

## Evaluation of Potential Imported Fire Ant Quarantine Treatments for Commercial Honey Bee Operations

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**Abstract.** This research evaluated the efficacy of using a contact insecticide applied to the base or to the ground area around beehives in preventing red imported fire ant (*Solenopsis invicta* Buren) foraging on beekeeping equipment. Results from our field experiments on pallet and soil treatments shows that soil and/or support pallet applications of Lorsban 4E® (chlorpyrifos) are reasonable and effective techniques for preventing fire ant infestation or foraging on bee equipment for at least six weeks post insecticide application. Sampling over the six week period showed that vegetation such as grass and weeds could grow into natural "bridges" over treated pallets that ants can use to access bee equipment.

### Introduction

Red imported fire ants (*Solenopsis invicta* Buren) can invade beehives and feed on pollen and developing bees. Weak bee colonies are more susceptible to ant invasions than healthy, vigorous colonies. Often, fire ants build their nests directly against or on beekeeping equipment. They typically use structures in contact with the ground for better colony thermoregulation and to escape localized flooding events. Fire ants can be transported in beehives or in soil adhering to hives and beekeeping equipment. Fire ant infestation of California's Central Valley has been linked to intra-continental transport of beehives for almond pollination. Consequently, beehives have recently become a regulated item by the United States Department of Agriculture (USDA). However, there are no currently established quarantine treatments approved for assuring that transported hives are fire ant free. To date, there are no insecticides registered specifically for treating bee equipment to eliminate red imported fire ant foraging. However, there are several products on the market labeled for fire ants under a variety of specific conditions. For example, Lorsban 4-E® (chlorpyrifos) is an agriculturally approved contact insecticide for control of various insects, including red imported fire ants, in certain field, fruit, nut, and vegetable crops (e.g. alfalfa, orchard floors, field corn, popcorn, sweet corn, cotton, cranberries, sorghum, and soybeans). The objective of this study was to evaluate the efficacy of using a contact insecticide applied to a support pallet or the soil area around beehives in preventing fire ant foraging on beekeeping equipment.

### Materials and Methods

Research was conducted September - October 2000 in Royalty Pecan Orchard - Burleson County, Texas. We used four treatments with four replicates of each treatment for a total of 16 sample units in a randomized block design to compare fire ant infestation levels among treatments. Treatments were randomly arranged under pecan trees in four blocks (i.e. tree rows)

in one section of the orchard. The grass was mowed under each replicate unit before beehives and pallets were set up in the field. For this study, we used a typical commercial beekeeping set-up without the bees; hive pallet with clips and two hive supers with lids. In double pallet situations we added a support pallet with no hive clips.

Treatments comprised of: 1) spraying a 10 x 10 foot area of soil with Lorsban 4E® directly under a single beehive pallet; 2) a double pallet with the bottom support pallet sprayed with Lorsban 4E®; 3) a double pallet with no insecticide application; and, 4) a single pallet with no insecticide application. Lorsban 4E® was applied to the soil area and pallets according to label directions. Three locations were sampled for fire ants on and around each beehive unit using 3 by 3-cm olive oil-soaked bait cards. Two bait cards were set adjacent (ca. 20 to 30 cm) to each pallet on the ground, four bait cards were placed directly on the hive pallet and two were placed on top of the beehive boxes. A ranking system was used to record the approximate number of ants per bait card (i.e. 0 = zero ants, 1= 1 to 24 ants, 2=25 to 49 ants, 3=50 to 74 ants, 4 = 75 or more ants). We compared the means and standard deviations of the ranks of fire ant infestation levels at each sampling location for each treatment.

## Results

Fire ant infestation levels were not significantly different between single and double pallet treatments in the absence of the contact insecticide (**Figure 1**). There were significant differences in fire ant infestation levels between non-insecticide treatments and insecticide treated pallets and soil applications, as indicated in non-overlapping standard deviations about the means respectively. In the double pallet (bottom pallet treated) insecticide treatment there were no fire ants found foraging on the pallets or the hives after six weeks post insecticide application, except in one sampling period. After four weeks post insecticide application a few fire ants were found on two bee pallets that were sitting on a treated pallet. Closer inspection revealed fire ants climbing on blades of grass, that crossed-over treated pallets, and onto untreated bee pallets. After removing these grass "bridges" no other ants were found on the bee equipment after subsequent sampling. Results from the soil insecticide application showed that fire ants were prevented from foraging on the ground area next to the bee equipment as well as on the bee equipment. During the last sampling period, which included a week of intense rainy weather, a few ants were found on a bait card on the ground next to one of the bee units. This indicates that the active ingredient in the insecticide was just beginning to degrade after six weeks post-insecticide application and several days of heavy rains.

## Discussion

We have shown that soil or pallet application of Lorsban 4E®, a long-residual contact insecticide, is a reasonable and effective technique to prevent fire ant infestation or foraging on bee equipment for at least six weeks. Our results indicate that simply stacking beehive equipment on supporting pallets or similar structures does not eliminate or reduce fire ant foraging on bee equipment. Preventative barriers, such as chemical barriers, are necessary and effective in eliminating fire ant foraging on bee equipment.

Double pallet hive set-ups appear to have several advantages over single hive pallet set-ups. Support pallets can be treated with insecticides to prevent ant foraging on bee equipment and can reduce or eliminate time spent on hive pallet sanitation (i.e. soil removal) and may even extend the life of the hive pallet. However, sampling over time indicates that it is necessary to monitor and remove any bridges that may form across treated areas between the soil surface and the bee equipment, such as over-grown vegetation or fallen tree leaves and limbs. Soil applications of contact insecticides can be used in loading yards for short-term hive storage before moving to new locations. By applying Lorsban 4E® to the soil surface or on a supporting pallet foraging honey bees can be protected from direct contact with the insecticide. Thus, making the use of contact insecticides a viable option for beekeepers as a potential quarantine treatment option. Future research is aimed at evaluating the behavior of ant colonies when placed on hives above treated pallets.

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**Figure 1.**

