Improving the Acceptance and Maintenance of European Honey Bee Queens in Areas with Africanized Bees

Project No.: 02-GD-00

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Objectives

1) Determine if there are seasonal fluctuations in the amount of pheromone emitted by European and African queens.
2) Determine if the rate of success in introducing European queens into African colonies is greater at times of year when the levels of pheromone emitted by queens are lowest.
3) Identify components of the pheromone profile emitted by intercastes and determine the influence of these compounds on the interactions between workers and their queen.

Objectives 1 and 2: 1) Determine if there are seasonal fluctuations in the amount of pheromone emitted by European and African queens. 2) Determine if the rate of success in introducing European queens into African colonies is greater at times of year when the levels of pheromone emitted by queens are lowest.

We began examining pheromone profiles of European (EHB) and African honey bee (AHB) queens in the spring of 2002. We were able to repeat the pheromone profiles obtained from EHB and AHB queens using the new Gas Chromatography/Mass Spectrometry equipment purchased by the ARS for our Laboratory. We used the early spring profiles as a base line, and sampled the same sets of EHB and AHB queens in the late spring during a honey flow. We found that the queens emitted the same profiles but the amount of pheromone particularly Compound-A (this compound identified in 2001 is present in EHB queens but absent or much reduced in AHB queens) was reduced. During the honey flow, space was limited in the colonies and the queens had fewer cells available for laying eggs. We hypothesized that the amount of Compound-A emitted by a queen might be related to her rate of egg laying since virgin queens do not emit Compound-A. To test our hypothesis, we took laying queens and confined them in cages for 48hrs. The amount of pheromone emitted by the confined queens particularly in the amount of Compound-A was much less then when they were actively laying.

We examined pheromone profiles again in the summer when there was not a honey flow, and the queens were actively laying. The profiles looked similar to the profiles seen during the spring. We have not yet examined fall or winter profiles.

Once we have the yearly pheromone profile defined and have identified factors that can reduce the amount of pheromone emitted by a queen, we will begin the process of introducing European queens into Africanized colonies using standard queen introduction techniques. This work will begin in late winter when egg laying by all queens is greatly reduced and pheromone profiles possibly are at their lowest point. We will compare our success rates for queen introduction in the late winter with those in the spring and summer when the amount of pheromone emitted appears to be greatest.

3) Identify components of the pheromone profile emitted by intercastes and determine the influence of these compounds on the interactions between workers and their queen.

The profiles from the intercastes more closely resemble those of queens than workers from the same colony particularly in Compound-A. Specifically, the profiles of intercastes more closely resemble those of European queens than African queens. We are in the process of conducting behavioral tests with pheromones emitted by intercastes to determine the effects they have on worker interactions with queens particularly in EHB colonies.