REGIONAL THRIPS TRIAL, 2009: THRIPS SPECIES COMPOSITION

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Abstract

The effect of preventive, insecticidal/nematicidal seed treatments on thrips species composition is reported as part of a regional cotton project that was initiated in 2009. The treatments were Aeris or Avicta seed treatments, Temik applied in furrow and an untreated control. Thrips species varied greatly among the 17 locations which included

trials within Arkansas, Georgia, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Texas, and Virginia. *Frankliniella fusca* (Hinds), tobacco thrips, was identified from fifteen locations; *Thrips tabaci* Lindeman, onion thrips, was found at 6 locations; *F. occidentalis* (Pergande), western flower thrips, and *Neohydatothrips variabilis* (Beach), soybean thrips, were found at 11 locations; and *F. tritici* (Fitch), flower thrips, was identified from 13 locations (Table 1). Tobacco thrips was the dominant species at all except four locations. Overall distribution of thrips species relative to preventive insecticide treatments appears not to differ greatly among treatments, although the percentage of tobacco thrips ranged from 8.3 to 14.7% higher in untreated plots than in the seed-treatments or Temik-treated plots, indicating that one or more species may be less susceptible to the insecticides than tobacco thrips. No effects of insecticide treatment on thrips species composition based on identification of adults were noted.

Introduction

The species of thrips occurring on seedling cotton in the mid-South have been identified in previous studies (Burris et al. (1989, 1990, 2000, 2001), Cook et al. 2003, Freeman et al. 2002, Karboutli and Allen 2001, Reed et al. 2001, Reed and Jackson 2002, Reed et al. 2006). Numerous pesticide evaluation publications report efficacy, but in general do not refer to species composition related to treatments unless a resistant species such as western flower thrips, *Frankliniella occidentalis* (Pergande) is involved. A regional cotton project was initiated during 2009, with an objective to examine the effect of insecticidal, preventive seed treatments on thrips species composition. A broad view of species composition on a regional basis as related to the use of Aeris (imidacloprid [insecticide] plus thiodicarb [nematicide]) seed treatments was therefore a desired outcome of the project. Results of these treatments were reported from trials in 17 total locations within Arkansas, Georgia, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Texas, and Virginia. Avicta seed treatment (thiamethoxam [insecticide] plus abamectin [nematicide]), as an optional treatment, was evaluated in three locations in Arkansas and Mississippi, two locations in Georgia, and one location in each of Tennessee, South Carolina, and Missouri.

Materials and Methods

Plots of cotton four rows wide by 50 feet long were planted at the various locations with cotton seed treated with Aeris or Avicta seed treatments, Temik (aldicarb) applied in the seed furrow, and an untreated control. Treatments were randomly arranged within each of the four replicates at each location. The seed used in Aeris, Temik and untreated plots was also treated with Trilex (trifloxystrobin) and Allegiance (metalaxyl) fungicides. Avicta treated seed was treated with the Dynasty CST (azoxystrobin, fludioxonil and mefenoxam) fungicide package. Inclusion of the Avicta treatment was optional and the treatment was included at 10 of the 17 locations. Other treatments in the trials included those listed followed by foliar application of acephate at different growth stages of the cotton. Cotton variety varied among locations, but reflected commercially released cultivars that were typical for different production regions.

Insects were collected by cutting 5-10 seedlings in each plot on each of three sample dates (two dates for Texas locations) beginning at the first to second true leaf stage. Each seedling sample was placed in an individual container in the field and returned to the laboratory where insects were washed from the plants onto a fine mesh sieve according to Burris et al. (1989). Thrips were identified to species only from plots receiving no additional foliar insecticide applications according to procedures described by Reed et al. (2006). All specimens of doubtful identification were mounted on microscope slides in CMC10 mounting medium and identified at 400X or greater magnifications, and specimens that were missing antennae or other taxonomically important body parts were ignored. Species composition was determined by summing thrips numbers relative to treatment across sample dates and replicates for each location, separating locations into groups by species so that data for a species would include only locations where the species was identified, and analyzing data of groups using locations as replicates. STATISTICA (data analysis software system) (Statsoft 2009) was used for analyses with all parameters fixed. Data were transformed with the arcsin(sqrt(X)) transformation (Marascuilo and McSweeney 1977) and analyzed by species with the Chi^2 median test at p=0.05.

Results and Discussion

A total of 2,911 adult thrips were identified from the three sample dates across all locations (test sites). A mean of 65 thrips per location were collected from the untreated plots, and means of 49, 37, and 32 from Aeris, Temik and

Avicta treated plots, respectively (Avicta treatments, 10 locations; other treatments, 17 locations). Tobacco thrips were identified from fifteen locations, onion thrips were found at six locations, western flower thrips and soybean thrips at 11 locations, and flower thrips at 13 locations. Thrips from Sunray and Dimmitt, TX, and the Lang Farm, Tift Co., GA, were predominantly western flower thrips, and tobacco thrips were the most common species in other locations except Jackson, TN, where soybean thrips were numerous (Table 1).

Table 1. Mean number of adult thrips per sample averaged across treatments, four replications per location, and three sample dates in 2009.

	Tobacco Thrips	Flower Thrips	Western Flower Thrips	Soybean Thrips	Onion Thrips	Other*
Keiser, AR	5.60	0.08	0.04	0.04	0.23	0.00
Marianna, AR	7.02	0.04	0.00	0.10	0.06	0.04
Rohwer, AR	1.02	0.02	0.00	0.02	0.00	0.02
ABAC Farm, Tift Co., GA	1.02	0.02	0.04	0.04	0.00	0.00
Lang Farm, Tift Co., GA	1.27	0.13	3.48	0.00	0.00	0.00
Macon Ridge, LA	5.83	0.08	0.71	0.00	0.00	0.00
Red River Research ST., LA	3.61	0.14	0.17	0.06	0.00	0.06
Portageville, MO	1.13	0.15	0.04	0.04	0.00	0.00
Raymond, MS	1.83	0.00	0.00	0.08	0.00	0.00
Starkville, MS	1.15	0.13	0.00	0.00	0.00	0.00
Stoneville, MS	0.94	0.04	0.02	0.00	0.00	0.00
Raleigh, NC	7.08	0.53	1.25	0.11	1.58	0.03
Blackville, SC	1.33	0.00	0.00	0.10	0.00	0.00
Jackson, TN	2.06	0.13	0.00	2.44	0.63	0.00
Dimmitt, TX	0.00	0.00	10.25	0.00	2.83	0.00
Sunray, TX	0.00	0.00	0.50	0.00	0.00	0.00
Suffolk, VA	5.35	0.13	0.40	0.29	1.44	0.00

*Other thrips include *Frankliniella williamsi* Hood, *Scolothrips paladus* (Beach), *Microcephalothrips abdominalis* (D. L. Crawford), or *Thrips nigripilosus* Uzel.

Thrips species composition varied considerably among locations (Fig. 1). Overall distribution of thrips species relative to insecticides appears not to differ greatly among treatments, although the percentage of tobacco thrips ranged from 8.3 to 14.7% higher in untreated plots than in the seed treatment and Temik-treated plots (Fig. 2), indicating that one or more species may be less susceptible to the systemic insecticides than tobacco thrips. When treatments were analyzed by species to determine differences among treatments, excluding locations where the species of interest was not detected, Chi^2 analyses for tobacco thrips (Chi^2=6.583, df=3, p=0.0864) (Fig. 3A), western flower thrips (Chi^2=3.084, df=3, p=0.379) (Fig. 3B), flower thrips (Chi^2=5.086, df=3, p=0.1656) (Fig.3C), soybean thrips (Chi^2=3.778, df=3, p=0.286) (Fig. 3D), and onion thrips (Chi^2=1.623, df=3, p=0.654) (Fig. 3E), were not significant, indicating that the percentage of thrips represented by each of these species did not differ among treatments (Chi^2; p=0.05).

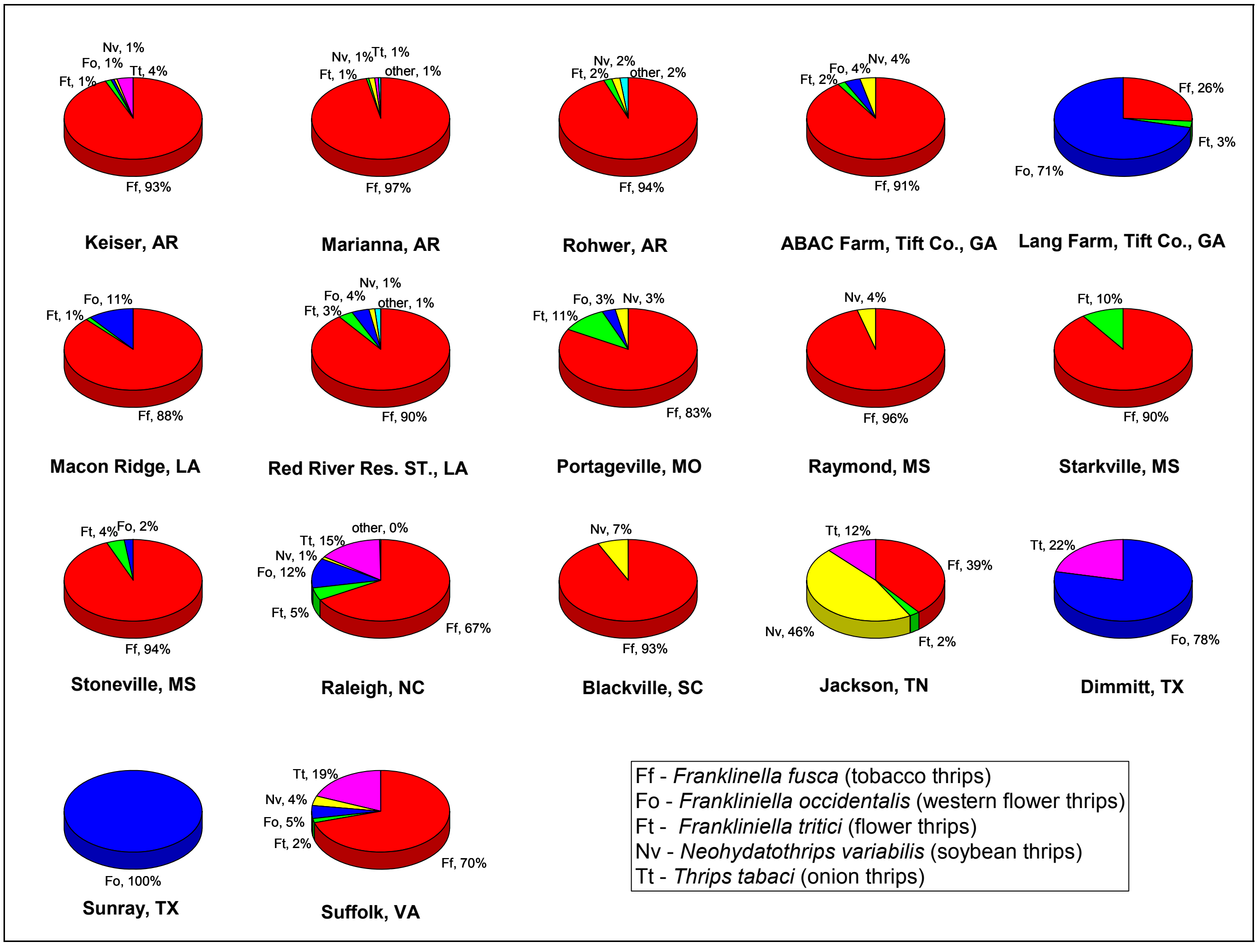

Figure 1. Species percentage composition of thrips by location computed across treatments and sample dates.

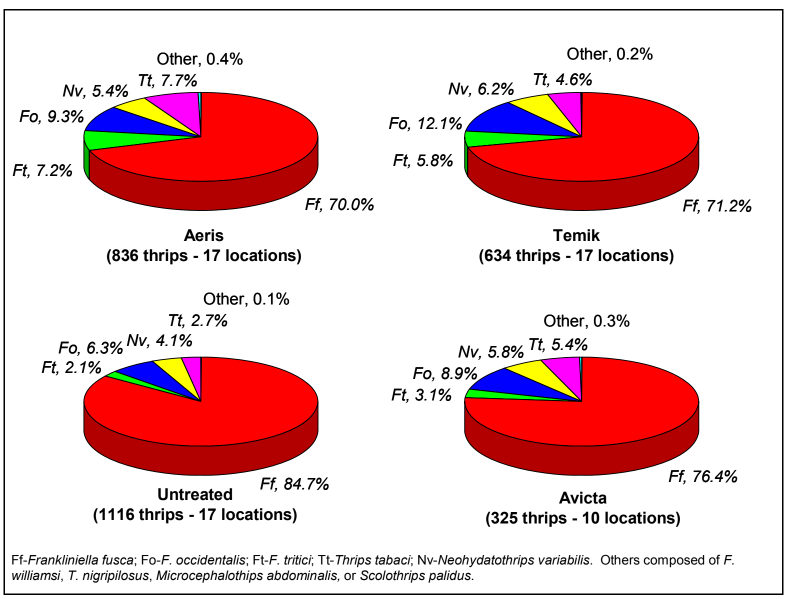

Figure 2. Species percentage composition of thrips by treatment averaged across all locations except Sunray, TX, Dimmitt, TX, and Blackville, SC, and across sample dates. Number of thrips identified for each treatment is parenthetically listed.

Thrips numbers were low in all locations, and species composition computations as presented in this paper may not be representative of conditions more conducive to high thrips numbers. The density of individual species and number of species present in seedling cotton are also related to the conditions of nearby crops or wild hosts, and may be affected by early or late planting, method of tillage, and possibly irrigation if used to potentiate germination and seedling development. Thus, individual test sites in relatively close proximity to each other may harbor drastically different thrips populations. Additionally, adult thrips are mobile and movement among plots is probable. Because of the complexity of these factors, such effects were not considered in the scope of these results.

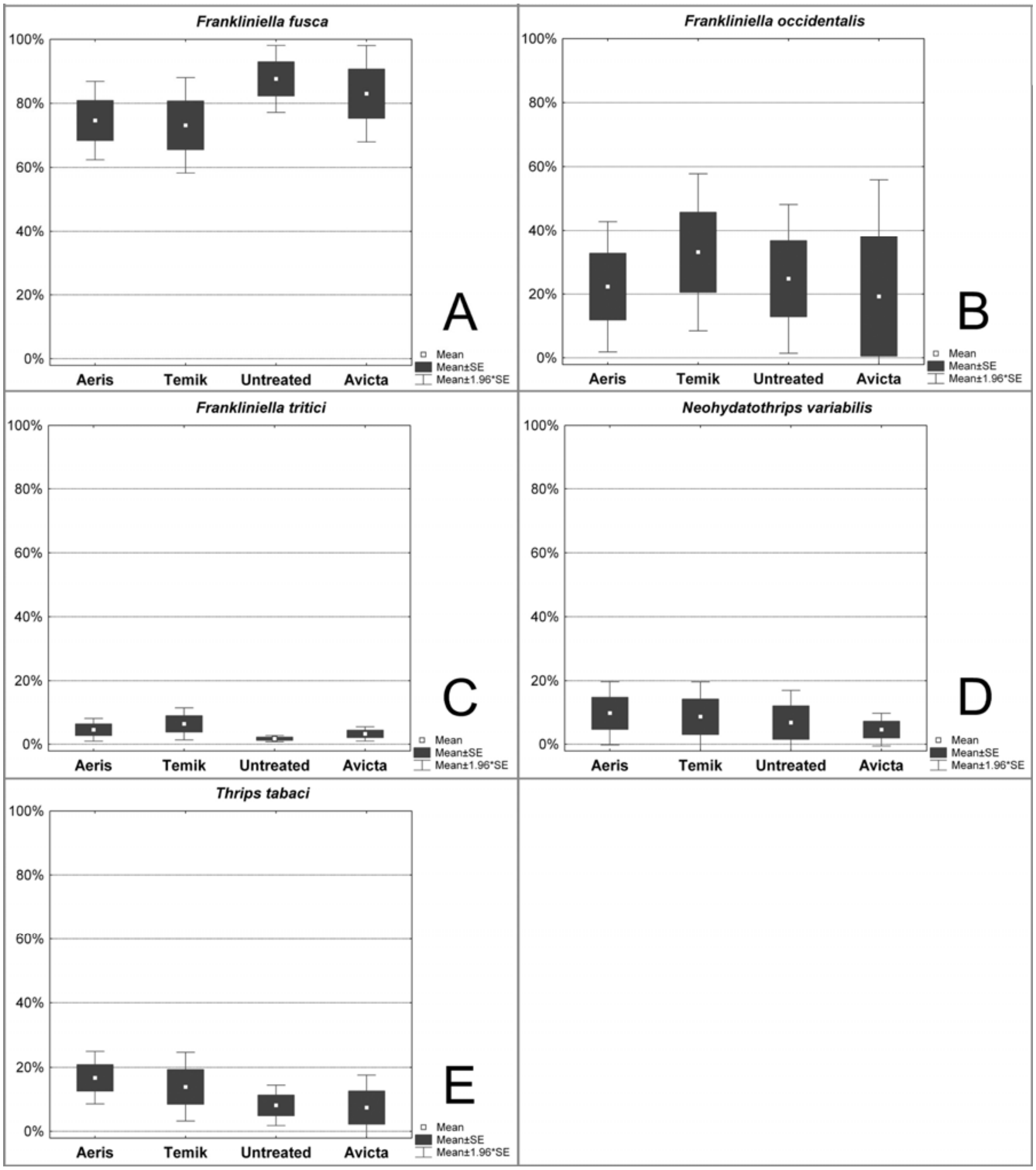

Figure 3. Percentage of adult thrips identified as tobacco thrips (A), western flower thrips (B), flower thrips (C), soybean thrips (D), and onion thrips (E) related to treatment. For each species, percentage data were derived only from locations where the respective species was found.

Conclusions

The most common species was tobacco thrips, followed by flower thrips, western flower thrips, onion thrips and soybean thrips. Species composition varied greatly among locations from one to five species, possibly influenced within location by wild host condition or availability, planting date, or the proximity of the cotton plots to other thrips-bearing crops. Adult thrips are extremely mobile and movement among small plots could mask insecticide related factors. In addition, adult thrips may be more attracted to relatively undamaged seedling cotton protected by systemic insecticides than to seedlings in untreated plots that become heavily damaged under high numbers of thrips, thus influencing the counts related to treatment. Such factors were not considered in the computation of treatment effect. The species composition of adult thrips did not differ significantly among preventive seed treatments, the untreated, or the Temik-treated plots, indicating that control of each species by the various treatments was similar. Survey results generally agreed with the review of Cook et al. (2003), who reviewed thrips species surveys on seedling cotton from Alabama, Arkansas, Georgia, Louisiana, Mississippi, and Tennessee.

It would be of value to repeat these trials in 2010-2011 to confirm trends indicated by these initial results and provide some long term, year-to-year thrips abundance and species composition data. Such additional studies combined with weather and crop information for research sites and surrounding areas may provide helpful, predictive information concerning thrips populations in seedling cotton and their management.

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