IMPROVING COTTON YIELDS WITH PLANTING TIME INSECTICIDE TREATMENTS

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Abstract

Early season insect management for Kansas cotton growers can be a challenge when hot, dry weather occurs during late spring. These conditions cause wheat and other cool season grasses to hasten maturity and force over wintering insects to find an alternative host. Thrips (Thysanoptera: Thripidae) are common in Kansas and pose a serious threat under these conditions. A study was conducted in 2000 and 2001 in south central Kansas to evaluate planting time insecticide application on cotton yields. Planting time insecticides (Orthene, Cruiser, Gaucho, and Thimet) were compared to a foliar application and an untreated control. Above average temperatures in 2000 resulted in heavy thrip pressure during early stages of cotton development. Planting time insecticide treatments increased yields by over 125 lb acre^{-1}, with the seed treatments having the biggest impact. The primary mechanism of yield increases was through increased bolls plant^{-1}. In 2001, cooler temperatures and above average rainfall during May reduced thrip pressure, resulting in no differences among the insect management treatments.

Introduction

Kansas plants over 10 million acres of wheat annually, with over 43 percent of these acres located in the southern half of the state. Cotton production in this region is concentrated in south central Kansas and north central Oklahoma. The co-existence of these two crops can pose serious problems for cotton emerging in the spring. Wheat and perennial grass species often serve as alternate hosts for insects such as thrips (Thripidae). The most common thrips found in Kansas are the onion thrip (*Thrips tabaci* Lindeman), flower thrip (*Fankliniella tritici* (Fitch)) and tobacco thrip (*Fankliniella fusca* (Hinds)) according to White and Salisbury (2000).

Newly emerged cotton seedlings are vulnerable as grass species begin to mature in late May and insects are forced to find alternative hosts. The impact that these infestations have on cotton is directly related to thrip populations, cotton growth stage and insect management decisions that were made at planting. Planting time insecticides can play an important role in reducing the impact of thrip infestations on cotton. The objective of this study was to evaluate the efficacy of planting time insecticides on cotton development and lint yield.

Materials and Methods

The efficacy of planting time insecticides were evaluated in cotton plots planted in the Wellington, KS area during the 2000 and 2001 growing seasons. In 2000, the plots were located on a Tabler silty clay loam (Fine, smectitic, thermic Udertic Argiustolls) and on a Bethany silt loam (Fine, mixed, superactive, thermic Pachic Paleustolls) in 2001. In 2000, plots were planted on May 18 and on May 10 in 2001. The cotton variety Paymaster '2280BGRR' was used both years.

In 2000, three seed treatments were compared to an untreated control (Table 1). In 2001, an in-furrow insecticide and foliar insecticide application were also included. All plots were four rows wide (30-in spacing) and 50 ft in length with the middle two rows machine harvested to determine yield. Prior to harvest, plant and boll number in 50 ft^2 were determined. Treatment effects were determined using analysis of variance procedures using plant population as a covariate.

Results and Discussion

Lint Yield

Winter precipitation in 2000 was below normal leaving the 2000 wheat crop in poor condition at anthesis. A period of above average temperatures at the end of May caused substantial stress to cool season grasses such as wheat and smooth brome grass (*Bromus inermis*) (Figure 1). This stress hastened grass species maturity and forced thrips to find alternative hosts. Boissot et al (1998) reported that annual variation in thrip populations were largely influenced by temperature variations.

High thrip populations were reported and foliar treatments to cotton were common throughout the region. Increased thrip pressure reduced yields in the untreated controls by 22% compared to the average of the planting time treatments (Table 2). The two seed treatments (Gaucho 600 and Cruiser) produced the highest lint yields in 2000.

These results are similar to those reported by All et al., (1995) who indicated that thrip damage to cotton yields were greatest in dry years. Funderburk et al., (1998) reported a similar response of thrip population and subsequent peanut yield response to planting time insecticide treatments.

In 2001, adequate winter rainfall resulted in favorable winter wheat and cool season grass conditions in the spring. A cool, wet period during late May and early June likely reduced thrip populations as suggested by Boissot et al., (1998). These two scenarios resulted in no yield response of insecticide treatments in 2001 (Table 3).

Yield Components

Overall yield component analysis indicated that bolls acre^{-1} had the highest correlation to lint yields ($r = 0.734$) with boll weight also having an impact on lint yield, but to a lesser degree ($r = 0.264$). This was consistent with the findings of Staggenborg and Krieg (1992) regarding dryland cotton. In 2000, bolls plant^{-1} illustrated that protecting plants from early season insect damage increased final fruit number plant^{-1} (and on an area basis) (Table 2). Our results showed trends in boll weights that favor seed treatments in 2000, but we were unable to distinguish between them statistically. In 2001, there were no observed differences in bolls plant^{-1} or boll weight as expected by the lack of a yield response to treatments during a light insect infestation.

References

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Table 1. Cotton insecticide treatments tested near Wellington, KS in 2000 and 2001.

Treatment					
Trade Name	**Chemical Name**	**Product Rate**	**Units**	**2000**	**2001**
Orthene 90S	Acephate	4.0	oz/a	X	
Cruiser	Thiamethoxam	7.0	oz/cwt	X	X
Gaucho					
600	Imidacloprid	6.4	oz/cwt	X	
480		8.0	oz/cwt		X
Thimet 15G	Phorate	3.3	lb/a		X
Orthene 90S +	Acephate +	7.0	oz/cwt		
Gaucho 480	Imidacloprid	7.0	oz/cwt		X
Orthene 75S (foliar)	Acephate	3.0	oz/a		X

Table 2. Lint yield, bolls plant^{-1}, and boll weight for three planting time insecticide treatments and the untreated check for cotton grown near Wellington, KS in 2000.

Treatment	**Yield lb acre^{-1}**	**Bolls Plant^{-1}**	**Boll Weight g**
Untreated Check	379 b†	4.4 b	1.14 a
Cruiser (7 oz/cwt)	585 a	4.9 a	1.43 a
Gaucho 600 (6.4 oz/cwt)	549 a	4.6 a	1.41 a
Orthene 90S (4 oz/acre)	420 b	4.3 b	1.20 a
Mean	483	4.6	1.27
C.V.	12.1	9.8	16.7

†means followed by same letter within a given column are not significantly different at the α=0.05 level.

Table 3. Lint yield, bolls plant^{-1}, and boll weight for five insecticide treatments and the untreated check for cotton grown near Wellington, KS in 2001.

Treatment	**Yield lb acre^{-1}**	**Bolls Number Bolls plant^{-1}**	**Boll Weight g**
Untreated Check	292 a†	3.7 a	1.19 a
Cruiser (seed)	357 a	3.0 a	1.74 a
Gaucho 480 (seed)	372 a	3.8 a	1.50 a
Orthene 90S + Gaucho 480 (seed)	326 a	4.0 a	1.24 a
Thimet 15G (3.3 lb/acre)	289 a	3.3 a	1.26 a
Orthene 90S (foliar)	407 a	3.5 a	1.22 a
Mean	340	3.8	1.36
C.V.	13.2	22.8	21.0

†means followed by same letter within a given column are not significantly different at the α=0.05 level.

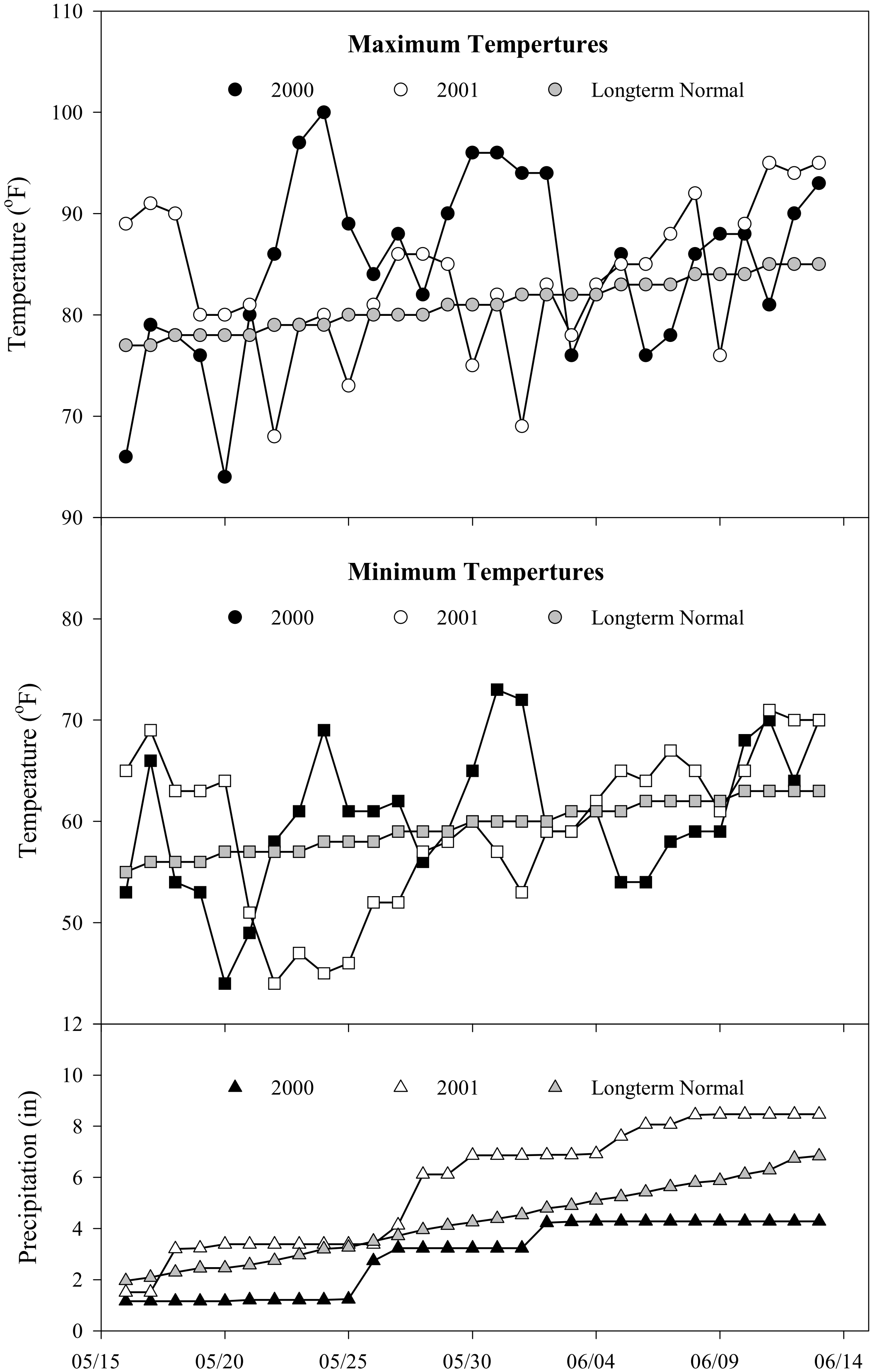

Figure 1. Long term normal, 2000, and 2001 maximum and minimum temperatures and precipitation for Wellington, KS from May 15 to June 15.