COMPARING EARLY SEASON FRUIT RETENTION ACROSS DIFFERENT PHYSIOGEOGRAPHIC REGIONS OF TEXAS

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Abstract

A comparison of early season fruit retention among cotton cultivars was examined from 1997 to 2000 for three dryland cotton growing regions of Texas: Coastal Bend, Southern Blacklands, and Northern Blacklands. All regions were tested due to their similar cotton production practices, similar soil structure (clay) and similar weather patterns. All fruit retention data were captured from Delta and Pine Land Company's Agronomic Systems Trials (AST) in conjunction with variety testing that were conducted with producers in commercial cotton fields. Fruit retention data showed that the Coastal Bend had the highest level of early season retention for every year tested and each year the data were significant. The Southern Blacklands was second in early season fruit retention in every year and the Northern Blacklands was third in each year tested. All data were also significant for the Southern and Northern Blacklands for each year tested. There was no interaction among varieties tested on fruit retention. All varieties within a region had similar fruit retention patterns so to be region specific and not variety specific. Examination of causes of fruit retention differences found no environmental explanation as to why differences in early season fruit retention occur between regions. Analyzing differences in early season insect pressure found that cotton fleahopper, *Pseudatomoscelis seriatus* (Reuter), densities have a negative effect on early season fruit retention. Linear regression analysis of fruit retention versus cotton fleahopper densities showed a significant negative relationship for the Northern and Southern Blacklands. This is to say that increasing cotton fleahopper densities subsequently lowered early season fruit retention. Lint yield was then regressed against early season fruit retention for each region for each year. This found that both the Coastal Bend and Southern Blacklands had negative relationship although not significant. This trend implies that lint yield increases were not dependent on early season fruit retention. The Northern Blacklands showed a positive yield response to increases in early season fruit retention although not significant which implies that increasing early season fruit retention increased lint yields. The Coastal Bend and Southern Blacklands regions showed a negative yield response to increases in early season fruit retention although the trend was not significant.

Introduction

Conventional wisdom is that dryland cotton usually has less ability to compensate for early season fruit loss due to the sheer nature of how the crop is grown. Namely, rainfall is most likely the limiting factor to yield. When dry production years are combined with poor early season fruit set, yields may not be fully realized due to missed fruiting positions and subsequent lack of moisture late in the season. This problem can be addressed in two ways. One would be to supplement rain-fed water with irrigation. Since this is not plausible in some areas, another option would be to try and maximize early season fruit set in the hopes of fully realizing the yield potential of the dryland crop. This study compares early season fruit retention across three dryland cotton growing regions of Texas: Coastal Bend (S.TX), Southern Blacklands (C.TX), and Northern Blacklands (N.TX). These regions are compared from 1997-2000. The objectives of this paper are to explore if differences in early season fruit retention occur between regions, analyze what causal agents may cause these differences, and decipher if early season fruit loss has any ramification on final lint yield.

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Materials and Methods

Plant map data was taken from D&PL's Agronomic Systems Trials (AST) from 1997-2000. These data were collected in conjunction with cultivar yield trials. These trials were conducted with local producers in commercial cotton fields in each of three dryland cotton growing regions of Texas, the Coastal Bend (S.TX), the Southern Blacklands (C.TX), and the Northern Blacklands (N.TX). In-season plant map data were taken from varieties within AST's approximately two weeks post bloom in each region. First position fruit retention on fruiting branches 1-5 (FB 1-5) was recorded for all varieties (10-15 plants/variety) within an AST. Means of first position fruit retention for each variety mapped were recorded. Mean early season fruit retention for all varieties mapped were compared for each year (1997-2000) for each region (S.TX, C.TX, N.TX). Analysis of Variance (ANOVA) was conducted for each year between regions. Standard errors for early season fruit retention were calculated for each region for each year and an average of the standard errors for each year was used for statistical separation of means of fruit retention between regions. Means of early season fruit retention for variety families common to all regions (Deltapine 20, Deltapine 50, Deltapine 51, Deltapine Acala 90, DP 5409, DP 5415, DP 5690, Sure-Grow 125, PM 1220) were analyzed and means were separated using ANOVA in the same manner. Linear regression analysis was used to examine relationships between early season fruit retention and cotton fleahopper densities and between lint yields and early season fruit retention for each region. Cotton fleahopper densities were taken from Texas Agricultural Extension Service (TAES) Integrated Pest Management (IPM) data from Hill (N.TX) and Williamson (C.TX) counties. These data are taken from commercial cotton fields once to twice a week from first square to early bloom. All fields are treated with insecticides according to documented insect pest thresholds. Regression analysis was also run to define relationships between lint yield and early season fruit retention for each region for each year. Lint yield data was taken from the ASTs in which the fruit retention data was taken.

Results

For all years tested (1997-2000), S.TX had the highest level of early season fruit retention for FB 1-5. C.TX had the second highest level of early season fruit retention and N.TX had the lowest level of fruit retention for all the years tested. Fruit retention differences between regions were significant for all years tested (Figure 1). Comparing varieties that were common to all regions showed the same results as S.TX had the highest level of early season fruit retention followed by C.TX second and N.TX third for all years tested (Figure 2). Fruit retention differences were again significant between regions for all year tested.

No environmental causes for fruit retention differences among regions could be found. Linear regression analysis of early season fruit retention versus cotton fleahopper densities for C.TX and N.TX indicated a significant negative linear relationship (Figure 3). Regression analysis of lint yield for N.TX versus early season fruit retention by year showed a positive response where lint yield increased as fruit retention increased although this relationship was not significant (Figure 4). Similar regression analysis of lint yield and early season fruit retention for C.TX and S.TX showed a negative response where lint yield increases did not correspond to higher levels of early season fruit set although these were not significant relationships (Figures 5 and 6).

Conclusions

The N.TX region consistently retained less early season fruit when compared to C.TX and S.TX. The relationship shown here that early season fruit retention decreases with increasing cotton fleahopper densities may be a pertinent finding of this study since the N.TX region historically has had higher cotton fleahopper populations when compared to the C.TX and N.TX regions within a given year (Dr. Roy Parker and Dr. Allen Knutson, personal communication). This is further supported by the fact that the Blacklands of Texas are highlighted in management guides to consider lowering thresholds for cotton fleahoppers during the first three weeks of squaring (Knutson et al. 1997). This finding may be even more important when one considers that most early season fruit loss has been shown to be caused by insects (Mauney and Henneberry 1984, Smith et al. 1986). Although not statistically significant, the positive trend shown that lint yields increase with increased early season fruit retention in N.TX may lead one to believe that this region could increase lint yields by reducing cotton fleahopper numbers in pre-blooming cotton. Parker et al. (1999) showed that properly timed insecticides for cotton fleahopper control in pre-blooming cotton increased lint yields significantly in Texas Coastal Bend cotton when compared to an untreated check. However, the C.TX and S.TX regions showed a trend that increasing early season fruit retention did not necessarily correspond to an increase in final lint yield. This finding may simply be a result of this study only being comprised of four years of data (1997-2000) in which the C.TX and S.TX regions received more late season moisture than the N. TX region. Another partial explanation for the trend in S.TX may also be that this region has a slight advantage in available water (water the cotton plant can actually use) in their slightly more silty soils (Texas Natural Resources Conservation Commission). So, combining the facts that the C.TX and S.TX regions had more late season rains in the years analyzed and that S.TX has a slight advantage to utilize available moisture may be some of the reasons why these regions did not show a positive yield response to higher early season fruit retention. These trends need to be evaluated for more years to support or refute the findings of this paper.

References

Knutson, A., R. D. Parker, G. Moore, J. Benedict and R. L. Huffman. 1997. Managing cotton insects in the southern, eastern and Blackland areas of Texas. Texas Agric. Ext. Serv., Bull. 1204, 15 pp.

Mauney, J. R. and T. J. Henneberry. 1984. Causes of square abscission in cotton in Arizona. pp. 1027-1030. Crop Sci. Vol. 24.

Parker, R. D., E. D. Bethke III and D. D. Fromme. 2000. Significance of the cotton fleahopper as a pest of Texas Coastal Bend cotton. pp. 1370-1371. Proc. Beltwide Cotton Conf., Nat'l Cotton Council, Memphis,TN.

Smith, C. W., N. P. Tugwell, and R. L. Maples. 1986. Causes of square shed relative to nitrogen fertility and stage of growth. p. 116. Proc. Beltwide Cotton Conf., Nat'l Cotton Council, Memphis,TN.

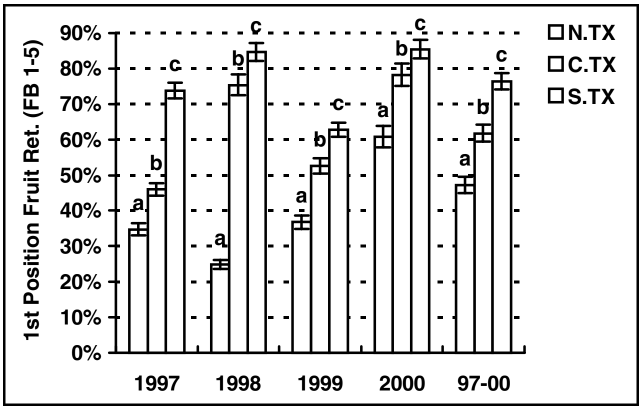

Figure 1. 1st position fruit set for all varieties plant mapped within a given region for 1997-2000.

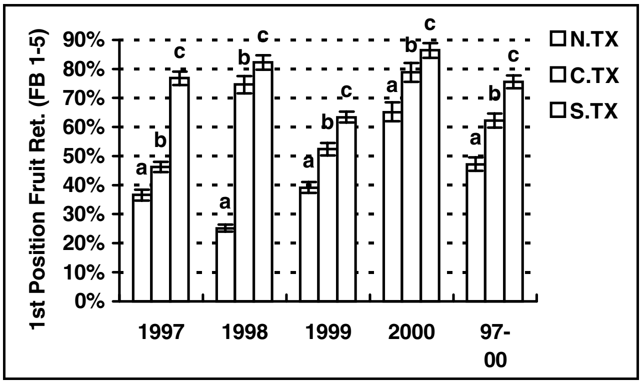

Figure 2. 1st position fruit set for common varieties among all regions for 1997-2000.

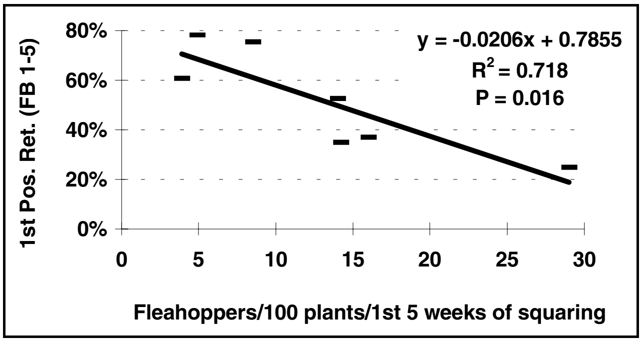

Figure 3. 1st position fruit retention for FB 1-5 versus fleahopper densities[1]. in N.TX and C.TX from 1997-2000[2].

[1]Densities from TAES IPM scouting data for Hill and Williamson counties.

[2]Data not available for Williamson county in 1997.

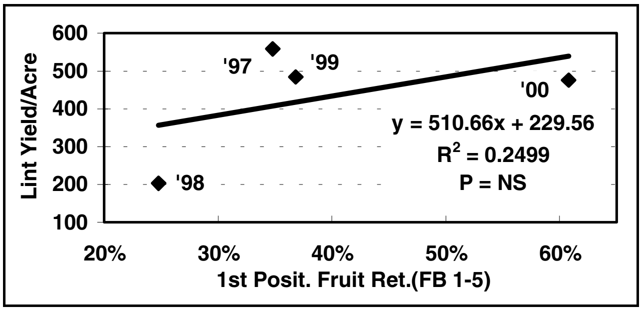

Figure 4. Lint yield versus early season fruit retention for N.TX from 1997-2000.

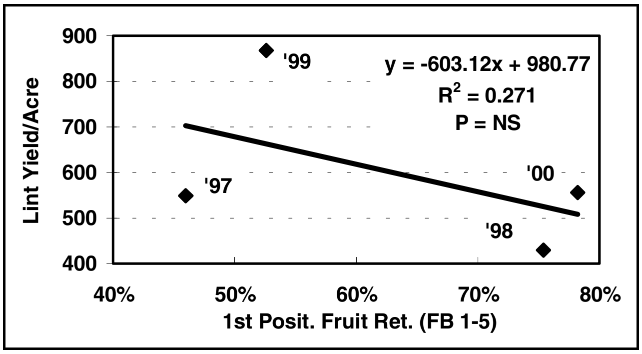

Figure 5. Lint yield versus early season fruit retention for C.TX from 1997-2000.

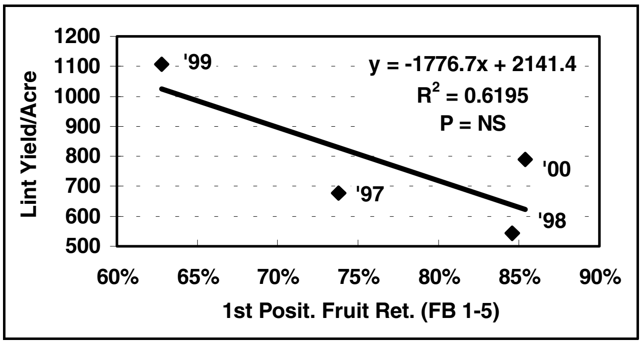

Figure 6. Lint yield versus early season fruit retention for S.TX from 1997-2000.