

NON-TOXIC FIRE ANT BARRIERS PROTECTING HONEY BEE COLONIES.

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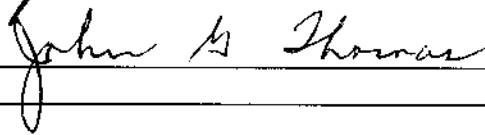
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Abstract:

This submission proposes to specifically test the efficacy of the non-toxic, natural products, Tanglefoot[®], and propolis as fire ant barriers in honey bee apiaries. Additionally, a cost-benefit analysis of apiary fire ant control products, GardStar, Lorsban, Tanglefoot, and propolis will be conducted as a management aid to beekeepers. A significant component of the beekeeping industry is migratory, moving colonies to fulfill pollination contracts in the spring, to honey producing parts of the US in late spring and summer, and finally to southern regions to overwinter. The majority of migratory colonies of the central US spend the winter in Texas. The movement of honey bee colonies and fire ants are regulated by State and Federal laws, as a consequence of the potential transport of fire ants with honey bee colonies. A zero tolerance policy exists for the detection of fire ants with colonies moving out of Texas. Methods to control and/or repel fire ants from migratory colonies that overwinter in Texas are critical to beekeepers and producers.

The objectives of this proposal are to:

- (1) test the efficacy of Tanglefoot[®] and propolis as fire ant barriers, and
- (2) estimate the cost of controlling and repelling fire ants in apiaries to assist beekeepers in pest management decisions.

Objective 1) The efficacy of non-insecticidal fire ant barrier substances.

Background

The USDA National Organic Program (NOP) does not permit the use of pesticides for organic food production (NOP, 2002). Presently, organic honey standards are being established that will limit the use of pesticides exclusively for honey bee disease and parasite control. Use of pesticides in or near apiaries for other reasons will not be permitted. Many crops that bees pollinate have established organic grower standards that prevent the introduction of pesticide treated bee equipment. To provide an alternative to conventional pesticides for organic food

producers and as part of an integrated pest management system, I propose to test the efficacy of Tanglefoot[®] and propolis (bee collected plant resin), as fire ant barriers on bee equipment.

Tanglefoot[®] is comprised of castor oil, waxes, and resins and is a proven ant barrier substance (Fleet and Young, 2000; Shorey et al., 1996; Shorey et al., 1993). However, it has not been used in an apiary setting on wooden pallets supporting live honey bee colonies. Propolis is comprised of bee collected plant resins and some beeswax. Only anecdotal reports of propolis as an ant repellent exist. It is reasonable to hypothesize that propolis is an ant repellent given the similarity of components found in Tanglefoot[®].

Treatments

- 1) **Propolis** treated wooden pallets. To collect propolis a well-established technique implementing a standard, commercially available propolis trap will be installed on colonies. The collected propolis will be applied to wooden pallets supporting live colonies;
- 2) **Tanglefoot[®]** treated wooden pallets supporting live colonies and,
- 3) **Control** of untreated wooden pallets with live colonies.

Methods

This experiment has 3 treatments and will be replicated 6 times. The research will be conducted on the Riverside Campus of Texas A&M University. Fire ant barrier effectiveness will be measured as described above. Propolis is not harmful to bees. However, the effects of Tanglefoot[®] to colonies are unknown. Measures of ant control efficacy, bee mortality and statistical analysis will be as described below. Frequency of re-application of the barrier materials will be measured because this could seriously impact the cost of barrier control.

Measure of ant control

The number of ants observed on soybean oil soaked 2.5 x 2.5 cm index cards placed on the pallets will serve as a measure of control. The standard fire ant bait will be placed in three locations on each pallet. Thirty to 60 minutes after placement the number of ants per card will be counted and recorded.

Measure of colony-level bee mortality

Dead bee count is dependent on colony size. One day prior to and every two weeks after treatment, colony adult populations will be estimated by summing the number of frames covered with bees per colony. Measures will take place in the morning or evening prior to or after foraging activity. This is a well-established, standard method for estimating colony size (Jeffrey, 1951; Nelson and Jay, 1972). Dead bee traps will be affixed to each colony (Pankiw, 1991). Counts will be conducted every day for the first week and subsequently on a weekly basis. Ten dead, paint-marked, bees will be added to colonies on a weekly basis and recovery recorded as a measure of trap integrity.

Statistical analyses

Data will be tested for normality. If necessary, appropriate data transformations will be performed. Analysis of variance (ANOVA) will be used to compare treatment differences. Colony population size will be used as a co-variate of colony mortality counts (SAS, 2000; Sokal and Rohlf, 1995).

Objective 2: Estimate the cost of controlling and repelling fire ants in apiaries using GardStar[®], Lorsban E[®], Tanglefoot[®], and propolis.

Background and Methods

As a part of the development of fire ant management tools for beekeepers, the cost of implementing various control measures will be estimated on an apiary and per colony basis. A GardStar[®] efficacy study is ongoing (Thomas, JG personal communications). A fire ant control study using Lorsban in a pseudo-apiary has been published (Weeks and Drees, 2002). Using published and unpublished efficacy data we will conduct a basic cost-benefit analysis to assist beekeepers in their fire ant management decisions.

Time Line:

- **Fall 2003:** We will attempt to collect propolis in the fall of 2003 in preparation for winter treatment of pallets with propolis and Tanglefoot.
- **Winter 2003:** Data collection for pesticide and organic control cost analysis.
- **Spring & Summer 2004:** Balanced replications of all treatments will continue until the planned experiments are complete.

Relevance to the Texas Imported Fire Ant Research and Management Plan:

- This research addresses a high priority area for shipping fire ant free articles.
- Transfer and implementation of new management tools is expected to be rapid because Tanglefoot[®] is composed of natural products not expected to be harmful to bees, and propolis is a natural hive product.
- Transfer of knowledge will be in the form of presentations to the Texas Beekeepers Association (TBA) Annual meeting and regional beekeeping groups in Texas, articles in the TBA bi-monthly newsletter, the American Bee Journal or Bee Culture (nationally circulated beekeeper journals with peer reviews for research articles), Department of Entomology extension web sites for fire ants and honey bees, and peer reviewed scientific publications.
- The development of non-toxic barriers for controlling fire ants meets with the development and implementation of IPM systems.
- If propolis proves to be an effective fire ant barrier it could become a commercial fire ant control product and an additional source of income to beekeepers.

Budget:

Item	2004
Graduate Student salary (Ramesh Sagili)	\$17,800
Student worker (40 h / wk for 3 months)	\$3,200
Materials and Supplies	\$4,000
Total	\$25,000.00

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