EFFICACY OF INSECTICIDE/NEMATICIDE IN-FURROW AND SEED TREATMENT PRODUCTS IN SOUTH CAROLINA - 2007

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Abstract

Trials were conducted to determine the effectiveness of in-furrow and seed-treatment insecticides/nematicides in providing control or suppression of populations of thrips and nematodes in cotton. Efficacy of the materials was examined in areas with varying levels of nematode infestations in order to evaluate the ability of insecticide-treated and untreated cotton to withstand injury from thrips while under varying levels of nematode stress. Under conditions of heavy nematode pressure, seed treatments significantly benefited from the addition of granular in-furrow insecticide/nematicide.

Introduction

Thrips and nematodes continue to be perennial pests of cotton in South Carolina. Thrips move into cotton from wild and cultivated hosts as they senesce and can reach high enough populations to cause economic damage to cotton if left untreated. Heavy infestations of thrips typically cause abortion of the terminal, resulting in branching and excessive vegetative growth, often leading to delayed maturity and reduced yields. Additional stress early in the season is due to nematodes that infest more than 60% of cotton fields in South Carolina at damaging levels. Because resistant cultivars are not available, management of cotton nematodes relies heavily on the use of nematicides. Pre-plant fumigant and in-furrow granular nematicides have been used for over 20 years for control/suppression of nematodes. These materials have proven to be very cost effective when used in appropriate fields. Selected in-furrow nematicides have insecticidal properties and serve as preventative treatment for both nematodes and thrips. These materials have provided long-established preventative control of nematodes and thrips in cotton, but, in recent years, seed treatments have become available as alternative methods of pesticide delivery. Efficacy and cost-effectiveness of seed treatment nematicide/insecticide combinations are relatively unfamiliar. The major objective of this project was to evaluate potential differences in control of nematodes and thrips with various products under varying infestations of nematodes.

Materials and Methods

Cotton (DP 164 B2/RF – Bollgard 2 / Roundup Ready Flex) was planted on 11, 16, and 22 May (4 trials) at Clemson University's Edisto Research and Education Center near Blackville, SC, and at producer fields in Hampton and Dorchester Counties. Plot size varied from 4, 6, or 8 rows wide (38-inch row spacing) and 40, 100, or 150 feet long. Plots were replicated 4 times and arranged in a RCBD. Standard fertilization and herbicide practices were followed according to current Clemson University recommendations. Thrips were collected by randomly pulling 10 plants from each plot and dipping them in 1-quart jars of 70% isopropyl alcohol. After filtration procedures, nymphs and adults were counted from filter paper. Ratings on insect injury to plants were conducted in all tests by observing the visible foliar damage caused by thrips. This damage was rated by assigning a number to each plot with “0" equal to the lowest damage and "10" equal to the highest damage. Stand counts were taken in each test.

Nematode samples were collected at planting and late-season. Six 1-inch diameter cores were taken 8 inches deep in a random pattern from the center 2 rows of each plot. Nematodes were extracted from soil using differential sieving and centrifugal flotation. Recovery was expressed as nematodes per 100 cm3 of soil. Nematodes were extracted from roots using a modified mist chamber. Twelve to 15 root systems were gathered at random in each plot. Roots were cut into pieces approximately 0.75 to 1 inch long. Approximately 15 grams fresh weight of these cut up roots were placed in the mist chamber for 5 days. After extraction of nematodes, roots were dried in an oven for 72 hours. Recovery was expressed as nematodes per gram dry weight of root. Ten to 15 plants were collected at random from each plot. Each root system was evaluated individually for galling using a 0 to 5 scale where 0 = no galling and 5 = 100% of the root system galled. Data were processed using Agriculture Research Manager (Gylling Data Management, Inc., Brookings, SD) and means were separated using Least Significant Difference (LSD) procedures following significant F tests using ANOVA.

Results and Discussion

Moderate to high numbers of thrips and injury were detected at the Hampton County trial location during the 2007 season (Figures 1 and 2). Except for Avicta Complete Pak (ACP) seed treatment used alone, all products and combinations significantly reduced seasonal mean numbers of thrips (Figure 1). Injury ratings (Figure 2) indicated that all treatments resulted in significantly reduced thrips injury but that ACP alone had higher injury, corresponding with the higher number of thrips collected for the season (Figure 1). Combinations of seed treatment plus Temik at 5 lb were numerically best in terms of thrips control and prevention of plant injury (Figures 1 and 2). Galling indices and populations of root-knot nematodes (Figures 3 and 4) indicated that pressure from nematodes was high at the Hampton County site. Galling indices were highest in the ACP alone treatment, followed by Aeris seed treatment alone (Figure 3). Galling indices in the untreated control (UTC) plots were likely prevented from approaching a "5" because of stunting due to nematode stress. The highest nematode counts were made in plots treated with Temik alone at 3 lb, ACP alone, and the UTC plots (Figure 4). Although no significant differences were detected in weights of stems and roots (Figures 5 and 6) of plants collected from plots at the Hampton County site, yields were significantly impacted by the treatments (Figure 7). Temik alone at 3 or 5 lb per acre resulted in the highest yields and was followed by combinations of Aeris or ACP plus Temik at 3 or 5 lb per acre (Figure 7). When data from all 2007 trials (4) were combined, all products and combinations of products resulted in significantly reduced populations of and injury from thrips (Figures 8 and 9). Positive effects on thrips numbers, plant injury, and yields were realized when Temik was used alone or in combination with either seed treatment.

Acknowledgments

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Disclaimer

The mention of trade names in this report is for informational purposes only and does not imply an endorsement by Clemson University or any of its employees.

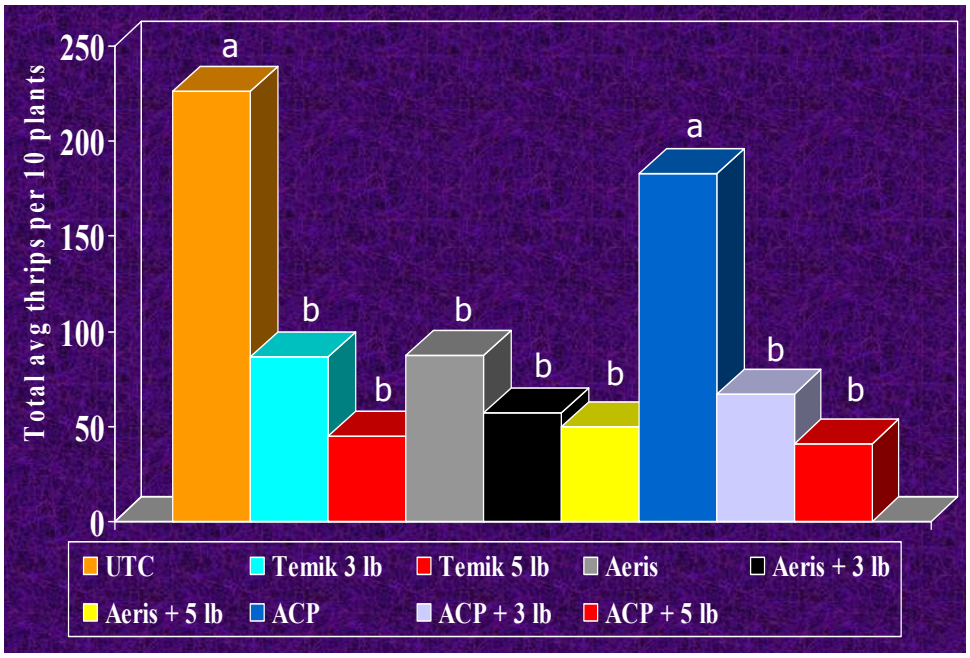

Figure 1. Seasonal mean number of thrips from a trial in Hampton County, South Carolina (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.

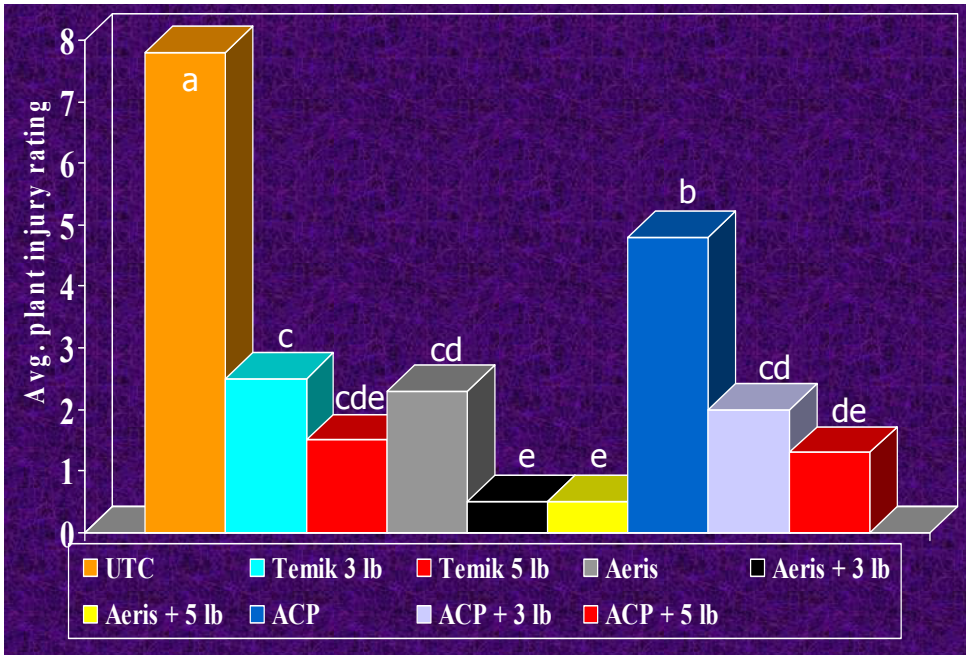

Figure 2. Seasonal average plant injury ratings caused by thrips (0 = no damage; 10 = dead plants) from a trial in Hampton County, South Carolina (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.

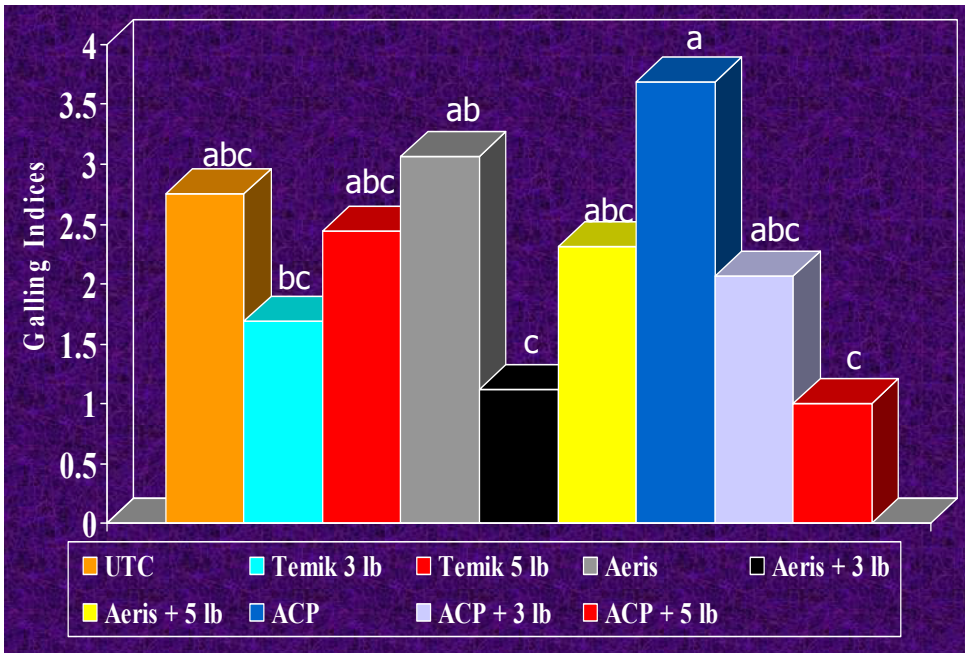

Figure 3. Seasonal mean galling indices for nematode injury from a trial in Hampton County, South Carolina (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.

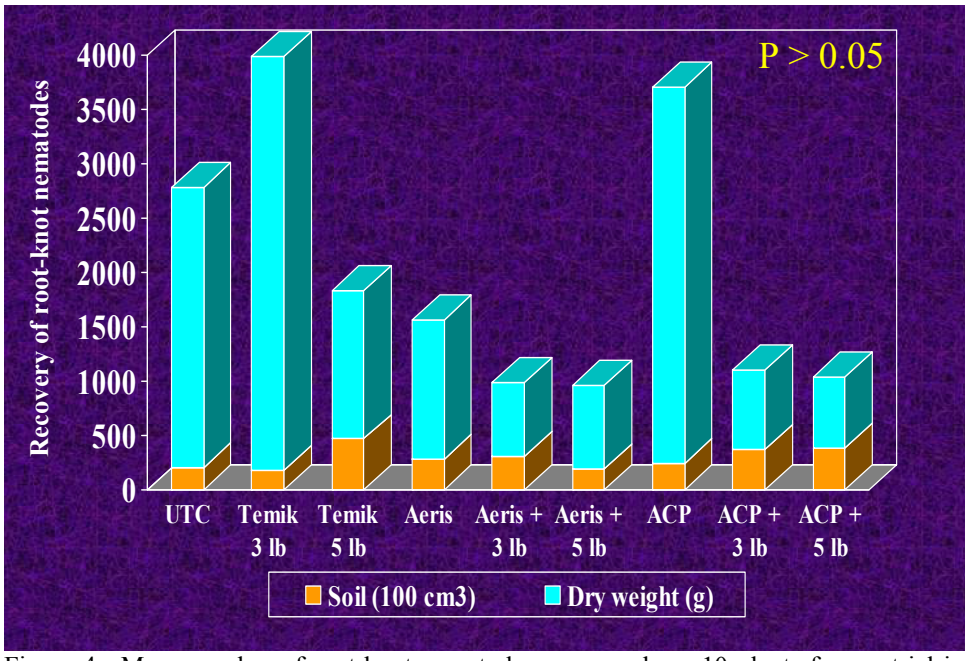

Figure 4. Mean number of root-knot nematodes recovered per 10 plants from a trial in Hampton County, South Carolina (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.

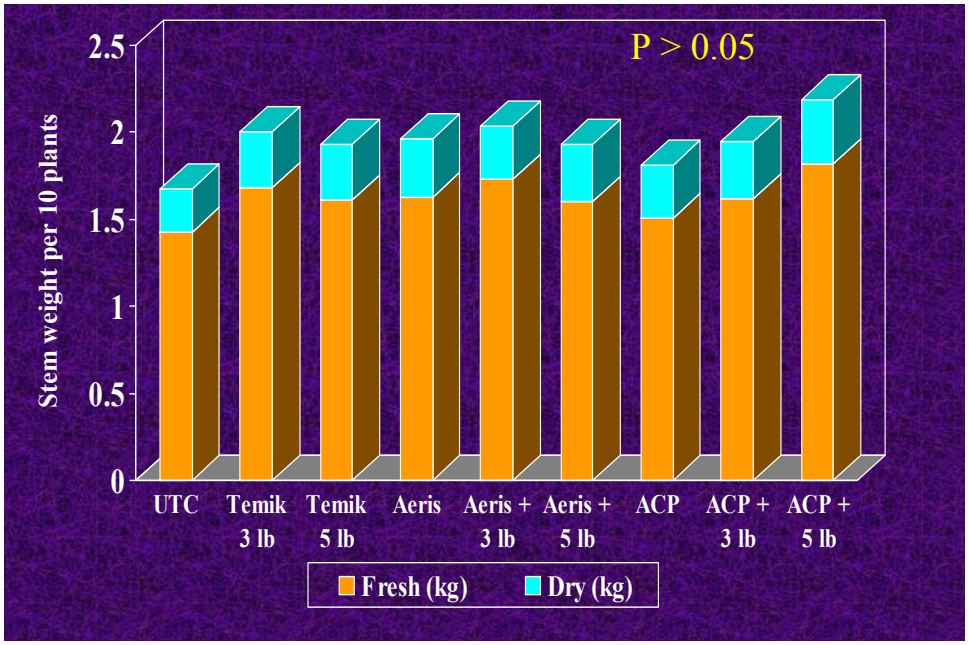

Figure 5. Average stem weights (fresh and dry) per 10 plants from a trial in Hampton County, South Carolina (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.

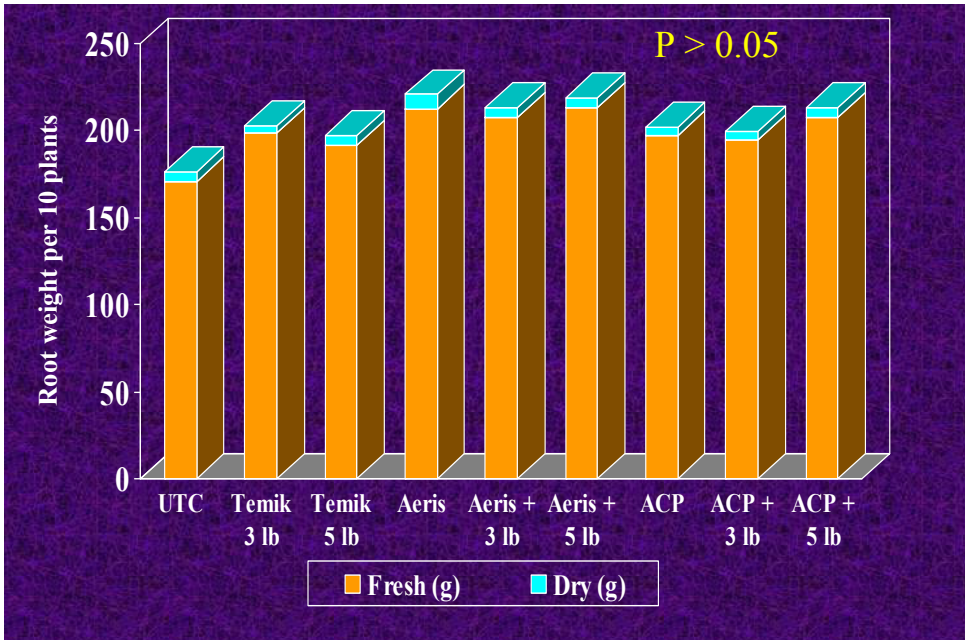

Figure 6. Average root weights (fresh and dry) per 10 plants from a trial in Hampton County, South Carolina (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.

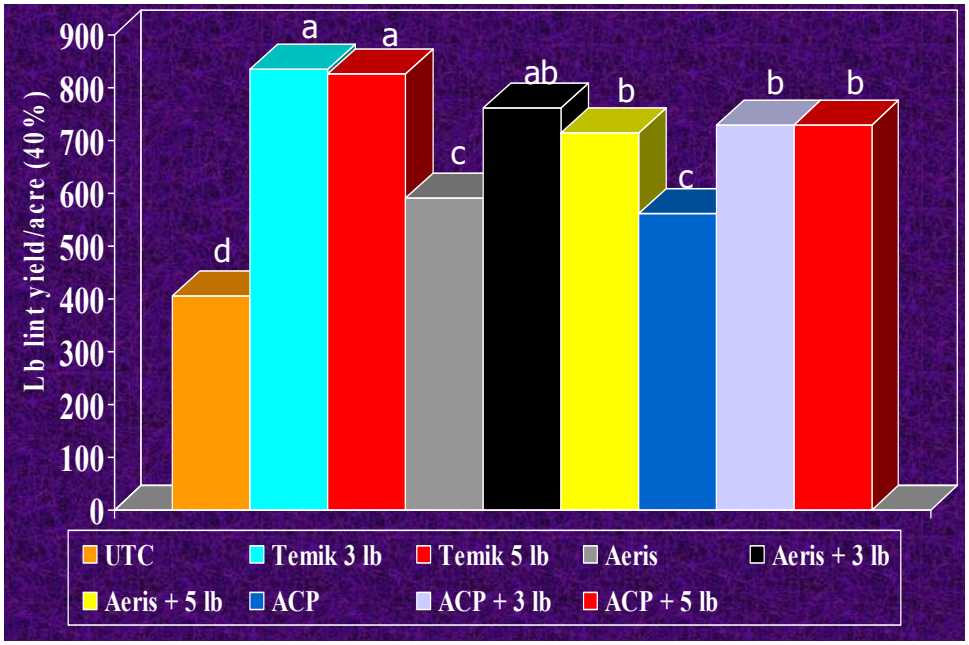

Figure 7. Mean lint yield (40% gin turnout) from a trial in Hampton County, SC (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.

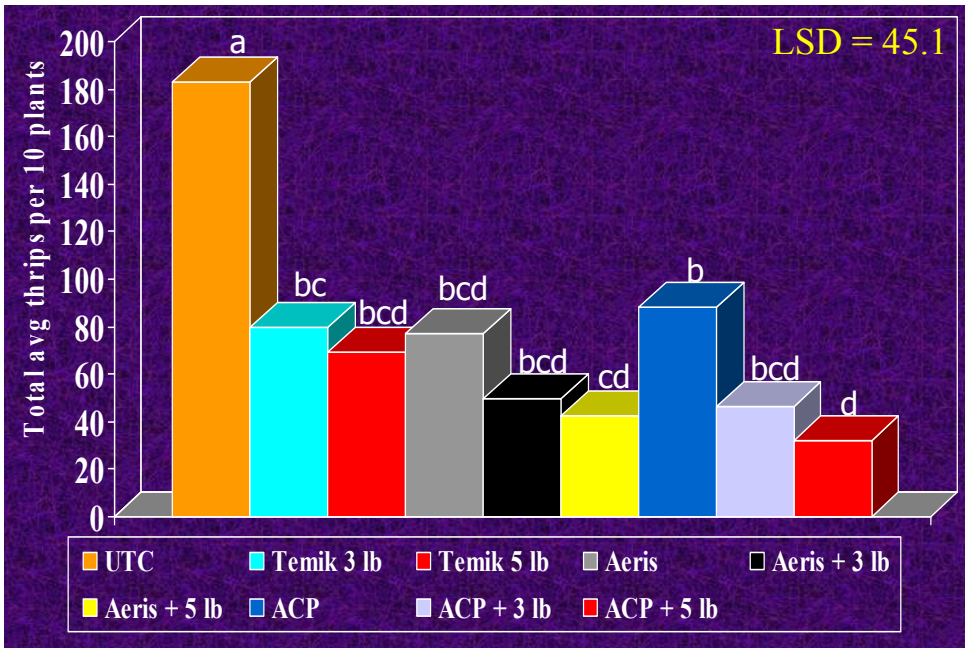

Figure 8. Seasonal mean number of thrips from multiple trials (4) in South Carolina (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.

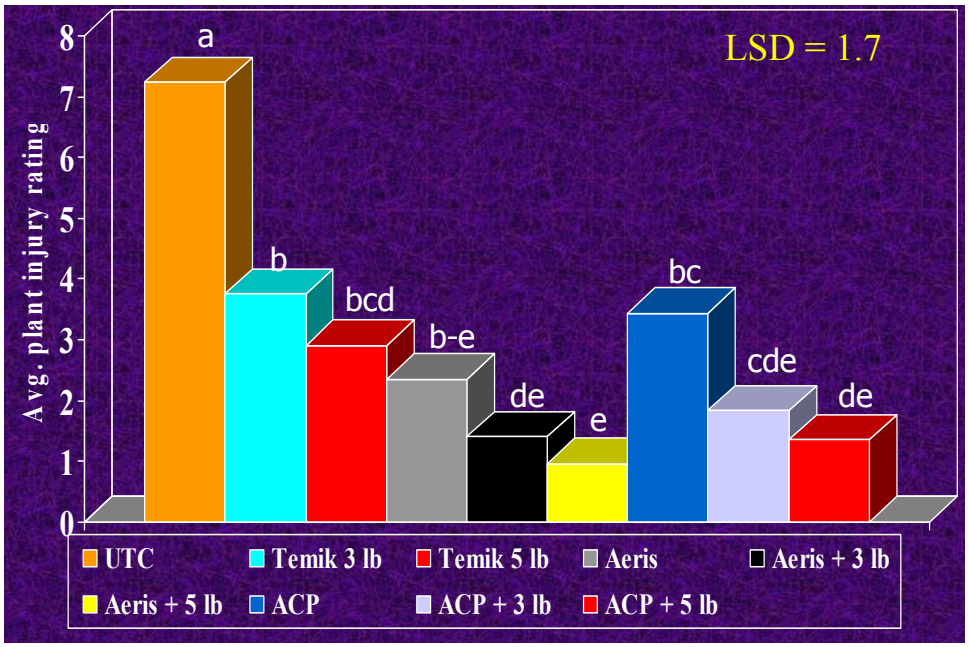

Figure 9. Seasonal average plant injury ratings caused by thrips (0 = no damage; 10 = dead plants) from multiple trials (4) in South Carolina (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.

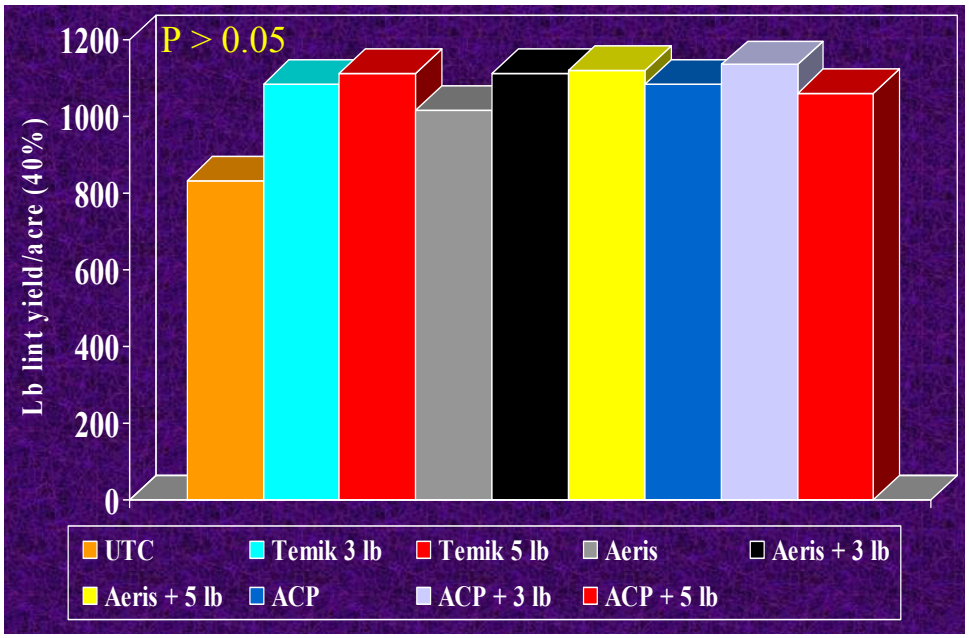

Figure 10. Lint yield (40% gin turnout) from multiple trials (3) in South Carolina (2007). Temik = Temik 15G in furrow at planting, Aeris = seed treatment, ACP = Avicta Complete Pak seed treatment.