EFFICACY OF TREATED SEED, BIOINSECTICIDES, AND FOLIAR INSECTICIDES, AGAINST WESTERN FLOWER THRIPS, FRANKLINIELLA OCCIDENTALIS, IN SEEDLING PIMA AND ACALA COTTON IN THE SAN JOAQUIN VALLEY

Larry D. Godfrey
Dept. of Entomology and Nematology
Univ. of California
Davis, CA
Treanna Pierce
Erick Morales
UC Davis Entomology
Shafter, CA

Abstract

Western flower thrips consistently infest cotton in the San Joaquin Valley; thrips distort the early-season growth but under favorable growing conditions the plants compensate for this damage. However, in recent years especially on Pima cotton, thrips damage has been more severe. Orthene seed treatment is commonly used and provides short-term thrips control. The efficacy of several foliar insecticides, including conventional and bioinsecticides, was compared in Acala and Pima cotton in 2014. Orthene seed treatment reduced immature thrips numbers by 90% at 17 days after planting but efficacy declined thereafter. At 7 days after treatment (DAT), Orthene, dimethoate, and Radiant (both rates) averaged 90% immature thrips control of the conventional insecticides and similarly for Entrust of the bioinsecticides. Efficacy declined in most treatments at 14 DAT with only Radiant (6 oz.) and Entrust reaching the 90 and 80% control level, respectively. Control of adult thrips was less efficacious than immature thrips and at 7 DAT, only Orthene (Acala) and Cyclaniliprole (both rates on Pima cotton) provided at least 50% control. Adult thrips control with the bioinsecticides was less than 50% for all sample dates Overall, thrips populations were comparable on the two cotton types.

Introduction

There are several species of thrips that infest cotton seedlings in the U. S. and in many areas they are an important pest management challenge. Thrips are small, slender insects less than 0.06" long, light-colored, and the adults have clear, slender wings. They have rasping-sucking mouthparts which they use to damage the plant's epidermal (outer) layer tissue and sucking out the cell contents. Thrips feeding causes most damage to cotton in the seedling stage. Leaves may become distorted and curl upward; damaged terminal buds may have abnormal branching patterns. Heavy infestations may kill terminal buds or even seedlings. The duration and intensity of thrips infestations vary greatly according to the species and the population density. Once cotton plants are four to six weeks old, it is not uncommon for seedlings to outgrow thrips damage and recover.

Western flower thrips (*Frankliniella occidentalis*) is the most common thrips species on cotton in the San Joaquin Valley (SJV). Historically, thrips infestations in SJV cotton are not as major of a concern as in many other parts of the cotton belt. They are often viewed as a beneficial predator of spider mites (a severe pest in SJV cotton), therefore outweighing the seedling damage they cause. However, in seasons with prolonged cool spring weather, thrips damage to cotton seedlings may be more problematic. In recent years, thrips have increasingly become a more severe problem; this seems to be particularly true on Pima cotton (*Gossypium barbadense*). The longer growing season required for Pima cotton than Acala cotton often necessitates planting earlier in the season at a time when temperatures are cooler.

Management: Guidelines developed for Acala cotton suggest that foliar insecticide treatment is generally not recommended for western flower thrips as seedlings will recover from injury. Western flower thrips are more tolerant to many insecticides and are poorly controlled by neonicotinoid seed treatments. Acephete (Orthene®) seed treatment is used for thrips management in California and has short-term positive effects. The loss of Temik has added importance on discovering new ways to control thrips. In addition, the threat from spider mite infestations influences this decision as insecticides applied to control flower thrips may promote outbreaks of mites. The switch of the California cotton industry from Acala cotton to Pima cotton (~72% Pima cotton) has placed added importance on developing alternative arthropod management plans specific for Pima cotton. Managing thrips on Pima cotton may differ from Acala cotton as there is less threat from spider mite infestations which may allow for more aggressive thrips management.

Materials and Methods

Field research on Acala and Pima cotton was conducted at the Shafter Research Station, Shafter, CA (Kern County) in 2014. Research was done to evaluate the activity of: 1.) Orthene-treated seed, 2.) foliar conventional insecticides, and 3.) foliar bioinsecticides, against early-season thrips. Research was conducted on Pima Phytogen 802RF and Acala Phytogen 725RF planted on April 21, 2014.
Treatments were evaluated in plots four rows wide by 20' long with four blocks in a randomized complete block design; Orthene treated seeds were planted using the same parameters, randomly placed among the foliar treatments. The foliar treatments were applied with a backpack CO2 sprayer on May 8 at 31 GPA. Fifteen cotton seedlings were sampled from each plot on each of the four sample dates (at about weekly intervals) starting with the first true leaf stage. Arthropods were recovered in the laboratory from ten seedlings using a washing technique; thrips (immatures and adults), cotton aphids, and spider mites were tabulated. Using five seedlings per plot, the lengths and weights of the above-ground plant tissue and roots were obtained on each sampling date. On the final sampling date, thrips & worm damage was rated as follows: 0=no injury, 1=10% injured leaves, no bud injury, 2=25% injured leaves, no bud injury, 3=75% injured leaves, 0-25% bud injury, 4=90% injured leaves, >25% buds injured, 5=dead plants.

The following treatments as shown in Table 1 were evaluated.

Table 1.

Product(s)	Rate (Product/A)
Warrior II	1.28 fl. oz.
Orthene 97	3.0 oz.
Dimethoate 2.67	1.5 pts.
Orthene 97 seed treatment	6.4 oz./100 lbs. seed
Radiant SC	3.0 fl. oz.
Radiant SC	6.0 fl. oz.
Untreated	----
Cyazypyr 10 OD	15.4 fl. oz.
BotaniGard ES	2 qts.
BotaniGard ES + Entrust	2 qts. + 1.5 oz.
Entrust	1.5 oz.
Grandevo	2 lbs.
Torac 15EC	21 fl. oz.
Cyclaniliprole 50SL	16.4 fl. oz.
Cyclaniliprole 50SL	22 fl. oz.
Sivanto	10.5 fl. oz.

Results and Discussion

Number of thrips per seedling

Seed treatment: Orthene seed treatment reduced immature thrips numbers by an average of 90% on the first sample date (17 days after planting) (Fig. 1). This percentage declined to 75 and 58% at 24 and 31 days after planting. Efficacy was similar on the two types of cotton. Control of adult thrips was less effective and had ceased 24 days after planting; the maximum percentage adult thrips control was 53% on the first sample date (Fig. 2).

Conventional foliar insecticides: At 7 days after treatment (DAT), Orthene, dimethoate, and Radiant (both rates)

averaged 90% immature thrips control (Fig. 1); Torac and Cyclaniliprole provided slightly less control. Efficacy declined in most treatments at 14 DAT. Only Radiant (6 oz.) reached the 90% level; Orthene provided 90% thrips control in Pima cotton but not in Acala. Radiant (3 oz.), Cyazypyr, Cyclaniliprole (22 oz.), and Sivanto averaged 60% immature thrips control (Fig. 2). At 21 DAT, no treatments averaged more than 60% control across the two cotton species. However, Radiant (both rates) provided 60%+ control of immature thrips on Pima cotton and five of the other foliar treatments showed better thrips control on Pima cotton than on Acala cotton (often at fairly low percentages). Control of adult thrips was less efficacious than immature thrips and at 7 DAT, only Orthene (Acala) and Cyclaniliprole (both rates on Pima cotton) provided at least 50% control. Later sample dates showed no adult thrips control. Overall, thrips populations were comparable on the two cotton types.

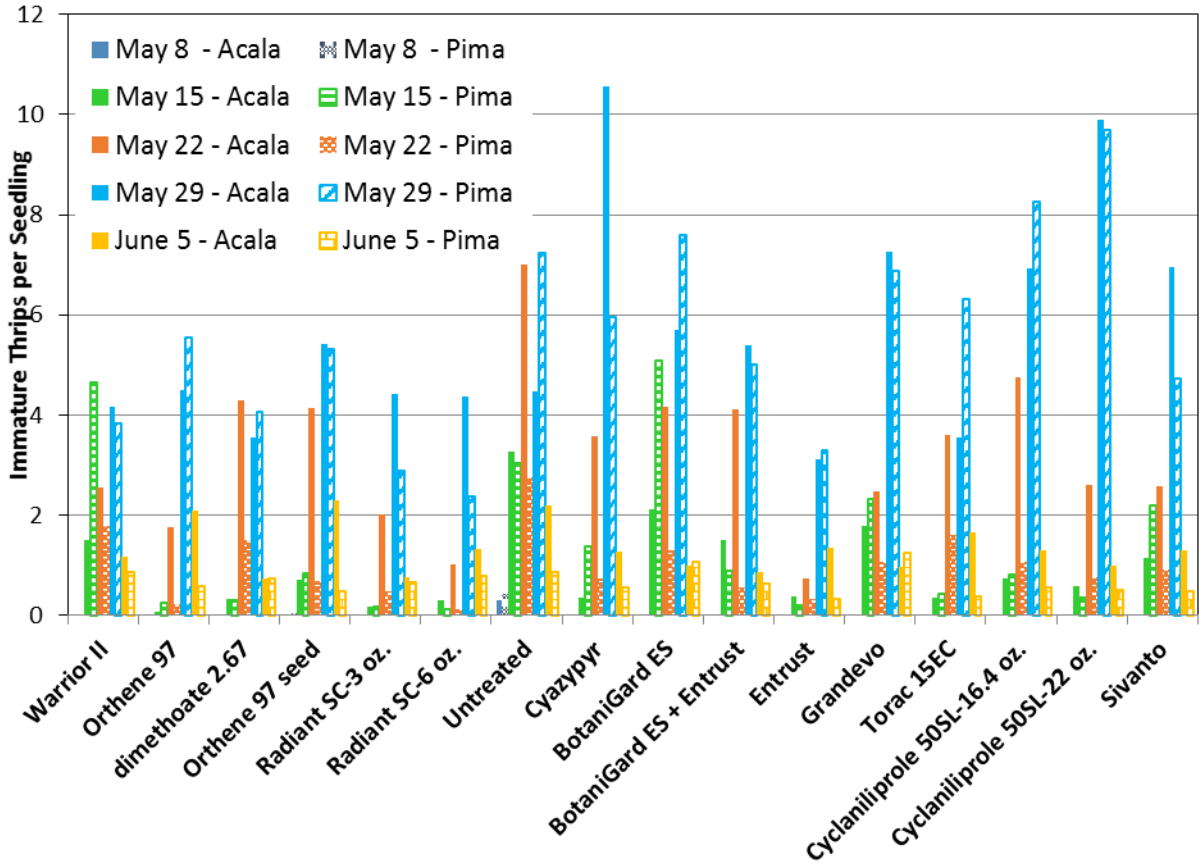

Figure 1. Population of immature western flower thrips at various days after insecticide application in Acala and Pima cotton.

Bioinsecticide foliar insecticides: At 7 DAT against immature thrips, Entrust (91% reduction) and Botanigard+Entrust (62% reduction) were effective (Fig. 1). Most of the activity for the latter treatment likely came from the Entrust component as Botanigard alone was largely ineffective. However at 14 DAT, all four of the bioinsecticides provided at least 40% control with the two entries containing Entrust being 80%+ effective in Pima cotton and 40-90% effective in Acala cotton. For the last two sample dates, the Entrust treatment maintained 50-60% and 30-40% immature thrips control for Pima and Acala cotton, respectively whereas the other three bioinsecticide entries declined in activity. Adult thrips control with these four products was consistently less than 50% for all sample dates (Fig. 2).

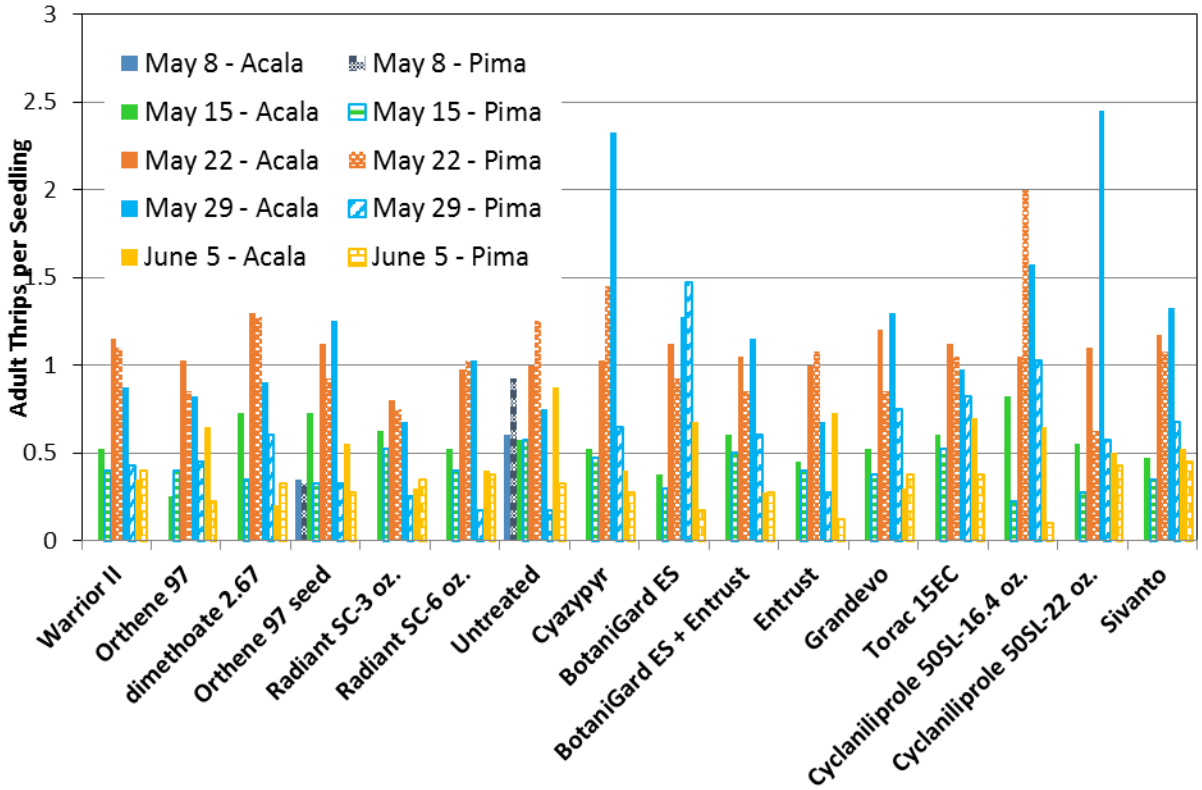

Figure 2. Population of adult western flower thrips at various days after insecticide application in Acala and Pima cotton.

Plant growth and development

Plant biomass data (early June sample date) showed that five treatments (Radiant [6 oz.], Cyazypyr, BotaniGard + Entrust, Grandevo, and Cyclaniliprole [22 oz.]) had seedlings 10% longer than the untreated plants in Pima cotton (Fig. 3). None of the treatments in Acala cotton reached this standard. Orthene seed, Radiant (both rates), Cyazypyr, BotaniGard + Entrust, Grandevo, Torac, and Cyclaniliprole [22 oz.]) had root lengths 10% or more longer than in untreated plants in Pima cotton and these same treatments plus Warrior and Cyclaniliprole (both rates) produced longer roots in Acala cotton. For seedling weights, eleven and two of the treatments increased above-ground dry weights by more than 10% over that in the untreated in Pima and Acala cotton, respectively (Fig. 4). Similarly, eight treatments increased root dry weight by 10% over the untreated in both cotton types.

Damage ratings

Orthene seed treatment and Orthene, dimethoate, Radiant (both rates), Cyazypyr, Entrust, and Cyclaniliprole (22 oz.) foliar treatments produced average damage ratings less than ½ that in the untreated plots. Overall, the damage was slightly greater in Pima (2.1 rating) than in Acala cotton (1.9 rating).

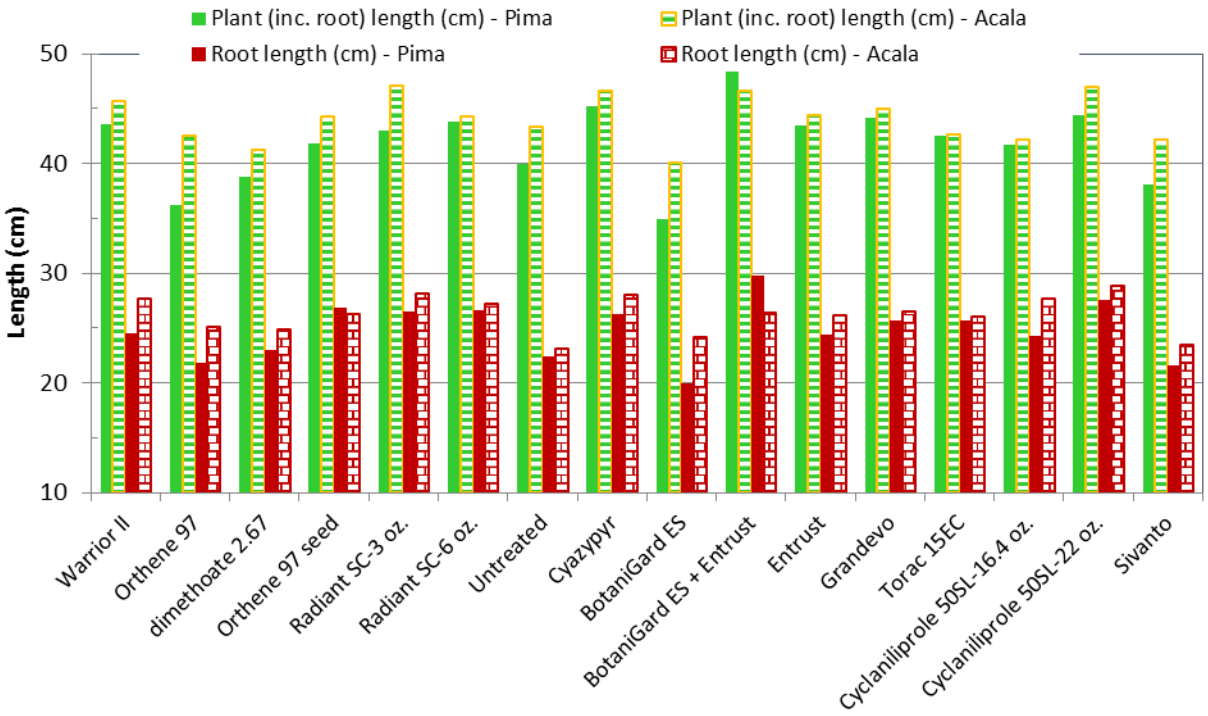

Figure 3. Cotton (Acala and Pima) seedling growth as influenced by insecticide treatment for western flower thrips.

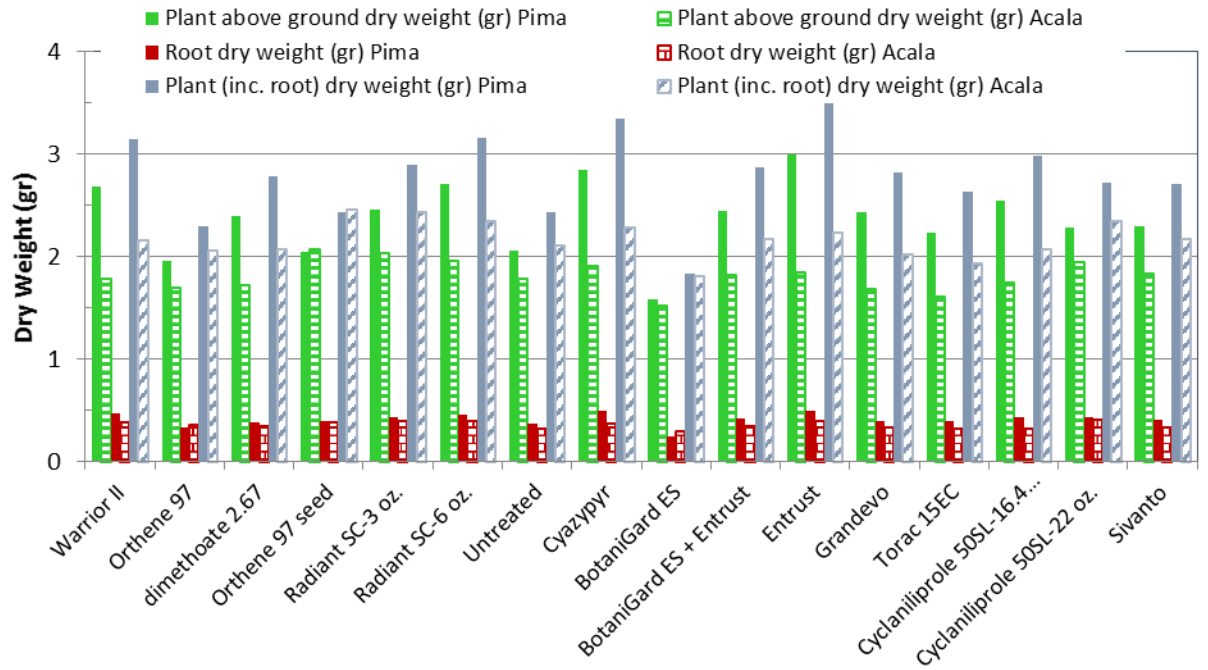

Figure 4. Cotton (Acala and Pima) seedling weights as influenced by insecticide treatment for western flower thrips.

Acknowledgements

This research was supported by funding from the Cotton Incorporated California State Support program. We thank Neal Hudson of the Shafter Research Station for technical support.