Day 2

Review of Day 1

Session 6: Beehives and Beekeeping Equipment

Session 7: Colony Inspection

Session 8: Annual Colony Cycle and Seasonal Management

Session 9: Swarming

Session 10: Absconding

Session 6 Beehives and Beekeeping Equipment

Sub-topics

- Types of bee hive, identification and use
- Identification and use of modern beekeeping equipment

Time: 1 hour

Theory: 15 minutes
Practical: 45 minutes

Objectives

Trainees will

- be able to identify and use beehives and other beekeeping equipment.

Training Methods

- Lecture
- Demonstration and discussion

Materials

- LCD projector and PowerPoint slides, diagrams, photos
- Movable frame beehive (empty)
- Other beekeeping equipment

Activities and Exercises

Activity 1: Lecture

Give a short presentation on the design of movable frame hives, and the various pieces of equipment and accessories used in modern beekeeping as outlined in the resource materials (below). Discuss the basic use of beehives and methods for identification. Use slides, photos, and drawings to illustrate the talk.

Activity 2: Demonstration of equipment and discussion

Show the trainees the hive(s) and equipment. Let them handle and try out the hive and different pieces of equipment while discussing among themselves. Answer, or allow other trainees to answer, any questions they may have on the equipment.

Take home message

- Beekeeping equipment is very important for apiary management in modern beekeeping.
- The quality of honey production is determined in part by the standard and cleanliness of the beekeeping equipment used by the beekeepers.

Session 6 Resource Materials

Beehives and Beekeeping Equipment

Introduction

Colony inspection and management, and harvesting of honey are quick and easy with a movable frame hive and the appropriate beekeeping equipment. The main pieces of equipment and accessories are described in the following.

Hives

Movable frame hive

A movable frame hive has two types of chamber: the super chamber for honey production and the brood chamber. The super chamber is only added during the honey flow season. (Where productivity is very high, more than one super can be added, but this is very uncommon in the Hindu Kush-Himalayan region.) The standard design used for *Apis mellifera* is a Langstroth hive, first patented in 1852 and still used throughout the world. The advantage of this hive is that the bees build honeycomb into frames – wooden rectangles designed to hold a comb, which are slotted downward into grooves from the top of the hive and can be easily lifted out. The frames are set at a fixed distance from each other, which is calculated to prevent bees from attaching honeycombs where they would connect adjacent frames or connect the frames to the walls of the hive.

The queen can be excluded from the super chamber, which allows combs to be built that contain only honey with no brood. Both the brood chamber and the super are designed to take ten frames, but in general the super is not as tall as the brood chamber and the super frames are not as long as the brood chamber frames. When colonies are small or weak and cannot build combs on all frames, individual frames can be replaced with a dummy board, which is solid and can't be used to build a comb. The dummy board fills the empty space and helps the colony to keep warm.

A smaller beehive called a Newton hive is used for *Apis cerana*. It is constructed in the same way with ten frames in each chamber, but the dimensions of both hive and frames are smaller than those of the Langstroth hive, as is appropriate for the smaller bees.

The main parts of a hive are shown in Figure 20. They include a bottom board, entrance, brood chamber, brood frames, super (honey chamber), super frames, inner cover and outer cover, with a ventilation hole covered with wire netting.

Nucleus beehive

A nucleus hive is a small beehive with only four or five frames which is used for colony division or to maintain bees (Figure 21).

Mating hive

A mating hive is a small hive filled with nursing bees and brood frames without a queen (Figure 22). A matured queen cell at a stage 1 or 2 days before emergence is put into the mating hive. After emergence, the virgin queen is nourished by the nurse bees. She mates with drones within a few days and starts laying eggs. If the egg laying pattern is good, she can be sold or used to replace a queen in a colony (requeening).

Hive stand with bowl

A four-legged stand is used to raise the hive and help protect it from ants. Each leg should stand in a bowl filled with water (Figure 23) to prevent ants entering.

Hive Accessories

Queen excluder

A queen excluder (Figure 24) can be placed between the brood chamber and the honey chamber to prevent the queen entering and laying in the honey chamber. The size of holes in the excluder is designed so that the queen bee cannot pass through but workers can.

Figure 20: **Parts of a movable frame hive**

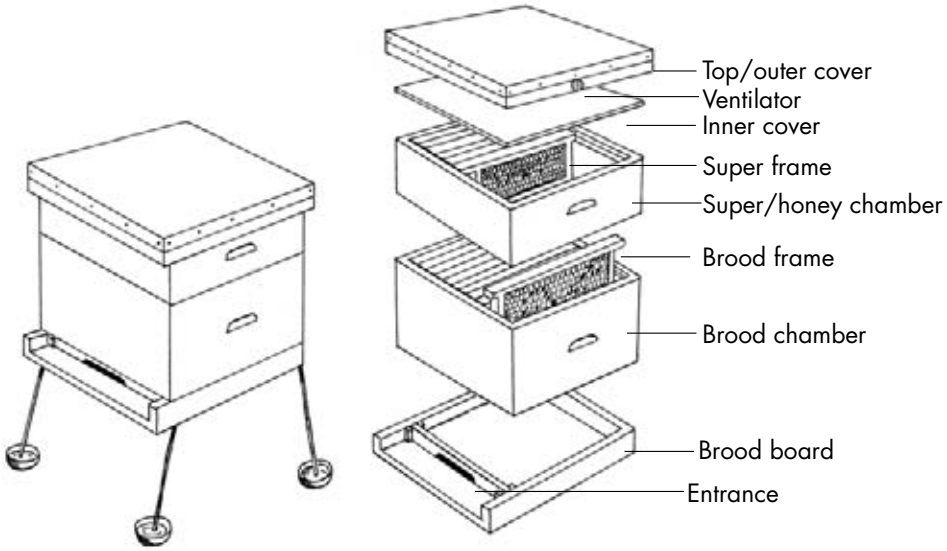


Figure 21: **Nucleus beehive**

Figure 22: **Mating hive**

Figure 23: **Hive stand with bowls**

Figure 24: **Queen excluder**

Queen gate

A queen gate made of aluminium (Figure 25) can be placed at the entrance of the beehive to prevent the queen flying out under certain conditions:

- until a queen bee has become accustomed to a new hive,
- during swarming and absconding, and
- after transferring a colony to a movable frame hive following swarming.

Do not use a queen gate if there is a virgin queen in the colony as it will prevent her from going out on a mating flight.

Queen gates are generally used in *Apis cerana* beekeeping, there is rarely any need for them with *Apis mellifera*.

Pollen trap

A pollen trap is a piece of equipment for collecting the pollen pellets from worker bees returning to the hive (Figure 26). There are many different designs and ways of positioning a trap, but the principle is always the same. A screen or grid is placed at the entrance of the hive so that the bees must pass through it to enter. As the bees go through the grid, the pollen pellets are dislodged from the hind legs and fall into a collecting box or tray below. The size of the hole in the grid is the crucial factor, the pellets must be dislodged without hindering the bees' flight. A typical screen would be 5-mesh hardware cloth or 3/16 inch (5 mm) diameter perforated sheet. The collecting tray is covered with a finer mesh screen so that bees can't enter it.

Feeder

A jar or frame feeder can be used to feed the bees during periods when wild food is unavailable, insufficient, or inaccessible, for example, in winter and the rainy season. A jar feeder is made by making small holes in the lid of a plastic jar with a heated needle (Figure 27). The jar is filled with sugar syrup and inverted over the central hole of the inner cover of the brood chamber to feed the colony. A frame feeder is made out of two parallel pieces of wood or plywood with a gap between and is the same size as a brood frame (Figure 28). The frame feeder is filled with sugar syrup and placed upside down in the brood chamber. The bees feed on the solution coming out through holes made in the lid.

Figure 25: **Queen gate**

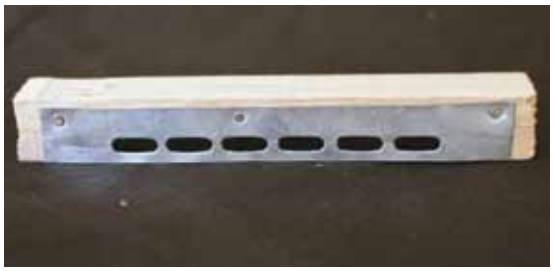


Figure 26: **Pollen trap**

Figure 27: Jar feeder

Figure 28: **Frame feeder**

Figure 29: **Comb foundation**

Figure 30: **Comb foundation press**

Figure 31: **Smoker**

Figure 32: **Bee veil**

Comb foundation

Prepared comb foundation sheets made of beeswax with a raised pattern of cell outlines are used to maximize the profit in modern beekeeping (Figure 29). Comb foundation for *Apis mellifera* is designed to fit the Langstroth hive brood frames and can be cut to fit the super frame. Comb foundation for *Apis cerana* is designed to fit the Newton hive; it is smaller and has a smaller cell size. Bees build cells on both sides of the foundation for laying eggs or storing honey. Comb foundation saves the bees time and energy in building new combs, which increases the honey yield. Because the bees follow a preset pattern for building, the combs are straight and regular and easier to handle. It is only possible to use a honey extractor if the comb is built on comb foundation.

Comb foundation press

A comb foundation press is made of sand and cement, cemented into a wooden frame (Figure 30). The upper and lower surfaces are imprinted deeply with a comb cell pattern. Melted wax is poured onto one side and the frame closed. The solidified sheet can be pulled off the cement base and has a raised pattern of cells on both sides. Comb foundation can also be made using iron rollers with an imprinted cell base pattern. Plain wax sheet is rolled between the rollers which print a cell base pattern on both the sides of the sheet.

Colony Inspection and Maintenance Equipment

Smoker

A smoker is used to smoke the honeybees and subdue them when opening a beehive for inspection or honey harvesting (Figure 31). When worker bees smell smoke they fill themselves with honey and are less able to sting, and the smoke encourages the bees to leave the combs. Any slow burning material can be used in the smoker such as old dry sacking, rotten wood, rags, or dried leaves. The smoker shown in Figure 31 has a bellows attached. A few puffs of smoke at the entrance and the central hole of the inner cover at the top of the opened hive are usually enough to calm the bees.

Bee veil

A bee veil is used to protect the face and head from bee stings while handling bees (Figure 32). The bee veil must be fixed tightly to the shoulder at the base to prevent the bees entering inside. It can be made from any wide-brimmed hat using black net and cloth. The black net provides good visibility for inspecting the colony. A bee veil is important for good colony management.

Gloves

Gloves are used to protect the hands from bee stings and to keep bees from crawling up inside the sleeves (Figure 33). They should be thick enough to prevent the sting reaching the skin but thin enough for the beekeeper to feel through. They are usually made of soft leather, and may have canvas or cotton forearm coverings and ventilation on the forearm. Sometimes, the entire glove is made of canvas and cotton, but leather is more sting-resistant. Gloves are useful for beginners to help them develop confidence in handling bees. But handling frames with gloves is cumbersome and experienced beekeepers rarely use them.

Figure 33: **Gloves**

Hive tool

A hive tool (Figure 34) is used to pry apart the frames from the brood or super chamber and/or to separate frames glued to each other with propolis or wax. Using the tool to pull out the frames while inspecting the colony or during honey harvesting doesn't disturb the bees. A hive tool is especially important for hives with *Apis mellifera* as they collect propolis and use it to seal hive cracks and gaps between the frames and the hive body.

Figure 34: **Hive tool**

Bee brushes

Two types of brushes are used in beekeeping. A soft brush is used to remove honeybees from the frame, and a rough brush is needed for cleaning the bottom board and inner cover (Figure 35).

Figure 35: **Bee brushes (soft and rough)**

Wooden or bamboo swat

A fly swat (Figure 36) is used to kill bee predators such as wasps and hornets that are trying to catch bees by flying near the hive entrance or around the beehive.

Figure 36: **Fly swat**

Honey and Wax Processing Equipment

Honey extractor

A honey extractor is essential in modern beekeeping (Figure 37); it is used to extract honey without destroying the combs. This helps to increase the honey yield as the empty combs can be reused in the super and bees do not have to spend time building new combs. The honey quality is also better than that of honey extracted by manual squeezing. The honey frame is taken out of the super, the wax is uncapped using a warm knife, and the frame is put in the extractor. Usually the extractor is designed to take two or four frames. In a tangential extractor, honey is extracted from one side of the frame, and the frame

Figure 37: **Reversible type stainless steel honey extractor**

Figure 38: **Knife**

Figure 39: **Honey strainer**

Figure 40: **Solar wax melter**

is then taken out, turned, and replaced to extract the honey from the other side. In a reversible extractor, both sides can be extracted without removing the frame. Stainless steel extractors give the best quality honey.

Knife

A sharp long knife is needed to uncap the sealed honey combs and to cut up old combs (Figure 38).

Honey strainer

The harvested honey may contain all sorts of impurities such as bee's wings, legs, combs, and wax. The honey is poured through a stainless steel strainer (Figure 39) or cloth to remove the contaminants.

Wax melter

A melter is needed for melting the beeswax; it can be electrical or solar powered (Figure 40). This is a cheap and easy way of melting wax which does not affect the wax quality or smell. Hot water can also be used for melting and processing wax.

Swarming, Migration, and Bee Management Accessories

Queen cage

A queen cage is a small netted box used to caging a queen under certain conditions. The box looks like a matchbox made with wood and iron net (Figure 41). It is used during requeening, transferring bees from one hive to another, and capturing and/or hiving a swarm. It helps the beekeeper to find the queen and hive her easily.

Carrying cage

A carrying cage is used for transporting a bee colony from one place to another. It is similar to a beehive but much smaller and can hold only 3 or 4 frames (Figure 42). The top cover has a handle for carrying and is well ventilated.

Swarm bag

A swarm bag can be used to capture a swarm during swarming or absconding, and to transport a colony from one area to another. The bag is made of thin cloth or nylon net (Figure 43).

Queen cell protector

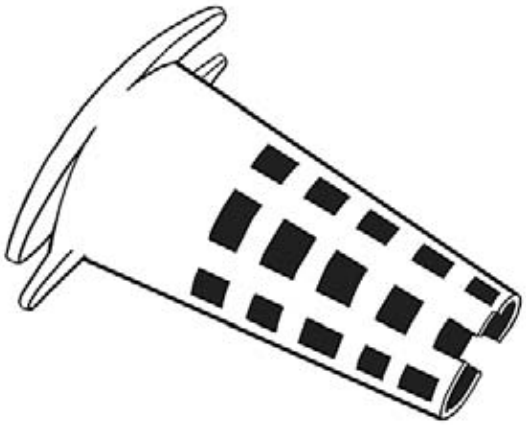
A queen cell protector is made of plastic or thin wire netting and shaped like a queen cell but larger (Figure 44). It is used to protect a new queen from an older queen or another emerging queen during swarming and other situations.

Figure 41: **Queen cage**

Figure 42: **Carrying cage**

Figure 43: **Swarm bag**

Figure 44: **Queen cell protector**



Session 7 Colony Inspection

Sub-topics

- Preparation for colony inspection
- Suitable weather and time
- Colony inspection (from outside and inside)
- Record keeping

Time: 1 hour

Theory: 15 minutes
Practical: 45 minutes

Objectives

Trainees will

- know why, when, and how to inspect a colony,
- be able to inspect the colony from outside and from inside after opening the hive, and
- be able to keep an apiary record.

Training Methods

- Lecture
- Practical exercise with colony observation
- Question and answer

Materials

- LCD projector and PowerPoint slides, diagrams, photos of colony inspection
- Movable frame hive with honeybees
- Colony inspection materials (bee veil, hive tool, smoker, globes, brush, knife, bee gloves, colony inspection forms, pen)
- A whiteboard and board markers or blackboard and chalk
- A flipchart with stand and marker pens, or large sheets of brown paper with pens and masking tape
- Metacards and pens, soft board and pins

Activities and Exercises

Activity 1: Lecture

Describe the reasons for colony inspection and the way it is carried out as outlined in the resource materials (below). Discuss the appropriate timing, the precautionary measures to be used, and the steps to follow. Use PowerPoint slides and photos to illustrate the talk, or large blown up photos and drawings in areas where there is no electricity.

Activity 2: Practical exercise

Step 1: Demonstrate the observations to be taken and activities to be carried out during a colony inspection.

Step 2: Divide the trainees into four or five groups and ask each group to carry out a colony inspection by opening the hive following the steps described in the resource material.

Step 3: Ensure that each group fills out a record of the inspection on a colony inspection form.

Activity 3: Discussion and question and answer

Use in depth discussion and question and answer approaches to discover whether trainees are fully clear about the importance of colony inspection, the best time to do it, and the actual techniques of inspecting and recording, including safety precautions.

Take home message

- Beekeepers should consider the weather and time when planning an inspection.
- They should undertake the inspection as quickly as possible, while taking due care.
- Diseased and angry colonies should be inspected last; hands and equipment should be washed thoroughly with soap after an inspection.

Session 7 Resource Materials

Colony Inspection

Introduction

Bee colonies must be inspected in order to know the status of colony development, whether any diseases are present, whether there is a queen, the amount of brood (eggs, larvae, and pupae), and of food (pollen and nectar stores). This information helps in determining and planning seasonal management practices. Colony inspection is performed from outside and inside (by opening the hive).

Appropriate Weather and Time

The best time to inspect a colony depends on the weather and also the bees' daytime routine.

- Inspection should be carried out during clear and calm weather.
- Inspection should not be carried out when it is hot and bright, cold, cloudy, or threatening storms or rain.
- Colony inspection is easier when a large number of bees are out foraging and fewer are in the hive.

The appropriate times and recommended inspection frequency at different locations are summarized in Table 4.

Table 4: **Appropriate time for colony inspection**

Area	Season	Time of day	Inspection frequency*
Hills and mountains	Winter	11:00 to 14:00	Every 3 to 4 weeks
	Summer	08:00 to 10:00 and 16:00 to 18:00	Every 10 to 15 days
Foothills and plains	Winter	10:00 to 14:00	Every 3 weeks
	Summer	07:00 to 10:00 and 16:00 to 18:00	Every 10 days

*Colony inspection should be carried out at 2 to 7 day intervals if the colony has shown a swarming impulse or signs of disease or pests, and after introducing a new queen or queen cell.

Colony Inspection from Outside

Colony inspection from outside provides an idea of the colony status without opening the hive. It can provide the following information about a bee colony:

Health

- A larger number of incoming and outgoing bees and pollen carrying foragers at the hive entrance indicates that the colony is strong and healthy.

Potential problems

- Larvae, pupae, and newly-emerged bees scattered at or in front of the entrance indicates that the colony is diseased.
- Bee excreta and black patches seen around the entrance indicates that the colony is abnormal or diseased.
- Many dead bees with an extended proboscis scattered at or in front of the entrance indicates that the colony has been poisoned.
- Bees crawling and unable to fly indicates bee disease.
- A large number of bees on flight, fighting with each other, and fighting to the death indicates robbing.

- Clustering of bees at the hive entrance with only a few flying to forage may indicate absconding or swarming.
- A large number of drones and erratic bee movement may indicate worker laying or a queenless colony.

If any signs are seen indicating possible problems, then the colony should be inspected from inside by opening the hive and the problem solved as soon as possible.

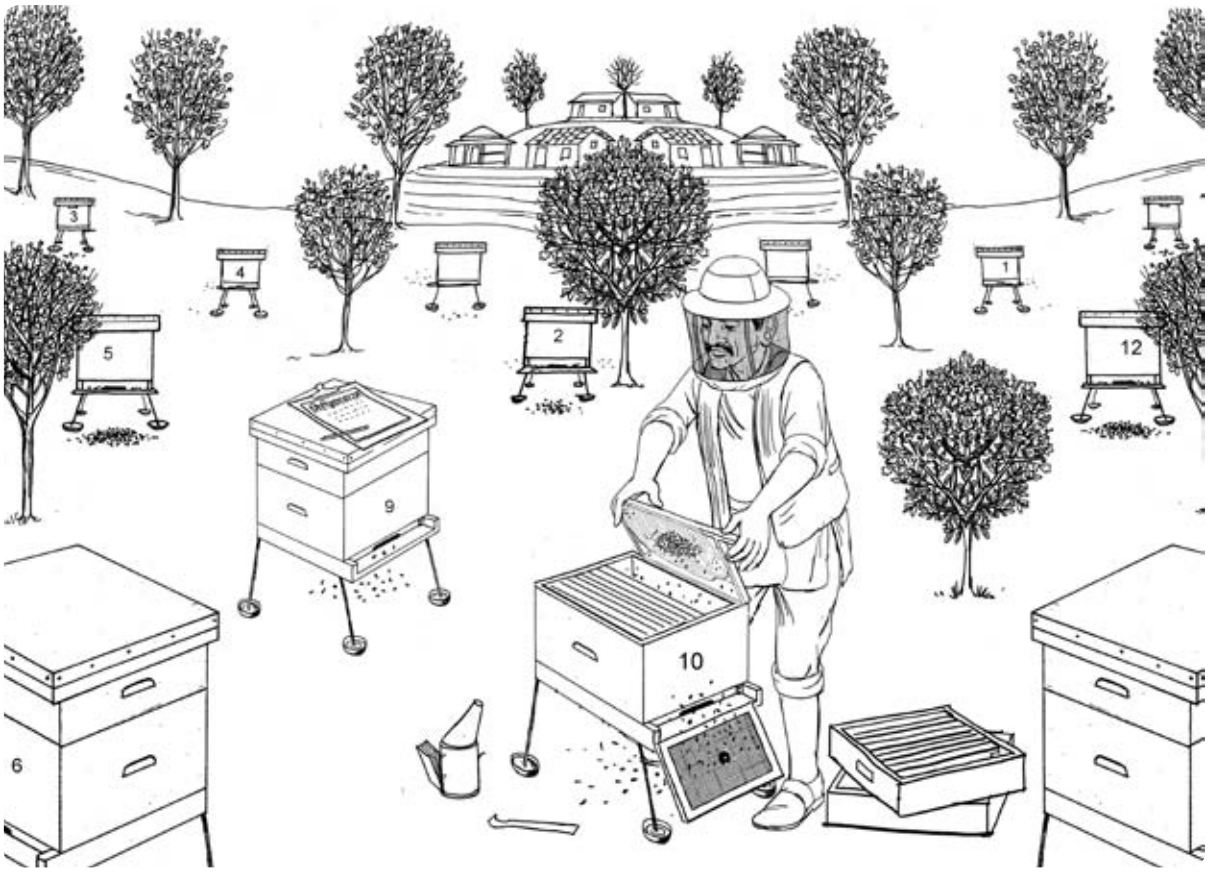
Colony Inspection from Inside

Inner inspection is carried out after the outer inspection to confirm the colony status, strengths, and any abnormalities, and to perform any necessary management practices (Figure 45). The inner inspection of a colony should carried out with a clear set of objectives. The necessary equipment should be gathered together before inspection starts. Observations should include the following:

- Condition of the queen
- Colony strength – number of adult bees and amount of brood (eggs, larvae, and pupae)
- Food stores (honey and pollen)
- Presence of pests and disease
- Symptoms of swarming and absconding
- Need to provide more frames with comb foundation or combs
- Cleanliness and hygiene
- Need to remove unnecessary, deformed, or additional combs built by the bees

A commercial beekeeper with many hives may inspect a sample to gain an idea of the general condition of the apiary.

Figure 45: **Bee colony inspection**



Preparation

The following equipment and accessories should be collected together before the inspection:

- Bee veil
- Hive tool
- Knife
- Smoker or cotton cloth roll
- Gloves if wanted
- Observation form
- Pen

Steps in inspection

- Stand beside the hive (standing in front of the hive disturbs incoming and outgoing bees).
- Give 2–4 puffs of light smoke from a smoker or roll of smouldering cotton cloth at the hive entrance.
- Lift off the outer cover and lay it upside down in front of the hive. Smoke the hive lightly through the hole of the inner cover. Remove the inner cover and place in a slanting position next to the hive stand. If the queen is seen while taking out the inner cover, she should be kept safely inside the hive.
- If there is a super, take it off and stand it safely on the outer cover.
- Remove any dummy boards or frame feeders from the brood chamber and put them down outside.
- Inspect the brood frames carefully on both sides one after the other by holding and rotating; make sure that the pollen, nectar, and queen and nurse bees don't fall outside the hive.
- Replace the brood frames carefully after each has been inspected.
- Replace any dummy boards or frame feeders, and/or replace with frames with empty combs or comb foundation.
- Replace the super, refit the inner cover, and cover the hive with the outer cover.
- Record the observations in the observation sheet while inspecting the colony. A sample observation sheet is shown in Table 5.

Table 5: **Colony inspection record sheet**

Apiary site			Colony number				Age of queen			
Date	Total number of combs		Bee status				Food storage		Presence of disease	Remarks
	Total brood	Honey	Adults	Eggs	Larvae	Pupae	Nectar	Pollen		

Excellent = + + + Medium = + + Poor = + Nil = –

Note the following

- The inspector should wear unscented, clean, and colourless clothes.
- The inspection should be carried out quickly and gently.
- Continue the inspection even if the bees sting, without becoming over-excited. Stings should be removed gently.
- If the bees are angry and defensive, immediately close the hive by replacing the cover.
- Strong and healthy colonies should be inspected first followed by weak or diseased and angry colonies.
- If the queen is seen in a brood frame while inspecting, take extra care and replace in the brood chamber immediately.
- After inspecting diseased colonies, wash hands and any equipment and accessories thoroughly with soap and water before inspecting another (healthy) colony. Otherwise wash hands and equipment with soap and water at the end of the inspection.

Session 8 Annual Colony Cycle and Seasonal Management

Sub-topics

- Location and seasonal factors affecting the colony cycle
- Colony management during the honey flow season
- Colony management in the off season

Time: 1 hour 30 minutes

Theory: 45 minutes
Practical: 45 minutes

Objectives

Trainees will

- understand the annual cycle of the honeybee colony, and
- be able to plan and carry out year round management of bee colonies including seasonal honey harvesting and periodic colony and brood management.

Training Methods

- Lecture
- Practical exercise
- Discussion and question and answer

Materials

- LCD projector, PowerPoint slides, diagrams, photos
- Movable frame hive with bees
- Beekeeping equipment
- Materials for colony inspection (see Session 7)
- A whiteboard and board markers or blackboard and chalk
- A flipchart with stand and marker pens, or large sheets of brown paper with pens and masking tape
- Metacards and pens, soft board and pins

Activities and Exercises

Activity 1: Lecture

Give a presentation on the annual colony cycle and seasonal management activities as outlined in the resource materials (below). Explain the differences between the honey flow and dearth periods and discuss seasonal honey harvesting and the periodic colony and brood management activities. Use PowerPoint slides and photos to illustrate the talk, or large blown up photos and drawings in areas where there is no electricity.

Activity 2: Practical exercise

Step 1: List and describe the various seasonal and periodic activities.
Step 2: Ask one trainee to open a hive
Step 3 Inspect the colony, pointing out the findings to the trainees, and discuss the activities that need to be carried out based on the results of the inspection. For example, some colonies may need supplementary feeding or more comb foundation may be needed.
Step 4: Show the trainees how artificial feeding is done and add comb foundation

Activity 3: Discussion and question and answer

Use discussion and question and answer approaches to discover whether the trainees understand the need for regular and seasonal colony management and know when and under what circumstances the specific activities are needed.

Take home message

- Beekeepers should be able to develop strong colonies by using appropriate colony management practices 2 months before the honey flow season and developing at least a 10 frame colony during the onset of honey flow.
- They should know how to prepare the hives, and should collect together the necessary equipment and accessories in time for the honey flow period.
- Dearth is an emergency period for honeybees. Beekeepers should provide sufficient supplemental food to maintain colonies and should take measures to protect them from pests.
- Beekeepers need to be aware of ways in which they can save a colony from destruction and prevent absconding.

Session 8 Resource Materials

Annual Colony Cycle and Seasonal Management

Annual Cycle of a Colony

The annual cycle or pattern of a honeybee colony reflects the process of sustaining the colony around the year based on the climatic conditions and weather, and the availability of forage. The annual cycle is affected by seasonal change. The morphology, anatomy, and genetic character of honeybees is adapted to allow continued development and maintenance of a colony even under unfavourable climatic conductions.

Seasonal Colony Management

Seasonal colony management is the set of management practices designed to meet the different needs of a colony over the year. Colony management is an integral part of modern beekeeping and is essential to maximize honey production, for colony division, for the production of other bee products, and for providing pollination services. The honey flow period is the time when the most flowering plants are available for forage. The off season or dearth period is the time when little forage is available and the climatic conditions are unfavourable for foraging. The timing of these periods differs in different locations. The approximate timings at different altitudes of the Himalayan region are provided as a guide in Table 6.

Table 6: **Honey flow and dearth periods at different altitudes in the Himalayas**

	Honey flow season	Off season (dearth)*
High hills	April, May, June, July, August	September, October, November, December, January, February, March
Mid hills	April, May, September, October, November, February, March	June, July, August, December, January
Foothills and plains areas	April, October, November, December, January, February, March	May, June, July, August, September

* The honey flow and off (dearth) seasons vary according to forage source and exact location

Flow Season Management

The honey flow season is very important for both bees and beekeepers. This is the time for increasing colony strength, honey production, colony multiplication, queen production, swarming control, brood disease control, and migration.

Activities before and during the honey flow season

Before the season

- Establish a healthy colony prior to the honey flow season.
- During the season
- Clean hives.
- Observe the presence and performance of the queen.
- Check the status of the brood and adult bees.
- Widen the entrance of strong colonies.
- Provide a honey super once all the brood frames are full and the colony active to create a good working environment for the bees. Fill all ten slots with frames with previously harvested combs that have been cleaned, or with comb foundation if no used combs are available.
- Add additional frames to the super as needed.

- Wait until 70% of honey cells in the super are capped and then harvest honey.
- Check the combs in the brood chamber and remove any that have been abandoned or that look very old (blackened).
- Control and manage swarming.
- Avoid using drugs to treat a colony during the honey flow season. If disease and pest attacks occur, apply suitable control measures but don't harvest the honey.
- Feed colonies and keep them warm if there is a cold wave during the honey flow season, especially during winter in foothill and plains areas.
- Keep bee colonies in the shade if it is dry and hot.

Off-Season (Dearth) Management

The dearth period is very risky for both bees and beekeepers. Colonies may become weak due to scarcity of food, pest and disease attacks, and robbing and absconding. The following management practices should be adopted in the off season (dearth) period.

Winter off season

- Ensure the bee colonies have enough food through feeding management.
- Keep bee colonies warm by narrowing the entrance and ventilator.
- Remove empty combs and use a dummy board(s). Unite weak and queenless colonies.
- Don't harvest honey during a cold period.
- Place the colonies in a sunny location with the entrance facing south to east.
- Migrate colonies to warmer areas if possible.
- Avoid colony division and queen rearing.

Dry and summer off season

- Ensure the hives have sufficient food and water.
- Keep the bee colony strong by feeding them sugar, and if necessary by uniting weak colonies.
- Take appropriate measures to control pests and disease.
- Take appropriate measures to prevent and control absconding.
- Unite weak and queenless colonies.
- Take appropriate measures to prevent colonies from robbing.
- Keep the bee colonies under a roof or shade during the rainy season.
- Remove empty combs and store in a safe place.
- Avoid colony division and queen rearing.
- Widen the ventilation and entrance to enable better air circulation.

Session 9 Swarming

Sub-topics

- Introduction
- Causes of swarming
- Time and season
- Control and management
- Method for capturing a swarm
- Management of a swarming colony and new swarm

Time: 1 hour

Theory: 30 minutes
Practical: 30 minutes

Objectives

Trainees will

- understand swarming, its causes, time and symptoms; and
- know how to control and manage swarming.

Training Methods

- Lecture
- Practical exercise
- Discussion and question and answer

Materials

- LCD projector and PowerPoint slides, diagrams, photos
- Movable frame hive with bee colony
- Empty movable frame hive
- Colony inspection equipment
- Swarm bag or basket
- Queen gate and queen cage
- A whiteboard and board markers or blackboard and chalk
- A flipchart with stand and marker pens, or large sheets of brown paper with pens and masking tape
- Metacards and pens, soft board and pins

Activities and Exercises

Activity 1: Lecture

Give a presentation on swarming and how to control it, including causes, timing, and symptoms, as outlined in the resource materials (below). Use slides and photos to illustrate the talk, or large blown up photos and diagrams in areas where there is no electricity.

Activity 2: Practical exercise

Step 1: Ask trainees to inspect the brood comb in a colony preparing for swarming.
Step 2: Ask them to identify the queen cells, drone cells, and worker cells in the brood comb.

Step 3: Describe the steps for preparing a new colony with a quality queen cell.
Step 4: Show them how to destroy unwanted queen and drone cells.
Step 5: Capture and relocate the swarm as described in the resource materials.

If no colony is available that is preparing to swarm, demonstrate as well as possible using a normal colony and diagrams and photos showing a colony preparing to swarm, queen cells, and other symptoms of swarming.

Activity 3: Discussion and question and answer

Use discussion and question and answer approaches to discover whether the trainees understand swarming, can recognize the symptoms, and know how to control it.

Take home message

- Honeybee population growth and honey collection take place during the same season.
- Swarming can significantly hamper honey production. Swarming control and regular requeening of colonies with quality queens is very important to avoid loss of honey production.

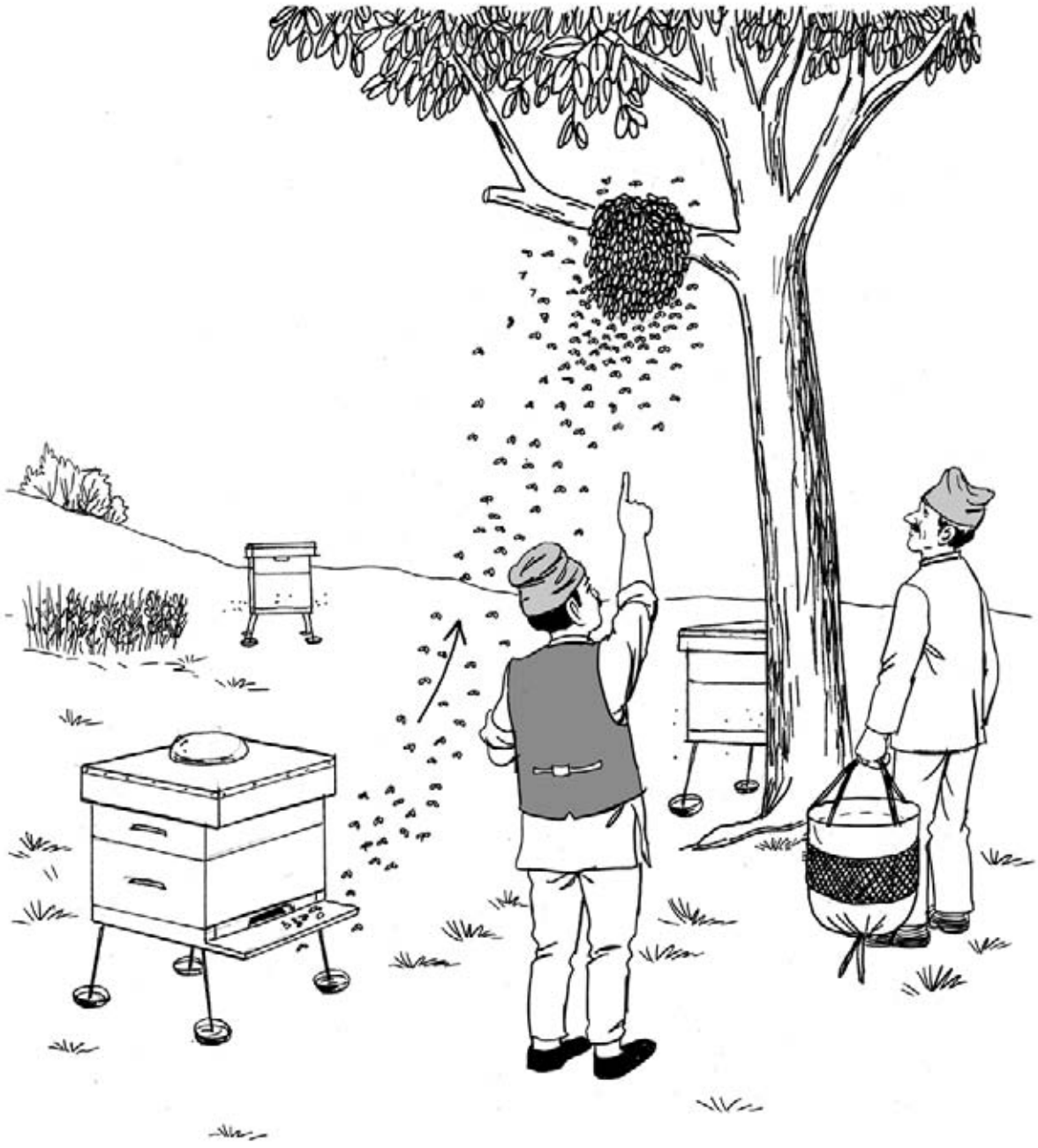
Session 9 Resource Materials

Swarming

Introduction

Swarming is the natural process used for colony reproduction. In swarming, the old queen flies away from the hive with thousands of worker bees to form a new colony (Figure 46). In the first swarming, the mother queen leaves with 50–70% of the workers. There may be further swarming with a virgin queen. Repeated swarming reduces the number of workers each time, which may leave the colony and late swarms too weak to survive.

Figure 46: **Honeybee swarming**



Symptoms of Swarming

- The number of drone cells and drones in the colony increases
- Queen cells are seen at the edges of combs
- Bees cluster at the hive entrance
- Bees hover around the hive making a piping sound
- There are many bees flying a short distance from the existing hive and clustering on a nearby tree branch or similar place.

Causes

- Genetic trait
- Congestion in the colony
- Lack of space for egg laying
- Lack of space for hive food storage
- Increase in temperature
- Delay in requeening

Season and Time

Swarming takes place when there is a sufficient flow of pollen and nectar. The most favourable time is spring and autumn at lower altitudes, and, May, June, and July in the high hills.

Swarming usually takes place on a sunny day from around 9 to 10 in the morning to 3 in the afternoon. In hot areas swarming may start earlier at around from 7 or 8 am. Swarming does not occur when it is rainy or stormy.

Control and Management

A strong colony can be weakened by swarming, which reduces honey yield. Management practices should aim to control swarming using the following approaches.

Prevention

- Inspect the colony at regular intervals.
- Allow sufficient space in the brood and super for brood rearing and honey storage.
- Add new comb foundation so that the bees can make more comb cells for eggs and collection of nectar and pollen.
- Destroy unnecessary queen cells.
- Remove any combs with unnecessary drone cells.
- Enable good ventilation with full air circulation in the hive.
- Requeen the colony with a quality queen each year.
- Place a queen gate at the hive entrance if there are signals indicating the start of swarming.
- Divide the colony.

Swarm capture

If a colony does swarm, it should be captured and rehoused as follows (Figure 47).

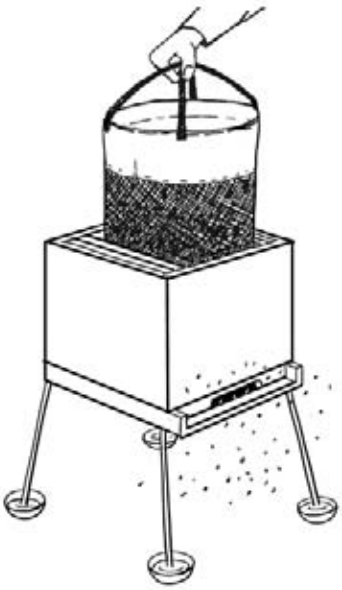
- Try to settle the flying bees by spraying dust and water.
- Allow the bees to cluster for a while at one place.
- Capture the swarm with the help of a swarm bag or basket (Figure 47a,b).
- Hang the bag with the swarm near the desired area for the new hive (Figure 47c).
- Put the swarm in a new beehive (Figure 47d).
- Transfer combs with nectar, pollen, and brood from the existing hive to the new hive.
- Provide supplementary feeding if there is a food deficit.
- Use a queen gate for 3 days to keep the queen in the new hive (Figure 47e).

Figure 47: **Capturing and hiving a swarm**

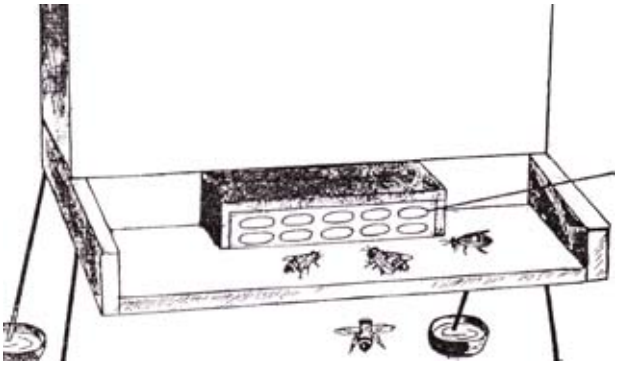
a) capturing a swarm with a swarm bag

b) capturing a swarm with a basket

c) hanging the swarm bag with the captured swarm



d) hiving the swarm into a new hive



e) new hive with queen gate fitted

Session 10 Absconding

Sub-topics

- Introduction to absconding, symptoms and identification
- Causes of absconding
- Types of absconding (planned and emergency)
- Control and management of absconding
- Differences between swarming and absconding

Time: 1 hour

Theory: 45 minutes
Practical: 15 minutes

Objectives

Trainees will

- understand the absconding process and when it is likely to occur,
- be able to control and manage absconding, and
- know the difference between swarming and absconding.

Training Methods

- Lecture
- Observation
- Discussion and question and answer

Materials

- LCD projector and PowerPoint slides, diagrams, photos
- Movable frame hive(s) with a weak colony
- Colony inspection equipment
- A whiteboard and board markers or blackboard and chalk
- A flipchart with stand and marker pens, or large sheets of brown paper with pens and masking tape
- Metacards, pens, soft board and pins

Activities and Exercises

Activity 1: Lecture

Give a presentation on absconding and how to control it, including causes, timing and symptoms, as outlined in the resource materials (below). Explain the difference between swarming and absconding. Use slides and photos to illustrate the talk, or large blown up photos and diagrams in areas where there is no electricity.

Activity 2: Observation

Step 1: Ask trainees to inspect the weak colony.
Step 2: Ask them to gather information on the status of egg laying and honey storage in the brood combs in the colony.
Step 3: Ask them to gather information about disease and natural pests in the colony.

Step 4: If symptoms of absconding are observed, start the control measures against absconding described in the resource materials as a practical exercise.

Activity 3: Discussion and question and answer

Use discussion and question and answer approaches to discover whether the trainees understand absconding, can recognize the symptoms, and know how to control it. Make sure they recognize the difference between swarming and absconding.

Take home message

- Transfer of a colony from a traditional to an improved hive at an unfavourable time of year, without appropriate technology, or by an unskilled person may induce absconding and result in a negative attitude towards modern beekeeping.
- Absconding of honeybees is always harmful to beekeepers, thus it is important to keep colonies strong during the dearth period, to continue feeding, and to protect the bees from diseases and pests.

Session 10 Resource Materials

Absconding

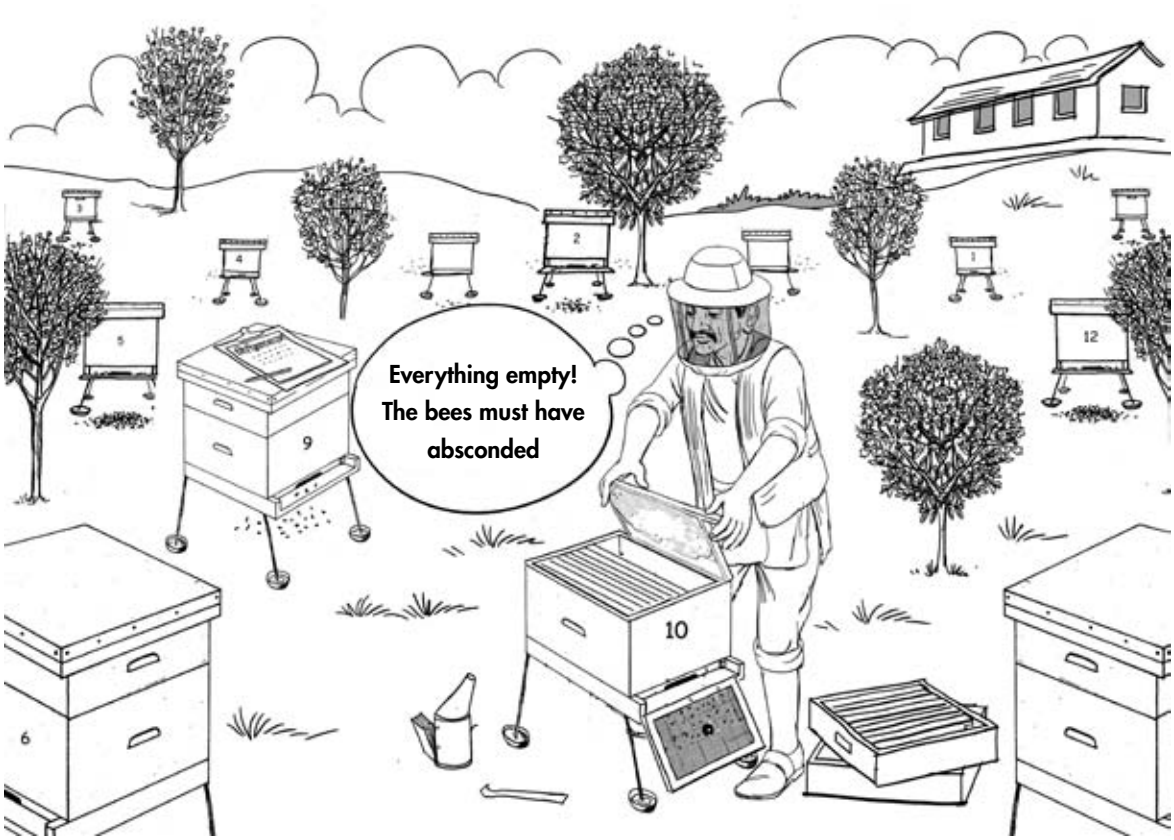
Introduction

Absconding is the process in which a honeybee colony completely abandons a hive as a result of problems. Absconding can result from unfavourable conditions, especially during the dry season or dearth period and in hot and rainy weather. Absconding usually takes place during the day between 10 am and 3 pm. Two types of absconding can occur: planned and emergency.

Symptoms of Absconding

- Workers create a non-laying environment for the queen 15 days before absconding.
- The number of eggs, larvae, and pupae in the colony is reduced.
- Stores of nectar and pollen are depleted.
- Fewer bee flights (incoming and outgoing) are seen at the entrance.
- Many workers fly around the hive making piping sounds. Bees take off fast and fly higher.
- After planned absconding, combs are left empty (Figure 48). Some brood and honey may be left after emergency absconding.

Figure 48: **An empty hive with no brood, bees, or food – the bees have absconded**



Causes

- Lack of food during the dearth period due to harvesting all the honey at the end of the honey flow season
- Endemic disease and attack by pests
- Too high a dose of medicine given to a diseased colony
- Inadequate and inappropriate seasonal management of the colony
- Transfer of a colony from a traditional to an improved hive at an unfavourable time of year
- Poor transfer of a colony from a traditional to an improved hive as a result of having inadequate technical skills
- Use of a sub-standard improved hive and technology
- Disturbance to bees as a result of poor methods of colony inspection
- In the case of *Apis cerana*, robbing as a result of insufficient space between hives
- Lack of an appropriate and safe site and obstacles in the path of bees flying to and from the entrance
- Genetic trait

Differentiating Absconding from Swarming

Swarming and absconding are similar in the followig ways.

- Worker bees crop the honey and exit from the hive at a specific time.
- The worker bees fly away after the queen bee exits.

Differences between swarming and absconding are shown in Table 7.

Table 7: **Differences between swarming and absconding**

Swarming	Absconding
Swarming occurs during the honey and pollen flow season because of population growth and lack of space (congestion) in the hive.	Absconding occurs during the dearth period and/ or because of adverse conditions resulting in weakening of the colony, including climate, lack of food, and occurrence of pests and disease.
Bees continue foraging.	Bees stop foraging.
Only a portion of the colony leaves the hive.	All bees abscond.
Brood, pollen, and honey stores remain in the comb after swarming.	Combs are generally empty after absconding, although some workers, brood and honey may be left.
The swarmed bees settle temporarily nearby at a lower height while deciding on their destination.	The destination has been decided, so absconded bees fly at greater height and settle permanently away from the apiary.
Bees fly at a lower height.	The bees fly higher and fast.
The swarm settles easily into a new hive and starts foraging immediately after hiving.	An absconded colony that is captured and placed in a hive does not settle easily and tries to abscond again.
A new colony develops after swarming. This is a colony multiplication procedure and can be beneficial for a beekeeper	Absconding is migration and no new colony develops. It is harmful for beekeepers.

Control and Management of Absconding

- Leave some honey when harvesting at the end of the honey flow period.
- Feed with sugar syrup continuously for 3 days if the brood combs don't have any food stores.
- Ensure timely investigation and treatment of diseases.
- Protect colonies from pests.

- Do not disturb the colonies with over frequent colony inspection.
- Undertake seasonal management practices to protect bee colonies from cold, hot, and moist conditions.
- Place additional brood combs from a strong colony into a weak colony and protect the colony against robbing.
- Place beehives at an appropriate site that protects them from heat, cold, and other disturbances such as smoke, vehicle noise, and animal transit.
- Requeen the colony every year.
- Provide additional brood combs from a strong colony to a colony suspected of planning to abscond during hive inspection.
- Make the bee entrance small using a queen gate.
- Try to settle the colony nearby through dusting or sprinkling water.
- Hive an absconded colony into a new hive after capture and placing the hive in a separate place to try and prevent further absconding.
- Have a skilled technician transfer a colony from a traditional to an improved hive during a favourable season and using appropriate technology.
- A colony in an apiary showing signs of absconding should be transferred to another hive and placed separately in a different place, otherwise other colonies may also develop an absconding impulse.