k-state extension AGRONOMY e-Updates

Number 65
January 19, 2007

1. Foliar potassium on irrigated soybeans

Potassium (K) deficiency has become more common on soils under reduced tillage systems. The cooler soils under reduced tillage interfere with plant root growth, nutrient availability in soil, and nutrient uptake. Potassium uptake by roots and K diffusion in the soil both occur more slowly in cooler soils. Potassium availability is also reduced by dry soil conditions and where there are zones of soil compaction.

Soybeans are heavy users of K, and K deficiency has occurred with greater frequency in recent years under conservation tillage systems. We conducted a series of tests in 2004 and 2005 at the Irrigation Experiment Field near Scandia to find out if K applied as a starter, either alone or in combination with foliar applications, would increase yields of irrigated, ridge-till soybeans.

This test was done on a Crete silt loam soil that had been in a ridge-till system since 1984. Potassium deficiencies had been observed in this area before the test was begun. The exchangeable K in the top 6 inches of soil was 280 ppm, the soil pH was 6.5, and the organic matter level was 2.5 percent.

Treatments consisted of liquid K (Trisert-K+) applied alone as a starter, 2 inches to the side and 2 inches below the seed; liquid K applied as a starter in combination with various foliar applications; and liquid K applied only as a foliar application, at various growth stages (listed in the chart below). Trisert-K+ is a liquid product that contains 2.34 lb K_2O, 0.58 lb nitrogen, and 1.55 lb sulfur per gallon. The soybeans in this test were furrow-irrigated, so the foliar applications were applied with a backpack sprayer.

All the K fertilizer treatments increased soybean yields. The treatments also increased whole-plant K concentrations (data not shown). Yields were maximized with either the combination of starter plus an application at the R3 (early pod) stage; or two foliar applications at the 5 gpa rate, one at V5 and one at R3. The preplant broadcast application

was not as effective as starter plus foliar-applied K. The maximum demand for K by soybeans occurs at full bloom, so it is not surprising that foliar applications at the V5 and R3 stages would benefit yields more than a preplant broadcast or starter application alone.

Making a foliar application of K is probably feasible only for ridge-till or no-till soybeans under sprinkler irrigation, where the yield potential is high and the fertilizer can be applied through the pivot. Otherwise, it is difficult to make a foliar fertilizer application at that stage without damaging the stand. For soybeans under pivot irrigation and in a conservation tillage system, applying K as a starter and foliar treatment may be profitable even at soil K test levels are not low. If using K as a starter, it should be applied in a band to the side of the seed. Producers should not apply any starter fertilizer containing N or K in direct contact with soybean seed.

Potassium Fertilizer Effect on Irrigated, Ridge-till Soybeans: North Central Experiment Field

		Yield (bu/acre)	
Trisert-K+ treatment timing	Application rate (gallons per acre)	2004	2005
None	--	69.5	70.1
Preplant broadcast	5	83.1	74.2
Starter	5	85.3	78.0
Starter + R3	5 + 2.5	**90.7**	**88.6**
Starter + R3	5 + 5	**92.9**	**90.8**
V5	2.5	75.5	75.9
V5	5	81.6	75.9
R3	2.5	84.9	76.5
R3	5	85.6	78.6
V5 + R3	2.5 + 2.5	89.3	86.2
V5 + R3	5 + 5	**91.8**	**90.1**
V5 + R3 + R4	2.5 + 2.5 + 2.5	**91.5**	87.6
LSD		2.5	2.2

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2. Mullein control in pastures and rangeland

Common mullein is one of the more unique broadleaf weeds found at times in Kansas. It has distinctive large, gray, woolly leaves. As a biennial, it emerges and forms a rosette in fall and early spring, then shoots up a bolt in May or June that can get as much as 6 feet tall or more, topped by a dense spike covered with yellow flowers. Its growth habit

closely follows that of musk thistle, and the two may be able to be controlled together with the same treatment.

Common mullein is primarily a weed of pastures, hay fields, roadsides, right-of-ways, and abandoned areas. It is found throughout the United States except for the upper Great Plains. In Kansas pastures and rangeland, mullein occurs in areas that have been abused through overgrazing or neglect, or under drought stress. It also prospers on dry, poor upland soils: clay, gravelly, or even stony ground. It is very drought tolerant. A good stand of grass can outcompete mullein, and this is the most effective control strategy.

It spreads from seeds that are undigested and scattered by birds. Cattle will not eat mullein, so it should not be allowed to overtake a significant area of any grazingland. Burning will probably not control mullein. It is unknown whether mowing can kill it or keep it from spreading.

We tested several herbicides on an infestation of mullein in Smith County last year. These herbicides were applied in April, on rosettes, before the plants had bolted. We have not yet tested fall herbicide applications on mullein in Kansas.

Mullein Control, Smith County, Kansas: Herbicides Applied April 21, 2006 on Rosettes		
Treatment	Rate	% Control 101 days after treatment
ForeFront	2 pt/A	99
Metsulfuron*	0.25 oz/A	93
Milestone	5 oz/A	93
Metsulfuron + Weedmaster	0.25 oz/A + 1 pt/A	90
Grazon P+D	2 pt/A	84
Surmount	2 pt/A	83
Overdrive	4 oz/A	81
Weedmaster	2 pt/A	77
Remedy	1 pt/A	76
PastureGard	2 pt/A	75
Tordon 22K	0.5 pt/A	74

* Metsulfuron is sold for use on rangeland and pasture as Cimarron or Escort XP

These treatments included a nonionic surfactant at the rate of 0.25 percent v/v. This is probably necessary to enhance herbicide uptake and improve control of mullein.

One of the most cost effective spring treatments for mullein control in the rosette stage is metsulfuron at the rate of 0.25 oz/acre, which costs about $5 per acre for the chemical. This chemical will also provide good control of musk thistle if applied in April. In May, it is probably best to use 0.20 oz/acre metsulfuron combined with 2 pts/acre of 2,4-D if both mullein and musk thistle are present.

Metsulfuron is ineffective on these weeds if applied in the fall, however. For fall treatments, it is best to apply a herbicide containing picloram.

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These e-Updates are a regular weekly item from K-State Extension Agronomy. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader
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