

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

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Objectives

- 1) Identify pheromones emitted by intercastes and compare them with those emitted by EHB and AHB workers, virgin queens, and mated queens.
- 2) Determine the influence of pheromones emitted by intercastes on worker behaviors in relation to mated EHB queens.
- 3) Determine the influence that various queen introduction protocols have on the rate of success in queen acceptance.

Objectives 1 and 2: Pheromones emitted by virgin and mated African and European queens and intercastes from African colonies and their effects on European and African worker behavior.

We have identified compounds emitted by virgin and laying honey bees queens with either European or African matriline and either European or African patriline. Virgin queens do not produce detectable pheromone profiles until several days after emergence. We have found compounds that are similar to those previously identified as queen mandibular pheromones (QMP) being emitted from live queens. However, we have also found isomeric compounds not previously included in QMP that are unique to African and European matriline and patriline combinations. Different profiles also were obtained from intercastes and workers. The profiles from the intercastes more closely resemble those of queens than workers particularly in a compound (hereafter referred to as Compound-A) we have found being emitted only by worker larvae less than 48hrs old and in queen larvae, pupae, and sealed queen cells. We conducted behavioral bioassays in 4-frame observation colonies containing European and African honey bees and mock queens exposed to Compound-A alone and in combination with QMP. We tested whether we could stimulate worker behaviors that are similar to those shown to a live queen with our pheromone preparations. The results are shown in Table 1.

Table 1. Responses of workers from five European and five African colonies. Data were normalized using the workers' response to a live queen (i.e., 1.0 indicates a response identical to the live queen).

Treatment	Colony Type	Average Worker Responses
Blank	European	0.23 a
Worker-same colony		0.53 ab
Worker other colony		0.58 ab
QMP		0.60 ab
Compound-A		1.10 bc
QMP + Compound-A		1.50 c
Blank	African	0.32 a
Worker-same colony		0.50 b
Worker other colony		0.63 c
QMP		0.92 d
Compound-A		0.83 d
QMP + Compound-A		1.00 d

We found that in European colonies, the reaction of workers to our compound was the same as that produced by a laying queen. The compound alone produced a greater reaction from the workers than QMP alone. A combination of QMP and Compound-A produced a response from workers that was significantly greater than a laying queen. In the African colonies QMP, Compound-A or a combination of QMP + Compound-A was similar to that of a laying queen alone. We have concluded that intercastes might mimic a queen in the compounds that they emit particularly Compound-A and its isomers, and thus confound the pheromone signals produced by the actual laying queen in the colony.

Objective 3. Determine the influence that various queen introduction protocols have on the rate of success in queen acceptance.

The proposal submitted for 2000 outlined work to be completed in 2 years. We will submit a proposal for 2001 that will be directed at using Compound-A and others we have identified from African and European queens to improve the success rate of introducing European queens into African colonies.