose of stealing. It is very easy to tell apart robber bees that fly around with the intention of stealing. These bees fly about the hive and look for any hole to enter inside. They gather around the crack or hole they find, and try to enter the hive unnoticed. They also harass one another as well as the guard bees infront of the hive. They then go even further and forcefully enter the hive. A flight such as the one during nectar collection periods starts and lasts until late hours of the evening infront of the robbed hive as well as the robbing hive. Normally, bee colonies would end this flight around that time.

It is also very easy to single out the robbing colony by using the following method. The robbed hive's flight entrance is covered with the help of a thin screen. Flour is sprinkled onto the bees that have piled up infront of the flight entrance. Then, the apiary is inspected to find out which hive the now flour-covered bees have entered and the robbing colony is identified.

If the robbing is allowed to spread, all honey of the robbed colony will soon be plundered and its bees killed. After that, the robbing will spread to the other hives and eventually the entire apiary. In an all-out assault and war, many hives of an apiary will be destroyed and rendered useless. In which case, it will be quite painful to watch the state of the apiary. They fly about, quite noisily and cluttered up in the air. The landing boards, any cracks on the hives, or the front side boards are completely filled with bees attempting to enter inside. Sometimes, bees in one apiary make a surprise attack to the bees in another apiary, which results in the destruction of the attacked side.

Robbing should be forestalled before it begins. Otherwise, it will be extremely difficult, sometimes even impossible, to prevent it once it starts.

PRECAUTIONS AGAINST ROBBING

As nectar collection is reduced in the case of robbing, the flight entrance should be narrowed depending on the strength of the bee colony. This can be minimum 1 cm depending on the situation. One should be careful not to spill honey around while inspecting the hives (in the case of reduced collection of nectar). Any honey spilt on the ground should be covered by earth. If nectar collection has stopped during hot summer days, the flight entrances of the hives of strong colonies should be covered by a thin screen wire, leaving only a narrow opening. The bees may get exhausted from heat unless a thin screen and a narrow opening are applied.

As a precaution, the hive flight entrance should be narrowed down to 1 cm during no-nectar periods or when collecting honey or just checking inside the hive, even if there is no robbing. In case of robbing, however, the hive flight entrance should be enlarged back to its normal size. Furthermore, hives should be placed in shade in hot regions or countries because, when exposed to heat, the honey and wax will become soft and their odours will attract bees. Any item smeared with honey should not be left in the apiary. Items and hives smeared with honey should be thoroughly washed and cleaned with a wet cloth.

Any cracks on the hives should be covered by pieces of paper or cloth and stuffed by paste or mud.

Feeders should not be left above the bees during daytime.

During the inspection of a hive, bees will also be following any smoke or box or cover used in the process. Therefore, bee smokers and other equipment used for inspection should be moved far away from the hives after the inspection is over. Since any robber bees will be gathering around such items, other hives can be inspected and controlled more easily.

However, after several hives have been inspected, robber bees get used to this situation and begin to cause difficulties. In such cases, one can also use the smoke of haystacks, dried dung, stalks etc. burnt at various spots of the apiary.

TWO QUEENS IN ONE HIVE

Sometimes two or even more egg-laying queens are observed in one single colony. This is not a coincidence. This situation occurs when a bee colony, entirely on its own initiative, leaves the old queen alive as a precaution during the rearing of another queen, until the new queen has emerged, gone out for the mating flight, become inseminated, returned to the hive and begun to lay eggs. The bees will not allow the two queens to fight and kill each other; they let these two lay eggs so long as the nectar flow is rich enough. Once the nectar flow has diminished, they kill the old queen and throw her out of the hive.

REASONS WHY BEES ABANDON THEIR HIVES

Often, for reasons given below, a swarm abandons the hive it has been placed into.

1-There is a bad smell inside the hive.

2-The hive has been exposed to sunlight for long periods of time.

3-There is stuffiness inside the hive due to excess heat.

4-There are old, deformed combs inside the hive.

5-There is no queen bee in the hive.

6-The hive is too small for the swarm.

Some colonies are also observed to abandon their nests during spring for the following reasons.

1-The nest is too narrow for the colony.

2-There is an excess amount of honey inside.

3-The combs contain moths, or are mouldy.

4-The colony is about to starve.

5-There is an abundance of honey but no room left for laying eggs or rearing broods. The underlying reason in this case is yet to be discovered by beekeepers.

6-Sometimes, bees of small-sized colonies accompany their queens in their mating flights and never return.

7-There are 10-15 worker bees and a queen bee as well as honey and clean, healthy combs in the hive in spring. This is mainly caused by varroa. The majority of the colonies that leave their nests are weak colonies. It is quite a rare occurrence that strong bee colonies well-cared for abandon their nests.

DWARF/DISABLED/WINGLESS BEES OBSERVED INFRONT OF HIVES

Dwarf, disabled, wingless or weak bees observed infront of hives are not necessarily caused by varroa or nosema. Many beekeepers become alarmed when they witness such a situation despite having carried out control or treatment against varroa or nosema. They begin to ask around what they did wrong, or continue to unnecessarily apply medications.

This situation does not necessarily arise from any disease or pest.

These abnormalcies, which may be encountered sporadically in each caste of bee in the hive, are observed also in chilled queens, worker bees and drones spread outside the bee cluster, i.e. at the lower parts and sides of the frames.

Disabled, one-winged, short or torn winged bees, or bees with one-antenna, short proboscis or missing legs may also be

the result of various other reasons such as chilling inside capped or uncapped comb cells, being distressed during inspections or transportations or due to shaking of the frames, being exposed to sunlight, thirstiness etc.

One should not forget that, during the rather changy weather conditions in spring, the temperature may sometimes go down to minus 6-10 at nighttime after having been around 25-30 degrees during daytime. Chilled during the night, bees narrow down their cluster on the frames and come closer to one another, which causes the broods found at the sides of the frames to catch a chill, as well. Consequently, the broods become disabled even before they emerge from their cells. The colony then isolates them, much like many other animals or even humans would do, since these weak or disabled members will not be useful to their community.

EFFECTS OF PESTICIDES ON BEES

It is well known that beekeeping and fruit growing develop side by side, benefiting from one another in many ways. In recent years, however, many new pesticides have been in use, with successful results, in order to obtain plenty of good-quality products in fruit growing and sometimes to combat various diseases and pests in other branches of agriculture. Unfortunately, a large number of these pesticides are harmful to bees: they have a toxic effect on bees which kills them.

Spraying is carried out during various periods. Spraying carried out during the flowering period in particular paves the way for the greatest catastrophe for bees because bees collect both nectar and pollen during that period. Taking the sprayed and therefore poisonous nectar into its stomach, the bee often dies halfway to its hive. This prevents the poisonous nectar from being carried into the hive and mixed in honey, which saves both the bees and humans from consuming it. However, most of the

bees that carry sprayed pollen do not die on their way back to the hive, and poisoning occurs only when the sprayed pollen brought into the hive is consumed as food by the hive population.

When bees visit sprayed flowers, they are harmed by these poisonous substances as they touch their residues or take them into their stomachs. Bees that have sucked sprayed nectar die within minutes. Consequently, hives incur massive losses in terms of bee population during the spraying season.

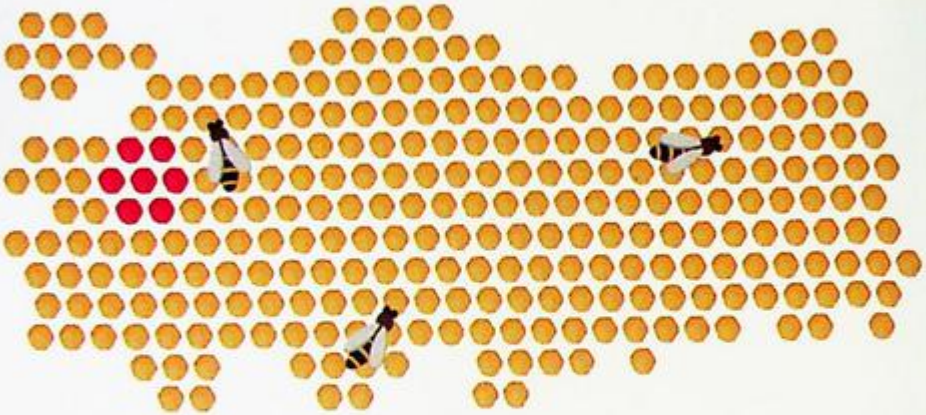
There are many different pesticides with different effects used in agriculture. Their lethal effects also differ from one another. Pesticides that contain arsenic or DDT have extremely lethal effects on bees. Those with DDT remain on plants for a long time, maintaining their effect. Those with phosphate are deadly toxic both for bees and humans. Their use requires a lot of knowledge and caution.

Sucking the nectar of a sprayed flower, the bee dies halfway to its hive, whereas carrying the pollen of a sprayed flower has no such deadly effect on the bee until it arrives in its hive. Poisoning in the latter case occurs only when the nurse bees of the hive begin to use this pollen to turn it into a jellified form. Bees poisoned this way usually thrown themselves out of the hive. By doing so, they apparently try to save the broods and the queen bee. Often, however, the poisoning may spread throughout the hive, eventually leading to a die-off. Sometimes, poisoned broods and larvae are thrown out of the hive and the remaining bees are saved, but at the expense of weakening the hive population. Surviving the danger is easier if the poisoning has affected only those bees which are flying about. However, it turns into a catastrophe if the poisonous pollen has already been carried into the hive and affected the broods via food intake. In that case, the poisonous pollen and the hive itself must be cleaned thoroughly and completely, neither of which is an easy

job. The best way is to move the hives away and take them out of the dangerous zone during the spraying period. Many bees die simply because these precautions are not taken on time.

A lot of countries greatly emphasise the matter that pesticides to be sprayed during the flowering periods should not be of the type that will kill insects and bees. There are even certain prohibitions regarding this matter. It is highly essential that agricultural spraying be re-arranged to prevent bee generations from dying off and that any necessary precautions be taken. The damage can be reduced to a certain extent by selecting non-deadly types of pesticides to use as well as by notifying beekeepers about the time of spraying so that they can move their bees away on time. For today, beekeeping in the fields of horticultural and industrial crops is quite strong.

NOTES



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