

## RESPONSES OF SELECTED COTTON VARIETIES TO STAPLE® (PYRITHIOBAC) APPLICATIONS

G. B. Baldwin, D. M. Panter, R. E. Seay,

C. B. Corkern and D. B. Reynolds

Stoneville Pedigreed Seed Co., Stoneville, MS;

Stoneville Pedigreed Seed Co., Leland, MS; E. I.

DuPont de Nemours, Greenville, MS; Louisiana State

University, LA; Mississippi State University,

Mississippi State, MS

### Abstract

A series of trials were established in 1996 to further investigate findings reported during the 1996 Cotton Beltwide Conference (Smith et al., 1996). Smith concluded from the 1995 evaluation of selected commercial varieties and two BXN® varieties that BXN58 and BXN57 were more sensitive to sequential treatments of Staple (pyrithiobac) than the other cultivars evaluated. Smith also concluded that there was a trend for BXN58 and ST132 to be more sensitive to early over-the-top (EOT) applications.

Two protocols were established to investigate the effects of 1) postemergence applications of Staple on a group of commercial varieties; and 2) the effects of sequential applications of Staple on the same group of commercial varieties. Trials were established utilizing both protocols with Stoneville Pedigreed Seed Co. at their Mid-South Research Station in Stoneville, MS and with E. I. DuPont de Nemours at their Greenville, MS research farm. An additional evaluation, a continuation of a dissertation project, was conducted with Louisiana State University at the Macon Ridge Experiment Station, Winnsboro, LA. The LSU trial contained additional BXN backcross strains that were not included in the Stoneville or DuPont trials.

Two protocols were established in order to properly separate and identify relationships between preemergence, preemergence followed by postemergence, and postemergence applications of Staple. The objectives of both protocols were to determine the susceptibility or tolerance of varieties containing the BXN® gene and other commercially available varieties to applications of Staple and those varieties' agronomic responses to the herbicide. Commercial varieties evaluated were chosen on the basis of current and anticipated volumes in the mid-south and southeastern cotton growing regions from the three major seed companies providing upland picker varieties. The BXN varieties included in the tests were BXN58 (introduced in 1995, and no longer commercially available), BXN57 (the only BXN variety available in 1996), and BXN47 which will be introduced for the 1997 growing season. BXN47 is the first BXN variety to be released from the Stoneville

BXN backcross program. The recurrent parent of BXN47 is ST474.

The Stoneville and DuPont trials were established in a split-plot design with the main-plot factor Staple treatment and the subplot factor variety. In the postemergence evaluation, Staple treatments were 1) untreated, 2) 1.0 ozai/A, and 3) 2.0 ozai/A. Postemergence over-the-top applications for both trials were made to cotton at the 2 to 5 leaf stage. The sequential evaluation treatments were 1) untreated, 2) 0.5 ozai/A PRE, 3) 0.85 ozai/A PRE 4) 0.5 ozai/A PRE followed by 1.0 ozai/A POST, 5) 0.85 ozai/A PRE followed by 1.0 ozai/A POST, and 6) 1.0 ozai/A. The PRE treatments were applied following planting and the POST treatments applied when cotton was at the 2 to 4 leaf stage. A nonionic surfactant at 0.25%(v/v) was included for all POST applications. The varieties planted in the Stoneville postemergence and sequential trials were C 315; BXN58; BXN57; BXN47; ST474; ST132; LA 887; DPL 5409; DPL 51; DPL 90; NuCOTN33b; SG 125; and SG 501. The DuPont trials had the same varieties except LA 887, DPL 51, DPL 90, NuCOTN33b, and SG 125 were not included. The LSU trial had an additional factor added to the split-plot design. The main-plot was soil moisture(irrigated or non-irrigated), the subplot variety, and sub-subplot Staple treatment. Staple treatments were 1) untreated, 2) 1.0 ozai/A POST, 3) 2.0 ozai/A POST, and 4) 1.0 ozai/A PRE followed by 1.0 ozai/A POST. The PRE application was applied immediately following planting and the POST over-the-top applications were applied to 3-6" cotton with 2-4 nodes. A nonionic surfactant at 0.25%(v/v) was included for all POST applications. The varieties or cotton strains planted were C 315; BXN58; BXN57; ST474; ST474BXN1; ST474BXN2; ST474BXN3; LA 887; LA 887BXN1; LA 887BXN2; DPL 20; DPL 5409; SG 125; and SG 501. Data collected from trials were % visible crop injury (chlorosis and stunting), plant height, and cotton yield (seed cotton yield and/or lint yield).

Crop injury in the DuPont postemergence trial was similar for all varieties at 4 and 12 days after treatment. In the Stoneville postemergence trial, BXN58 had significantly more injury than all varieties 5 and 12 DAT. 5 DAT, SG 501 and ST474 had injury greater than DPL 51, BXN57, NuCOTN33b, C 315, and LA 887; however their injury levels were similar to DPL 5409, BXN47, DPL 90, and ST132. By 12 DAT, BXN58 had greater crop injury than all other varieties. Test results indicate that there are some varietal differences, but only BXN58 developed injury greater than any other variety. PRE applications of Staple resulted in no visible crop injury in the Stoneville and DuPont trials. There were no additive effects from the sequential Staple treatments in the Stoneville or DuPont trials. In the LSU trial, there were significant varietal differences 7 DAT but not 14 DAT. The soil moisture X Staple treatment interaction was significant 7 DAT. Injury was significantly greater under irrigated conditions as compared to non-irrigated for all Staple treatments.

Analysis of injury means for varieties across all rates shows that BXN58 had significantly more injury than all other varieties. C 315 had the second highest injury rating, and was significantly higher than the other varieties. Analysis of individual treatments also resulted in BXN58 having more injury than the other varieties for each treatment except for C 315 and in one instance DPL 5409. The BXN backcross lines in the evaluation had similar injury response to Staple as their recurrent parent, except for LA 887BXN1 in the non-irrigated 1.0 ozai/A POST treatment. This indicates that a cotton strain that contains the BXN gene is not more likely to develop injury to Staple because of the BXN gene.

Differences in plant heights between varieties from these trials are to be expected due to inherent genetic differences between varieties for their plant development and structure. A significant variety X Staple treatment interaction is the parameter to use to determine if a variety demonstrates a greater plant height response to Staple than another variety. Staple applications, both preemergence and postemergence, significantly decreased plant heights at each location. However; only 3 of 13 evaluation dates from the three locations had a significant variety X Staple treatment interaction. Factors other than Staple applications, such as inherent varietal responses to environmental conditions or plant development, could have affected a variety's plant development in comparison to the other varieties. For the significant interactions, the varieties significantly affected were across different germplasms.

Because there also inherent differences between the yield potential of varieties, the most accurate means to measure varietal differences due to Staple treatments is through investigating interactions between varieties and herbicide treatments. A significant interaction would indicate that at least one variety exhibits a greater yield response to different treatment levels of Staple than other varieties. The Stoneville postemergence and sequential trials and the LSU trial had a non-significant variety X Staple treatment interaction, indicating similar varietal yield responses to Staple. The DuPont trials had significant variety X Staple treatment interactions at the  $\alpha = 0.10$  level of probability. In the DuPont postemergence trial, only BXN58 was significantly more affected by Staple applications than the other varieties. In the sequential trial, BXN57, BXN47, ST132, and DPL5409 expressed significant yield responses to Staple applications.

Crop injury, plant height, and yield evaluation analyses indicates that if there are differences in varietal susceptibility to Staple, it is based on differences between germplasm, and not because a variety contains the BXN gene. BXN58 does appear to be more susceptible to Staple injury, but the other BXN varieties and strains have similar responses to Staple as the traditionally developed cotton varieties that were evaluated.

#### References

Smith, M. C., McClelland, M. R., Carter, P. C., Corkern, C. B., Reynolds, D. B. 1996. Weed control and cotton varietal sensitivity with Staple herbicide. Proceedings Beltwide Cotton Conferences. 1536-1540.