THRIPS DAMAGE POTENTIAL IN TEXAS HIGH PLAINS COTTON

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Abstract

The western flower thrips, *Frankliniella occidentalis* Pergande were field-collected and released on seedlings of six cotton varieties in the greenhouse at 1-2 true-leaf stage @ 0.5, 1, and 2 thrips per plant. Three weeks after releasing thrips, seedlings were carefully clipped, preserved in ethyl alcohol and washed to recover thrips. Visual ranking of the seedlings was conducted, and chlorophyll readings were recorded. Leaf area was measured using a LI-COR® leaf area meter. Adult thrips numbers retrieved after three weeks of study were the highest in the 0.5 and 1 thrips per plant treatments while the lowest numbers were observed in control. No significant differences in thrips densities were detected between cultivars. Thrips density augmentation significantly influenced the degree of seedling injury as reflected in visual ranking of the cotton seedlings. Thrips density treatments did not affect chlorophyll readings.

Introduction

The western flower thrips (WFT), *Frankliniella occidentalis,* Pergande (Thysanoptera: Thripidae), is an important polyphagous pest of many crops including greenhouse crops throughout the world. WFT is an important pest of seedling cotton throughout the United States cotton belt. In Texas, WFT is considered as the most significant growth stressor for seedling cotton. WFT can cause stunted growth, loss of apical dominance, leaf area destruction, delayed maturity, and reduced lint yields. Excessive feeding of thrips leads to the browning of leaves on the edges, development of a silvery leaf surface color, or curling upward from the edges. WFT can be found in cotton throughout the growing season, but cotton is the most vulnerable to thrips damage for the first three to four weeks following planting and cotyledon emergence or 3-4 true leaf stage. In the U.S., thrips infested 9.4 million acres in 2016 while in Texas, thrips infested 5.4 million acres causing yield loss of approximately 6,720 bales (Williams 2017)**.** Early infestations of thrips can reduce as much as 50% of the leaf area but cotton plants can regain lost leaf area once thrips infestations cease (Lei and Wilson 2004). Gaines (1934) documented that the plants injured by thrips set bolls two weeks later and produced 44 percent fewer bolls per plant than normal plants; however, it is pertinent to observe that relatively small number of studies indicating no yield losses even in presence of heavy thrips presence (Harp and Turner 1976). This may be due to the ability of cotton varieties to compensate for early season damage in favorable environmental conditions (Kerns et al. 2009, Vandiver et al. 2009, Cook et al. 2011). Limited information is available on the impact of different densities of thrips on seedling cotton in the Texas High Plains. The objective of this study was to evaluate the impact of thrips augmentation on seedling cotton health.

Materials and Methods

A 3-year greenhouse study (2013-2015) was conducted at the Texas A&M AgriLife Research and Extension Center, Lubbock. Six cotton cultivars (07-7-1001 CT-1206, 07-7-1407 CT-1205, PHY367 WRF, SSG HQ212 NCT, FM 1740B2RF and ST 5458B2RF) were planted in 16-oz Styrofoam® cups. The study was deployed in a completely randomized block design with six cultivars, four thrips densities, and four replications. Field-collected immature thrips, provisioned for 24 h on green beans in the laboratory, were released using a small camel brush to dislodge thrips from the green beans onto the cotton seedlings. Thrips densities released included: no thrips (*Control*); ½ thrips per plant (e.g., one thrips per two plants) (*Density 0.5*); one thrips per plant (*Density 1*); and two thrips per plant at the 1- to 2-true leaf stage (*Density 2*). Orthene® 97 was sprayed to manage thrips on control treatments.

Visual leaf tissue damage rankings of all plants were recorded prior to plant clipping 21 days after the deployment of thrips augmentation treatments. Thrips damage ranking was based on a scale of 1-10: 1-2) no or insignificant damage (<5% damage), 3-4) slight damage (<25% damage), 5-6) moderate damage (<50% damage), 7-8) severe damage (<75% damage), 9) <90% leaves and terminals damaged, and 10) 100% leaves damaged and plant stunted or dead. Leaf area from each treatment was recorded using a leaf area meter to test whether leaf surface area was reduced by thrips density treatments. Chlorophyll readings were also recorded using a chlorophyll meter to determine if thrips densities and/or tested cotton varieties influenced the chlorophyll level. Three weeks after initial releases, seedlings were clipped near the soil surface and placed into a mason jar containing 75% denatured ethyl alcohol, and the adult

and juvenile thrips were quantified (Rummel and Arnold 1989). Adults and juveniles were counted using a microscope at a 10X or higher magnification.

Results

In 2013 greenhouse study, several highly significant factors were observed between thrips densities released and thrips numbers recovered. Thrips density augmentation significantly increased thrips densities in sampled seedlings compared to that in control, indicating that the thrips movement across treatments was minimal (Fig. 1). In 2013 study, total thrips retrieved were the highest at 1 thrips per plant treatment, followed by 2 thrips per plant, and the lowest numbers were in 0.5 thrips per plant, all significantly different from each other. In 2014, highest densities were recovered from Density 2 treatment; Density 0.5 and 1.0 had similar thrips densities. In 2015, thrips colonization was much higher than in 2013 and 2014 (Fig. 1).

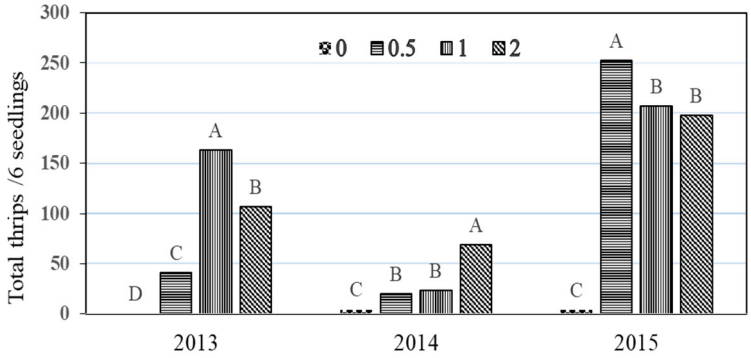

Figure 1. Numbers of total thrips (adults plus larvae) recovered from six-seedling sample unit in the greenhouse using a plant washing technique, 2013-2015.

Thrips augmentation reduced leaf surface area in two of the three years of the study, whereas the effect was not clearly separated in 2015 (Fig. 2). Additionally, leaf area did not vary across the six cultivars evaluated. Overall, visual injury rankings increased with increased thrips densities, clearly suggesting that the density of 0.5 to 1 thrips per seedling can exert significant injury to the young cotton seedlings (Fig. 3).

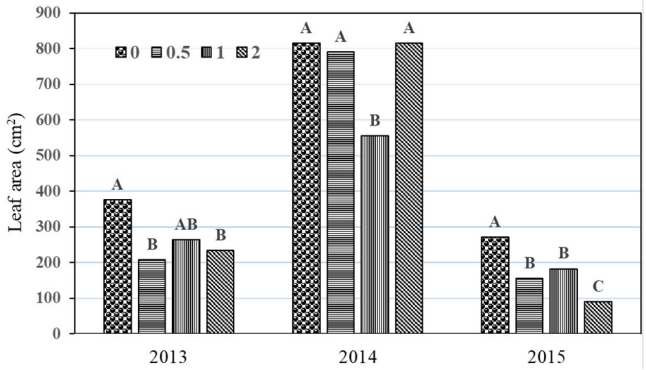

Figure 2. Leaf area per 6-cotton seedlings as affected by varying densities of western flower thrips in the greenhouse.

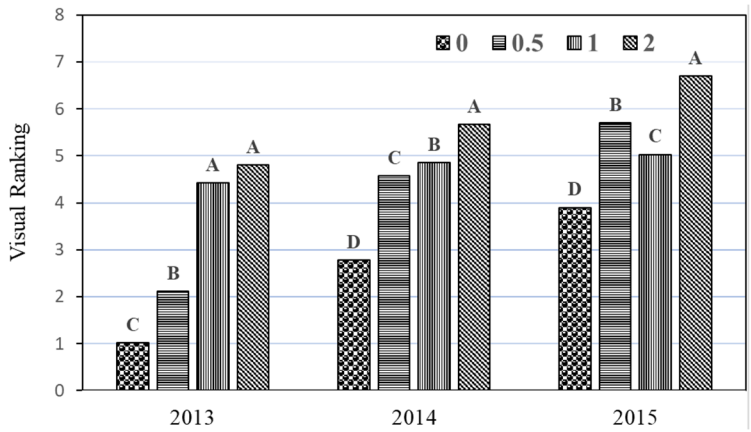

Figure 3. Visual damage ranking (1=no damage to 10= extreme damage and death of the seedling) of the cotton seedlings influenced by varying densities of western flower thrips in the greenhouse.

Acknowledgements

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