EVALUATION OF SHORT SEASON COTTON GENOTYPES ON THE HIGH PLAIN OF TEXAS

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Abstract

Chemical mutagenesis was used to identify five mutant lines that produced mature cotton fiber when planted on July 3rd at Lubbock, TX. Because the initial mutants had relatively short fiber length they were backcrossed with Fiber Max 958 and the resulting F_3 families were evaluated in Lubbock and Tulia, TX in 2008. PM 183, FM 958, DPL 444 and Nexgen 2448R were used as check varieties. On Sept. 29th at Lubbock, PM 183, Nexgen 2448R and DPL 444 had an average of 7.5, 6.5, and 6.0 open bolls, respectively. Eight of the backcross derived F_3 lines appeared to be earlier maturing than PM 183. One F_3 line derived from the cross between Sphinx 4-2 X FM 958 had an average of 10.1 opened bolls on this date. It is anticipated that the fiber harvested from these lines will have higher fiber quality than PM 183 and help ensure acceptance of these cotton genotypes in International markets.

Introduction

The relatively short growing season of the Texas High Plains presents an annual challenge to cotton growers who must produce economically competitive yields and high quality fiber in this highly variable growing region. Freezing temperatures in late spring and early fall require varieties of cotton that can be planted in late May and produce completely mature fiber before mid-October. Development of short season, cotton germplasm adapted to this region will help ensure that both high quality fiber and a high yielding crop mature before termination of this crop. Texas Tech University in cooperation with Texas AgriLife Research has conducted an intensive plant breeding effort to solve this challenging problem.

A short season variety may also provide a benefit in longer season production regions due to enhanced insect & disease control, reduced irrigation costs, and increased flexibility in crop rotation The impact of tobacco budworm[*Heliothis virescens* (Fabricius)] and pink bollworm [(*Pectinophora gossypiela* (Sanders)] infestations are directly proportional to the duration of cotton production (Far;1978). Crowder, et al (1975) reduced the impact of these insects through the use of short season cotton varieties. Another important pest of cotton influenced by the short season cotton is the boll weevil [*Anthonomus grandis* (Boheman)]. Watson (1985) showed that increasing the cotton free period with the use of short season cotton varieties improved the control of the bow weevil by decreasing the size of overwintering insect populations and reducing the cost of insecticides need to protect the crop.

Another advantage of short season cotton varieties is potential improvements in cotton fiber quality. The lack of high levels of fiber uniformity and high levels of immature fiber (IFC) can be partially improved by increasing the time available for deposition of cellulose in the fiber before crop termination or frost. Use of varieties that mature 15 to 30 days earlier than existing varieties could save 2 to 3 irrigations in Arizona (Willet et.al, 1973). Our research targeted development of short season cotton genotypes with good fiber quality and high yield .that are adapted to the High Plains of Texas.

Materials and Methods

In 1995, six varieties of cotton were treated with 2.7% v/v of Ethylmethane Sulfonate (EMS). The M_3, M_4 and M_5 generations of these mutant populations were screened to identify mutant lines that would flower and produce mature fiber when seed on July 3 of 1997, 1998, and 1999, respectively. The M_6 and M_7 generations were planted in Mid-May of 2000 and 2001 in replicated trials where they were evaluated for lint yield and fiber quality. The five

best lines selected from this program were then crossed with Fiber Max 958 and increased to the F_3 generation in the greenhouse. The five original mutants, eleven F_3 lines and four check varieties was evaluated in Tulia and Lubbock ,Texas in 2007 and 2008 in trials seeded in mid-May. Fiber harvested from these plots was analyzed using HVI analysis at the Texas Tech University - Fiber and Biopolymer Research Institute. The numbers of open bolls on October 9, 2008 were used to provide estimates of relative maturity of this material.

Results and Discussion

The number of open bolls on October 9, 2008 at Lubbock, TX was higher then the lowest check variety and in most cases were higher than all of the check varieties (Figure 1). This demonstrated that the selection for earliness was maintained through the crossing program. The lint yields of the eleven F_3 lines were higher then the lowest check variety and higher then most part of the original mutants. This demonstrated the value of the crosses to FM 958 (Figure 2). Fiber strength of the eleven F_3 lines was higher then the lowest check variety (Figure 3).

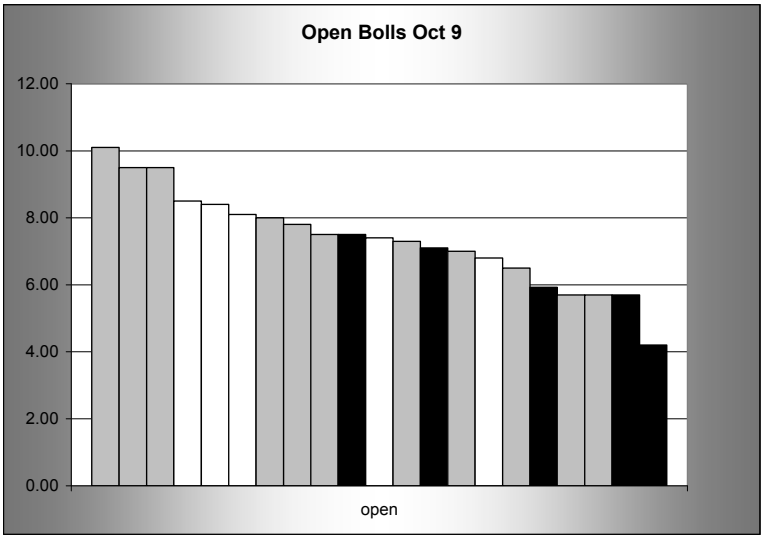

Figure 1. Average number of open bolls of 21 genotypes of cotton when harvested on October 9, 2008 at Lubbock Texas. (Gray = F3 lines; White = Original Mutant Lines and; Black = Check Varieties).

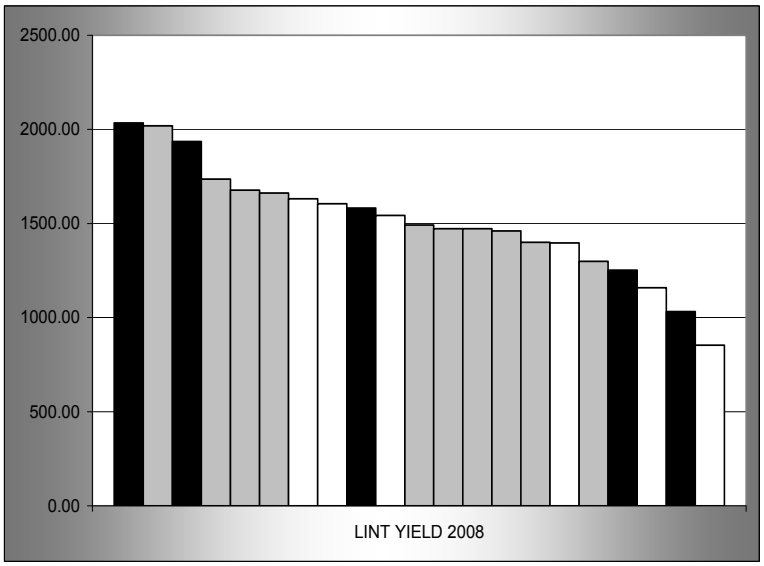

Figure 2. Average lint yield of 21 genotypes of cotton when harvested on October 11, 2008 at Lubbock Texas. (Gray = F3 lines; White = Original Mutant Lines and; Black = Check Varieties).

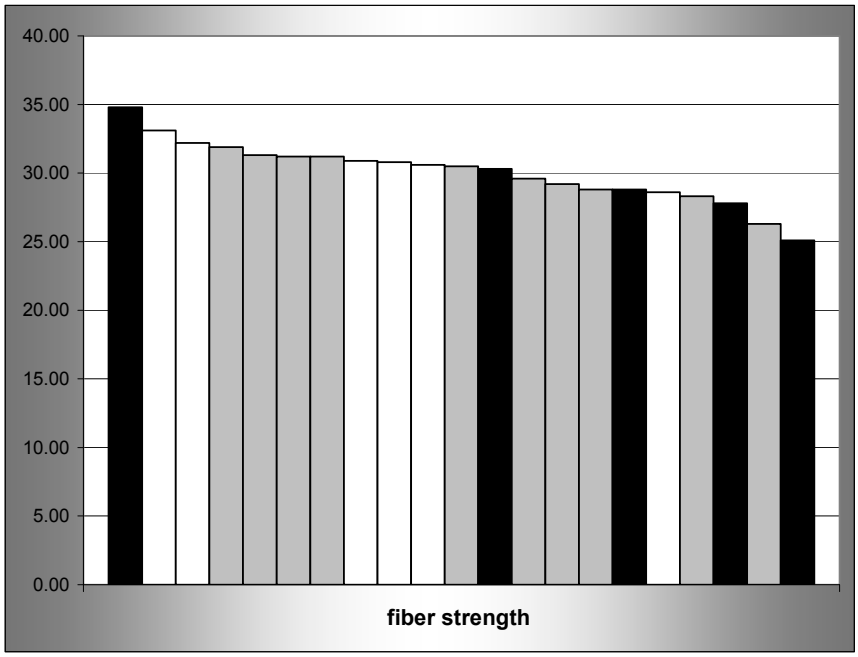

Figure 3. Average fiber strength as measured by HVI analyses of 21 genotypes of cotton when harvested on October 11, 2008 at Lubbock Texas. (Gray = F3 lines; White = Original Mutant Lines and; Black = Check Varieties).

Summary

The material of both nurseries showed similar lint yield and Fiber Quality then most part of the checks but has a shorter season in a way that when these nurseries come to be a Variety the producer has a short season material benefits without loosing Yield or quality.

Acknowledgements

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