

Participant Handbook

Sector
AGRICULTURE AND ALLIED

Sub-Sector
Agriculture Allied Activities

Occupation
Bee keeping

Reference ID: **AGR/Q5301, Version 1.0**
NSQF Level 4



Beekeeper

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Shri Narendra Modi
Prime Minister of India

“ Skilling is building a better India.
If we have to move India towards
development then Skill Development
should be our mission. ”



Certificate
COMPLIANCE TO
QUALIFICATION PACK- NATIONAL OCCUPATIONAL
STANDARDS

is hereby issued by the

AGRICULTURE SKILL COUNCIL OF INDIA

for

SKILLING CONTENT: PARTICIPANT HANDBOOK

Complying to National Occupational Standards of
Job Role/ Qualification Pack: **'Beekeeper'** QP No. **'AGR/Q5301 NSQF Level 4'**

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Authorised Signatory
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It is expected that this publication would meet the complete requirements of QP/NOS based training delivery, we welcome the suggestions from users, Industry experts and other stakeholders for any improvement in future.

About this book

Beekeeper is a person who is responsible for various activities involved in Bee keeping as per the Qualification Pack (QP). The Beekeeper is responsible for carrying out beekeeping operation right from understanding bee biology and behaviour to harvesting and processing of products. The bee-keeper manages colonies of bees in order to harvest honey and other Bee related by-products (Wax, Pollen, Propolish, Royal Jelly, Bee venom etc). His responsibilities include nurturing the bees to sell the raw and finished products in the market. The job requires the individual to have mental and physical ability, good sight, attention to details, capability to follow safety procedures and stamina to work for long hours. The individual should also be able to demonstrate skills of using various tools and keep records as required. The trainee will enhance his/her knowledge under the guidance of the trainer in the following skills:

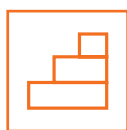
- **Knowledge and Understanding:** Adequate operational knowledge and understanding to perform the required task
- **Performance Criteria:** Gain the required skills through hands on training and perform the required operations within the specified standards
- **Professional Skills:** Ability to make operational decisions pertaining to the area of work.

The Beekeeper should work independently, and has the ability to make various strategic and operational decisions pertaining to his / her area of work. The individual should have clarity and should be result oriented. The individual should also be able to demonstrate skills to use various tools.

Symbols Used



Key Learning Outcomes



Steps



Time



Tips



Notes



Unit Objectives



Exercise

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1. Introduction

Unit 1.1 - Objectives of the programme

Unit 1.2 - Importance of bee keeping

Unit 1.3 - Role of beekeeper

Unit 1.4 - Bee body structure and usefulness of modifications



Key Learning Outcomes

At the end of this module, you will be able to:

- Recognize the objectives of the programme
- Explain scope or job role of beekeeper
- Explain importance of beekeeping in generating self-employment
- Describe importance of beekeeping in generating job opportunities in allied sectors
- Describe importance of beekeeping in enhancing agricultural productivity
- Identify the basic structural features of honey bee body
- Explain the special structural modifications in honey bees
- Describe the importance and utility of various modifications on honey bee body
- Identify job opportunities in various sectors associated with beekeeping

UNIT 1.1: Objectives of the Programme

Unit Objectives

At the end of this unit, you will be able to:

- Recognize importance of the programme

1.1.1 Beekeeper

Beekeeper is a person who manages honey bee colonies in order to harvest and sells honey and other hive products produced or collected by honey bees either in raw form or as finished products after their processing.

1.1.2 Importance of Bee keeping Programme

For creating more job opportunities especially in rural areas, Central and State governments are making concerted efforts to promote beekeeping as one of the tools for generating jobs in agriculture related subsidiary occupation. This programme will enable the rural and unemployed youth to provide job providers rather than job seekers. This will be highly useful in the upliftment of rural people, unemployed youth, farm women, farm workers, small and marginal farmers.

Exercise

1. What is beekeeping?

Answer: _____

2. How can this programme benefit in creating jobs?

Answer: _____

Notes



A large rectangular area containing numerous horizontal lines, intended for taking notes. The lines are evenly spaced and span the width of the page.

UNIT 1.2: Importance of Bee keeping

Unit Objectives

At the end of this unit, you will be able to:

- Explain importance of beekeeping in generating self-employment
- Describe importance of beekeeping in generating job opportunities in allied sectors
- Describe importance of beekeeping in enhancing agricultural productivity

1.2.1 Self-employment By Adopting Bee keeping

Bee keeping is an important subsidiary occupation which can be adopted by persons of any gender, landless, marginal and small farmers, students, ex-servicemen, rural unemployed youth, etc. as full time or part time occupation to increase family income. Bee keeping equipment are simple and easy to use. Beekeeper can take services of his/her family members in managing colonies, honey extraction and sale, etc instead of hiring labour to further increase profitability from the occupation.

1.2.2 Bee keeping Generates Job Opportunities In Allied Sectors

A beekeeper needs various equipment, hives, honey bees and sells hive products. During this whole process, several other sectors get linked. To meet demand for bee hives, hive fabricator, timber merchant, transporters, carpenters, paint industry, painters, labourers, drivers and helpers will also get jobs. Similarly to meet demand for steel/iron equipment like honey extractors, drip trays, settling tanks, etc. Jobs are created for workshop workers, steel industry, fabricators, etc. in the process of extracting and selling honey and other hive products, several farm workers, beekeepers' helpers, traders, exporters, fabricators and suppliers of honey bottles and packaging material are getting benefitted. In brief, beekeeper will not only earn for his/her family, but will help in creating several jobs for others also.

1.2.3 Benefits Of Bee keeping To Agriculture

Bee keeping will be contributing towards augmenting national income by improving productivity of several field, fruit and vegetable crops through pollination service provided by honey bees. Honey bees are the most important pollinators worldwide. Migratory bee keeping further contributes in enhancing crop productivity in those areas also where there are no colonies of hive bees but beekeepers migrate their colonies in several such areas having bee forage crops or plantations.

Exercise



1. Who can adopt beekeeping?

Answer: _____

2. How beekeeping is beneficial to the farmers also?

Answer: _____

3. How beekeeping can help in self-employment?

Answer: _____

4. How beekeeping can help in creating job?

Answer: _____

Notes



UNIT 1.3: Role Of Beekeeper

Unit Objectives

At the end of this unit, you will be able to:

- Define role of beekeeper engaged in self-employment
- Explain the role of beekeeper in beekeeping industry

1.3.1 Role Of Self-employed Beekeeper

Beekeeper will be managing honey bee colonies in different seasons, honey flow periods, nectar/pollen dearth periods, pests and diseases infesting honey bee colonies, extracting honey and other hive products and marketing these products. He/she will multiply his/her stock of bee colonies and sell surplus bees to other farmers or beekeepers.

1.3.2 Role Of Beekeeper In Bee keeping Industry

Beekeepers have job opportunities in managing honey bee colonies large beekeepers, trading of honey in retail market, hive and other equipment fabrication industry, as apiarist in government or private institutes having institutional apiaries. Working in partnership is another opportunity.

Exercise

1. What will be your major job role in your own apiary?

Answer: _____

2. What are the job opportunities for you as beekeeper?

Answer: _____

Notes



Lined area for taking notes, consisting of 30 horizontal lines within a rectangular border.

UNIT 1.4: Bee Body Structure and Usefulness of Modification

Unit Objectives

At the end of this unit, you will be able to:

- Identify different body segments of honey bees
- Identify different types of legs and wings of honey bees
- Explain function of different types of legs of honey bee

1.4.1 Body Structure Of Honey Bee

The body of the honey bee is divided into three regions, namely head, thorax and abdomen (Fig 1.4.1). Head of honey bee bears mouthparts, two compound eyes, three ocelli and two antennae. Thorax is the body region having organs for locomotion. Thorax has three pairs of legs and two pairs of wings. Abdomen is soft and has organs of digestion, excretion, reproduction, etc. and a sting at the abdominal tip

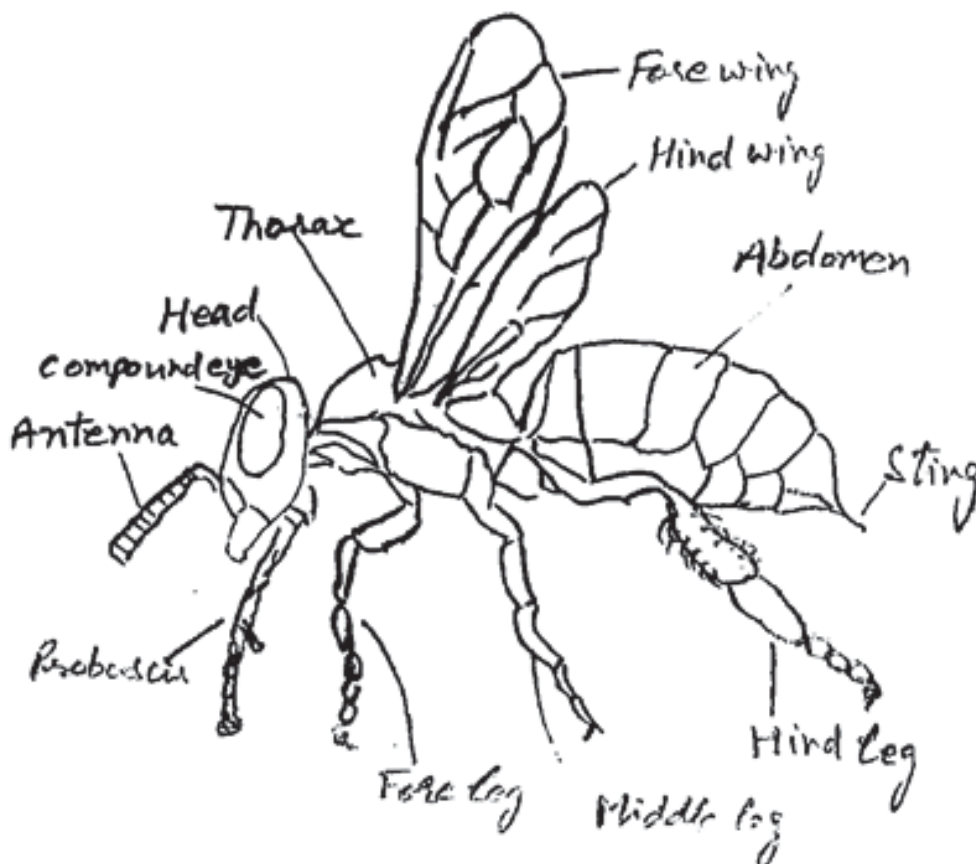


Fig 1.4.1 : Structure of honey bee body

1.4.2 Shape Of Honey Bee Head and Modifications On Honey Bee Head

The head of the honey bee is triangular in shape and is anteroposteriorly flattened. Its front surface is convex whereas posterior surface is concave. The lateral sides of the head are roundish and have a pair of well-developed compound eyes. Shape of the head of worker bee is slightly longer than its width whereas head of queen bee is relatively roundish (Fig 1.4.2). The head of the drone bee is much roundish and larger than that of worker and queen bee. Most of the drone head surface is occupied by compound eyes. The three celli are arranged in an inverted triangle and are located on the vertex (top of the head) in worker and queen bee and on front side below compound eyes in drone bees.



Fig 1.4.2 Head of worker, queen and drone honey bees

1.4.3 Structure and Function Of Antennae On Honey Bee Head

Honey bees have two antennae on the front side of the head in between the compound eyes. The antennae are geniculate type (having elbow type bend) and have sensory structures for touch and smell. Worker and queen bee antenna has 10 flagellomeres and drone antenna has 11 flagellomeres.

1.4.4 Mouthparts In Honey Bees

The mouth parts of honey bee are chewing and lapping type. Mandibles are spatula-like (stumpy basally, narrow medially and expanded distally). They differ in shape and size in the three castes.

1.4.5 Appendages On Thorax Of Honey Bee

This is the second body region of honey bees and comprises of three segments. It bears three pairs of legs and two pairs of wings.

1.4.6 Structure and Function Of Wings In Honey bees

Honey bees have two pairs of wings on the thorax. These are membranous and have veins. The fore wings are much larger than the hind wing (Fig 1.4.3). During flight the two wings on each side are joined (coupled) together with the help of a row of hooks (hamuli) present on the anterior margin of the hind wing and wing fold present on the posterior margin of the fore wing. This wing coupling helps honey bees to have better control during flight.

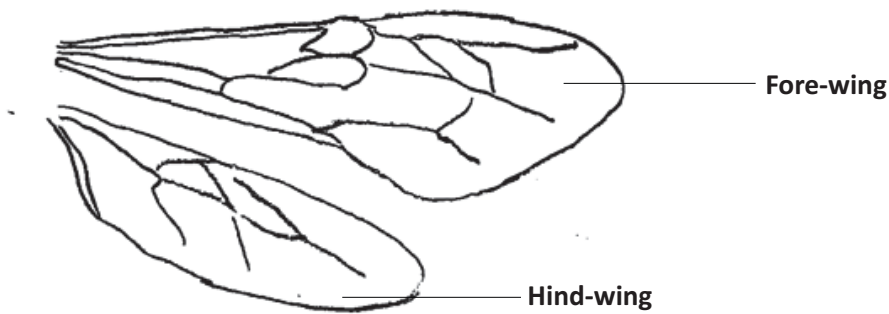


Fig 1.4.3: Wings of honey bee

1.4.7 Structure and Function Of Fore Legs Of Honey bees

The fore legs are also known as antenna cleaning legs (Fig 1.4.4 a). As the name suggests, this pair of legs is used by honey bees to clean their antennae. There is a semicircular notch present on the inner surface of the leg at the proximal end of basitarsus. The notch has fine hairs which enable bee to clean three sides of the antenna whereas fourth side of the antenna is cleaned by the large flat membranous structure called fibula. Regular cleaning of antennae enables the bee to keep clear the sensory structures present on the antennae.

1.4.8 Structure and Function Of Middle Legs Of Honey bees

The middle legs of the honey bees are also known as pollen brushing legs (Fig 1.4.4 b). These legs on the inner surface of their basitarsus have transverse rows of fine bristles for brushing pollen from the body of honey bees.

1.4.9 Structure and Function Of Hind Legs Of Honey bees

The hind legs of the honey bees are also known as pollen collecting legs (Fig 1.4.4 c). These legs collect pollen from the body using the combs on the inner side of basitarsus. The pollen on the combs of one side is then removed by rake (present on the apex of tibia) of the opposite hind leg and is collected in the pollen press. The outer side of both the pollen collecting legs has pollen baskets formed by long curved hair. The pollen ball is carried from field to the hive, in these pollen baskets. When such bees arrive on their combs, the pollen pellets are dislodged into the comb cells with the help of middle legs.

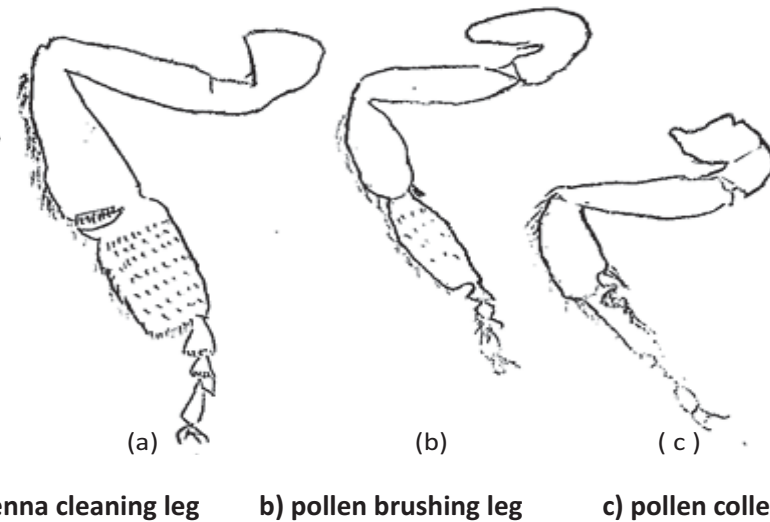


Fig 1.4.4: Modifications in honey bee legs

1 4.10 Major Useful Modifications On Abdomen Of Honey bee

The first abdominal segment has undergone fusion with the met thorax and is called the propodeum. The second abdominal segment is greatly constricted anteriorly at its union with the propodeum. The constricted part is called the petiole and it gives bees' greater freedom for movement of their abdomen. The remaining abdominal segments are collectively called gaster. The gaster consists of six exposed segments in the worker and queen bees and seven in the drone bees, and the remaining are concealed and considerably modified.

1.4.11 Wax Production in Honey bee

Honey bees produce wax from the wax glands present in their body. There are four pairs of wax glands present on the lower side of their 4th to 7th abdominal segments. Wax is secreted in liquid form from these glands and on coming in contact with air the wax hardens in the form of wax flakes or scales. These wax scales are removed by bees with the help of their legs. Honey bees masticate these wax scales and use it for construction of new combs.

1.4.12 Structure Of Bee Sting and Utility To Honey bee Colony

The bee sting is a modified ovipositor. Whole of the sting apparatus including sting shaft, muscles attached to it, venom sac and venom gland are present in the posterior part of the abdomen. The bee sting is used by honey bee as a defense tool against intruding animals. Venom produced by long thread like venom gland is stored in venom sac and is injected through the sting shaft into the body of the intruder. Sting of queen bee lacks barbs (Fig 1.4.5 b) and is retractable whereas, sting of worker bee has barbs (Fig 1.4.5 a) which get entangled into the victim's skin and whole of the sting apparatus get torn of the body of worker bee.

(a)



(b)



Sting shaft of a) worker and b) queen bee

Fig 1.4.5: Sting shaft of a) worker and b) queen bee

Exercise



1. What are three major body regions of honey bee?

Answer: _____

2. How many wings and legs a honey bee has?

Answer: _____

3. What is the function of hind legs of worker honey bee?

Answer: _____

4. What is major difference in sting shaft of queen and worker bee?

Answer: _____

5. What is the source of beeswax?

Answer: _____

Notes



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