Title: Using Dolomitic Limestone and Timing of Phosphorus Fertilization to Maintain High Leaf Phosphorus and Magnesium Concentrations in Stockpiled Fescue During the Winter

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Objective: to maintain high phosphorus (P) and magnesium (Mg) concentrations in tall fescue leaves in late winter by using dolomitic limestone (Mg source) and the correct timing of P applications. The dolomitic limestone should provide more soil Mg and the (timing) application of half of the P fertilizer during winter months may boost leaf Mg concentration during these months.

Procedures: A K31, endophyte-infected, established tall fescue pasture was selected at the Southwest Center near Mt. Vernon, MO. Soil samples were collected in June and analyzed by the University of Missouri Soil Testing Laboratory (Table 1). The soil pHs for this plot area was below 6.0 and the Bray I P levels were 10 lbs/acre or lower. The Bray 2 levels were also extremely low. The soil Mg levels were in the medium range, according to the University of Missouri Soil Testing Laboratory. These soil test results are very typical of tall fescue pastures used in much of the state.

In mid-July, forage was cut and removed from the plot area. Plots were established with the following dimensions: 10' x 25' with 5' alleys. On July 19, dolomitic limestone (ENM = 467 & EMG = 137) was applied to specific plots at a rate of 0 or 2000 lbs/acre (Fig. 2). During late August, forage was harvested and removed from the plot area and, on September 7, 100 lbs N/acre (as urea) was applied to all plots. In mid-September, a total of 25 lbs P/acre was applied to the September P treatment plots and all other P treated plots were treated with 12.5 lbs P/acre, as 0-46-0, Then in October, the October plots were treated with their remaining 12.5 lbs P/acre, and in November and December, those specific P-treated plots received their remaining 12.5 lbs P/acre. January and February plots were treated with their final 12.5 lbs/P acre in 2008. Starting in October 2007, 20 of the most recently collared leaves from each plot were harvested monthly. Leaf samples from the September through December harvests are currently dried and are in the process of being ground, digested in nitric acid in our microwave digestion system, diluted, filtered and analyzed for macro- and micronutrient concentrations by ICP.

Results: Just a reminder that the key treatments in this study involve applying one-half of the P fertilizer (12.5 lbs/acre) in September and the other half (12.5 lbs/acre) in one of the months of the stockpiling season. The September treatment (a control treatment) received all 25 lbs P/acre in September. The split P applications in Nov and Dec were best for increasing leaf P concentrations form Jan through Mar (Fig. 1). The split application in other months also increased leaf P concentrations, but not as effectively as the Dec treatment. The Dec split P application was best for increasing leaf Mg concentration in Feb and Mar (Fig. 2). Interestingly, all of the P treatments ere effective at decreasing leaf K concentrations in Feb and Mar (Fig. 3). High leaf K concentration combined with low leaf Mg and Ca concentrations are considered important factors contributing to the cause of grass tetany in beef cows. Dolomitic limestone application was not very effective in increasing Ca concentrations of stockpiled tall fescue leaves in this study (Fig. 4). However, split P applications made from Oct through Feb were effective in increasing leaf Ca concentrations in late winter. All of the leaf Ca concentrations were about the 0.3% required in the diet of a lactating beef cow.

Summary: The design of this experiment was based on results that we observed on a poultry litter experiment where we used an equivalent amount of fertilizer applied in three installments to mimic the slow release of nutrients from litter. A Dec fertilizer treatment in that experiment increased leaf P in Jan

and Feb. Our hypothesis was that Dec P treatments might also increase leaf Mg concentrations, based on other research that we have done linking P fertilization with Mg uptake. Indeed this was the case in the present experiment, where the Dec treatment with 12.5 lbs P/acre increased leaf Mg concentration in Feb and Mar, and all P fertilization treatments increased leaf P concentrations each month of the study. In addition, the P application increased leaf Ca and lowered leaf K concentrations. In putting all of these results together, the macronutrient quality of the forage should be improved by the Dec application of P.

In summary, it looks as thought Dec P fertilization is good for improving forage quality of stockpiled tall fescue in late winter months.

Figure 1. Leaf P concentrations of stockpiled tall fescue following liming with dolomitic limestone and split P fertilization applications. Note that the December P fertilization split was best for increasing leaf P concentrations in late winter months.

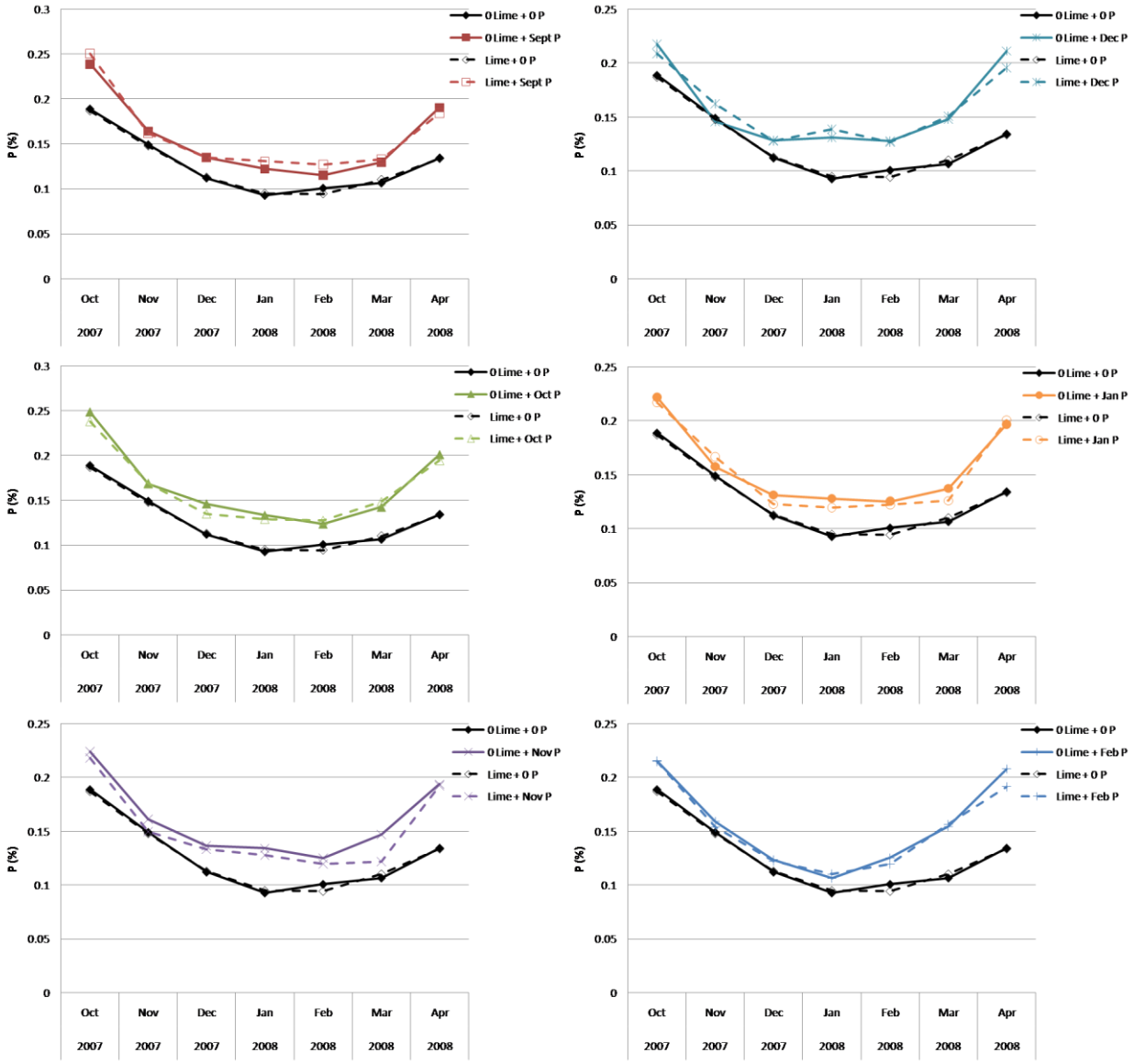

Figure 2. . Leaf Mg concentrations of stockpiled tall fescue following liming with dolomitic limestone and split P fertilization applications. Note that the December P fertilization split was best for increasing leaf Mg concentrations in late winter months.

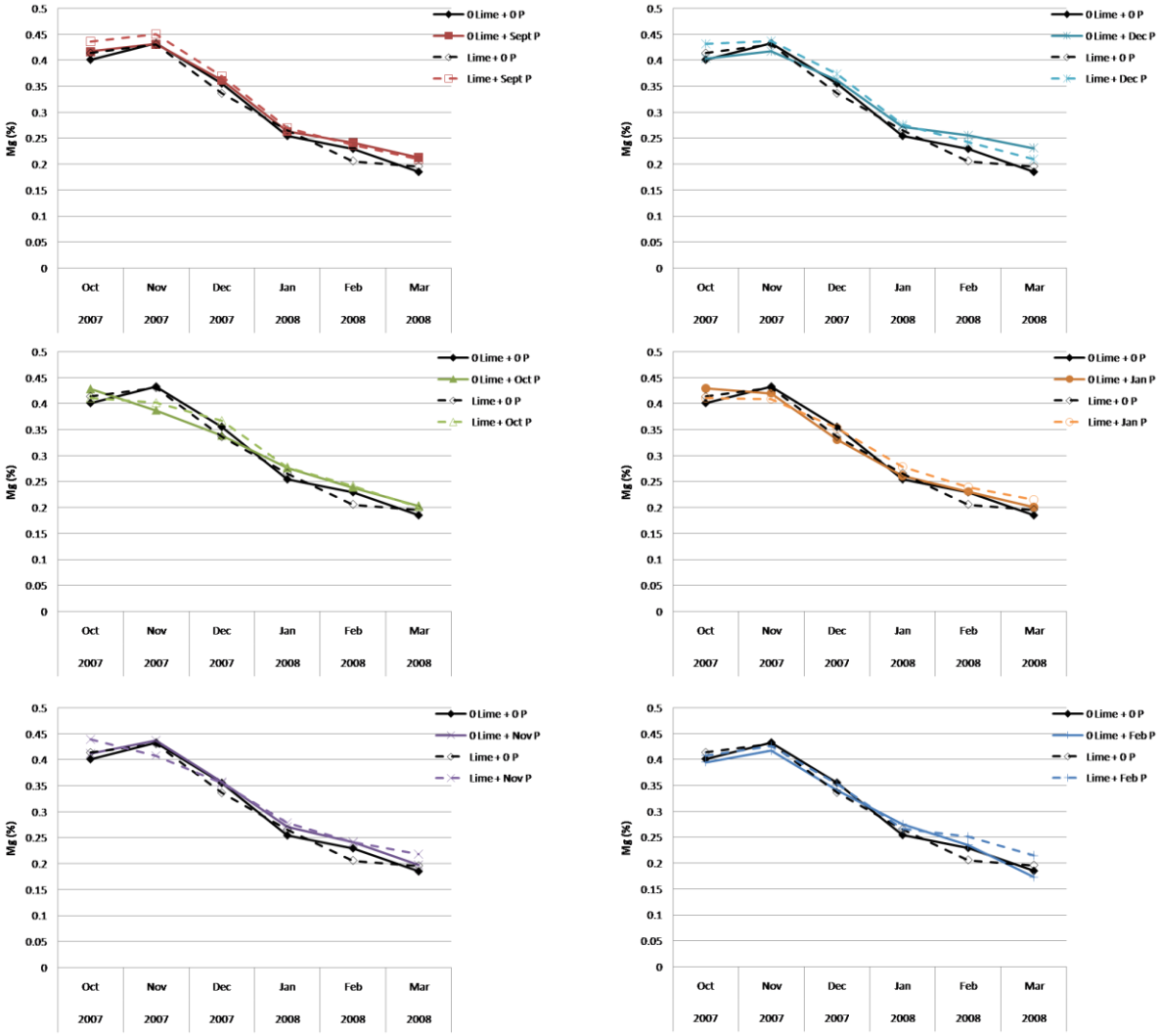

Figure 3. . Leaf K concentrations of stockpiled tall fescue following liming with dolomitic limestone and split P fertilization applications.

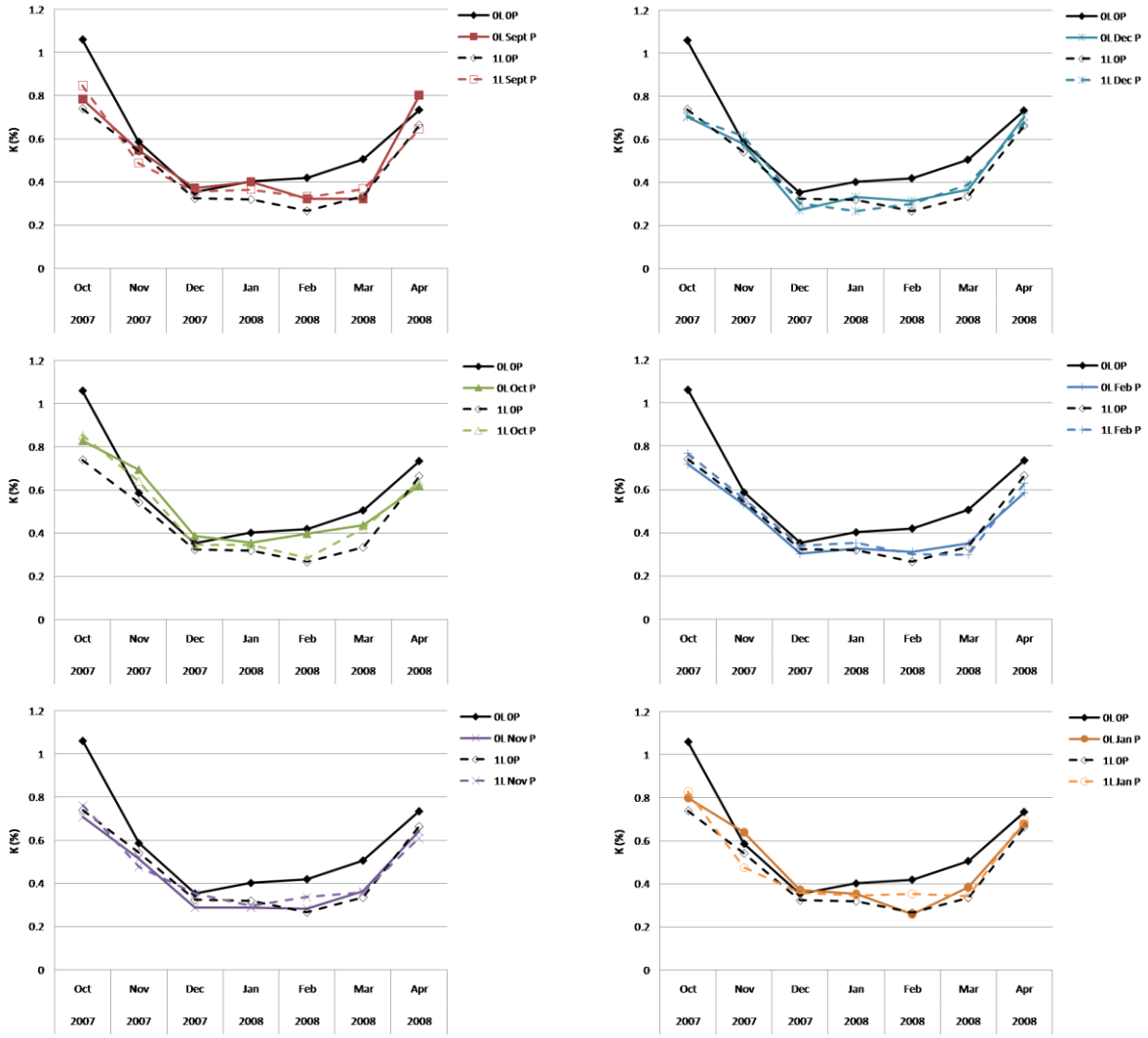

Figure 4. . Leaf Ca concentrations of stockpiled tall fescue following liming with dolomitic limestone and split P fertilization applications. Note that the December P fertilization split was a little better for increasing leaf Ca concentrations in late winter months.