2006 RESEARCH SUMMARY
ARKANSAS CORN AND SORGHUM BOARD

Title: Development of Effective Weed Control Programs with Crop Safety

Investigators: Dr. Kenneth Smith, Extension Weed Scientist, SEREC Monticello
Dr. Leo Espinoza, Extension Soils Specialist, Little Rock
Dr. Dick Oliver, Crop, Soil, and Environmental Sciences Dept., Fayetteville

Crop: Grain sorghum

Status: Funded in 2004 for 3 years

OBJECTIVES AND ACCOMPLISHMENTS:
The funding allowed the weed science crews to conduct one field trial at Pine Tree Branch Experiment Station, Colt, one field trial at main experiement station, Fayetteville, and three at Southeast Branch Experiment Station, Rohwer in 2006. Specific objectives to be answered in the field trials were:

(1) To evaluate various cultural practices and herbicide programs and develop effective weed control programs in grain sorghum with improved crop safety.

The study to evaluate Aatrex (atrazine) rate and soil fertility level on early-season grain sorghum injury was not conducted in 2006. After 2 years, data were inconclusive, but did show no interaction between soil fertility and Aatrex on crop safety. Thus, emphasis was changed to evaluating the influence of plant population and row spacing on grain sorghum yield and number of herbicide applications on weed control (see fourth objective).

(2) To provide information on new herbicides entering the market as to their effectiveness and fit in Arkansas grain sorghum programs.

The new or potentially new herbicides for grain sorghum are Aim (carfentrazone), and Facet (quinclorac). Aim preharvest at 0.016 lb ai/A plus Roundup Weathermax at 0.75 lb ai/A and Aim 0.016 lb/A plus Defol 5 (Na chlorate) plus COC at 1% v/v both provided 100% desiccation of morningglory which was 70% better than Roundup. Aim post-directed at 0.008 lb/A controlled all small weeds under the 14-inch grain sorghum. Facet at 0.375 lb ai/A PRE provides excellent crop tolerance and morningglory control but does not provide full-season Palmer amaranth control. Also, lack of soil moisture for activation preemergence drastically reduced weed control. The conventional herbicides Dual II Magnum or Bicep II Magnum applied PRE still provide excellent control, but an additional follow-up postemergence treatment at 2 - to 4- leaf grain sorghum generally improves late-season weed control.

(3) To evaluate grain sorghum germplasm for tolerance to glyphosate drift.

Glyphosate-resistant crops are being planted on increasing acreage and leads to an increase use of glyphosate; however, the increase in usage has also led to an increase in drift injury to non-glyphosate resistant crops, such as grain sorghum. Therefore, cultivars of susceptible grain sorghum were tested for tolerance to glyphosate.

The experiment was conducted at the Pine Tree Experiment Station, Pine Tree, AR, and Southeast Branch Station, Rowher, AR, to evaluate grain sorghum tolerance to glyphosate drift. The test was established as two-row plots in a split-split plot design with four replications. Nine cultivars (Asgrow A571, Dyna Gro 751B, Dyna Gro 780B, Golden Acres 444E, Pioneer 83G66, Pioneer 84G62, Terral TV1050, Terral TV9421, and Triumph TR82-G) were planted. Glyphosate was applied at four application rates of 0, 0.001, 0.01, and 0.1 lb ai/A. Treatments were made at two grain sorghum growth stages (3 leaf and early boot stage) in 2003 and three growth stages (3 leaf, 12 inch, and early boot stage) in 2004 and 2005.

No individual cultivar injury differences were noted due to concentrations of glyphosate. However, there were differences in the overall effect of glyphosate concentrations on injury, seedhead suppression, or yield only at the 0.1 lb ai/A. The 0.1 lb/A concentration caused more injury at the early boot stage in 2003 and 2004 than at the 3-leaf stage. However, in 2004 and 2005 grain sorghum at the 12-inch stage was most susceptible to glyphosate drift (0.1 lb/A) resulting in >68 and >89% injury at 3 and 6 weeks after treatment, respectively. Yields were reduced >90% across all cultivars when glyphosate was applied at 12-inch grain sorghum. The 3-leaf grain sorghum yield was the least affected by glyphosate drift and suffered no more than 20% yield reduction across all cultivars. The low yield reduction was due to the lack of injury and time for recovery before grain sorghum began the reproductive stage.Yield reductions to the 12-inch and early boot sorghum were due to crop injury and some seedhead suppression occurring at the early boot stage.

In conclusion, glyphosate drift at a concentration of 0.1 lb/A can injure grain sorghum and reduce yields. Crop stage can affect injury level or yield loss. Thus, grain sorghum cultivars are not a method to avoid glyphosate drift.

(4) To determine the influence of plant population and row spacing on grain sorghum yield and number of herbicide applications for weed control. (New objective)

The objective was initiated at Rowher and Fayetteville to reduce herbicide applications and increase grain sorghum yield by reducing safe sites for weeds. The factorial experiment evaluated three plant populations (80,000, 110,000, and 140,000 plants/A)**,** two row spacings (single and twin rows on 30 inch beds), and three herbicide programs (Aatrex, pre, Aatrex + Dual Magnum, pre, and Aatrex + Durl Magnum, pre fb Aatrex at 4-leaf grain sorghum). At Rowher, no differences were noted, but at Fayetteville,

significant results were found. At 80,000 and 110,000 plants/A, the twin row production system improved grain sorghum yield. The twin row system gave 20% better large crabgrass and broadleaf signalgrass controled by 9 weeks in the Aatrex only herbicide program. At 140,000 plants/A, no differences were noted between row spacing or weed control programs. Twin rows at 80,000 and 110,000 plants/A, regardless of herbicide program, improved grain sorghum yield 928 and 793 lb/A, respectively. Thus, we feel further evaluation is warranted in order to enhance grain sorghum profitability.