



Liming Raises Soil pH and Increases Winter Wheat Forage Yields

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Soils in the central Great Plains have become severely acidic due to intensive crop production. As many as 39% of the wheat fields had a soil pH less than 5.5. Remediation of soil acidity is needed for those fields to sustain normal crop yields. A field study was conducted in Garber to investigate the effects of liming on soil pH, soluble aluminum (Al), and the forage and grain yields of a Tonkawa winter wheat. The initial pH of the field was 4.5. The calibrated full lime rate to raise the pH to 6.8 for this soil is 2.5 tons/acre (we call it X rate) effective calcium carbonate equivalent (ECCE), and $\frac{1}{4}$ of that is recommended for continuous wheat production in Oklahoma. The test plots were established on July 10, 1997 under conventional tillage. Seven lime rates were used: 0 (no lime), 1/16X, 1/8X, 1/4X, 1/2X, X, and 1.5X ECCE. Soil samples were taken periodically for measuring pH and plant nutrients. Wheat forage was harvested in December of 1997, 1998, and in January, 2000.

Soil pH was monitored for over 850 days from the beginning of the study. The average soil pH of four replications for each of seven lime rates is plotted with time in Figure 1. In general, soil pH increased as lime rates increased. The increase of soil pH was the fastest during the first 3 months. Slight further increase in pH took place 3 mo. after lime incorporation with some seasonal fluctuations. The change of soil pH was more rapid than farmers might expect due to the thorough

incorporation and heavy rain occurred immediately after lime application. One quarter (1/4X) of the normal lime rate required to raise pH to 6.8 raised soil pH to almost 5.0 in the first two weeks and then it slowly increased to a stable level (5.5) in the following three and half months. Slight pH increase in the control plot was observed probably due to lime contamination from the treated plots. Soil pH remained at the raised level during the entire study period (850 days) without signs of decrease.

The average of three years' forage yields was plotted with lime rates in Figure 2. Wheat forage yields increased with lime rates up to the half rate (1.25 tons/acre). Forage yields increased by 53% from the control to the half lime rate. This increase of forage is significant for wheat farmers with cattle production since most farmers in the central Great Plains use winter wheat for grazing during the winter and spring or for grazing and grain dual production. However, the impact of lime on forage yields of aluminum tolerant wheat varieties may be different from Tonkawa used in this study, which is an acid susceptible variety.

Liming can increase soil pH, decrease soluble Al in soils, and improve wheat forage yields, but it takes time for lime to react with soils. Now is the time to find out the soil pH in your field and plan liming for your summer and winter crops.

Figure 1. Soil pH changes with time after lime was applied.

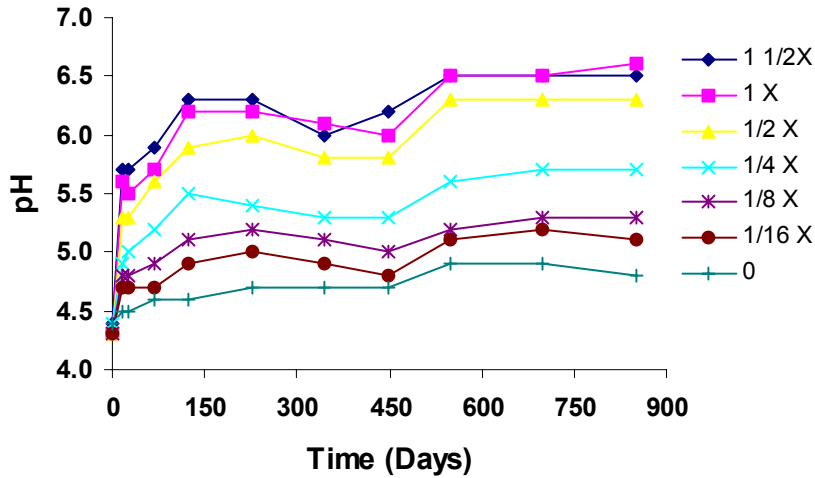
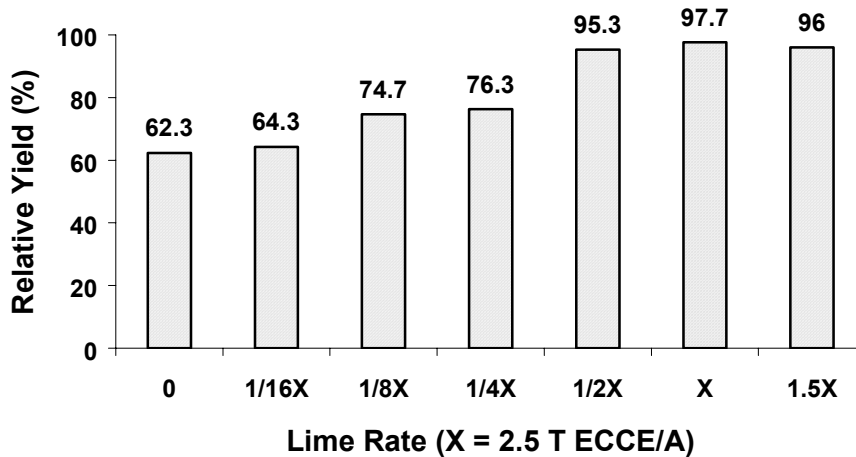


Figure 2. Winter wheat fall forage yields as affected by lime rates (the 100% yield was 2,290 lbs./acre).



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