UTILIZATION OF NO-THRIPS® CAGES TO QUANTIFY THRIPS-INDUCED LOSSES TO COTTON IN THE TEXAS HIGH PLAINS

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Texas produces 55% of U.S. cotton, of which, approximately 66% is produced in the Texas High Plains region. In 2013, arthropods caused a 2.27% cotton yield loss in the U.S. Thrips infested 6.7 million acres of cotton in the U.S. in 2013, with 2.4 million acres infested in Texas. This infestation caused a 0.56% yield loss due to thrips and ranked third among arthropod-caused losses, with ca. 7,000 bales lost to thrips in Texas (Williams 2014). The western flower thrips, *Frankliniella occidentalis* Pergande, is a major thrips pest on seedling cotton in Texas. Thrips are an early season pest which can cause severe damage to seedling cotton. Thrips cause damage to seedling cotton and excessive feeding leads to browning of leaves on the edges, develop a silvery color, or curl upward from the edges and cause the loss of leaf chlorophyll and leaf area. Thrips are very small insects which make it harder to study them in enclosures. The objective of this study was to evaluate No-Thrips® cages (Green-Tek, Edgerton, WI) to study thrips behavior.

This study was conducted at the Texas A&M AgriLife Research farm located near Lubbock, Texas. The study was deployed in a randomized block design with five replications and six treatments. Cotton cultivar ST 5458B2RF was planted on June 3, 2014. Rectangular wooden-frame cages [98 cm (L) x 30 cm (W) x 44 cm (H)] with No-Thrips® screen were constructed and deployed in the field, with each cage enclosing 8-13 cotton seedlings (Fig. 1). Silicone caulk was used to attach No-Thrips® screen to the wooden frame. A thin metal flashing (2.54-3.8 cm) was attached at the bottom of the cage to restrict thrips movement from the bottom of the cage. A temperature sensor was kept inside the cage to record the internal cage temperatures. Freshly collected adult thrips, primarily western flower thrips, were released at various densities to generate a damage gradient across density treatments. Six thrips density treatments were released onto plants on June 18 when the cotton seedlings were at the 1-2 true-leaf stage. Six density treatments included 0, 1, 2, 4, 6, and 10 thrips per plant, replicated five times (total 30 cages) plus an uncaged control. Cages were removed on June 23 and two plants from each cage were clipped at the base, secured in a glass jar, and washed to retrieve thrips. After removal of cages, thrips augmented rows were sprayed with Orthene® 97. The remaining plants from the caged sections were maintained relatively insect-free for the remainder of the growing season, and were harvested upon crop maturity for lint yield. This study was repeated for three phenological stages of cotton, but only one data set is presented in this paper.

Figure 1. Wooden-framed field cage covered with No-Thrips® screen for threshold study (left); Installation of thrips cages in the field and release of thrips densities (right).

No-thrips® cages appeared to hold thrips in the field cages better than any of the other field cage materials (fabrics) that we have used in previous studies. Different materials and designs were used in the past with very little success. Those designs included 1) transparent plastic cup cage, 2) wire mesh sleeve cage, 3) opaque plastic cylinder, 4) transparent plastic jar without ventilation, and 5) transparent plastic jar with ventilation (Fig. 2). None of these methods were suitable for thrips studies in the field because of the excessive temperature buildup inside the cages, plus material of the screen was unable to contain the thrips. However, the No-Thrips® cage design provided a satisfactory performance. Unfortunately, heavy rainfall within 48-hour of the thrips cage release severely comprised our test in this study. Unusually cool weather during the thrips exposure period resulted in low thrips survival and reduced feeding on the cotton seedling tissues (Fig. 3).

Figure 2. Cage types evaluated previously: 1) transparent plastic cup cage, 2) wire mesh sleeve cage, 3) opaque plastic cylinder, 4) transparent plastic jar without ventilation, and 5) transparent plastic jar with ventilation.

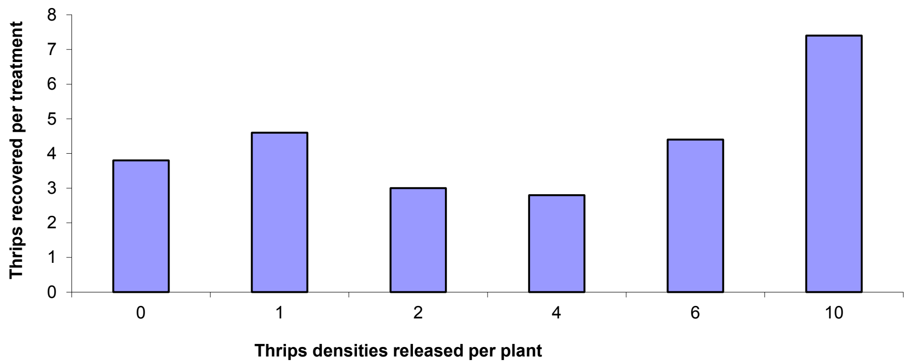

Figure 3. Recovery of thrips from cotton seedlings 5-days post-release of varying densities of thrips in No-Thrips® cages.

Although the thrips retrieval post-release was very low, it appears that the thrips feeding had exerted some effect on plant, resulting in reduced plant height and smaller main-stem diameter in all thrips augmented plants compared to that in control cages (Figs. 4-5). Nevertheless, the thrips feeding, if any, during the seedling stage in this study did not significantly impact lint or seed yields (Figs. 6-7).

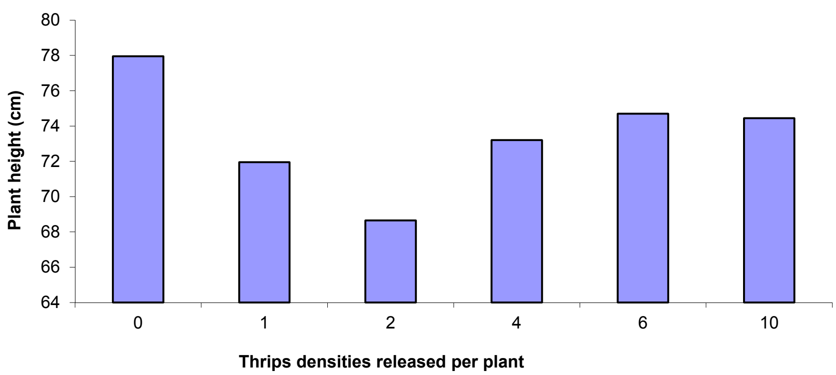

Figure 4. Plant height measurements of cotton plants at full maturity that were infested with varying densities of thrips in No-Thrips® cages during the seedling stage.

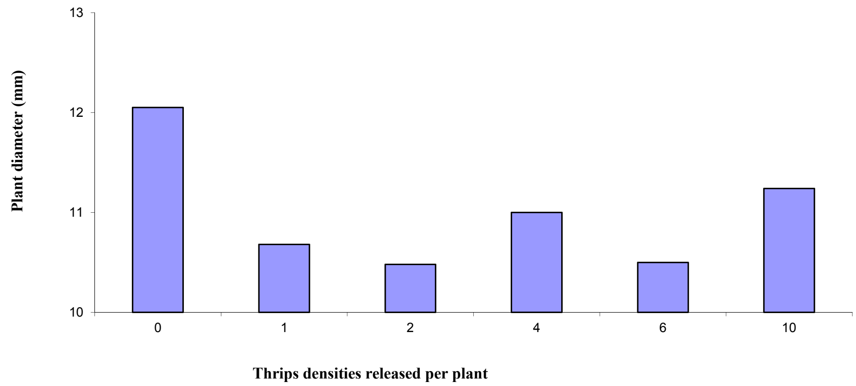

Figure 5. Plant diameter measurements of cotton plants at full maturity that were infested with varying densities of thrips in No-Thrips® cages during the seedling stage.

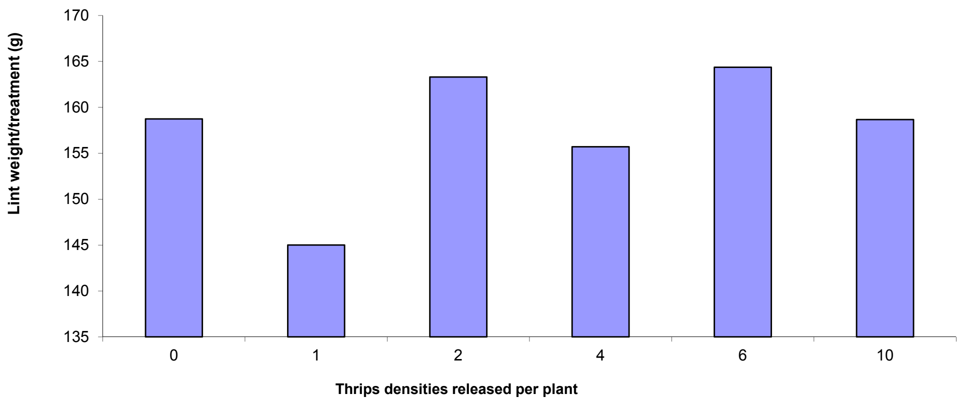

Figure 6. Lint weight from cotton infested with varying densities of thrips in No-Thrips® cages during the 1-2 true-leaf stage, Lubbock, Texas, 2014.

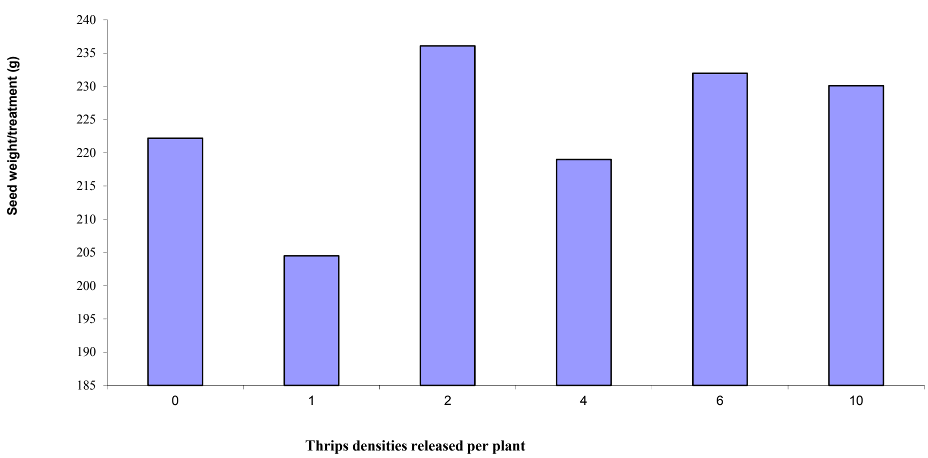

Figure 7. Seed weight from cotton plants infested with varying densities of thrips in No-Thrips® cages during the 1-2 true-leaf stage, Lubbock, Texas, 2014.

Reference

Williams, M. R. 2014. Cotton insect losses-2013, pp. 798-812. *In* Proceedings, Beltwide Cotton Conf., National Cotton, New Orleans, LA.