Cotton Fleahopper and Its Damage to Cotton as Affected by Plant Water Stress and Insect Seasonality

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Introduction

Cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter) (Hemiptera: Miridae), can cause excessive loss of cotton squares, resulting in reduced yield and harvest delays. Cotton fleahopper is a key insect pest of cotton in Texas and Oklahoma, and an occasional pest in New Mexico, Arkansas, Louisiana, and other mid-South states. Within Texas, regional average cotton fleahopper induced yield loss estimates vary, reaching up to 6% in Texas (Williams 2000). Damage to individual fields vary from none to extremely high square loss when heavy populations develop and are left uncontrolled.

How is this variability in cotton fleahopper damage explained? This variability is partly associated with cultural differences and other host plant factors (Holtzer and Sterling 1980, Knutson et al. 2009, Barman et al. 2011), with timing and magnitude of cotton fleahopper movement from non-cultivated weed hosts to cotton and the stage of cotton development when migration occurs (Parajulee et al. 2006), and with physical stresses in particular soil moisture (Stewart and Sterling 1989).

Understanding of these factors contributions to cotton fleahopper dynamics will allow better estimation of cotton risk from cotton fleahopper damage. Some of these factors are manageable. Our ultimate goal is to discern when in-season management (i.e., insecticides, irrigation) is most useful to reduce risk to cotton fleahopper damage than has been previously achieved.

Experimental Question and Approach

We propose that plant water stress, insect seasonality, and plant sensitivity are interacting factors that result in damage differences attributable to cotton fleahopper feeding which are currently difficult to predict.

Field testing initiated in 2011 at Corpus Christi and Lubbock, TX; drought conditions provided opportunity to assess insect activity in a high contrast of dryland and irrigated conditions (irrigation targeted as % ET replacement). Drought conditions resulted in delays of cotton fleahopper occurrence in Corpus Christi, and in very low cotton fleahopper density in Lubbock season-long. Therefore, we have reported cotton fleahopper and harvest results from Corpus Christi and plant measurement results from Lubbock.

**Corpus Christi**
- Split-plot with five replications
- Main plot: water regimes
  - Dryland
  - Medium Irrigation (75%)
  - High Irrigation (90%)
- Split: combination of 3 cultivars
  - Phytoen 367 WRF (April 1/April 15)
  - Deltapine 1032 B2RF (April 1/April 15)
  - Stoneville 5458 B2RF (April 1/April 15)
- Plot size: 100 ft by four rows, data from inner two rows, half of plot for in-season data collection and half left undisturbed for harvest
- Insect Measurements: 5 cotton fleahopper weekly sampling dates once population exceeded 0.1 fleahopper per plant using a beat bucket; 10 plants sampled per plot

**Lubbock**
- RCB with three replications
- Treatment: water regimes
  - Dryland
  - Low Irrigation (30%)
  - Medium Irrigation (60%)
  - High Irrigation (90%)
- Cultivar
- Plot size: same as Corpus
- Insect Measurements: Cotton fleahopper populations did not develop in Lubbock vicinity in 2011

Results

**Corpus Christi:** Insect Measurements. Cotton fleahoppers were detected late with good numbers first occurring June 9 (about 1 month late), corresponding to peak bloom for the early planting (about 8 NAWF) and early bloom for the late planting (about 7 NAWF). There was no major pattern in the fleahopper populations related to the treatments (P>0.05 for treatments and interactions Fig 1). In 2 weeks, fleahopper populations increased on average 10-fold. They tended to be least abundant in the early planting (INAWF) and in the high irrigation regime (P<0.05; Fig. 2).

- **Plant Measurements:** Lint yield was greatest in the high irrigation regime and in the early planting for all cultivars (P<0.05 for main effects, Fig. 3), where cotton fleahoppers also were less abundant (Fig. 2). Through season COTMAN data and at cutout complete plant mapping data are being processed. These data will be used to compare yield, fleahopper abundance, and cotton fruit set and retention.

**Lubbock:** Plant Measurements. Total number of fruit set per plant increased with increasing irrigation, but fruit retention suffered only when irrigation was reduced (low irrigation and dryland) (Fig. 4, data taken from a complete plant mapping on August 3, 2011). Irrigation level significantly influenced cotton fruit physiology, with larger and heavier bolls with harder carpel walls produced at high irrigation regimes compared to those at the low irrigation and dryland (Figs. 5 and 6).

Acknowledgements

We thank Patricia O’Leary (Cotton Inc.) and Charles Suh (USDA ARS) for discussions as we developed this study. Cotton Inc. Core Program funds (project 11-952) and existing collaborations were critical in launching this project. Thank you.