Introduction to Queen Rearing

Heather Blackwell Graduate Research Assistant MSU Apiculture





Mississippi Agricultural & Forestry Experiment Station

Members of the Colony

- Drones are reproductive & haploid
- Workers are sterile & diploid females
- Queens are reproductive & diploid females





Life Cycle of Queens

- Mates when 6 8 days old
- Mates while flying (12 90 ft. above ground)
- Mates on multiple days & with multiple drones (if present)
- Diverse drone populations are better (genetic diversity)
- Mates when weather condition is acceptable (rainy days affect success
- Properly mated queens are fertilized with over 6 million sperm
- Pheromones, Chemical Substances & Worker Bee Activity
- Avg. eggs/day = 1200 to 1800 (Spring & Early Summer)
- Avg. Reproductive Life Span 1 2 yrs.
- Avg. Life Span (subspecies influence) 3 5 yrs.

Role of the Queen

- Considered "most important" bee of the colony
 - Produce new bees
 - Produce pheromones
 - Regulate the development of worker bees
 - Keep the colony in balance
 - Serve as a sex attractant for drones
- However the queen does not "rule" the colony
 - Worker bees rule by consensus





Natural Mating

- High in the air at Drone Congregation Areas (DCAs)
- Drones fly to DCAs close to home
- Drones only mate with queens in DCAs
- Queens tend to visit DCAs farther from home



Nurse Bees Feed Larvae

- Nurse bees eat pollen and honey
- They secrete brood food from glands in their heads
- Two glands make the brood food: hypopharyngeal and mandibular





Diet Controls Development

- Worker larvae are fed smaller volumes of brood food than queen larvae
- Worker food has a different mixture of components than queen food
- Diet controls gene expression

Worker Jelly

- 60-80% hypopharyngeal gland contents
- 20-40% mandibular gland contents
- Glucose early; fructose later
- Average food ratio 2:9:3
 (mandibular : hypopharyngeal : pollen)

Royal Jelly

- Nearly 100% mandibular contents during 1st three days
- Becomes a 1 : 1 mandibular gland to hypopharyngeal gland ratio later
- High levels of glucose throughout development (feeding stimulant)



PLATE 20. Stages in development from egg to pupa (after J.A.Nelson, A.P.Sturtevant, & B.Lineburg, 1924).





Bipotent larva

(L1 – early L2)

high JH





low JH





When Queens Fail

- Natural Responses
 - -Biology of Cell Production
 - Queen supersedure
 - Emergence queen replacement response
 - Swarm cells
 - Overcrowding Induced Swarming

Quality of Cells



Swarm Cells usually form with periods of good nutrition

Supersedure Cells often formed during periods of poor nutrition



Why make your own queens? Cost Reduction

- Save time if queens are on hand when needed
- Avoid possibility of unwanted genetics
- You control quality of queens
- You select breeders

The Goal of Queen Rearing: Get the Most Number of Queens with the Genetics or Traits desired from the Least Resources

Requirements for Queen Production

Breeder Queen

 Should be selected for traits you want to see expressed in your apiary

- Cell Builder (starter/finisher)
 - Strong healthy colony with a lot of bees
- Drones
 - For breeding purposes
- Pollen & Nectar
 - Spring is the easiest time of the year



Key Ingredients



Feeding Colonies (bucket gravity)



Cells from queenless starters have the greatest acceptance.

Cells finished under crowded and queenright conditions are fed the best (and result in largest queens).

Cell Starter

•Starter hive

- Used to start the grafted cells
- Queenless hive, can be free flying or enclosed hive
- 3 most important things are nurse bees, nurse bees, nurse bees





200 bees, 6-10 days of age are needed per queen cell

Cell Finisher

- Finisher hive
- 24 hrs after grafting move cells into a super strong colony
- Place cells above excluder with queen in bottom box
- Place open brood (larva) in top box
- Place sealed brood in bottom box
- Make sure the queen is in the bottom box



Swarm Box

- Collect 2-3 lbs. of bees into a deep 5-frame nuc box a few hours before the graft (without a queen)
- Fit the nuc with either an empty rim, or a screened chamber (for cluster expansion)
- Provide honey and pollen combs; water on a clean sponge inside box; also feed syrup
- Do not allow bees to fly freely



A ventilated swarm box.



Free Flying Cell Builder

- Keep the unit queenless
- Support colony with older, capped brood from other colonies (weekly)
- Feed syrup and pollen when actively rearing queens

Free Flying Cell Builder

Empty rim and feeder





Cell Builder





Bee Density is the most important feature to successful queen rearing.

Whatever the size of the hive, it should have a healthy beard of bees hanging on the outside.

Keys to Solid Beekeeping

Constantly evaluate honey productions from bee yards

- Push your mean honey production to be better all of the time
- Understand that colony loss is a reality accept that 20-25% loss may be normal
- Use increases (splits) to either keep number of colonies stable through time, or to increase the size of your operation
- Making queens is important