

## Annual Report: Fire Ant Monitoring Device

**Project No: 04-GD-03** Project number should be 04-GW-03

**Title:** Developing and Testing a Device to Monitor Fire Ants in and around Honey Bee Colonies

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### Summary

Under a research grant provided by the Almond Board of California, we screened feeding attractants for the imported fire ant *Solenopsis invicta*. We identified several compounds attractive to fire ants and have developed a successful bait product. In addition, we have a suitable clear plastic monitoring station to be used in these trials and a commercially available glue product that will ensnare the ants without repellency. Successful trials of the monitoring station conducted in the summer of 2004 indicate that the prototype monitoring station is ready for the next phase of testing. USDA Aphis is currently testing the monitoring stations at the fire ant research station in Gulfport Mississippi. Anticipating a successful trial, we project an alpha test of the product by the winter bee migration season.

### The Problem and its Significance

Nearly one million honey bee colonies are moved to California for almond pollination each year. Most of these colonies come from or through states where the imported fire ant *Solenopsis invicta* is a problem. If ants are observed on the colonies or truck trailer at the inspection station either entering or leaving the California, the colonies will be quarantined until the ants are identified. This usually results in the death of the colonies because they are unable to be cooled fed or attended to during quarantine. Currently, there are no insecticides registered specifically for treating apiary equipment to eliminate *Solenopsis invicta*, nor are there any monitoring devices that will identify *Solenopsis* infestation in or around colonies or on truck beds. Our goal is to develop a monitoring station that will indicate the presence or lack of fire ants on the colonies or trucks. We intend to test this product in conjunction with USDA's Animal Plant Health Inspection Service and hopefully provide a monitoring tool that will allow speedy cargo certification and prevent the quarantine impoundments at state borders that have occurred in the past. This product will also give beekeepers a tool to better determine the presence or lack of ants on the colonies or truck prior to loading and give the beekeepers the management options they need to safely transport their colonies.

## Objectives

1. Test phagostimulants and essential oils identified in earlier studies against commercially available baits. Preference will be given to the bait that can draw in fire ants from the greatest distance.
2. Work with a Tucson based plastics manufacturer to develop an effective monitoring station.
3. Field test the prototype stations through growers and beekeepers to determine ease of use and efficacy of the product.
4. Field test the successful product with collaborative partner USDA Animal Health Plant Inspection Service (APHIS).

## Results and Discussion

### 1. Test phagostimulants and essential oils identified in earlier studies against commercially available baits. Preference will be given to the bait that can draw in fire ants from the greatest distance.

We successfully tested over seventy five essential oils, baits and attractants and have selected three of the most attractive compounds to place in the bait station. Table 1 shows the testing procedure and results of the testing in twenty five potential phagostimulants. We have successfully identified three products that attract fire ants and would be compatible with a monitoring station technology. The first is a mix of lipids and sugars. The second formulation involves volatile components found in natural pollen impregnated into a starch/lipid complex, and the third formulation is strictly a mixture of lipids.

### 2. Work with a Tucson based plastics manufacturer to develop an effective monitoring station.

The monitoring station selected is clear plastic and approximately 5cm by 10cm (Fig. 1.) with a clear plastic top that will allow easy detection if ants are present. An entrapping compound is placed in the middle of the monitoring station and the bait is placed in the back of the trap (Fig. 2). The ants enter from the front of the trap and are entangled in the sticky glue while trying to get to the bait in the back of the trap. Trials were conducted for 1, 4, 8, and 24 hours. The traps were placed within 5 meters of known fire ant colonies. Typically, the ants found the traps within one hour and never longer than four hours.

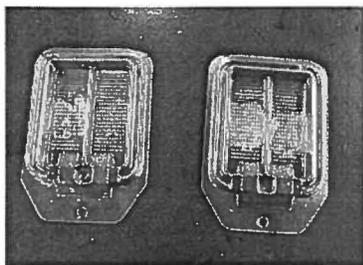


Figure 1

Traps loaded with two types of glue.

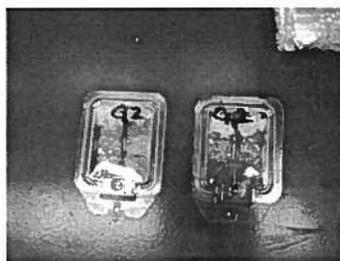


Figure 2

Traps with glue and bait

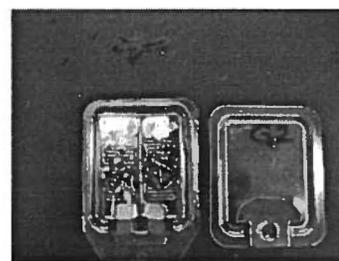


Figure 3

Trap with fire ants and debris (4 hour trial)

When the ants found the traps many would become ensnared in the sticky glue in the front of the trap. Some ants would carry debris into the trap in an attempt to cover the sticky substance to bridge their way to the bait. Once the ants found the bait station their presence was very noticeable. From the standpoint of a detection device the fire ant monitoring station appears quite successful.

### 3. Field test the prototype stations through growers and beekeepers to determine ease of use and efficacy of the product.

Prototypes currently being tested in Gulfport Mississippi will determine if the monitoring stations are appropriate for their intended use. Through industry meetings and personal contacts we have identified twelve beekeepers who are willing to test the monitoring stations in a migratory beekeeping setting prior to this winter's migration to California for Almond pollination. Tests conducted at the Carl Hayden Bee Research station demonstrated the effectiveness of the product and its ease of use under apiary conditions (Fig. 4 & 5)

### 4. Field test the successful product with collaborative partner USDA Animal Health Plant Inspection Service (APHIS).

Currently we are conducting field trials in conjunction with our collaborative partner USDA Animal Health Plant Inspection Service (APHIS) at Gulfport, Mississippi. If the prototype trials look promising in Mississippi, we will manufacture a trial batch of the monitoring stations and conduct a test under field conditions this coming year prior to Almond pollination.

Table 1. Selected phagostimulant trials.

Attractant	tot # of ants	at 5 min	at 10 min	at 15 min	at 20 min	ants in dish	Signif.
fructose	0	0	0	0	0	0	N
corn oil	0	0	0	0	0	0	N
sunflower oil	1	0	0	0	1	0	N
salt in water	20	1	8	4	20	5	Y
pine oil	25	5	10	25	20	6	Y
cod liver oil	8	4	5	7	8	0	Y
almond oil	0	0	0	0	0	0	N
sage	0	0	0	0	0	0	N
anise	0	0	0	0	0	0	N
sweet basil	0	0	0	0	0	0	N
geraniol	0	0	0	0	0	0	N
bergomot	0	0	0	0	0	0	N
caraway	0	0	0	0	0	0	N
palm	10	4	0	10	2	3	N
coconut oil	15	0	4	9	15	6	Y
water	2	0	2	0	0	50	N
lard	70	70	50	50	45	20	Y
peanut butter	55	7	40	40	55	6	Y
flax seed oil	3	3	3	0	0	1	N
olive oil	60	45	55	55	60	15	Y
sesame oil	5	4	5	0	0	1	N
Compound 1c	4	4	3	0	0	1	N
water and honey	0	0	0	0	0	1	N
Compound O	4	4	4	3	3	3	N
Pollen extract	37	4	12	34	27	10	Y



Figure 4. Monitoring Station in place. Note foil cover to protect the bait and glue from effects of the sun.

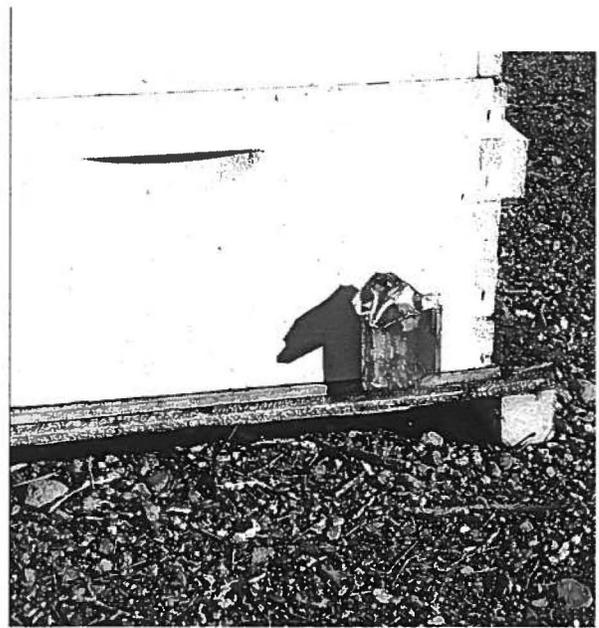


Figure 5. Viewing activity in Fire Ant Trap. Foil cover removed.