The UNCP Honey Bee Center Works To Promote Regional Beekeeping

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Introduction

Beekeeping is essential to modern agriculture for the pollination of over 90 different commercial crops. Due to the unknown disappearance of honey bees, beekeepers are concerned about the increasing pressure upon pollination of crops and honey production. This negative impact on honey bees is called *Colony Collapse Disorder* (CCD).

CCD has been witnessed worldwide. Colonies that experience CCD may have some of the following characteristics: (1) sudden loss of honey bee population; (2) the healthy, capped brood (larvae) is abandoned; (3) food and water are still readily available and (4) depopulated hives are not immediately infested by pests and disease.

Objective

The **UNC Pembroke Honey Bee Center** will: (1) promote the hobby of beekeeping throughout the service region; (2) assist regional beekeepers by providing educational and technical support; (3) conduct basic laboratory research on biological and environmental agents, which negatively impact the health of the hive; (4) collect data for a Geographical Information System (GIS) mapping out beekeeping activities across the region and (5) share data with regional and state beekeeping associations.

Purpose

The purpose of this research is the establishing of a regional partnership for the provision of technical assistance to local beekeepers, the stimulation of interest in beekeeping, and the study of antagonists that would prove harmful to the otherwise normal perpetuation of life by the honey bee.

Figure 1 – Italian honey bee

Biological Agents

American Foulbrood (AFB) disease is caused by the bacterium, *Paenibacillus larvae*, and is the most destructive bee brood disease. *P. larvae* is a Gram-positive endospore forming bacilli that is transmitted to honey bee larvae through the ingestion of the bacterial endospores. Germination of the spores within the gut of newly hatched bee larvae will form vegetative bacteria that infect and kill new honey bee larvae. When the nutrients of the digested larvae become scarce, the vegetative bacteria begin to form more infective endospores, which are then transmitted throughout the hive by worker bees removing the decayed bee larvae. Figure 2 depicts cells that indicate an infection with AFB.

Some of the usual qualitative characteristics include: sunken, perforated, discolored and greasy individual cell appearance; (2) dead larvae are flat and fluid-like on the bottom of the contaminated cell; (3) larvae are discolored brown and have a dull appearance and (4) the infected brood have a pungent, “foul” odor. Our immediate aim is to culture *P. larvae* in the laboratory and characterize its morphology and biology. Our future goal is to establish protocols to prevent and control *P. larvae* infections. We have begun to collect specimens that are suspected of being associated with AFB. Figure 3 depicts a Gram-stained isolate of one of the suspected AFB specimens.

***Nosema* spp.** are microsporidian, intracellular parasites that infect adult honey bees and cause dysentery-like symptoms called *nosemosis* within a colony of honey bees. These spore-producing microbes, related to fungi, weaken or decimate hives leading to reduced honey production. Infection is usually seen in the spring, following a winter of hive confinement. The pathogenic spores are resistant to temperature extremes and dehydration.

The spores germinate within epithelial cells of the intestinal tract after they have been ingested by the adult honey bees. Once inside the epithelial cell, the vegetative form increases in size and proliferates. Second generation spores are produced after 6-10 days. Nosemosis is discouraged through proper placement of hives with respect to airflow, sunlight and fresh, clean water. Figure 4 depicts a negatively stained slide of *Nosema cerenae*.

Figure 2 –Indication of an AFB infection

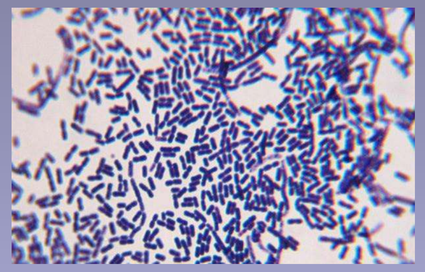

Figure 3 – Bacterial isolate from a suspected AFB specimen

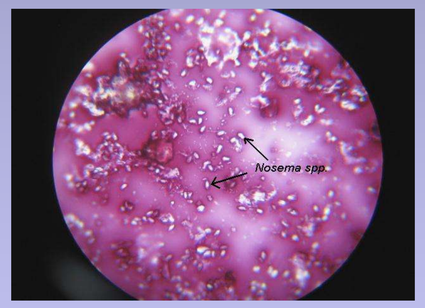

Figure 4 – Negative stain of *Nosema cerenae*.

Geographic Information System (GIS)

A geographic information system (GIS) will combine hardware, software, and data to organize, map and display regional geographical information on beekeeping activities. The GIS will aid the **UNCP Honey Bee Center** to solve honey bee problems by storing and interpreting data that is rapidly understood and easily shared. The ideal GIS map will contain the following data: (1) location of honey bee yards, (2) number of hives per yard, (3) honey bee species and (4) epidemiology. Figure 5 depicts the UNCP Honey Bee Center’s current GIS map.

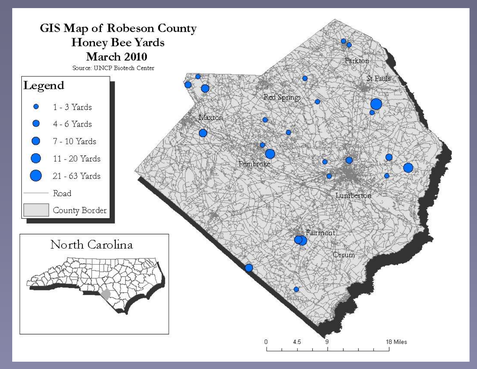

Figure 5 – Current UNCP Honey Bee Center GIS map

Discussion

Southeastern North Carolina’s economy is driven by its agricultural base. The UNCP Honey Bee Center will stimulate regional growth in beekeeping and increase the agricultural biotechnology strength of the UNCP. The honeybee center will serve as a resource for educational and applied technologies throughout the region. A robust beekeeping community is pivotal to building a stronger agricultural economy.

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