COTTON LEAF GRADE AS INFLUENCED BY COTTON DEFOLIATION AND VARIETIES

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Abstract

Defoliation of cotton, *Gossypium hirsutum* L., has been referred to as more art than science by industry leaders. The remnants of leaf material in harvested cotton can significantly increase leaf grade values and result in dockage to the producer. Cotton classed through the USDA-AMS Classing office in Corpus Christi, Texas has reported increases in leaf grade values beginning in 2000. The impacts of the agronomic variables were studied during the 2010 and 2011 growing season and data collected were used to identify possible contributors to leaf grade, including leaf pubescence and harvest-aid treatments. Harvest-aid and variety by harvest-aid trials were conducted in 2010 and 2011. Variety by harvest-aid trials provided an approach to analyze the combined impact of the two factors. All samples were ginned on a miniature gin in Lubbock, HVI and fiber analysis was done. Wide ranges of percent defoliation and desiccation were obtained with the treatments, but had no significant impact on leaf grade during 2010 or 2011. In the variety by defoliation trial, the hairy variety of cotton had higher leaf grades than a smooth variety across multiple levels of defoliation in 2010 and 2011. Overall leaf grades were lower in 2011.

Introduction

Cotton leaf grade is a visual estimation of the amount of plant material in a lint sample on a scale of 1 to 7, with one being the ideal score (Larson and English, 2001). Plant material in harvested lint is waste, and can result in price dockage for the producer because additional processing is required to remove the plant material. Currently, several factors are believed to negatively influence the leaf grade values. First is the level of defoliation and desiccation prior to harvest. Second are the varietal characteristics, such as leaf hairiness, bract hairiness, and leaf and bract size. The efficacy of chemical defoliation can be an unpredictable process but is vital for the harvest efficiency and to minimize dockage from plant materials (Valco and Snipes, 2001). Factors impacting defoliation vary from harvest-aid selection, plant condition, weather prior to and during application, spray coverage, canopy density, translocation, and varietal traits (Cathey, 1986, Oosterhuis et al. 1991). Additionally, hairier varieties are suspected of contribute to higher leaf grades through a "velcro effect". The hairiness of commercial cotton varieties are assigned by a subjective rating system (smooth to very-hairy), and inconsistencies exist between varietal ratings available to producers.

Objectives

This study will identify the impact of traditional harvest-aid products on defoliation, desiccation and leaf grade. Additionally, data will shed light on the impact of variety characteristics, defoliation and desiccation on cotton leaf grade.

Materials and Methods

All trials were four rows wide and 40 feet long and were treated with a Lee Spider sprayer with 11 GPA carrier volume using XR 8002 flat fan tips. Percent defoliation, desiccation and green leaf were rated at 7 and 14 days after treatment. Untreated check was rated as zero and complete absence of leaves was 100%. Plots were mechanically harvested with a picker. Samples were ginned in a miniature gin, and leaf grade and fiber quality parameters were processed at the Fiber and Biopolymer Research Institute using HVI analysis.

In the defoliation trials, treatments were superimposed over a field of Phytogen 375 WRF. Twenty defoliation treatments were applied to obtain a wide range of defoliation and desiccation levels in 2010 (Figure 1). In 2011, sixteen defoliation treatments were selected to provide the range of defoliation and desiccation (Figure 2).

In the variety by defoliation trials, Stoneville 5458 B2RF, a hairy leaf variety, and DynaGro 2570 B2RF, a smooth leaf variety, received five defoliation treatments and had four replications in a split block design. Treatments were applied to achieve variable defoliation levels. In 2010 the trial was conducted in Colorado county (Figure 3), and in 2011 the trial was repeated in Matagorda county (Figure 4).

ANOVA was performed and means separation using LSD with P=0.05 (data not shown). Kruskal-Wallis was used to identify significance between leaf grades. Locations are shown separately due to significant location interaction.

Results and Discussion

Defoliation Trial

A wide range of defoliation and desiccation levels were obtained with the selected defoliation treatments (Figure 1 and 2). Despite the range of defoliation levels, no differences were observed in leaf grade values (Figure 1 and 2). The 2010 season had leaf grades of 3 and 4, while in 2011 leaf grade values did not exceed 2. Low leaf grades in 2011 were the result of more suitable harvest conditions, compared to 2010.

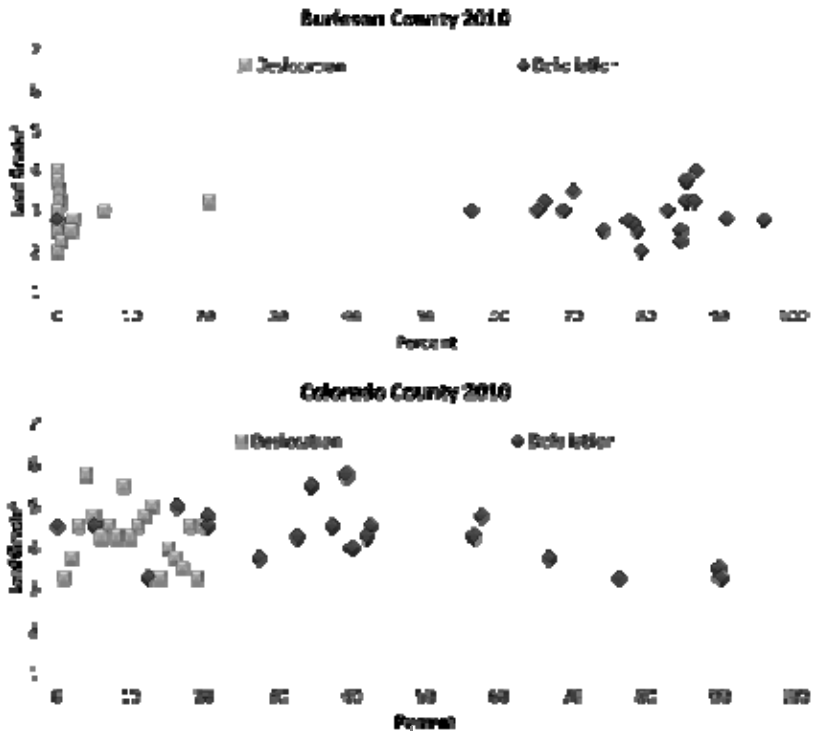

Figure 1. Leaf grade of cotton in defoliation trials from two locations in 2010 based on defoliation ratings at 14 days after application of treatments.

[a]Kruskal-Wallis test indicated the cotton leaf grade was not affected the defoliation treatment at any of the locations in 2010 or 2011 (P = 0.05).

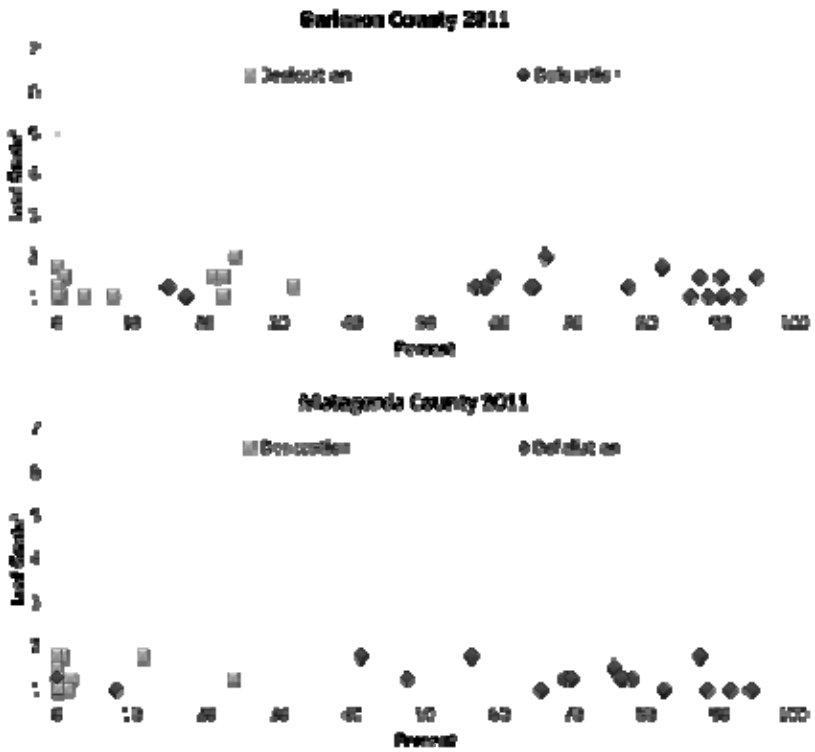

Figure 2. Leaf grade of cotton in defoliation trials from two locations in 2011 based on defoliation ratings at 14 days after application of treatments.

[a]Kruskal-Wallis test indicated the cotton leaf grade was not affected the defoliation treatment at any of the locations in 2010 or 2011 (P = 0.05).

Variety Hairiness by Defoliation

An extended range of defoliation levels were obtained with the 5 defoliation treatments and efficacy was comparable for the smooth leaf and hairy leaf varieties (Figure 3). Leaf grade values were consistently lower across all defoliation levels for the smooth leaf variety (Figure 3 and 4). Leaf grade ratings were less than 1.5 regardless of the defoliation level or variety hairiness (Figure 4). Though 2011 conditions were suitable for low leaf grade, there was a variety affect on the scores (Figure 4).

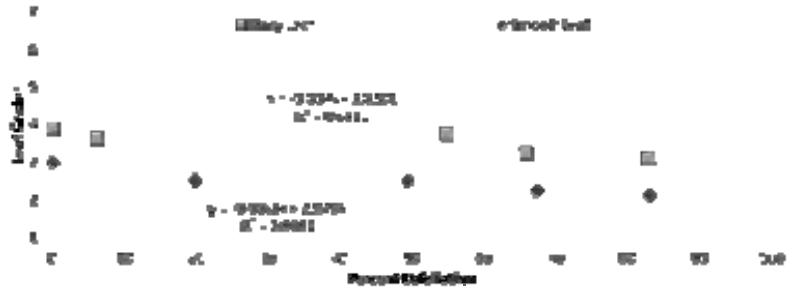

Figure 3. Impact of leaf hairiness on the leaf grade of cotton treated with five harvest-aid treatments during the 2010 growing season.

[a]Kruskal-Wallis test indicated the cotton leaf grade was affected by leaf hairiness (P = 0.05).

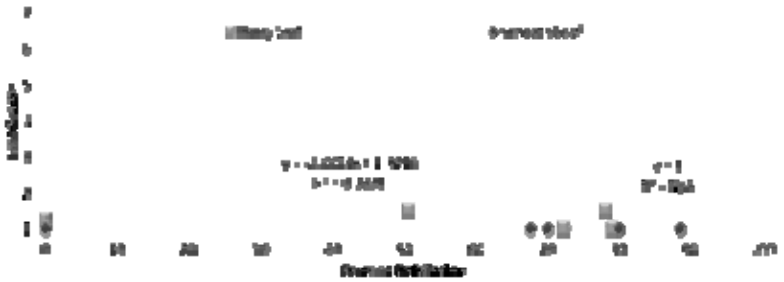

Figure 4. Impact of leaf hairiness on the leaf grade of cotton treated with five harvest-aid treatments during the 2011 growing season.

[a]Kruskal-Wallis test indicated the cotton leaf grade was affected by leaf hairiness (P = 0.05).

CONCLUSIONS

The leaf grade data showed no correlation with the percentage of defoliation or desiccation in any trial. Variety by harvest-aid trial data demonstrated leaf hairiness is positively correlated with leaf grade. Environmental differences between 2010 and 2011, rainfall after harvest-aid application, impacted leaf material in harvested lint, and conditions in 2011 were not negatively influenced by late season rain.

Based on these results, when concerned with leaf grade, defoliation treatments need to be examined on the basis of economical rates and product costs. Various physiological traits may influence cotton leaf grade and other fiber qualities, and need to be evaluated. Leaf hairiness was found to significantly affect leaf grade and was more influential than defoliation leaf grade.

ACKNOWLEDGEMENTS

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