Nitrogen Use Efficiency of Grain Sorghum Genotypes

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Introduction

- Grain sorghum [Sorghum bicolor (L.) Moench] is an important crop in the semi-arid regions of Africa, Asia and United States. Productivity of grain sorghum is limited by soil fertility, especially nitrogen fertilizer. Nitrogen is an expensive input both in developed and developing countries. Genotypes vary in response to nitrogen fertilizer. Grain yield of sorghum can be dependent on nitrogen response. However, the information on nitrogen use efficiency (NUE) of genotypes is limited.

Objectives

- To determine the response of sorghum genotypes (hybrids and inbred lines) to nitrogen fertilizer; and
- To quantify genotypic difference in NUE.

Materials and Methods

- Field experiments were conducted in three locations (Hays, Ottawa and Manhattan, Kansas) in 2010.
- The experimental design was a randomized complete block design with a split plot arrangement with four replications. The main plots were assigned to three N regimes: control (no inorganic N), half recommended rate (45 kg N ha⁻¹) and optimum recommended rate (90 kg N ha⁻¹). The subplots were assigned to six hybrids and six inbred lines. Plot size was 6.1 m x 3.0 m. There were four rows per plot spaced at 76 cm.
- Soil samples at a depth of 0-15 cm and 0-60 cm were taken before planting. Planting was done in May and June across all the locations and nitrogen fertilizer (urea, 46%) was applied at emergence.
- Data on biomass was measured at three growth stages (vegetative, flowering and maturity) and grain yield was measured at maturity.
- Nitrogen concentration in the grain and components of NUE (uptake, utilization, N recovery, nitrogen harvest index (NHI) and total NUE) were determined at Ottawa and Manhattan.
- N Uptake efficiency = N uptake / Total N supply
- N Utilization efficiency = Grain weight / Total N uptake
- Percent N recovery = [uptake (fertilized plot) – N uptake (un-fertilized plot)] / [N applied] * 100
- N efficiency of use = Grain weight / Total N supply
- Nitrogen harvest index (NHI) = Grain N / N uptake
- Data was analyzed using SAS version 9.1 with GLM at an alpha level of 0.05. For significant variables, mean separation was accomplished using LSD test.

(results and discussion continues...