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INFLUENCE OF IRRIGATION METHOD AND TILLAGE SYSTEM ON COTTON FLEAHOPPER ACTIVITY

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Abstract

A field study was conducted at Munday, Texas, in 2004 and 2005 to evaluate the effects of irrigation and tillage systems on cotton fleahopper, *Pseudatomoscelis seriatus* Reuter, seasonal abundance in cotton. The experiment consisted of six treatments deployed in a randomized complete block with three replications. The six treatments included 40-inch spacing subsurface drip, 80-inch spacing subsurface drip, and standard furrow irrigation in conservation and conventional tillage systems. Cotton fleahoppers were monitored using a backpack vacuum sampler for 30 seconds in each plot for six weeks from mid July to late August in 2004 and from late June to early August in 2005. Fleahopper abundance in conservation tillage was significantly lower compared with that in conventional tillage plots in both years. There were no significant differences in cotton fleahopper abundance among the different irrigation systems in 2004 or 2005. However, there were significant differences in fleahopper abundance among sampling dates in both years as expected. For 2004 the highest numbers of cotton fleahoppers were found on 20 July, 5 weeks after planting, whereas the 2005 peak fleahopper activity occurred on 2 August, 7 weeks after planting.

Introduction

Drip irrigation is near 100% efficient water delivery system. The main characteristic of the drip system is the application of water through pipes on or below the soil surface directly to the plant roots. This reduces evaporation and enhances water use (Dasberg and Or 1999). Conservation tillage is a crop production system that minimizes field cultivation. This system often utilizes cover crops, planted prior to cotton, to reduce soil erosion and to conserve and trap rainfall within the field. Some cotton pests such as the cotton aphid, *Aphis gossypii* Glover (Homoptera: Aphidae), are more abundant in non-water stressed plants than in cotton plants grown in dryland (Slosser et al. 2001), whereas the pests such as bandedwinged whitefly, *Trialeurodes abutiloneus* Haldeman (Homoptera: Aleyrodidae), are more abundant in water-stressed cotton (Parajulee et al. 2002).

The cotton fleahopper, *Pseudatomoscelis seriatus* Reuter (Hemiptera: Miridae), is an important economic pest in Texas, and in 2003 this insect infested 3.5 million acres and caused a loss of 63,386 bales of cotton (Williams 2004) and in 2004 cotton fleahopper plagued 2.5 million acres and was responsible for the loss of 34,489 bales of cotton. Cotton fleahopper adults and nymphs generally feed on tender plant parts including new terminal growth and small squares, and the period of greatest susceptibility is from square initiation until bloom (Pfadt 1985). Their piercing, sucking mouthparts penetrate small squares causing desiccation from sap removal (Leser 2004). Monitoring of cotton development is essential for understanding the potential fleahopper damage in the cotton plant and for selecting appropriate control measures (Leser 2004).

Materials and Methods

This study was conducted in 2004 and 2005 in the Texas Rolling Plains at Munday, Knox County, using the cultivar SureGro 215 BG/RR. Cotton was planted in early June in 2004 and mid May in 2005. Three irrigation methods were compared: (1) cotton grown using drip lines spaced 40" apart, (2) cotton grown using drip lines spaced 80" and (3) cotton grown using standard furrow irrigation. A standard tillage was compared with a conservation tillage practice within each irrigation system, with a total of six experimental treatments. The system was designed with 18 individually controlled plots consisting of about 0.369 acres each. Plots were 16 rows wide by 100 meters long and could either be irrigated on 40-inch or 80-inch drip line centers or furrow irrigated. In conservation tillage plots, cotton was planted into Roundup-killed rye that was planted in early to mid-winter. The six treatments were deployed in a completely randomized block with three replications.

Insect Sampling and Plant Monitoring

Fleahoppers were sampled weekly from 13 July to 17 August in 2004 and from 29 June to 9 August in 2005, using a backpack vacuum sampler for 30 seconds in each plot. The samples were taken to the laboratory and placed in the freezer; samples were examined under a magnifying glass in the laboratory, and the number of fleahopper nymphs and adults in each plot were counted. The data were recorded as the number of fleahoppers per 30 seconds of vacuum sample per plot. Data were analyzed using analysis of variance, and means were compared using the least significant difference method (SAS Institute 2000).

Results and Discussion

Abundance of adults, nymphs and total cotton fleahoppers in conservation tillage was significantly lower compared with that in conventional tillage in both years (Figs. 1 and 2). This could be attributable to the reflectance induced by the killed grass under the cotton plants making them less attractive to fleahoppers than plants grown without this mulch. There was no difference among irrigation treatments for total abundance of fleahoppers in 2004 or 2005 (Figs. 3 and 4). The peak activity of cotton fleahopper was observed on 20 July, 5 weeks after planting in 2004 and on 2 August, 7 weeks after planting in 2005 (Figs. 5 and 6). The use of conservation tillage is a suitable alternative to conventional tillage systems; and pests such as fleahoppers are less abundant throughout the season, while the cost of implementing conservation tillage is generally lower than cost associated with conventional tillage.

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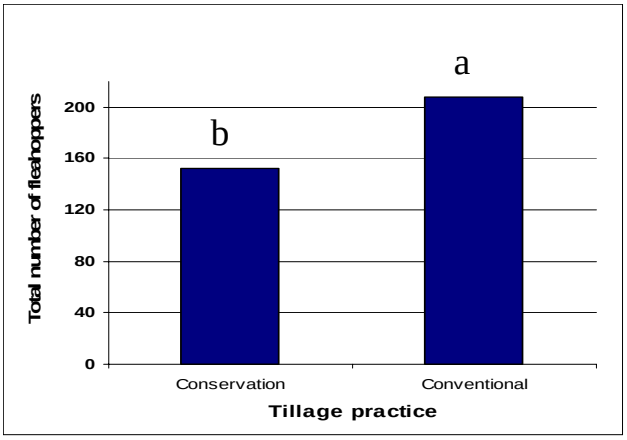

Figure 1. Seasonal numbers of cotton fleahoppers, 2004.

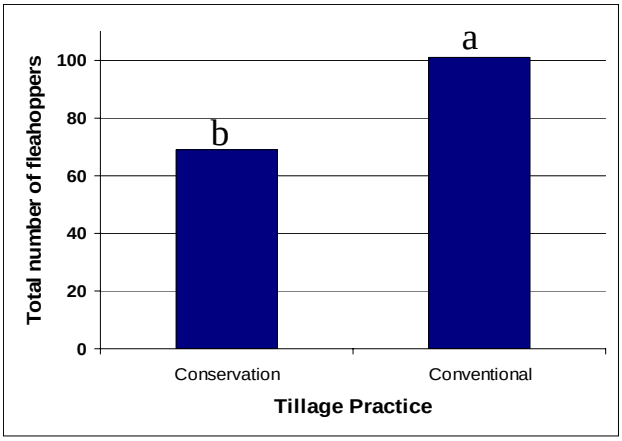

Figure 2. Seasonal numbers of cotton fleahoppers, 2005.

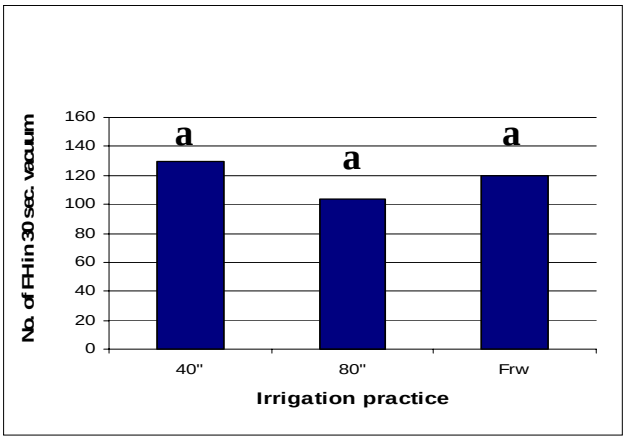

Figure 3. Cotton fleahopper activity and irrigation practice, 2004

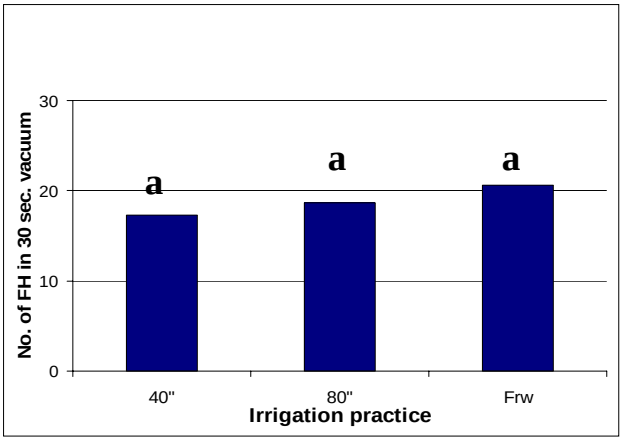

Figure 4. Cotton fleahopper activity and irrigation practice, 2005.

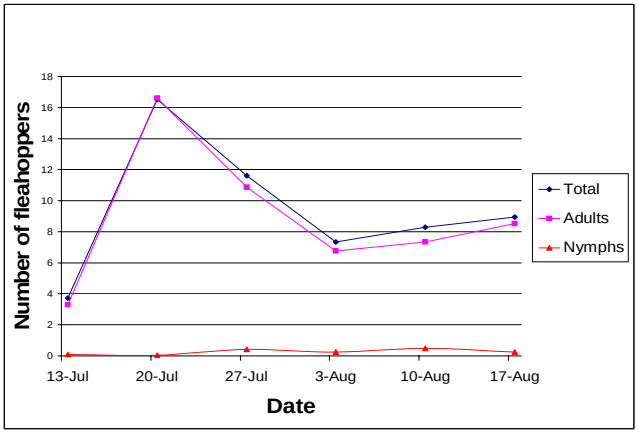

Figure 5. Seasonal abundance of cotton fleahoppers, 2004

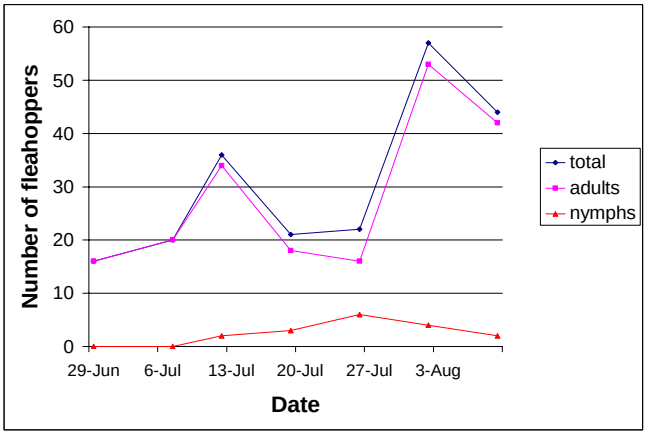

Figure 6. Seasonal abundance of cotton fleahoppers, 2005