Course: University of Florida Genetics

Lesson: Honey Bee Production

Objectives:

1. Identify the role, purpose, and importance of honey bees.
2. Compare the different bee breeds.
3. Integrate the major components of gender and roles in a beehive.
4. Discuss honey combs and the process of honey production.

Equipment, Supplies, References, and Other Resources:

Featured Videos:

1. I Heart Honey Bees
2. Show Me the Honey
3. Where are the Bees?
4. Bee Love
5. Public Enemy #1: African Bees
6. Honey, I'm Home

References:
Dr. James D. Ellis – UF Bee Expert
Nathan Sasse – Owner of Sasse Apiary in Chestnut, IL

Recommended Resources:
Cooper, E. L., Burton, D. L., (2002) *Agriscience Fundamentals and Applications*. Albany, New York: Delmar.
University of Florida Entomology & Nematology Department web site http://entnemdept.ufl.edu/.

List of equipment, tools, supplies, and facilities:

- Writing surface
- Overhead projector or computer with projector
- Copies of student lab sheet

Terms (the following terms are presented in this lesson (shown in bold italics):

- Apiary
- Bee wax
- Brood
- Brood boxes
- Drones
- Hive
- Honey
- Larva
- Nectar
- Queen bee
- Royal jelly
- Supers
- Swarm
- Tree resin
- Worker bees

Teacher Directions	Content Outline and/or Procedures
INTEREST APPROACH	*Bring in honey products like wax, honey, an old hive or any other product you have access to and display on a table. Start a discussion with students about each product.* *OR* *Start student discussion with questions about honey bees to get a general knowledge of your learners and use this discussion to provide an overview of the lesson plan.*
OBJECTIVES	
Objective 1: Identify the role, purpose, and importance of honey bees.	***Anticipated problem:*** What is the importance and role of honey bees? I. Importance of honey bees: • It is estimated 1/3 of the world's human food production is dependant on honey bees because they pollinate fruits and vegetables as they collect pollen and nectar for themselves. • Bees support the livestock industry through the pollination of alfalfa other cattle food plants. Alfalfa is a perennial flowering plant cultivated as an important forage crop. • Bees collect pollen to use as an immediate protein food source: o Bees may fly up to 2 miles to obtain food. o To feed themselves and other bees in the ***hive*** during seasons when pollen can be found. ▪ A hive is a colony of bees' home, which may contain up to 60,000 bees during peak production season. • Bees also collect nectar for honey production. o Bees produce honey from the sugar water a plant produces call ***nectar***. o ***Honey*** is the product produced by bees from nectar and is stored and used for food. The excess honey not needed by the bees is harvested by the beekeeper. • In addition to nectar and pollen, bees collect tree resin and water. o ***Tree resin*** is sap contained in trees. Bees use this to waterproof their hive. • Water is collected for drinking purposes. *Show video titled: I Heart Honey Bees*

Objective 2: Compare the different bee breeds.	***Anticipated problem:*** What are the differences between bee breeds? II. The difference between bee breeds: • Honey bees are not native to the United States. • There are three predominate (all European) breeds used in the United States. o Italians (most common) o Carniolans o Caucasians • There is little difference between all European breeds that are used in the United States. • African honey bees can be found in the United States and are more defensive then European breeds. o African honey bees are more of a problem in Florida and the southern United States. ▪ Due to research that was conducted in South America when researches were trying to cross the two breeds. o African honey bees are very similar to European honey bees. ▪ One of the ways to tell a difference between African and European honey bees is by looking at the wings. ▪ Some experts report African honey bees are smaller then their European cousins. o So why is the African honey bee a problem? ▪ They are genetically dominate. ▪ Over time they will out compete, and outbreed the other races. ▪ Crossbreeding a European and an African honey bee will result in a defensive bee variety because African bees genes are very dominate. • Research has been conducted unsuccessfully for over 50 years to try to breed the defensiveness out of the African race. ▪ Research continues to include African honey bees because • They are disease and pest resistant. *Show video titled: Public Enemy #1 – African Bees*

Objective 3: Integrate the major components of gender and roles in a bee hive.	***Anticipated problem:*** What makes up a bee hive and does each bee have a job? III. Bees that make up the hive and their purpose: • ***Worker bees*** o Make up 90% of the hive o Worker bees are female ▪ They do not reproduce offspring under most circumstances. o Worker bees do nearly everything, for example: ▪ Keep the hive and ***honeycomb*** clean. • Honeycomb is composed of hexagonal cells used for honey storage and as a baby bee nursery. ▪ Regulate the temperature of the hive. • Many times bees will appear outside the hive and one can notice they are flapping their wings. o This brings air into the hive to regulate the temperature o This is also why a hive has a continual buzz sound. o Hive temperatures are kept around 92 degrees Fahrenheit no matter the outside temperature. ▪ Collect: • Water • Tree resin • Nectar • Pollen ▪ Produce honey ▪ Produce ***bee wax,*** which are secretions from worker bees wax glands and used to build up the comb. ▪ They feed the rest of the hive and take care of the ***larvae*** or unborn bees also called ***brood.*** ▪ Defend the hive and are equipped with stingers. • ***Drones*** are male bees. o They are much larger then worker bees: ▪ Larger abdomen ▪ Larger eyes o Do not have a stinger. o Only purpose is to mate:

	▪ Male bees mate once with virgin queens. ▪ They can only mate once because mating kills them. • ***Queen bee*** is the mother of the hive. o The largest bee in a hive o Only one queen per hive o If another queen is produced in a hive, the hive will ***swarm*** and break up the current hive. ▪ When a hive swarms it is usually caused by lack of space as well as other stimuli. ▪ Over half of the hive will leave to find a new home. o Worker bees can create a queen bee by feeding them ***royal jelly***. Royal jelly is a special type of food created and fed to the brood. ▪ Once a new queen emerges she will kill other unborn queens. ▪ This is why an ***apiary*** (where a hive or group of hives is managed) must be looked after and hive boxes added as the hive grows. o Queen bees only mate once in their life. ▪ At the time of mating she may have to mate with 10 or more drones in order to gain enough sperm to produce eggs. ▪ Queens can live three to four years. ▪ Queen bees are capable of producing 2,500 eggs each day. *Show video titled: Bee Love*

Objective 4: Discuss honey combs and the process of honey production.	***Anticipated problem:*** What are honey combs and how is honey produced? IV. Combs and the process of making honey: • Combs o Typically bees are given a wax foundation to build upon. o The wax foundation only provides them a place to start their comb. ▪ Providing a foundation: • Helps control where they produce their comb • Also speeds up honey production o This process speeds up honey production because worker bees are not required to do as much work to start their hive leaving more time to produce honey. o Combs are where honey is stored and brood at born ▪ There are three types of hive boxes • ***Shallow Supers*** are the shorter of the three boxes while medium supers are an intermediate size. Both are used by beekeepers to collecte honey from the bees. • ***Brood boxes*** are the larger of the three boxes and this is where the brood are produced *Show video titled: Honey, I'm Home (2 minutes)* • Honey is produced by the worker bees. o Nectar is collected by worker bees. ▪ Nectar is regurgitated into the comb ▪ Once in the comb the honey must reach a specific moisture content to be honey. • A worker bee, in addition to cooling the hive, will flap its wings to speed up the drying process. • Once the process has been accomplished they will cap over the honey. *Show video titled: Show Me the Honey*

REVIEW	
Review questions	Questions for review Objective 1: 1. What percentage of the world's food supply is dependant on bees? 2. How many bees make up an average hive during pollination season? 3. What are the four items worker bees are collecting when they are away from the hive? Why is each item important and what is its use? Objective 2: 4. What bee breed is native to the United States? 5. List or discuss at least two reasons why African honey bees are unwanted in the United States. 6. What is one goal of research that is being conducted on African honey bees. Objective 3: 7. What are the three types of bee that make up a colony and what are their major "jobs" in the hive? 8. How can one tell the difference between the worker bee and the male bee? 9. List what the term swarm means and one reason a hive may swarm. Objective 4: 10. What is a comb and what is stored in the comb? 11. How does the process of worker bees flapping their wings, at the front of the hive or flapping their wings at the comb cells, effect honey production. 12. How could a beekeeper tell when honey is ready to be harvested?
CREDITS	**Producer** Andrew Thoron **Editors** Dr. James Ellis Dr. Brian Myers