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Impact of Stubble Heights on Native Hay Meadows in Southeast Kansas

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Impact of Stubble Heights on Native Hay Meadows in Southeast Kansas

Cover Page Footnote

This work was supported by Montgomery and Wilson County Conservation districts; the U.S. Department of Agriculture National Institute of Food and Agriculture, Hatch project 1003478; and the K-State Research and Extension Wildcat Extension District.

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Impact of Stubble Heights on Native Hay Meadows in Southeast Kansas

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Summary

Management practices affect hay production in native meadows. The objective of this study was to evaluate how stubble heights affect forage yield and quality in a native meadow. Prescribed spring burns contribute to improving forage quality. Setting the stubble height at 3 inches resulted in high forage quality and had a low impact on yield.

Introduction

In eastern Kansas, livestock production is mostly forage-based; cattle rely on pastures during the growing season but are highly dependent on hay or silage during the winter months. For that reason, harvesting hay is a very common practice in native meadows. Conversely, farmers need to consider nutrient replenishment and stubble heights to assure regrowth. In the last few decades, the lack of nutrient replenishment associated with the new mowers that can mow closer to the ground has led to overall yield reductions and weed problems.

Prescribed fire is also a common practice on native meadows, a low-cost way to control weeds and improve forage quality. Burning removes old plant material and stimulates production of new tissues, improving forage quality.

This study aims to evaluate stubble height effects on native meadows in southeast Kansas, with or without prescribed fire.

Experimental Procedures

The three sites selected for this study were native meadows at the Southeast Research and Extension Center in Parsons, and in two farms located in Coyville and Caney. The soil's chemical analyses are shown in Table 1.

In Parsons, the experimental design was a randomized complete block in a split-plot arrangement with three replications. The plots (30 × 40 ft) were burned or unburned, and the sub-plots (10 × 30 ft) were four stubble heights (1, 3, 5, and 7 inches). The spring burn plots were burned on April 19, 2022, and all plots were harvested on July 8, 2022, to determine yield and quality. In each sub-plot, forage inside two quadrats (1.6 × 3.3 ft) was sampled at their respective stubble heights. These samples were dried

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in a forced-air drying oven to constant weight at 130°F and weighed. Dried samples were sent to a laboratory for quality analyses of crude protein (CP) and total digestible nutrients (TDN). The CP concentration (%) was multiplied by forage yield to calculate crude protein yield (CPY).

In Coyville and Caney, a randomized complete block with three replications was used. The treatments applied in the plots (10 × 30 ft) were the same four stubble heights applied in Parsons (1, 3, 5, and 7 inches), but the native meadow was not burned. On July 5, 2022, the forage yield, CP, TDN, and CPY were evaluated by the same procedure used in Parsons.

Results and Discussion

Forage yield was lower in the burned native meadow than in the unburned, mainly when the stubble heights were 1, 3, and 5 inches (Figure 1a). This result occurred because all of the old material was removed from the last year's growth. However, the new tissues usually have higher CP and TDN than the old tissues (Figures 1b and 1c). The higher forage yield in the unburned plots also resulted in higher CPY (Figure 1d).

The forage yield was lower with higher stubble heights in all locations (Figures 1a, 2a, and 3a). This result was expected because stubble height will directly affect the amount of harvested forage. At shorter stubble heights, most of the dead tissues located at the bottom of the canopy were collected. Dead material has low quality, and, consequently, CP and TDN were reduced in forage harvested with shorter stubble heights. On the other hand, when the stubble height was taller, forage was predominantly composed of young leaves with higher CP and TDN (Figures 1b, 1c, 2b, 2c, 3b, and 3c). Nonetheless, even with the higher CP in the taller stubble heights management, the CPY increased as stubble height was reduced (Figures 1d, 2d, and 3d) following the same trend of the forage yield.

Based on our results, 3-inch stubble height resulted in satisfactory yield quality in all sites evaluated. Also, mowing and leaving only 1-inch stubble height is always a challenge for the plant because regrowth is delayed and as long-term management can reduce plant vigor, weed infestation can increase.

Conclusions

The forage yield and CPY are higher when native meadows are not burned. However, on the burned meadows, forage quality is higher. Harvesting with a 3-inch stubble height resulted in great forage quality and a lower impact on yields.

Acknowledgments

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Table 1. Soil chemical characteristics in the experimental area in three locations in south-east Kansas

Location	pH	Phosphorus, ppm	Potassium, ppm
Parsons	5.2	2.4	61.0
Coyville	5.8	1.1	25.9
Caney	5.8	2.1	26.6

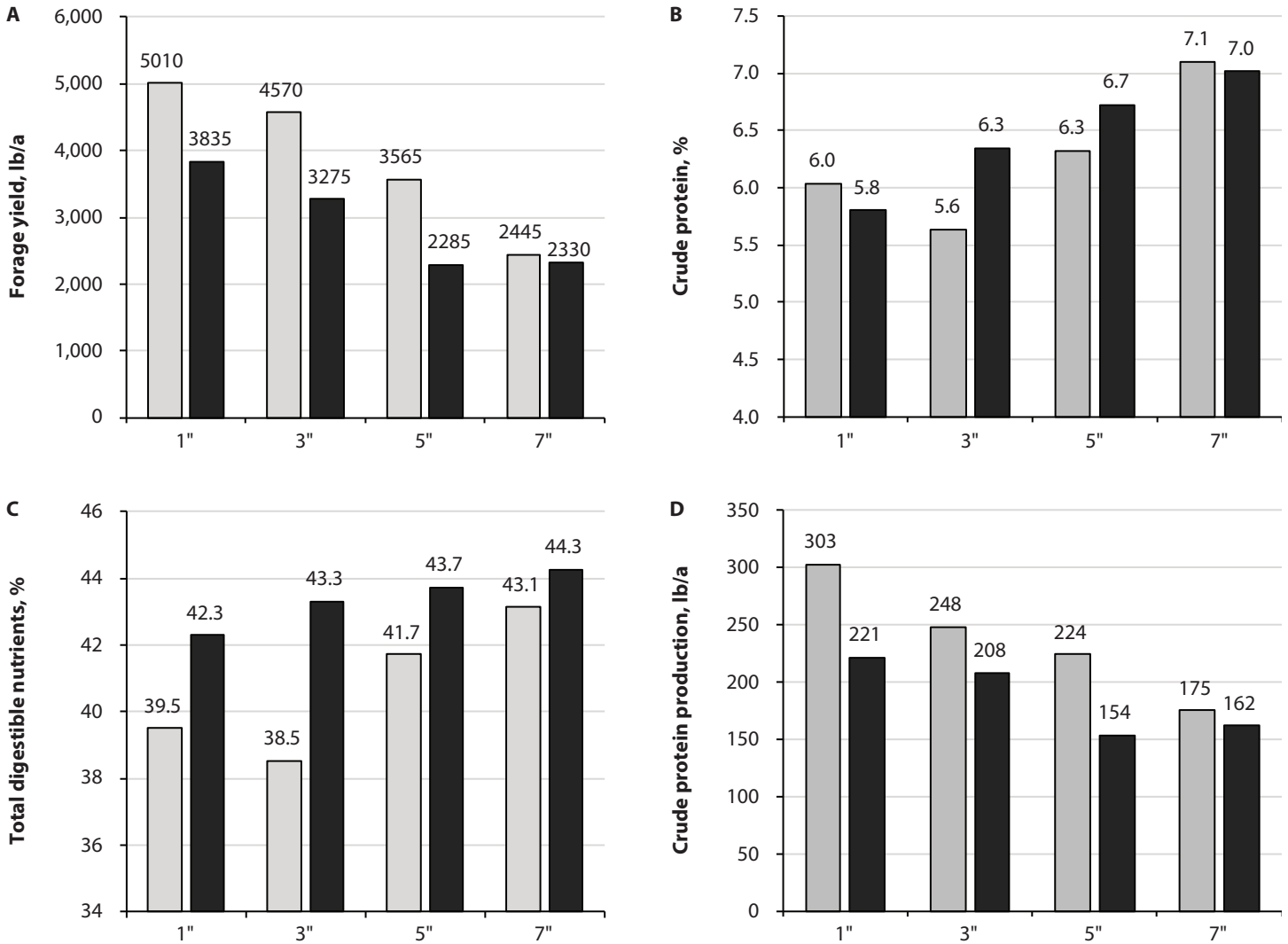


Figure 1. Spring burn and stubble height effects on forage yield (a), crude protein (b), total digestible nutrients (c), and crude protein yield (d) in native meadows in Parsons, KS.

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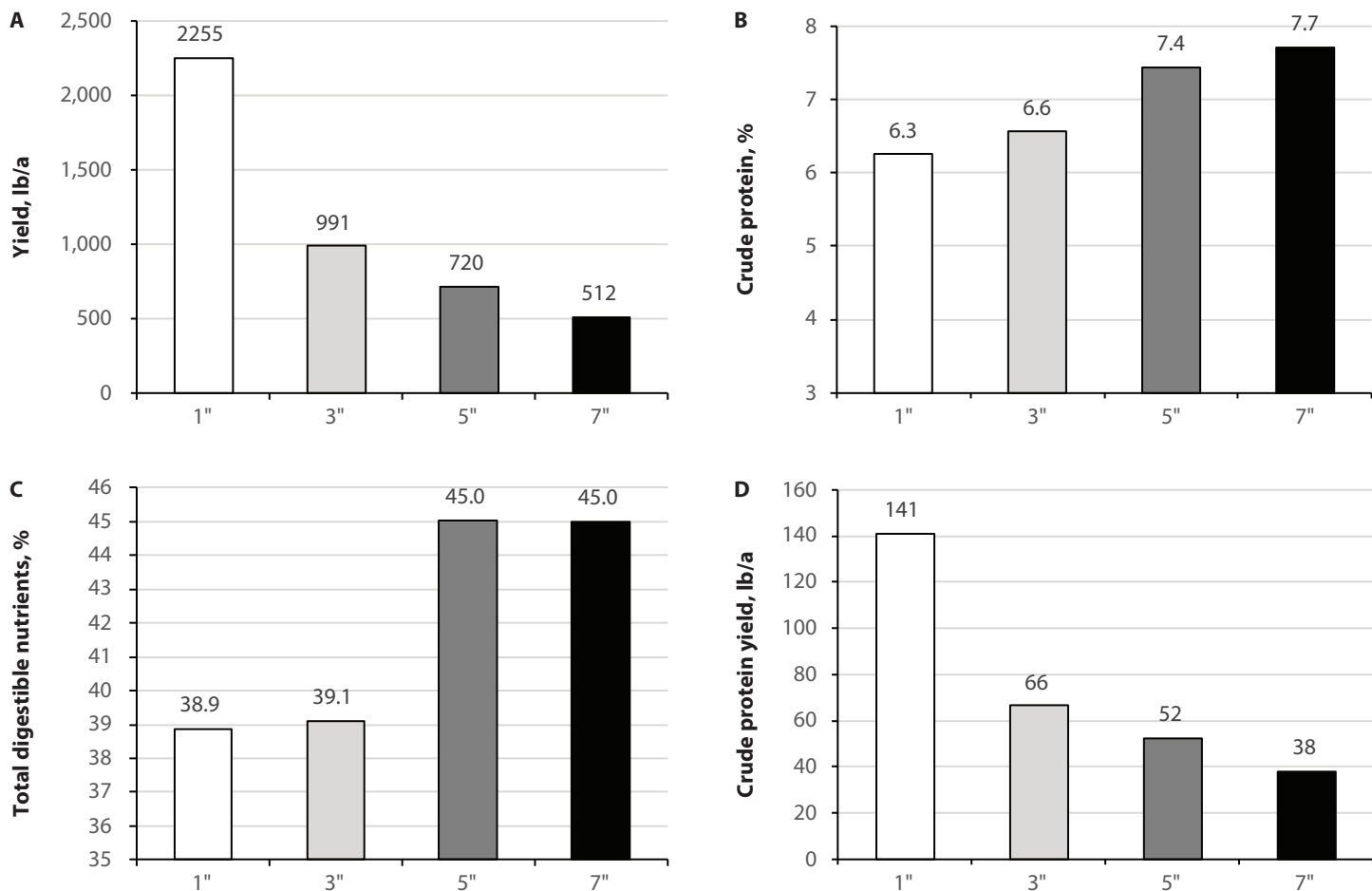


Figure 2. Stubble height effect on forage yield (a), crude protein (b), total digestible nutrients (c), and crude protein yield (d) in native meadows in Coyville, KS.

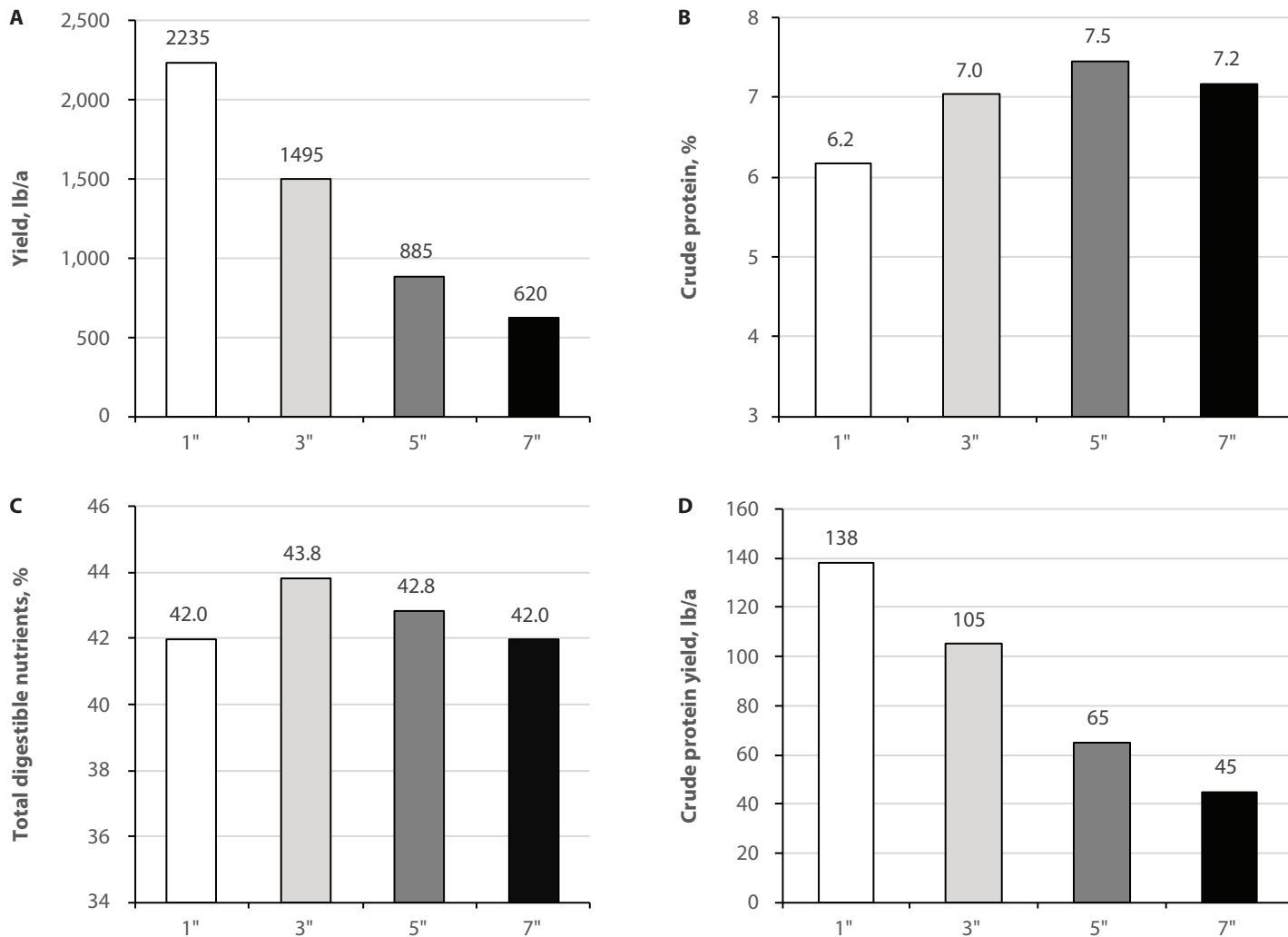


Figure 3. Stubble height effect on forage yield (a), crude protein (b), total digestible nutrients (c), and crude protein yield (d) in native meadows in Caney, KS.