

PRACTICAL 15

QUEEN REARING

Aim: To understand technique of mass queen rearing of honey bees which include, prerequisite to produce good queen, basic grafting, management of cell builder colony and handling of queens produced.

In a normal bee colony, there is only one queen and raising of new queens is inhibited by pheromones secreted by the queen. Mated queen inhibits queen raising by workers only if it is able to move freely over brood area by distributing a pheromone from its tarsi on the combs by foot pads

- This pheromone in combination with secretions from mandibular glands inhibits raising of queen cells. When used alone, neither of these secretions inhibits construction of queen cups
- Natural periods for colony to rear queens attributed to inadequate queen movement over brood area
- Crowding of workers restricts queen movement.

Under natural conditions bee colonies raise queen cells during:

- Swarming period
- If queen becomes inefficient (due to old age, injury or disease)
- If a colony becomes queen less.

Production of queen

Queen rearing can be taken up during the periods when the queens are raised naturally. For quality queen production there should be abundance of drones for mating and plenty of floral sources for bees to collect nectar and pollen.

- Spare queen cells produced during swarming season can be used but the colonies raised from these queens may have more swarming instinct, hence generally discouraged.
- Few queen cells can be raised by removing the queen from a strong colony making it queen less
- For large number of queen cells: Doolittle (1889) method of queen rearing is used which involves transfer of young larvae from worker cells to artificial queen cups by grafting

How to proceed for mass queen rearing:

Queen transmits to the colony all the important characters like longevity, disease resistance, temperament, swarming tendency etc. Hence, selection of a breeder colony (colony providing brood for grafting and raising quality queens) is made on the basis of progeny potential of such queens like increased honey production and other characters. For selecting breeder colony, best performing colony in the apiary is marked and brood from this colony is used for raising quality queens.

Pre-requisites to produce good queens

- Presence of well fed larvae (24 h old or younger)
- Strong cell builder colonies to provide surplus royal jelly and proper care for queen cells
- Large number of mature drones of desired stock near queen mating yard
- Stimulation of cell builder colony by constant feeding during development period
- Nucleus of adequate strength to keep ripe cell (matured queen cells) warm and proper care of emerging queen.

Requirements: Queen cell forming rod, grafting needle, beeswax, oven, bee colonies, queen cell protector, queen cell holding frames and queen storage frames, sugar, candy, feeders.

Controlled queen rearing

- Preparation of queen cups: Cell forming rod of 7.5 cm length, tapering from 9.4 mm diameter at 12.5 mm from the tip to a diameter of 6.25 to 7.8 mm at tip
- Prepare queen cups using molten beeswax, having diameter of 9 to 10 mm and 11 to 12 mm in length for mass queen rearing of *A. mellifera*. The cup size will be different for *A. cerana* queen rearing
- Cell builder colony: colony managed to rear queen cells. Select a strong colony with young bees having access to stored or fresh pollen. Feed continuously using friction- pail feeders.
- Strength of cell builder colony should be more than 20000 worker bees (one frame full of bees has about 1600 number of bees)
- The colony should have nine combs containing sealed brood, honey and plenty of pollen with 2 combs of young brood in the centre, next to where queen cups are to be placed
- Breeder queens: it represents the selected stock of mother queens from which new queens are to be reared.

Basic grafting

- Grafting is best done inside a building under bright light preferably at temperature of 30°C and 60-70 per cent relative humidity. Items required are:
 - bars of cell cups (Fig. 15.1a)
 - a grafting needle (Fig. 15.1b)
 - frame containing (frame marked after egg laying by queen) 12-24 h old brood
 - royal jelly in case of wet grafting
- In dry grafting there is no need of priming the cells with royal jelly
- In wet grafting, a drop of royal jelly (1:1 diluted with water) is placed in queen cup before grafting



a



b



c

Figure 15.1 (a to c) Grafting of larvae in queen cups



Figure 15.2 Accepted queen cells after 24hours of grafting

- Young larvae from the selected breeder stock (from best performing colony in an apiary) are picked up with a grafting needle from (Fig. 15.1a-c) the brood comb.
- The grafting needle is moved down from the side of the comb cell and as it reaches under the “c” larva, it is moved up with the larva on its tip.
- This larva from the grafting needle is then dislodged at the bottom of queen cup attached on the bars without changing its position (15.1c).
- In this way 15 to 30 queen cups can be grafted with larvae and once grafting is complete, the frame with grafted cells is immediately moved to cell builder colony.



Figure 15.3 Sealed queen cells



Figure 15.4 Protected sealed queen cells



Figure 15.5 Queens in mating nuclei kept for mating

Management of cell builder colonies

- Cell builder colony needs proper management and same colony can be used to rear queen cells during entire season
- Cell builder colony is made queen less by removing its queen. Grafted cells are accepted within few hours after making it queen less (Fig. 15.2); better acceptance if dequeened in morning and first lot of cells given in afternoon or next day
- This colony being queen less needs sealed brood or nurse bees to maintain sufficient population. For this purpose two frames of brood (1 with uncapped cells) are sufficient which should replace 2 brood less combs
- Frame containing grafted queen cups is placed in the centre of cell builder colony and workers start raising queen cells once accepted by them (Fig. 15.2)
- Destroy any queen cell reared on other brood combs, since these queen cells are not from selected stock.
- On 10th day after grafting: shift finished queen cells (Fig. 15.3) to individual queen mating nucleus or use queen cell protector to prevent cell destruction by any of the emerging queens (Fig. 15.4)
- Mating nuclei can be baby nuclei (Fig. 15.5) or large 2-3 frame full depth nuclei. However, generally baby nuclei are preferred by breeders as these are easy to feed, easier to stock and easier to find mated queen.

Mating of queens

- Mating nuclei are placed in mating yard having ample mature drones from selected colonies (better performing colonies)

- Young queen mates after 5 to 10 days of emergence during mating flights in the open air with a number of drones in drone congregation areas (areas having hundreds of drones)
- Queen starts laying after 7-10 days of mating and is ready for further use.

Transportation/Mailing of queens

After successful mating of the queens, these can be transported in mailing queen cages

- Standard wooden mailing cages are used for mailing
- One end of each queen cage is provisioned with candy. The mated queen is placed in this cage with 3-4 attendant worker bees
- Queens can be transported to long distances in these mailing cages
- In many advance countries, queens are even mailed as parcels in queen mailing cages through department of posts.

Preparation of honey-sugar candy: 0.568 litre (800 g) honey & 1.82 kg sugar (1:2.27 w/w mixtures). Prepared by warming honey to 65.6 °C, adding powdered sugar with continuous stirring and then kneading the mass produced. This candy can be fed to the bees when queen is transported in mailing cage or introduced in to a new colony.

Practical things to do:

- i. Prepare queen cells using cell forming rod & beeswax
- ii. You are given a colony. Make manipulations to prepare it as cell builder colony
- iii. Select the breeder colony from the record of apiary and use 12-24 h old larvae for grafting in queen cells fixed on queen raising frame
- iv. After grafting larvae, give the frame in the centre of cell builder colony for raising of cells
- v. Observe raised cells after 24 hours
- vi. Protect the ripe queen cells using queen cell protector
- vii. Draw labelled diagrams showing all the operations you performed.