LABORATORY MANUAL & WORK BOOK

EXPERIENTIAL LEARNING PROGRAMME (ELP) in Commercial Beekeeping

[B.Sc.(Hons.)Agriculture, Semester-VIII]

"Activity & Learning Record"

Submitted by:

Name of Student:_____
Enrollment No. :_____

Submitted to:

Dr. Hitendra Kumar
ELP Coordinator

DEPARTMENT OF ENTOMOLOGY
SCHOOL OF AGRICULTURAL SCIENCES
(SHRI GURU RAM RAI UNIVERSITY)

CERTIFICATE

This is to certify that Mr./Ms._____Enrollment No._____has sucessfully completed the Experiential Learning Programme (ELP) in Commercial Beekeeping at Bee keeping and training Unit,Department of Entomology,School of Agricultural Sciences ,Shri Guru Ram Rai University,Dehradun.

During his attachment with Bee Keeping and Training Unit from_____to_____for acquiring Experiential Learning in Bee Keeping ,he/she has been a sincere, hardworking and disciplined student and has gained the knowledge and skills necessary to start his own Beekeeping Entrepreneurial business in future.

Dr.Hitendra Kumar
ELP Coordinator
(Commercial Beekeeping)
Department of Entomology
School of Agricultural Sciences
Shri Guru Ram Rai University
Dehradun-248001

ELPActivity- 1

IDENTIFICATION OF HONEY BEE SPECIES

Notes

Objective

After completion of this practical you will be familiar with various honey bee species.

Tools/ Equipments/ Material required

Honey bee colonies, protecting clothings, smoker, insect collecting net, insect killingbottle, insect pins, insect collection box, dissection microscope, glass slides, cover slips.

Procedure

1. Visit the habitats of wild honey bees (i.e. forest areas) and apiaries of hive honeybee species.
2. Collect a few live bees of each species.
3. Put them into the insect killing bottle.
4. Pin the bees at the thorax and fix them in an inset collection box.
5. Observe the bees of different species for their size, shape and colour of differentbody parts.

Observations & Result

1. Complete address of apiary site visited:

.....

.....

.....

2. Behaviour of comb construction:

.....

.....

.....

Notes

3. Average number of combs in one colony:

.....

.....

.....

4. Note down the bee species characteristics in the given space to differentiate amongdifferent species:

S.No.	Characteristics	*A. dorsata*	*A. florea*	*A. cerana indica*	*A. mellifera*
1.	Body size				
2.	Body colour				
3.	Wings colourand type				
4.	Tongue size				
5.	Comb size andnumber				

Precautions

1. Use protective clothings and smoker while examining honey bee colonies.
2. Follow recommended techniques for opening and examining hive honey bee colonies.
3. Take the collected samples immediately to the laboratory.

Notes

.....

.....

.....

.....

.....

(Signature of the ELP Coordinator)

ELPActivity-2

NoteS

CASTES OF HONEY BEES

Objective

After completion of this practical you will be able to identify different castes of honeybees.

Tools/ Equipments/ Material required

Honey bee colonies, bee veil, hive tool, smoker, insect collecting net, insect killing bottle, insect pins, insect collection box.

Procedure

1. Visit the apiaries of hive honey bee species.
2. Examine the worker bees, drones, and queen bees and note down their morphological features.
3. Collect a few live bees of each species, put them into the insect killing bottle.
4. Pin them at the thorax and set them and fix them in an inset collection box.
5. Observe their comparative size, shape and colour of different body parts.
6. Press out the sting of worker bee and examine the variation under microscope.

Observations & Result

S.No.	Characteristics	Queen bee	Drone bee	Worker bee
1.	Body size			
2.	Wings			
3.	Head			
4.	Compound eye			
5.	Abdomen			
6.	Pollen collecting legs			
7.	Sting			

Notes

Precautions

1. Use protective clothing and smoker while examining honey bee colonies.
2. Follow recommended techniques for opening and examining hive honey bee colonies.

Notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Signature of the ELP Coordinator)

Notes

ELP Activity-3

BEEKEEPING EQUIPMENTS

Objective

After completion of this practical you will be familiar with different equipments used in beekeeping.

Tools/ Equipments/ Material required

Various beekeeping equipments.

Procedure

1. Collect all the bee keeping equipments at your workplace.
2. Identify various bee equipments.
3. Observe and note down the material of which the various bee equipments are fabricated.
4. Learn the application and working of these equipments.

Observations

(a) Measure and write down the dimensions (in cm) against the under mentioned beekeeping equipments:

1. Hive tool

(i) Length

(ii) Breadth

2. Honey extractor

(i) Diameter

(ii) Height

(iii) Combs holding capacity

(iv) Type (Tangential/Radial)

(v) Any other

Notes

3. Queen excluder

(i) Type (sheet type or wire type)

(ii) Length

(iii) Breadth

(iv) Distance between two adjacent longitudinal wires

(v) Total number of longitudinal wires

4. Comb foundation

(i) Length

(ii) Breadth

(iii) Thickness

5. Uncapping knife

(i) Length

(ii) Breadth

(iii) Any other

6. Queen bee cages

(i) Type (rectangular wooden type/hair roller type)

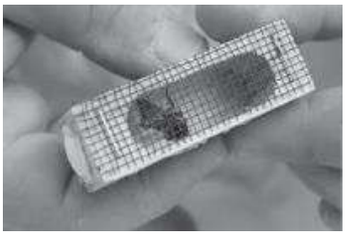
(ii) Length

(iii) Breadth / diameter

7. Any other

(b) Identify and label the equipments given below:

(a)  .....

(b)  .....

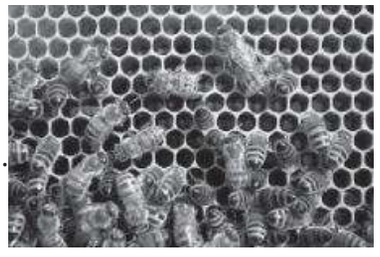
Notes

(c)  .....

(d)  .....

(e)  .....

(f)  .....

(g)  .....

Not

(h)  .....

(i)  .....

Notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Signature of the ELP Coordinator)

Notes

ELP Activity-4

CATCHING A STRAY SWARM FROM A POST OR TREE

Objective

After completion of this practical you will be able to catch a stray swarm from a post ortree.

Tools/ Equipments/ Material required

Overall, bee veil, gloves, rubber boots, swarm basket, hive tool, sugar syrup, smoker, pen, knife, string, hessian cloth, decoy bee hive, cow dung cake and wood shavings for smoker, match box, first aid box, water & ladder.

Procedure

1. Prepare equipment and supplies.
2. Wear overall, bee veil and gloves.
3. Take a swarm basket and pour some sugar syrup on it.
4. Place the basket underneath a decoy beehive hanging to a branch of a tree or post.
5. Push the bees inside the basket with hand.
6. Once the bees enter the basket, close the mouth of the basket with a hessian clothand tie with string.
7. Remove the roof, supers and queen excluder of a hive.
8. Take the swarm basket to a new brood chamber and transfer them into the chamber by shaking. The bees will get dislodged and drop down in a lump over the brood byframes.
9. Replace the super chamber and the roof in their original position.
10. Feed the swarm on sugar syrup or a mixture of 2/3 honey and 1/3 water.
11. Do not allow the bees to go out for at least 24 hours by sealing the entrance of thehive with some dry grass.

12. Allow the bees to leave the hive after 24hrs by opening the entrance in the evening. If the bees have accepted their new home, they will be seen bringing nectar and pollen into the hive.

Notes

Observations & Result

.....

.....

.....

Precautions

1. Wear bee gloves, overall, bee veil and rubber boots before catching a stray swarm.
2. Capturing should be done before 9.00a.m. during summer and after 9.00a.m. duringwinters.
3. Capturing should be done during good breeding season i.e., February, March andApril.
4. At least two persons should be involved in catching a stray swarm.
5. Be careful while handing the smoker.
6. Do not keep the hive top feeder on the ground.
7. Do not remove the queen from the old hive.
8. Apply ant proofing like used grease on the hive stand so that ants do not enter thehive.

Notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Signature of the ELP Coordinator)

ELP Activity-5

Note

BEE COLONY INSPECTION

Objectives

After completion of this practical you will be able to

- inspect a bee colony;
- record the performance of bee colonies.

Tools/ Equipments/ Material required

Gloves, mask, smoker, hive tool, bee brush, bee veil, bucket of washing soda solution toclean your gloves and hive tools, and a sealed container for scrap wax.

Procedure

A. Opening the hive

1. First remove the top cover of beehive and place it on the side of beehive.
2. Before removing inner cover give puff of smoke by smoker. Wait for 30 to 60 seconds, and then lift the inner cover slightly.
3. Remove supers if any and place them close to the front of the hive – they will tendto attract the returning bees and make inspection easier.
4. Carefully remove the queen excluder and check to ensure that the queen is not on it.
5. Clean up any brace comb or propolis on the queen excluder at this stage so that youare able to quickly re-assemble the hive if necessary.
6. Make sure that any brace or burr comb is placed into a sealed container that you can take away with you – do not discard it on site as it can set up robbing and is anagent for spreading wax moth infestation.
7. Carefully remove either an end frame, or dummy board if there is one, to give space to easily remove or move the other frames without damaging the bees. After inspectingto see if the queen is on it, place it in a safe place at the side of the hive preferablynot in direct sunlight.

Notes

Fig. 11.1: Opening of beehives

B. What to look for and what to do

1. Examine each comb thoroughly for the presence of brood, queen, honey, pollen and presence of any disease or enemy.
2. Always replace combs in the same sequence and same orientation as they were atthe start of the inspection.
3. The top and side bars of each comb should be kept clean by scraping off any wax orburr comb.
4. Unless you are moving frames to the outside of the brood box with a view to removethem from the hive at the next inspection, do not split the brood.
5. Any new, undrawn frames that need to be added should be placed in the centre ofthe hive.
6. If you suspect disease is present in the colony make certain that you do not cross infect another colony. Clean up your gloves and all hive tools – change your glovesif necessary.
7. If the disease is noticed, reduce the entrance to minimise robbing by bees from othercolonies and follow the management practices.

Notes

C. Closing up

1. Re-assemble the hive making sure that frames are tightly pushed up together to provide correct bee space.
2. Ensure that the hive is stable on its stand or the ground and that it is properly assembled with no gaps between boxes.
3. Check that the site is clean and tidy and make the notes on your record card before leaving the site.

Observations & Result

Inspection report of bee colony

Date: **Site:**

Bee colony	No of bee frames	No of brood frames	Brood area		Queen	Egg/ larva	Honey		Pollen	Pest/ disease
			Sealed	unsealed			Sealed	unsealed		
1.										
2.										
3.										
4.										
5.										

Precautions

1. Be quick, calm and methodical throughout your examination of the colony avoiding any sudden or sharp actions.
2. Always have a reason for examining the colony.
3. Keep colony records and consult them prior to examining the colony so that you know the priority actions and can arrange suitable equipment in advance.
4. Keep a bucket of washing soda solution to clean your gloves and hive tools between frames or colonies, and a sealed container for scrap wax.
5. Be certain that all circumstances are suitable to examine the colony. Do not start your examination if the weather is likely to be adverse or if there are people or animals in the vicinity.
6. Before opening the colony, make an assessment from the outside (e.g. are the flying bees behaving normally, are there significant numbers of dead bees outside the hive, is pollen and nectar being brought in).
7. Before opening the colony, know where all of the hive parts to be kept and where all the equipment you will need are present.

Notes

8. Light the smoker away from the hive and ensure that your veil is not likely to be affected by any sudden flare up from it whilst lighting.

9. Use smoke sparingly to control the bees rather than "let them know you are coming" – smoke from the top downwards rather than from the bottom (smoking from the bottom drives the bees upwards).

Notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Signature of the ELP Coordinator)

ELP Activity-6

Notes

DIVIDE/MULTIPLY THE BEE COLONIES

Objective

After completion of this practical you will be able to divide/multiply the bee colonies to increase number of colonies.

Tools/ Equipments/ Material required

Empty bee box, wax frame, protective clothing, all handling tools, bee colony, smoker.

Procedure

Bee colony division is a technique for making a new bee colony by dividing the existing bee colony. An existing colony is divided into two colonies, each containing more or less equal number of bees during breeding season i.e. February-March and October-November. The simple division of a colony can be done in two ways: (i) by separation of chambers, and (2) by separation of frames.

Separation of chambers

1. In this method, simply divide the existing hive by separating various chambers into a separate colony.

Separation of frames

1. Divide all the frames with brood and bees, equally in two or more colonies.
2. Keep them in separate chambers with bottom.
3. Usually one frame each with egg, sealed brood, pollen and nectar are placed in each new colony.
4. Rest of the space is filled with new frames with fitted comb foundation and fed properly.

Observations & Result

.....

.....

.....

Notes

Also, visit few apiaries and note down the following:

Sr. No.	Name of bee keeper visited	No. of bee colonies at the end of previous years	No. of bee colonies at present	Methods used for multiplication
1.				
2.				
3.				
4.				
5.				

Precautions:

1. Handle the smoke carefully.
2. Do not puff too much of smoke on the honeybees.
3. Handle the frames carefully so that the bees do not drop on the ground.

Notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Signature of the ELP Coordinator)

ELPActivity-7

Notes

UNITING THE BEE COLONIES

Objectives

After completion of this practical you will be able to:

- To unite weaker colonies to make them stronger.
- To unite queenless colony with queen right colony.

Tools/ Equipments/ Material required

Overall, bee veil, gloves, rubber boots, hive(with weak and strong colony), hive tool, sugar syrup (sugar: water in ratio of 1:1 ie.,100g sugar in 100ml water), smoker, cow dung cake and wood shavings for smoker, match box, newspaper, queen excluder, First Aid box, water

Procedure

1. Wear the protective clothing
2. Move the two colonies close together taking all the steps for moving bees carefully
3. Smoke three to four puffs on the entrance of the hives to be united
4. Remove the queen from the weak colony
5. Remove supers shaking the bees into their brood box
6. Place a single sheet of newspaper over the queen less colonies brood box. Ensure that there are no gaps and use two overlapping sheets if necessary
7. Make two or three holes or slits with the hive tools to give the bees a starting point
8. Place the queen right colony on top of the queen less brood box
9. If you have to remove supers and there are still some bees in them it is safer to put them above the top brood box with a queen excluder and another sheet of paper.

Notes

Observations & Result

.....

.....

.....

Precautions

1. Handle the smoker carefully.
2. Do not puff too much of smoke on the honeybees.
3. Handle the frame carefully so that the bees do not drop on the ground.
4. Do not use damp newspaper.

Notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Signature of the ELP Coordinator)

Notes

ELPActivity-8

DISEASES AND PESTS OF HONEYBEE

Objectives

After completion of this practical you will be able to:

- identify the disease and pests of honey bees.
- manage the diseases and pests of bees.

Tools/ Equipments/ Material required

Infected bee colonies, insect trap, hand gloves, plastic jars, magnifying glass, hand sprayer.

Procedure

1. Arrange a visit the bee unit.
2. Identify the different disease and pests present in bee colonies.
3. Collect the infected samples in a jar.
4. Bring it into the laboratory.
5. Identify the diseases or pests.

Observations & Results

Sr. No.	Name of disease/Pests	Infected part	Intensity of damage	Suggested management measures
Diseases				
1.				
2.				
3.				
4.				
5.				

Notes

Sr. No.	Name of disease/Pests	Infected part	Intensity of damage	Suggested management measures
Pests				
1.				
2.				
3.				
4.				
5.				

Precautions

1. Use hand gloves while collecting infected sample of disease or pest.
2. Take the collected samples immediately to the laboratory.

Note: Teacher should guide the learners regarding management of diseases and pest affecting honeybees.

Notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Signature of the ELP Coordinator)

Notes

ELPActivity-9

EXTRACTION OF HONEY FROM HONEYCOMB

Objective

After completion of this practical you will be able to extract honey from honeycomb.

Tools/ Equipments/ Material required

Apron, disposable gloves, headwear, mask, beehives having sealed honey, hive tool, uncapping knife drip tray, honey extractor (radial or tangential)

Procedure

1. Wear apron, disposable gloves, mask and headwear.
2. Smoke the colony or super before removing frames.
3. Remove the combs with sealed honey only. Select only those combs in which more than 70% of cells are capped. Do not select honey combs having sealed/unsealed brood.
4. Gently brush them off the comb.
5. Keep the removed honey frames separately in an empty chamber and cover it.
6. Honey extraction process should be done in a closed room or in a tent made of fine mesh netting away from the apiary.
7. Uncap the wax seals on both sides of the honey-filled combs with uncapping knife by placing the combs in the drip tray. Knives are heated before uncapping the sealed honey in the hot water. Usually two knives are used by putting one for heating while second one is used to uncap the wax capping. The capping can also be removed by steam operated or electrical uncapping knife (Fig. 17.1). First uncap one side, then turn the frame and uncap the other side.
8. Place uncapped honey combs in the honey extractor (Fig.17.2) and rotate it to force the honey out of the combs by centrifugal force. To harvest honey tangential or radial types of honey extractors are used. In tangential honey extractor after extracting

honey from one side, it is required to reverse the combs by hand to extract the honey from the other side of the comb. In radial honey extractors both sides of the comb are extracted simultaneously as the combs are rotated, the centrifugal force acting radially across the face of the comb.

9. Rotate the extractor slowly at first. If the extractor is turned too rapidly, the weight of the honey may break the combs. The combs should not be damaged during extraction as they are to be reused and are quite costly for man and the bees to produce.

10. The extracted honey is passed through the muslin cloth or wire mesh for straining the extraneous material and wax capping.

11. During honey flow season queen excluder should be used to restrict the queen within brood chamber.

12. After honey extraction empty combs should be given back to the honey bee colonies (as many as were drawn out from every colony).

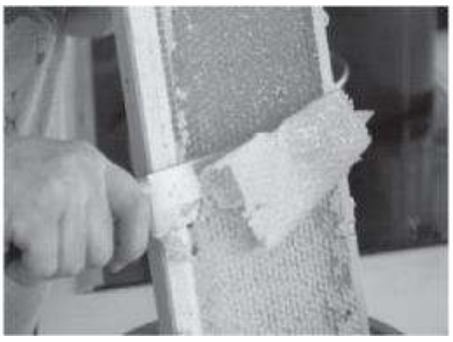


Fig. 17.1: Uncapping honey comb

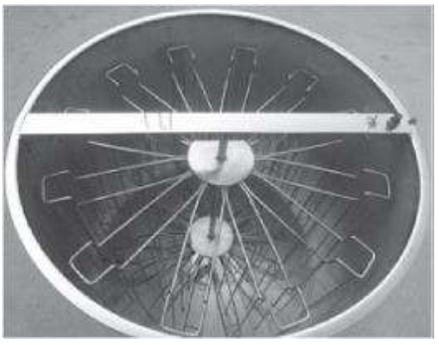


Fig. 17.2: Radial honey Extractor

Observations & Result

.....

.....

.....

Precautions

1. Remove the combs properly to avoid cell damage.
2. Proper heating of knife in boiling water is necessary for smooth uncapping of combs.
3. Place combs of almost equal weight opposite to each other in the extractor to avoid any imbalance in the movement of the extractor.
4. Take all necessary measures to maintain hygienic conditions during extraction.
5. Wash and dry the honey extractor, utensils and other equipment thoroughly after use.

Notes

Notes

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Signature of the ELP Coordinator)

Extra Information