EFFECT OF WATER LEVELS ON COTTON FLEAHOPPER-INDUCED FRUIT LOSSES IN COTTON

Sean D. Coyle
Abdul Hakeem
Megha N. Parajulee
Stanley C. Carroll
Texas A&M AgriLife Research
Lubbock, TX

Abstract

A field study was conducted at the AG-CARES research farm located near Lamesa, Texas, to determine the effect of two irrigation levels (low and high) on cotton fleahopper-induced fruit loss and resulting cotton yield when exposed to varying cotton fleahopper densities. Cotton cultivars FM2011 and DP1454 were planted under a center pivot modified to provide "low" (3.3 inches in-season) and "high" (6.5 inches in-season) irrigation treatments. Field collected cotton fleahopper adults were released onto cotton squares in multi-plant cages. Cotton fleahopper nymphs were released onto uncaged plants. Three cotton fleahopper density treatments included 'high' (5 fleahoppers per plant), 'low' (2 fleahoppers per plant), and an uninfested control. Released cotton fleahoppers were allowed to feed for one week to mimic a natural early-season acute infestation. After one-week feeding period, cages were removed and plants were sprayed with Orthene® 97UP. Pre- and post-plant mapping were conducted to monitor fruiting patterns. The highest lint yield was recorded in control treatment, followed by low cotton fleahopper density, and the lowest lint yield was recorded in the high cotton fleahopper density treatment. Significantly more lint yield was recorded from 'high' irrigation plots compared with 'low' irrigation plots. Cotton variety DP1454 had a significantly higher yield compared to FM2011.

Introduction

Cotton fleahopper (*Pseudomatoscelis seriatus*) is an important economic pest of cotton in Texas. Cotton fleahopper is an early season pest which causes damage to cotton squares, often resulting in fruit loss, delayed crop maturity and potential yield reductions. Cotton may compensate for fleahopper-induced fruit loss by producing new fruits and adding lateral fruiting positions. It is unclear what impact varying irrigation levels will have on cotton fleahopper infestation levels and the resulting impact on crop compensation and final lint yield. It was hypothesized that irrigated cotton would exhibit a greater compensatory capability compared to a low irrigation scheme. The objective of this study was to determine the impact of cotton fleahopper density on cotton fruiting and lint yield under low and high irrigation water regimes.

Materials and Methods

The study was conducted during summer 2015 at the Agricultural Complex for Advanced Research and Extension Systems (AG-CARES) located near Lamesa, Texas. Two cotton cultivars, FM2011 and DP1454, were planted on May 16, 2015 under a center pivot modified to provide replicated "low" (3.3 inches in-season) and "high" (6.5 inches in-season) level irrigation treatments. Laboratory-reared (Hakeem and Parajulee 2015) and/or field collected cotton fleahoppers were released onto cotton terminals in 3-ft. (L) x 2-ft. (W) x 3 ft. (H) multi-plant cages (adults; Fig. 1) or in the 3-ft sections of cotton rows on open field (nymphs). Each section contained 7 plants.

Experimental design consisted of two insect stages (adults versus nymphs), three insect release treatments (high, low, and control), two water levels (high versus low), and two cotton cultivars, replicated three times and deployed in a randomized complete block design (total 72 plots). Insect release treatments, 1) control (zero fleahopper augmentation), 2) two bugs per plant (low density), and 3) five bugs per plant (high density), were deployed on July 2, 2015 (Fig. 1), and then allowed to feed for one week in order to mimic a natural early-season acute infestation. Plant mapping was conducted before and after cotton fleahopper releases to monitor for altered fruiting patterns. Yield monitoring was achieved via hand-harvesting of each experimental plot on October 26. 2015.

Figure 1. Multi-plant cages deployed in the field to examine the impact of cotton fleahopper densities on cotton yield, Dawson County, TX.

Results and Discussion

As expected, acute infestations of cotton fleahoppers resulted in lint yield reductions in cotton. While the numerical trend in the effect of cotton fleahopper on cotton lint yield was similar between adults and nymphs (Fig. 2), treatment differences were not detected on nymphal data due to high variability in the data. Nevertheless, significantly lower lint yield was recorded in high fleahopper density treatment (5 fleahoppers adults per plant) compared to that in control (no fleahoppers released) (Fig. 2). While no significant differences were observed in nymphal release treatments, a higher numerical yield was recorded in control followed by low fleahopper density released (2 fleahoppers per plant) and then the high fleahopper density release.

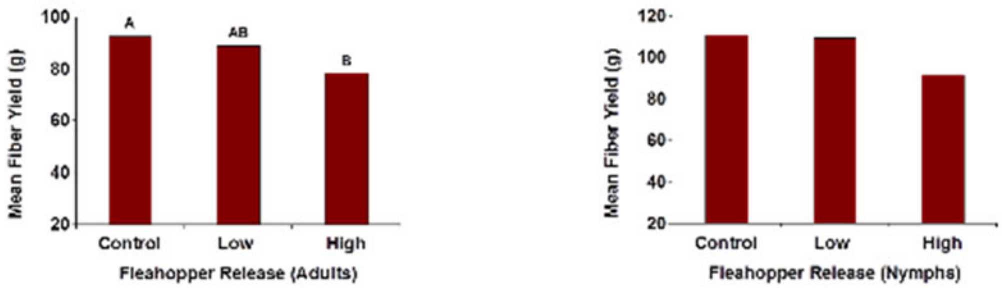

Figure 2. Cotton lint yield (g per 7-plant experimental unit) influenced by an acute infestation of cotton fleahoppers in pre-flower cotton on the AG-CARES farm, Lamesa, TX.

Regardless of the cotton fleahopper infestation, irrigation water level significantly influenced the cotton lint yield (Fig. 3). Significantly more lint yield was recorded from the higher irrigation plots compared with low irrigation plots. Cotton variety DP1454 had significantly more lint yield compared to FM2011 (Fig. 3). Although there were no significant cultivar x water level interactions in the impact of cotton fleahoppers on cotton lint yield, our data suggests that cotton grown under a higher irrigation level may compensate yield loss caused by cotton fleahoppers compared to that in a low water regime. Brewer et al. (2012) also noted this phenomenon in a similar study at both South Texas and Texas High Plains locations.

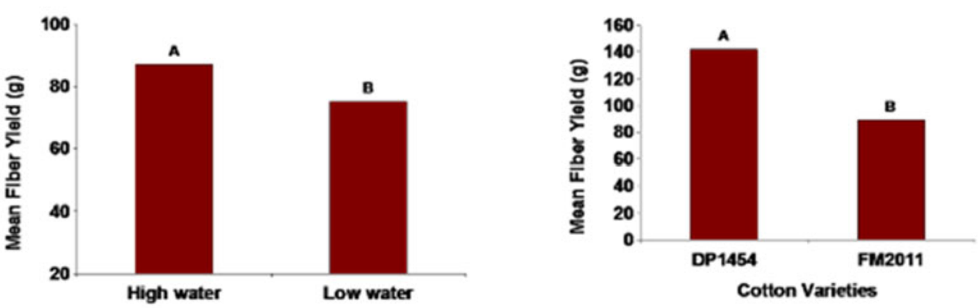

Figure 3. Cotton lint yield (g per 7-plant experimental unit) influenced by irrigation water level (left) and cotton cultivar (right) in absence of cotton fleahopper infestations on the AG-CARES farm, Lamesa, TX.

Acknowledgments

Plains Cotton Growers, Inc. and Texas A&M Cropping Systems Initiative have provided funding for this study.

References

Brewer, M. J., M. N. Parajulee, D. J. Anderson, and R. B. Shrestha. 2012. Cotton fleahopper and its damage to cotton as affected by plant water stress and insect seasonality, pp. 909-913. Proceedings, Beltwide Cotton Conferences, National Cotton Council, Memphis, TN.

Hakeem, A., and M. N. Parajulee. 2015. Moisture conditions for laboratory rearing of cotton fleahoppers from overwintered eggs laid on woolly croton plants. Southwestern Entomologist 40: 455-462.