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Yield and Forage Quality on Native Meadows as Affected by Burn and Fertilization Management

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Cover Page Footnote

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Yield and Forage Quality on Native Meadows as Affected by Burn and Fertilization Management

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Summary

Native meadows are widely used by producers in southeast Kansas. However, there are few studies about management practices to improve agronomic performance in southeast Kansas. This study evaluated the spring burn effect combined with the application of lime, nitrogen, phosphorus, and potassium on yield and forage quality in native meadows. Yield and forage quality on native meadows were not affected by lime application, or P and K fertilization in the first year of the study. However, N fertilization increased yield, crude protein, and total digestible nutrients when associated with spring burn.

Introduction

In southeast Kansas, native meadows are an important forage source (hay or grazing) in livestock systems. However, native species are known for low yield potential and forage quality due to soil and plant limitations. An alternative to improve production and, especially, forage quality is to burn the pasture in the spring to remove old plant materials and stimulate a new flush of tillers. Combining prescribed spring burning with lime or fertilizers applications may contribute to improving soil fertility, resulting in greater forage production to feed cattle.

This research studied combinations among spring burn, lime application, and N, P, and K fertilization aiming to improve yield and forage quality on native meadows.

Experimental Procedures

The study was conducted at the Southeast Research and Extension Center in Parsons, KS. The native meadow soil is a Parsons silt loam with pH = 5.2, P = 2.4 ppm, and K = 61.0 ppm.

The experimental design was a randomized complete block with a split-plot arrangement. In the plots (30 × 40 ft), treatments were combinations between prescribed spring burn or not; and 0 or 30 lb/a of N (N0 and N30); and in the sub-plots (10 × 30 ft), lime, P, K, and a control (without any application). The lime rate was 2200

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lb/a, and P and K were 30 lb/a. On October 18, 2021, half of the lime rate (1100 lb/a) was applied. On April 19, 2022, prescribed spring burn plots were burned, and on April 25, 2022, the rest of the lime (1100 lb/a) was applied. On May 6, 2022, N, P, and K were applied in their respective subplots.

To measure forage yield, on July 8, 2022, a flail harvester (Carter) was used to sample a 3 × 25 ft area in each subplot. All collected forage was weighed fresh, and a 1-lb subsample was taken, dried at 130°F in a forced-air drying oven to constant weight, and weighed. The dried sub-samples were sent to the laboratory for crude protein (CP) and total digestible nutrients (TDN) analyses. Forage yield was multiplied with CP to calculate crude protein yield (CPY).

Results and Discussion

The application of lime, P, and K did not increase forage yield when compared to the control (Figure 1a). Similarly, lime, P, and K did not improve forage quality (CP and TDN) in native meadows (Figures 1b and 1c) and, consequently, CPY was similar among treatments (Figure 1d).

On the other hand, N fertilization and burning affected the yield and forage quality. When the meadow was burned in the spring, all plant materials were eliminated, and new tissues were grown. For this reason, the forage yield was lower than when the meadow was not burned (Figure 2a). Forage yield was 31 and 20% higher in the no burn/N0 and no burn/N30, respectively, when compared with the burned meadows.

Although the yield was higher when the meadow was burned, the forage quality in these treatments was lower, mainly with no N fertilization. The CP and TDN were 10 and 14% higher in the N0/spring burn, respectively (Figures 2a and 2b). Thus, it is important to understand the trade-off between yield and forage quality to decide if the goal is to produce high-yield or high-quality hay.

The N input increased forage yield, but this effect was greater in the burned meadows. When the meadow was not burned, the fertilization with 30 lb N/a increased by 325 lb/a while in the burned meadows, the yield was increased by 555 lb/a (Figure 2a). This difference occurred because the new tillers that would most benefit from N were shaded by the old tillers when the meadow was not burned. Thus, spring burning can reduce or eliminate the accumulated dead plant material as well as the weeds, favoring the use of N by the new tillers, mainly warm-season grasses. Therefore, the N response will be greater when combined with spring burning on native meadows.

Nitrogen also affected forage quality, improving CP and TDN concentrations (Figures 2b and 2c). Because of the increased yield and CP, the CPY was also enhanced by N fertilization. The fertilization of 30 lb N/a increased CPY by 44 or 73 lb/a more than the CPY when the meadow was burned or not, respectively (Figure 2d).

Conclusions

In the first year of this study, the application of lime, P, and K does not improve yield and forage quality on native meadows. Nitrogen fertilization improves yield, CP, and TDN when associated with spring burning. The no-burn meadow produces higher yield

but TDN and CP are lower. Therefore, the decision regarding the spring burn depends on whether the goal is to improve tonnage or quality in the native meadow. The trial will be repeated in 2023.

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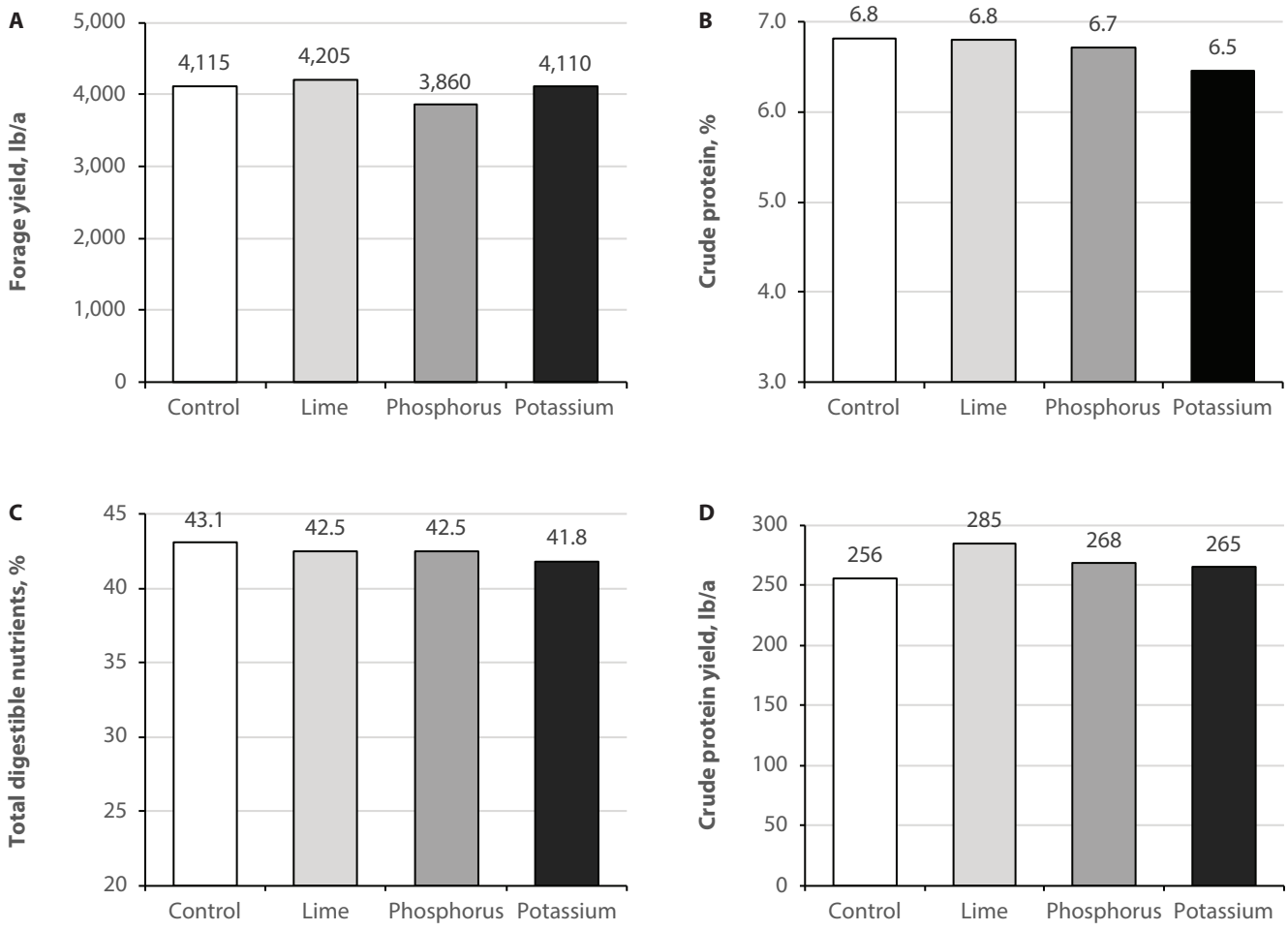

Figure 1. Lime application, phosphorus, and potassium fertilization effects on forage yield (a), crude protein (b), total digestible nutrients (c), and crude protein yield (d) on native meadows in Parsons, KS.

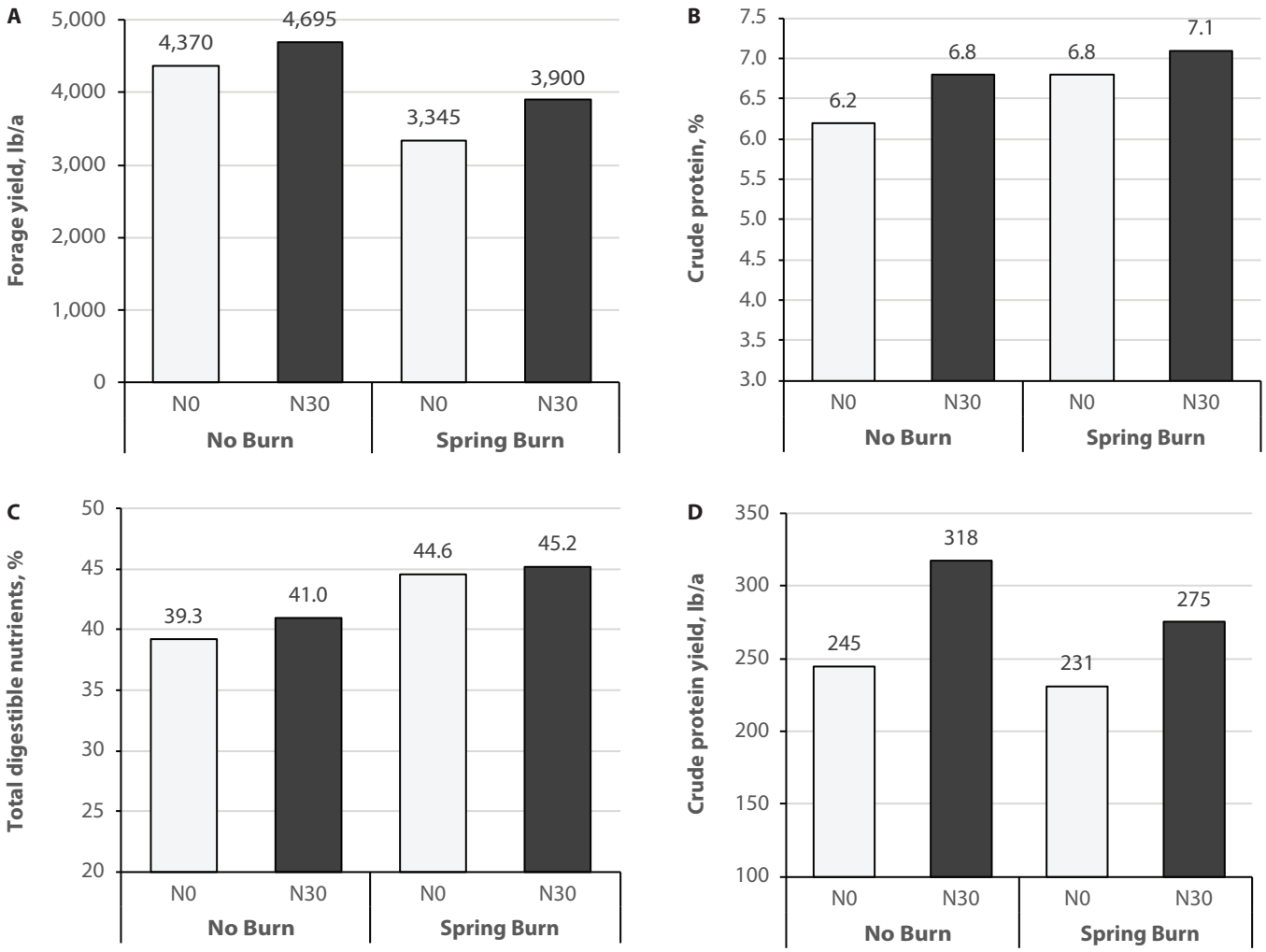

Figure 2. Nitrogen fertilization and spring burn effects on forage yield (a), crude protein (b), total digestible nutrients (c), and crude protein yield (d) on native meadows in Parsons, KS.