K A N S A S

Phosphorus Benefits Grain Sorghum on Acid Soils

By R.E. Lamond, A.J. Suderman, D.A. Whitney, S.R. Duncan and T.L. Wesley

Kansas and Oklahoma research has demonstrated the need for liming for wheat production on acid, high potassium chloride (KCl) extractable aluminum (Al) soils by increasing soil pH and reducing exchangeable Al levels. Banding P with the seed has also been shown to be an effective management alternative for improving wheat production when liming is not possible, even on very high P testing soils. Banded P forms complexes with Al, taking the Al out of soil solution, lowering the toxicity to plants and allowing plants to grow in acid soils where acidity may be largely confined to surface soil layers. The Kansas and Oklahoma research showed that wheat variety selection was also critical, because considerable differences exist among varieties in their tolerance of Al toxicity.

When liming is not possible, banding phosphorus (P) with grain sorghum seed at planting is an effective short-term management option on acid soils even with very high P soil tests.

Research was initiated in Kansas in 1995 to evaluate liming and P fertilization to improve grain sorghum production on acid, high KCl-extractable Al soils. Responses in the first two years have mirrored those observed earlier with wheat.

Results are summarized in **Table 1**. Lime responses were variable in 1995. Lime was applied only 10 days prior to planting, with minimal incorporation. Banded P responses occurred across all lime rates. Banding 35 lb P_2O_5/A with the seed at planting increased grain yield and test weight and reduced grain moisture at harvest even though Bray-1 P soil test was very high. Banded P reduced concentrations of soil Al. The site had a soil pH of 4.6, KCl-extractable Al of 55 parts per million (ppm), and a Bray-1 P level of 47 ppm.

TABLE 1. Phosphorus is highly effective in increasing grain sorghum yields on acid soils.

Lime rate, lb ECC/A	P_2O_5, lb/A	Yield, bu/A 1995	Yield, bu/A 1996	Grain moisture,[1] %	Test weight,[1] lb/bu
0	0	72	39	15.2	57
0	35 Band	106	45	11.6	61
5,000	0	75	52	14.5	58
5,000	35 Band	106	59	11.7	61
10,000	0	85	61	13.9	58
10,000	35 Band	110	61	11.7	61
LSD (0.05)		17	8	2.6	2

[1]Grain moisture and test weight data are for 1995 only.

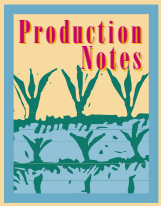
The 1996 yields were low for all treatments due to dry weather conditions during the growing season. Even under dry conditions in 1996, response to banded P occurred only where no lime or the 5,000 lb effective

GRAIN SORGHUM, like wheat, responds to starter P on acid (pH 4.6), high P soils. Plants on the right received 35 lb P_2O_5/A banded in direct seed contact. Banded P helps lower Al toxicity in the vicinity of the seedling.

calcium carbonate (ECC)/A rate had been applied.

A companion study recorded large differences in the performance of grain sorghum hybrids under these acid soil conditions. BC

The authors are with Kansas State University, Manhattan, KS.



Fescue Needs Phosphorus

Fertilizing with phosphorus (P) in early March can significantly boost tall fescue production and reduce chances of grass tetany, a paralyzing disease of cattle.

University of Missouri research shows 25 lb/A of P applied during the first week in March increases tall fescue production by more than 1,000 lb/A at the first cutting in mid May.

Also, the forage is higher in quality in terms of more magnesium (Mg), calcium (Ca) and P for grazing animals. In other words, the fescue is no longer tetany-prone.

About two-thirds of Missouri forage acres have problems with low-P soils. Based on soil test data, more than 60 percent of these pastures need P fertilization in order to increase hay yield by 1,000 lb/A. With tall fescue hay worth $40/ton, this effort is worth more than $140 million to producers in the state in terms of fescue yields, plus the reduction in grass tetany disease.

The complex set of problems associated with grass tetany usually boils down to low Mg and Ca in the diet of cows in the late winter and early spring. Laboratory research revealed that the P concentration around the roots was a major factor in controlling the uptake of Mg and Ca into grass plants. Further work in the greenhouse showed uptake of these two important nutrients and their movement from roots to leaves was dependent on the P nutrition of the plant.

Field studies showed that the addition of 25 lb/A of P resulted in significant increases in Mg and Ca concentrations of tall fescue leaf blades in late March and throughout April. BC

Source: Dr. Dale Blevins, Professor of Agronomy, College of Agriculture, Food and Natural Resources, University of Missouri, Columbia. This research was supported in part by PPI and the Foundation for Agronomic Research (FAR).