

Assessing Longevity, Hoarding Behavior, and Response to *Nosema* in Honey Bees¹

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A LONG-RANGE program for the genetic improvement of honey bee stocks is being conducted at the Baton Rouge Bee Breeding Laboratory (Rinderer 1977). If such a program is to be successful, we must find out what characteristics of the honey bee should be improved and how they correlate with each other, for example, whether bees that are short-lived are the fastest nectar gatherers. We have summarized here what we have found out in laboratory tests about longevity, response to *Nosema apis*, and hoarding behavior in honey bees. The details are reported elsewhere (Rinderer and Sylvester 1978). Laboratory tests were used because they provide more precise and repeatable measurements than field tests.

Longevity was one of the characteristics studied because, all things being equal, a bee that lives longer should contribute more to the buildup of large colony populations. It was therefore of interest to find out whether bees vary in longevity and whether this variation leads to or is related to variation in any other characteristics. We also looked for variations in susceptibility to *Nosema* disease since treatment, is expensive. It would be helpful to have bees that are genetically resistant to *Nosema* unless this resistance is accompanied by an undesirable change in another characteristic. Finally, we measured hoarding behavior, that is, the removal by caged bees of sugar syrup from feeders. In this latter case we are attempting to determine whether the hoarding rate in the laboratory is correlated with nectar collection in the field; that is, whether bees that are rapid or high hoarders in the lab will also be high honey producers in the field. However, again, any correlation of hoarding behavior with other characteristics is important since, for example, if high hoarding rate is genetically linked to short life (negative correlation), there may be no net gain from selection for high hoarding.

The studies were made with bees obtained from 38 randomly selected colonies containing naturally mated queens. Combs of emerging brood from each of these source colonies were separately caged in an incubator. Worker bees less than 1 day old were collected from the cages and tested for longevity, hoarding behavior, and response to *Nosema apis*. Tests were made from June to August 1976.

The test cages are shown on the upper shelves of the incubator (Figure 1) while the brood cages are on the bottom shelf. An individual cage with the front paper and glass removed was shown on page 94 of the March 1974, *American Bee Journal* (Kulinčević, et al. 1974). The two vials visible on top of the test cages had two holes drilled in each cap to convert them into gravity feeders. One contained sugar syrup while the other contained water. A pollen substitute feeder was placed inside the cage in the tests for longevity and response to *Nosema*.

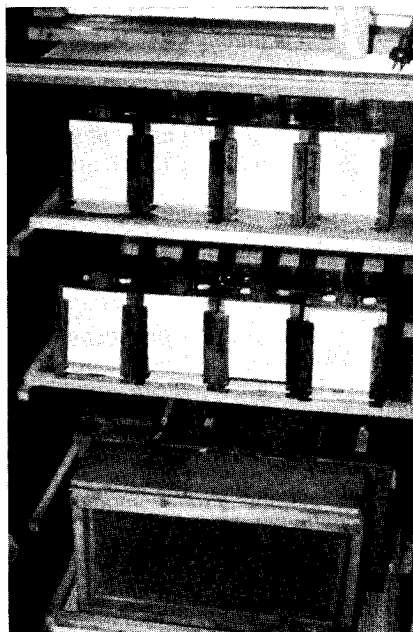


Figure 1 — Hoarding test cages (above) and brood emerging cages (below) in incubator.

While an experiment was in progress, the incubator door was closed so the bees were in the dark at 35° C and 50% relative humidity.

The bees were fed *Nosema* spore suspension (response to *Nosema* test) or sugar syrup (longevity test). This was done by confining the newly emerged bees individually in feeding chambers (Figure 2). These chambers were holes in a board that were closed by corks with a piece of glass tubing through their length. A droplet of a suspension of *Nosema* spores or of sugar syrup was placed in the end of the tubing and lights were shone on the chambers to attract the bees to the food (Rinderer 1976). After feeding, the bees were placed in the test cages (Kulinčević and Rothenbuhler 1973) and held in incubators. Dead bees were removed daily and counted. The results, calculated as the number of days for 1/2 of the bees in each cage to die, were analyzed statistically.

For the tests of hoarding behavior, bees from 34 of the source colonies were placed directly in the test cages from the brood cages without individual feeding. The amounts of sugar syrup removed from the feeders daily during the first 3 complete days after the bees were put into the cages were recorded. The results were analyzed statistically.

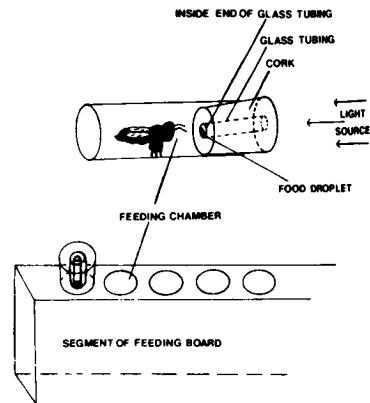


Figure 2 — Device used to feed individual bees measured amounts of sugar syrup or *Nosema* spore suspension.

We found highly significant differences among the colonies for all three characteristics. These variations we observed among the colonies in these three characteristics indicate that genetic differences exist with a good potential for the genetic improvement of bee stocks for these traits through the use of selection procedures.

The correlation between longevity and response to *Nosema* was highly significant. There was no correlation between hoarding behavior and either longevity or response to *Nosema*, which indicates that there is little genetic relationship between hoarding and either longevity or response to *Nosema*. The reasonably high correlation between longevity and response to *Nosema* indicates that improvement in one has a strong likelihood of improving the other. However, two colonies performed counter to this general correlation so a few colonies may show a negative correlation for these two traits.

The unintentional use of such colonies in a breeding program in which testing is done for only one trait might develop the second characteristic in an undesirable direction in the breeding stock. That is, if bees from such colonies were selected solely for resistance to *Nosema*, the progeny would probably be more resistant to *Nosema* but they might also become short-lived.

In summary, our experiments indicate the following:

- 1) longevity and response to *Nosema* are genetically related,
- 2) hoarding rate is not genetically related to either longevity or response to *Nosema*,
- 3) bees vary genetically for all three characteristics examined,
- 4) improvement for all three traits should be possible with selection,
- 5) selection for long life generally should produce bees that also live longer when infected with *Nosema*,

- 6) selection for long life may sometimes produce bees that die sooner when infected with *Nosema*.

FOOTNOTES

¹ In cooperation with Louisiana Agricultural Experiment Station.

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Bees Buzz Up Business in Shopping Mall

by FLOYD H. MOORE, Vice-President Tampa Bay Beekeepers Association

A DISPLAY of bees in two observation hives with beekeeping tools and equipment, and honey for sale, created so much interest during a recent five-day zoorama in the Tampa Bay Center Shopping Mall that the management asked for a repeat performance a month later.

Tampa Bay Beekeepers Association was happy to participate in the Jerry Lewis Muscular Dystrophy Telethon and gave more than \$70 to the drive as a part of the proceeds from the sale of honey during the exhibit.

Beekeeper Floyd and Kathleen Moore arranged the details and with the help of Jerry and Nancy Harris

designed the display for both exhibitions.

Florida's 1978 Honey Queen, Miss Jill Jacobs, helped in the July display at the zoorama, but the request for the second exhibition came too fast to fit another visit into her busy schedule.

Children and adults are all fascinated by the bees activities in the observation hive wherever they have been displayed in the Tampa area. After watching the bees intently, they look over the tools and equipment and many buy the delicious orange blossom honey displayed in honey bears and jars.

Experienced beekeepers volunteer

their time to man the exhibit and answer the many questions asked by the public. Among the questions first asked is always, which is the Queen? Followed by where is she? There are always other visitors telling of an experience they have had with bees or beekeeping.

The success of the Tampa Beekeeping Association's displays are convincing people that bees are useful in more ways than just production of delicious table honey. Informing people about bees and flowers will result in more people eating honey and support for the existence of bees in today's environment.



Florida's 1978 Honey Queen, Miss Jill Jacobs, smiles at the child's fascination as they watch the honey bees in an observation hive exhibited with beekeeping tools and equipment by the Tampa Bay Beekeepers Association at a July Zoorama in the Tampa Bay Center Shopping Mall.



Florida's 1978 Honey Queen, Miss Jill Jacobs, flanked by Floyd and Kathleen Moore at the exhibition of beekeeping tools and equipment at the July Zoorama at the Tampa Bay Center Shopping Mall in Tampa, Florida. Floyd is vice-president of the Tampa Bay Beekeepers Association, sponsor of the display.