

## **ABILITY OF COTTON TO COMPENSATE FOR EARLY-SEASON FRUIT LOSS AND IMPACT ON YIELD AND LINT QUALITY**

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### **Abstract**

It is not uncommon for cotton in the high plains of Texas to experience a short season due to late planting or early cold conditions. There has been research demonstrating the extraordinary capability of cotton to compensate for pre-bloom square loss. However, when cotton is subjected to a shortened season, the ability of the cotton to compensate is questionable. Additionally, if the crop has sufficient time to compensate for lost squares, the quality of that compensated fruit is uncertain. In this test we demonstrated the ability of cotton to compensate fruit loss given an extended warm autumn, and the impact on lint quality. At 18 days into squaring, cotton plots had 0, 20, 40, 60, 80 and 100% of their squares removed, with no significant impact on yield. Compensated fruit were primarily produced at the 3+ fruiting positions and appeared to be vertically uniform. Although, there was a trend towards lower lint quality in the form of lower Mic and increased yellowness, there was no significant impact on loan value. Thus, given enough time, cotton grown in the Texas high plains can compensate for significant early square loss with no impact on yield and little impact on quality.

### **Introduction**

Windblown sand, sustained cloudy weather and insects often result in the loss of squares in pre-bloom cotton grown in the Texas high plains. Among the insects, the cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter), is a common pest that feeds on small squares causing them to abort. In recent years, extensive research has been conducted demonstrating the extraordinary capability of cotton to compensate for pre-bloom square loss. However, full compensation is questionable when cotton is planted late or cold late-season temperatures result in a shortened season. Additionally, the lint quality of compensated fruit may be compromised.

The objectives of this test were to assess the ability of cotton to compensate for early season square loss and the impact compensated fruit has on lint quality.

### **Materials and Methods**

This test was conducted at the Texas AgriLife Research and Extension Center in Lubbock, TX. The cotton variety, 'Phytogen 375 WRF', was planted on 1 June 2010 on 40-inch rows and was irrigated as needed using furrow run irrigation. Plots were 1 row wide x 14-feet long. The test was a randomized complete block design with 4 replicates.

Plots were evenly thinned to 28 plants per plot (26,136 plants per acre) on 13 July 2010. All abnormally small or deformed plants were removed leaving a uniform plant population.

Treatments consisted of 0, 20, 40, 60, 80 and 100% manual square removal on pre-bloom cotton. On 13 July 2010, all of the squares in each plot were counted and numbered. The numbered squares from each plot were then randomized and removed based on the treatment percentage. Squares slated for removal were removed using fine forceps on 13 July 2010. At that time the plants were approximately 18 days into squaring and averaged 13.7 nodes across all treatments.

At harvest on 10 November 2010, 10 plants from each plot were plant mapped and the entire plot was hand harvested. Samples were ginned at the Texas AgriLife Ginning Facility in Lubbock. Lint samples were submitted to the International Textile Center at Texas Tech University for HVI analysis, and USDA Commodity Credit Corporation (CCC) loan values were determined for each treatment by plot.

All count data were analyzed using PROC GLM and the means were separated using an F protected LSD ( $P \leq 0.05$ ). Relationships were determined by using linear regression models.

## **Results and Discussion**

### **Impact on Yield**

The 2010 growing season in Lubbock was marked by wet weather in June and July, dry conditions in August, and a prolonged warm fall that facilitated cotton maturation. Thus, the possibility of achieving full compensation for yield and fiber maturity was high during this test. Consequently, we could not detect any differences in yield among the treatments. This suggests that even the 100% square removal treatment was able to compensate (Figure 1).

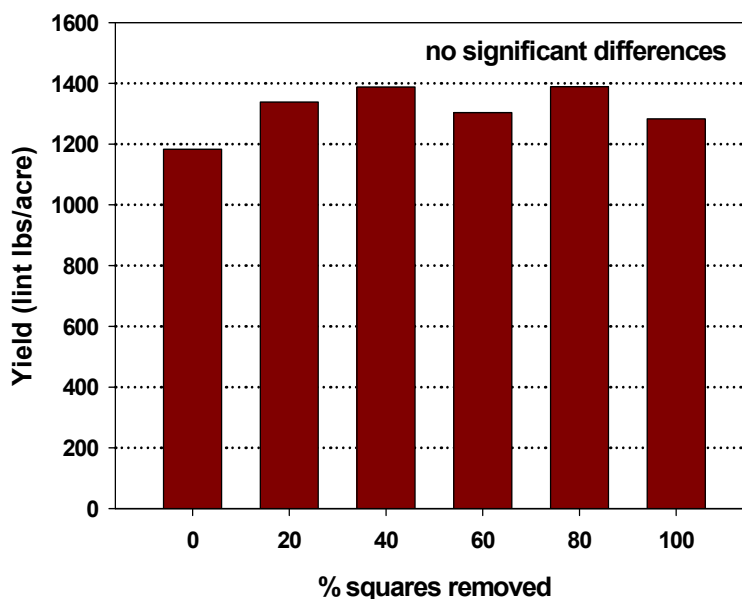


Figure 1. Impact of pre-bloom square removal on yield; no significant differences among treatments based on an F protected LSD ( $P > 0.05$ ).

### **Impact on Bolls and Node Quantity**

Although plots had as much as 100% of their early squares removed, there were no significant differences among treatments in the total number of bolls produced or the number of fruiting nodes per plant (Figures 2A & B). Thus, it appears that compensation in yield was primarily from adding bolls to replace missing fruit rather than increasing the size or quantity of the surviving fruit.

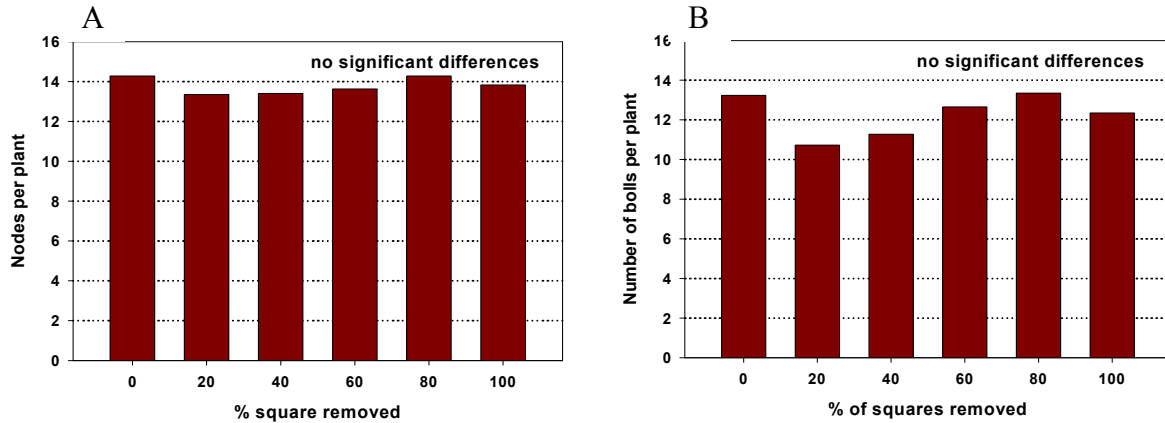


Figure 2 (A) Impact of pre-bloom square removal on the number of nodes per plant and (B) bolls per plant; no significant differences among treatments based on an F protected LSD ( $P > 0.05$ ).

### Impact on Fruiting Pattern

Plants in the 20, 40 and 100% square removal treatments had fewer bolls on the lower portion of the plant (nodes 11+) than plants where there were no squares removed (Figure 3A). This would be expected since we physically removed squares from this area. However, if the plant compensated by adding second and third position squares, primarily in this area, one would expect there to be no differences. Additionally, there were no differences among treatments in the ratio of lower bolls to upper bolls, which further supports the conclusion that replacement fruit was uniformly distributed from top to bottom (Figure 3B).

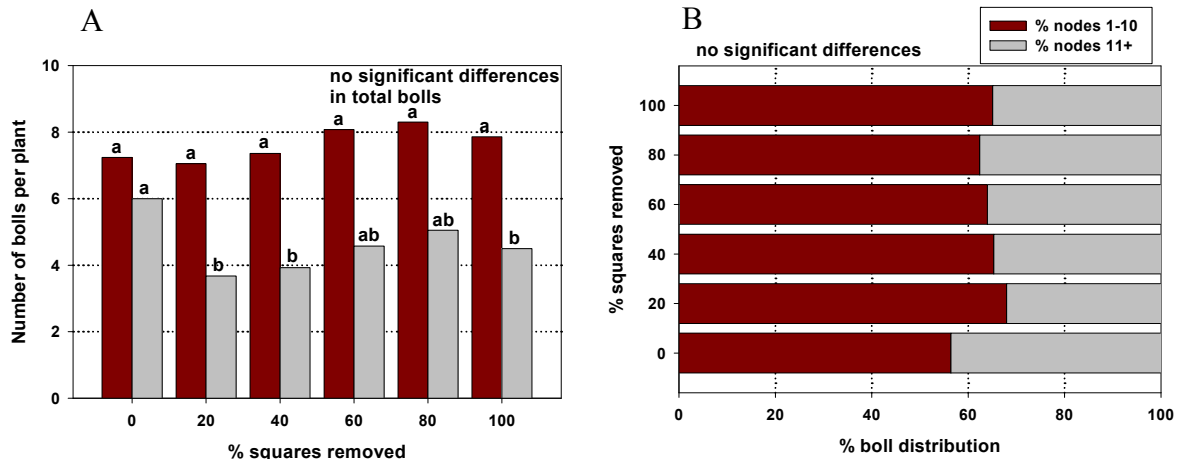


Figure 3. A) Number of bolls in the upper (nodes 1-10) and lower (nodes 11+) portions of the plant and B) vertical distribution as % of bolls within the top and bottom portions of the plant; similar colored bars capped by the same letter are not different based on an F protected LSD ( $P > 0.05$ ).

There were more first position bolls where no squares were removed, no differences in second position squares, and it appeared that third position squares increased relative to the number of squares removed. (Figure 4A). This is also evident when comparing boll distribution relative to total bolls per plant (Figure 4B). Thus, it appears that the compensated fruit were third position bolls and, based on vertical distribution (Figure 3A & B), were uniformly distributed from top to bottom.

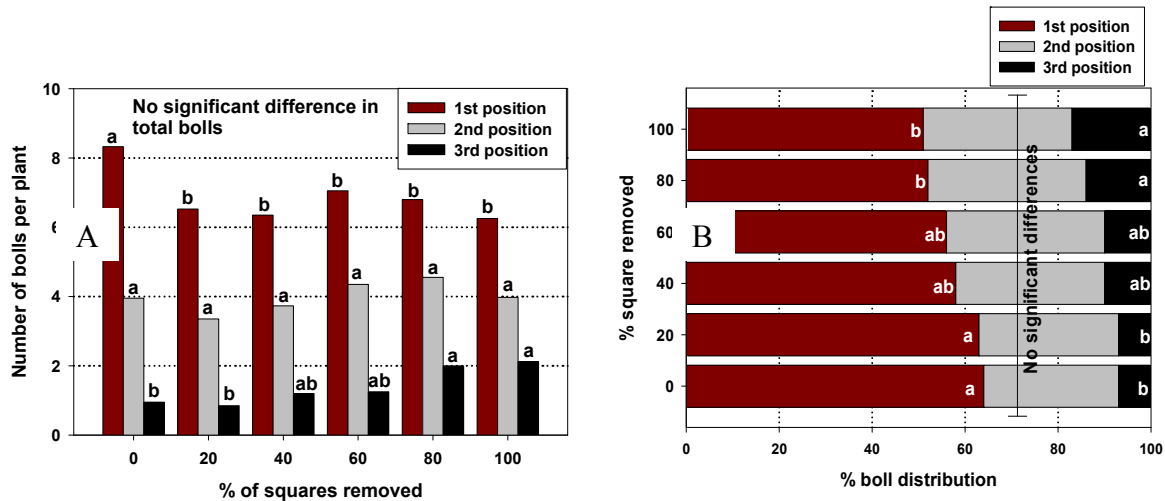


Figure 4. (A) Number of bolls in the upper (nodes 1-10) and lower (nodes 11+) portions of the plant and (B) vertical distribution as % of bolls within the top and bottom portions of the plant; similar colored bars capped by the same letter are not different based on an F protected LSD ( $P > 0.05$ ).

### Impact on Lint Quality

Significant differences in qualitative parameters among the square removal treatments were not detected based on GLM ( $P > 0.05$ ), but trends were observed. Compensated bolls tended to have lower micronaire and higher fiber strength qualities (Figures 5A and B).

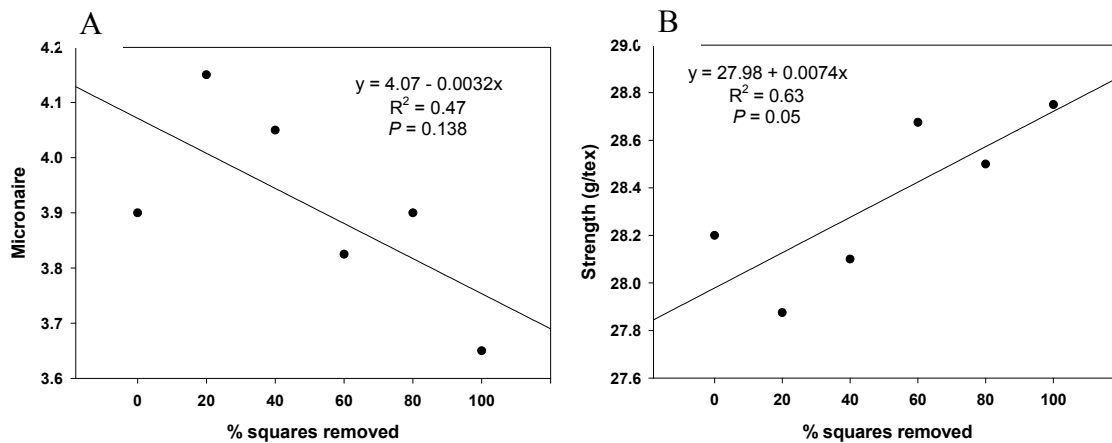
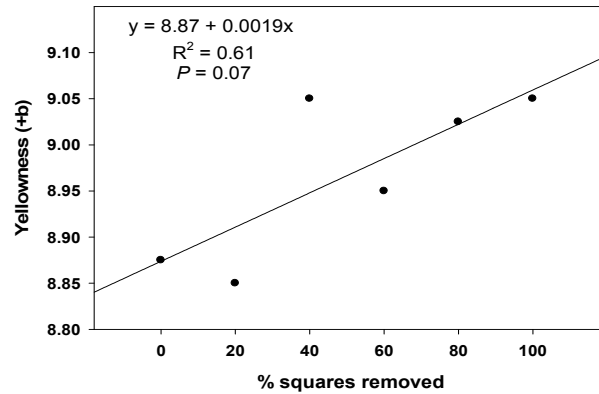


Figure 5. Linear relationships between % of squares removed and fiber (A) micronaire and (B) strength.

Lower micronaire is indicative of immature cotton fibers and suggests that compensated bolls did not have sufficient time to mature. This is not uncommon for cotton with a truncated growing season, especially for fruit produced later in the season (i.e. third position bolls).

The trend detected for increased fiber strength with more square removal is a function of micronaire (Figure 5B). Increased strength is commonly associated with decreasing micronaire.

A trend was also detected for the degree of yellowness (+b) (Figure 6). Yellowness increased with increasing early square removal. Similar to low micronaire, increased yellowness is indicative of immature cotton fibers; thus,



further supporting the premise that compensated bolls are more likely to suffer qualitatively.

Although we detected trends in reduced lint quality with regard to increasing square removal (Figures 5 & 6), it did not significantly impact loan value based on GLM ( $P > 0.05$ ) (Figure 7). Thus, even 100% pre-bloom square removal did not significantly affect yield or overall quality as it relates to loan values. However, keep in mind that these data are representative of the Lubbock area during a year with a prolonged growing season. In cooler climates, or in situations favoring a shorter growing season, the impact on lint maturity and/or yield may be adversely affected.

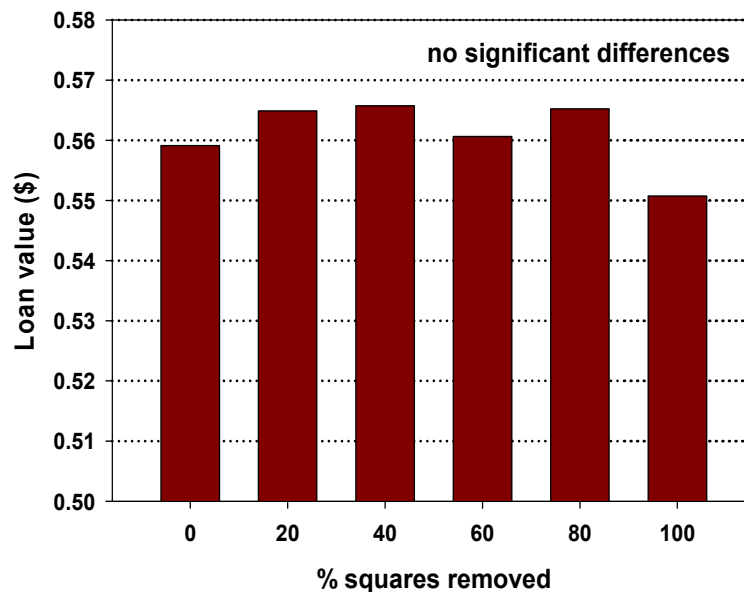


Figure 7. Impact of early square removal on loan values; no significant differences among treatments based on an F protected LSD ( $P > 0.05$ ).

### **Summary**

Given sufficient time, similar to that experienced during 2010, cotton can fully compensate yield from 100% square loss at 18 days into squaring. However, compensated lint may be of lower quality than non-compensated lint. Like yield, the degree of lint quality degradation in compensated lint is undoubtedly associated with length of season.

### **Acknowledgements**

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