Evaluation of Weed Management Strategies on Grain Sorghum Nitrogen Status

A.A. Lorence, D.A. Ruiz Diaz, J.A. Dille, C. L. Edwards, and A.R. Asebedo
Department of Agronomy, Kansas State University

Kansas State University
Department of Agronomy

Objectives

- Determine the effects of different weed management and nitrogen fertilization strategies on grain sorghum nutrient uptake and yield.
- Weed pressure on nitrogen status and development of grain sorghum.

Materials and Methods

- Study was established summer 2014 at two locations: Reno Co (convention al tillage) and Smith Co (no-tillage).
- Used a factorial design in a randomized complete block design.
- Two factors were included N application timing (at planting and split) and herbicide application timing (pre, post, pre + post, and none).
- Nitrogen management: Planting 180 kg/ha urea, Split (planting and GS3) 90 kg/ha urea each.
- Herbicide management: Pre Lumax EZ at 5.9 L/ha, Post Starane 0.80 L/ha Atrazine 1.2 L/ha, and crop oil 1% v/v.
- Weed specie composition and biomass was collected for each plot for evaluation of total nutrient content.
- Whole plant samples of grain sorghum and weeds were collected at growth stage 3.
- Soil moisture content and rainfall monitored with the John Deere Field Connect.

Figure 1. Untreated plots with significant weed pressure at the GS3 growth stage for sorghum and at harvest for the Smith Co location (no-tillage).

Figure 2. John Deere Field Connect, rain gauge, and soil moisture probe for evaluation of soil moisture with different weed and strategies.

Results

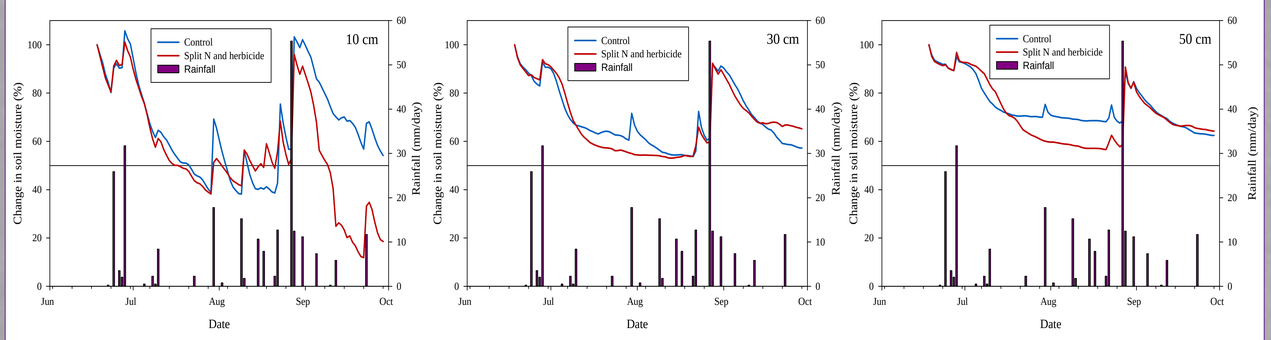

Figure 3. Relative change in soil moisture within two treatments (1-control and 2- split N application plus pre + post herbicide applications). Values are relative changes over the growth season.

Reno Co Location

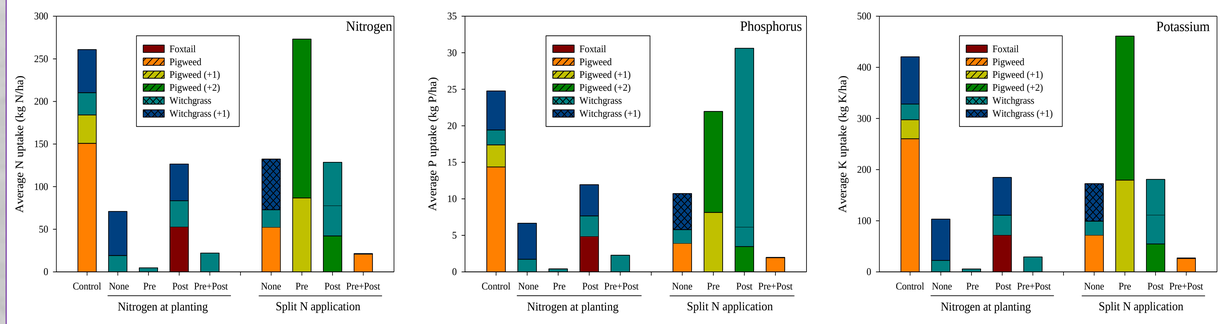

Figure 4. Nutrient uptake (N, P, K) by weed species at the Reno Co location (conventional tillage). Numbers in parenthesis indicate one or two additional species collected for those plots.

- Pre + Post application reduced weed species and nutrient uptake providing more for grain sorghum. Split N application + pre appeared to feed post weeds.

Smith Co Location

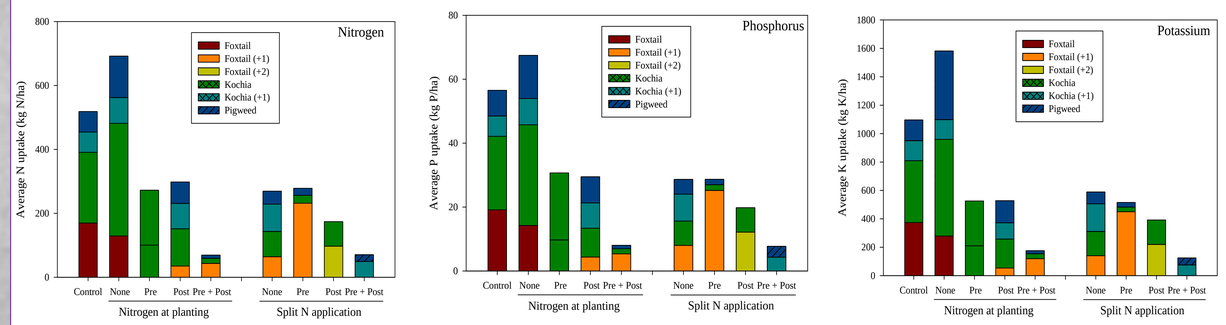

Figure 5. Nutrient uptake (N, P, K) with weed species at the Smith Co location (no-till). Numbers in parenthesis indicate one or two additional species collected for those plots.

- In no till; increasing intensity of weed management reduced uptake of nutrients by weeds.

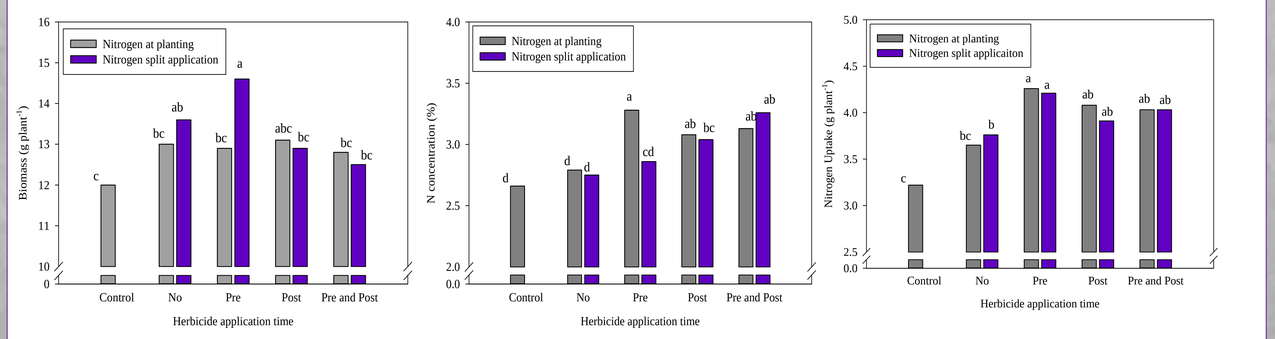

Figure 6. Sorghum biomass, N concentration, and N uptake at growth stage 3 across locations in response to N and herbicide applications.

Summary

- Preliminary results show sorghum N content, biomass, and N uptake early in the season were affected by weed management.
- Nutrient uptake by different weed species can be significant for N, P, and K.
- Lower soil moisture for weed-free plots may suggest higher total biomass with sorghum with active canopy, particularly later in the season (Fig. 3).
- Despite low competition for light interception and water, the competition for nutrients can be significant and likely affecting the sorghum crop for the rest of the season.
- Potentially large nutrient uptake with weed species that generate high biomass may immobilize nutrients that would not be available for sorghum uptake during the growing season .

Acknowledgments

We would like to thank Landmark Imp for the use of the John Deere Field connect, rain gauge, soil moisture probes, and for the EC sled for this project.