Influence of pH on Carryover of Triketone Herbicides in Missouri No-till Corn and Soybean Rotations

Missouri Fertilizer and Lime Council

Progress Report, 2008

Investigators:

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Accomplishments in 2008:

- Lime and iron sulfate applications were made in late winter/early spring to maintain the desired range in soil pH levels. The soil pH treatments in this experiment are: 1) high lime, 2) low lime, 3) high acid (iron sulfate), 4) low acid (iron sulfate), and 5) 'no amendment' (limed just enough to maintain initial pH). Lime was applied to the 'high lime' plots and iron sulfate was applied to the 'high acid' plots. These applications were made based on the fall 2006 pH in each plot, as these plots had been maintained with varying soil pH levels at the Bradford Research and Extension Center for a number of years. A small lime application was also made to the 'no amendment' treatment (the first in 9 years) to counteract the acidifying effect of nitrogen fertilizer over that span and return the treatment to its original pH.
- One-half of the research area was no-till planted into corn while the other half of the research area was no-till planted into soybeans. Due to poor planting conditions that were experienced throughout the spring, corn was not able to be planted until May 15th, approximately 4 weeks behind normal planting for the Columbia location. The experiments were arranged in a split-plot design with four replications of four herbicide treatments and five soil amendment treatments/pH ranges. Soon after corn planting, a preemergence application of Dual II Magnum® (*S*-metolachlor) was made to reduce early season weed competition and reduce overall weed pressure. Dual II Magnum® is also labeled for use in soybean, thus there is no chance of carryover injury to soybean in 2008 as a result of applications of this herbicide. A Roundup Ready® corn and soybean hybrid was also utilized in these experiments in order to keep all plots weed-free throughout the season with applications of glyphosate (Roundup®).
- Herbicide treatments evaluated for carryover potential in 2009 were applied on June 21st to corn that was 29- to 30-inches tall. The herbicide treatments applied to each soil amendment treatment were 1) Callisto® at 3 fluid ounces per acre, 2) Impact® at 0.75 fluid ounces per acre, 3) Laudis® at 3 fluid ounces per acre, and 4) an untreated control.
- Unfortunately, a severe error was made soon after soybean emergence which eliminated any possibility of determining carryover injury to soybeans from the 2007 herbicide applications. Due to an error made in the mixing lab, all soybeans received an application of a non-labeled herbicide that killed all soybeans in this half of the 2008 experiment. As explained below, we are requesting a no-cost extension of this grant for one additional growing season in order to provide the results agreed to initially.

- Corn was harvested from all plots with a small plot combine and grain yields determined. Corn yields were taken in this set-up year in order to determine the response of corn to the varying soil pH's that have been established, but evaluating corn yield response to pH is not really a primary objective of this research. The soybean yields that will be collected over the course of the next two seasons in response to each herbicide and pH level will be one of the primary objectives of this research. The following table provides the 2008 corn yield results:

	Yield[a]	
Treatment	Corn	Soybean
	---------- Bu / A ----------	
Low Lime (avg. pH_s 6.6)	106 a	----
High Lime (avg. pH_s 7.1)	115 a	----
Low Acid (avg. pH_s 5.0)	113 a	----
High Acid (avg. pH_s 4.3)	111 a	----
No Soil Amendment (avg. pH_s 5.9)	109 a	----

[a]Means followed by the same letter are not different, $P \leq 0.05$.

Objectives for 2009:

- All corn plots from 2008 will be rotated into soybeans. A Roundup Ready® soybean variety will be no-till planted and early-season soybean stunting and injury in response to the previous corn herbicide treatments and pH levels will be evaluated visually and by measuring the heights of soybeans in response to each treatment. All soybean plots will be maintained weed-free throughout the season and yields determined.
- Conversely, all soybean plots from 2008 that were inadvertently killed with the corn herbicide treatments will be no-till planted with corn and the same four triketone herbicide treatments discussed previously will be applied to plots having the variation in soil pH values. As in the first year experiments, corn will be harvested and grain yields determined. Then, we are proposing a no-cost extension of this project in order to plant soybeans into these plots in 2010 and evaluate any carryover injury in the same manner as discussed previously. In this manner, we will still be able to provide two years of data pertaining to soybean carryover injury response to these herbicides and pH ranges as initially proposed.

Budget Request for 2009:

Category	2007	2008	2009	Total
Salary				
Research Associate (20% in years 1 & 2, 10% in year 3)	12,000	12,000	6,000	30,000
Fringe Benefits (31%)	3,720	3,720	1,860	9,300
Materials and Supplies (seed, stakes, herbicides, etc.)	1,000	1,000	500	2,500
Soil Analyses	800	800	800	2,400
Total	$17,520	$17,520	$9,160	$44,200