CHARACTERIZATION OF COTTON CROP RESPONSE TO WESTERN FLOWER THRIPS INJURY AND ITS MANAGEMENT IN TEXAS HIGH PLAINS COTTON

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Abstract

The western flower thrips, *Frankliniella occidentalis* Pergande, is a serious pest on seedling cotton in the Texas High Plains and other regions of the U.S. cottonbelt. Thrips are an early season pest which can cause severe damage to seedling cotton. First three weeks of seedling stage is important because thrips can cause significant damage during this period when plants are in the 1-3 true-leaf stage. Heavy infestations can cause leaves to shrivel, reduction in leaf chlorophyll content and leaf area, and ultimately significant yield reduction. The manipulation of thrips populations in a cotton field setting is very challenging and maintaining selected thrips densities on cotton seedlings in an open field condition are unmanageable. Nevertheless, it is essential to use field cages and confine known number of thrips per caged plants to obtain a desired thrips density. The ultimate goals of the research project were to develop new economic thresholds for thrips based upon plant response characteristics, validating or revising the current Texas High Plains thrips treatment threshold recommendations, and precisely characterizing the cotton crop response to various levels of thrips injury at different cotton seedling ages. Results reported herein consisted of a series of two greenhouse experiments conducted at the Texas A&M AgriLife Research and Extension Center, Lubbock. In the greenhouse study, 0, 0.5, 1 and 2 thrips per plant were released at 1- to 2- true-leaf stage. Twenty-two days following the release, the seedlings were harvested, washed and thrips were counted. Significantly higher thrips densities were observed from treatments where 1 or 2 thrips were released per seedling compared to 0.5 and control seedlings. Visual plant damage ranking values of plants from thrips densities 0 and 0.5 were significantly superior (i.e., less visual damage) compared to that from thrips densities 1 and 2. Similar densities were achieved in field cages via thrips release in No-Thrips® screen cages to compensate for 80% field mortality. Significant numbers of thrips were recovered from all thrips-augmented treatments, with lowest numbers recovered from control plants. Leaf area was significantly higher in uninfested control compared to those in thrips augmented treatments. Seedling health, measured by visual ranking, declined progressively with increased thrips densities. Thrips densities @ 0.5 released thrips per plant or greater significantly reduced plant vigor. Thrips densities of 0.5, 1, and 2 per plant at early seedling stage all reduced lint yield significantly compared to that in uninfested control plots. Similar densities were achieved in field cages via thrips release in No-Thrips® cages to compensate for 80% field mortality. Thrips densities of 0.5, 1, and 2 per plant at early seedling stage all reduced lint yield significantly compared to that in uninfested control plots.

Introduction

Western flower thrips, *Frankliniella occidentalis* (Pergande) is a serious pest on seedling cotton in Texas and other regions of the U.S. cottonbelt. Thrips are an early season pest which can cause severe damage to seedling cotton. Heavy infestations can cause leaves to shrivel and cause the loss of leaf chlorophyll, reduced leaf area and cause delayed maturity, thereby causing significant yield reduction, if not controlled. Several insecticides, including Orthene®, are commonly used to reduce thrips infestations during the early cotton growth stages. The overall objective of this study was to estimate thrips damage potential and management tactics against thrips in the Texas High Plains. The specific objectives were to determine the effect of thrips densities on seedling cotton in the greenhouse, and to quantify thrips-induced losses to cotton lint yield.

Materials and Methods

Greenhouse Study

Two experiments were conducted at the Texas A&M AgriLife Research Center-Lubbock, Texas. Six cotton cultivars were planted in 16-oz Styrofoam® cups (1 plant per cup). Thrips were reared on green beans in the laboratory. Immature thrips were released onto cotton at the 1- to 2-true leaf stage. Greenhouse was disinfected by spraying three days before the start of the experiment. Four thrips density treatments (No thrips, one thrips per two plants, one thrips per plant and two thrips per plant) were applied and thrips were allowed to feed for three weeks. Visual leaf tissue damage rankings were recorded (scale of 1-10), 1 = healthy plants; 10 = plants killed by thrips. Chlorophyll meter was

used to record chlorophyll readings. Seedlings were clipped, washed and thrips counted. Leaf area was also recorded using a LI-COR® leaf area meter.

No-Thrips® Field Cage Study

Wooden cages were covered with No-Thrips® screen and placed in the field. Each cage contained 8-13 seedlings. Thrips were reared on green beans in the laboratory. At the 1- to 2-true leaf stage, immature thrips were released onto the cotton seedlings. Cages were removed five days after releases and Orthene®97 was sprayed. Treatments included no thrips (control), two thrips per plant, five thrips per plant, and ten thrips per plant to achieve 0.0, 0.5, 1, and 2 thrips per plant, after accounting for 20% field survivorship. Five days after thrips release, two plants from each cage were clipped, washed and counted immature and adult thrips. Remaining plants were harvested for lint yield.

Results and Discussion

Greenhouse Study

Significantly higher number of thrips were recovered from thrips densities released treatment plants than control plants (Fig. 1). Leaf area was significantly higher in uninfested control compared to that in thrips-augmented treatments (Fig. 2). Seedling vigor was significantly reduced with increased thrips densities (Fig. 3).

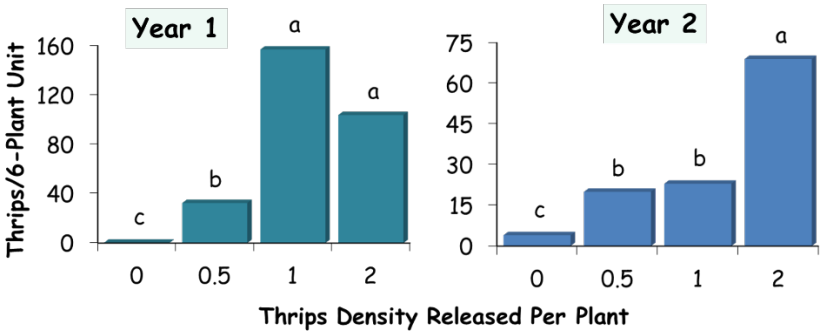

Figure 1. Thrips recovery from seedling cotton using whole-plant washing technique.

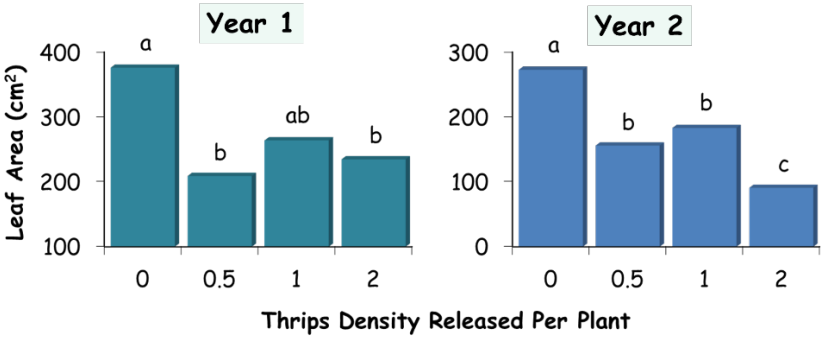

Figure 2. Effect of thrips densities on seedling growth, represented by seedling leaf surface area.

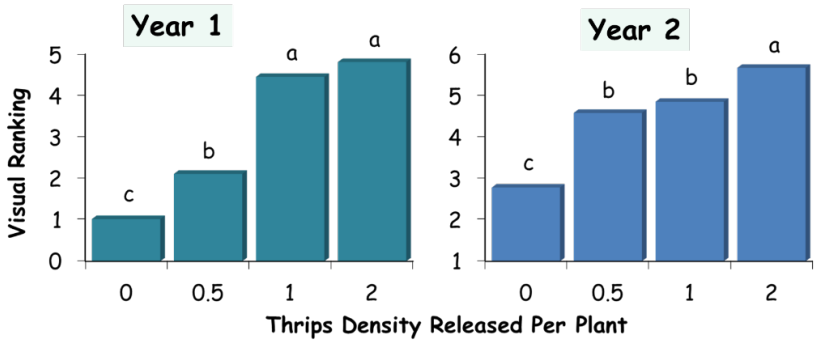

Figure 3. Effect of thrips densities on seedling health, as measured by visual ranking (1=no thrips damage; 10=plants killed by thrips injury).

No-Thrips Field Cage Study

No-Thrips® cages allowed to maintain the desired thrips densities of 0, 0.5, 1, and 2 thrips/plant relatively well. Thrips augmentation of 0.5 thrips per plant and higher densities reduced the lint significantly compared with that in uninfested control plots in both years (Fig. 4).

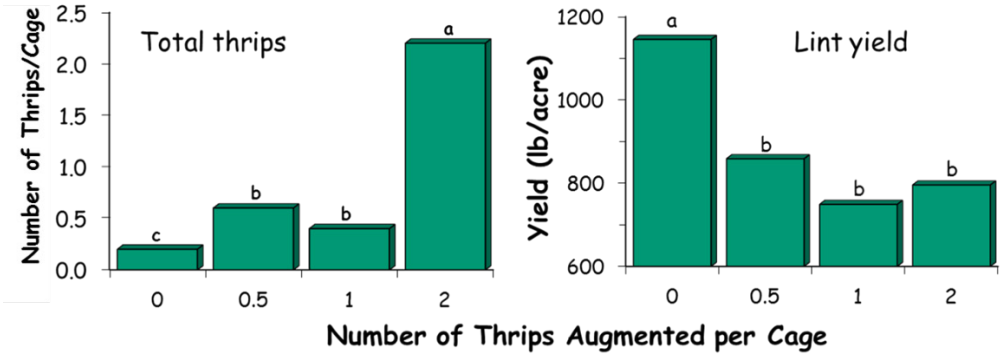

Figure 4. Thrips recovered from different treatments using whole-plant washing (left) and lint yield (right).

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