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Leland James Allen

R.R. Schalles

B.E. Brent

See next page for additional authors

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Effects of late spring burning and nitrogen fertilization on nutritive values of big and little bluestem plants

Abstract

Effects of late spring burning and nitrogen fertilization on nutritive value of Big Bluestem (*Andropogon gerardi*) and Little Bluestem (*Andropogon scoparis*) on native rangeland were determined at monthly intervals during the 1972 growing season. Burning significantly decreased dry matter percentage, crude fiber, cell walls, and lignin. Fertilization did not significantly influence any of those factors except for increasing lignin slightly. Big Bluestem had significantly less crude fiber, cells walls, and lignin than Little Bluestem.

Keywords

Cattlemen's Day, 1973; Report of progress (Kansas State University. Agricultural Experiment Station); 568; Beef; Burning; Nitrogen; Big bluestem; Little bluestem

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Authors

Leland James Allen, R.R. Schalles, B.E. Brent, J.S. Woolfolk, and E.F. Smith

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Effects of Late Spring Burning
and Nitrogen Fertilization on Nutritive Values
of Big and Little Bluestem Plants

L. J. Allen, R. R. Schalles, B. E. Brent,
J. S. Woolfolk, and E. F. Smith

Effects of late spring burning and nitrogen fertilization on nutritive value of Big Bluestem (*Andropogon gerardi*) and Little Bluestem (*Andropogon scoparis*) on native rangeland were determined at monthly intervals during the 1972 growing season. Burning significantly decreased dry matter percentage, crude fiber, cell walls, and lignin. Fertilization did not significantly influence any of those factors except for increasing lignin slightly. Big Bluestem had significantly less crude fiber, cell walls, and lignin than Little Bluestem.

Introduction

Both increasing populations and per capita consumption of beef in the United States and in other countries call for new management practices to increase the carrying capacity of native rangelands.

It has long been recognized that annual late-spring burning of True Prairie rangelands stimulates beef cattle performance. Commercial fertilizers also have been used to increase production of cultivated crops but such use on native prairies has been questionable.

Reported here are how annual late-spring burning and nitrogen fertilization, separately and together, affect nutritive values of Big and Little Bluestem, two primary grass species of the True Prairie.

Experimental Procedure

The study was conducted during the 1972 growing season on native True Prairie rangeland near Manhattan, Kansas. Four pastures varied in size from 44 to 60 acres were involved.

Samples of two species of grass, Big Bluestem and Little Bluestem, were collected on loamy upland range.

One of four treatments was applied to each pasture to evaluate effects of annual late-spring burning and nitrogen fertilization on the nutritive value of bluestem grass.

Burning. Burning was April 28 with a light northern breeze. All organic matter was consumed by the fire.

Nitrogen. Nitrogen in the form of granular urea was aerially applied May 17 at 40 pounds of nitrogen per acre.

Burning and Nitrogen. Burning and nitrogen fertilization were as just indicated.

Control. No burning or fertilization.

The grass samples were clipped at ground level from within 25-foot square exclosures in three randomly located, loamy upland sites in each pasture. The exclosures were constructed with "T" type steel posts and 4 strands of barbed wire.

Three samples were taken from each pasture on the first of each month, June to November.

Preparation for analysis consisted of drying overnight at 90° C in a forced air oven and grinding in a Wiley mill through a one-millimeter screen.

Results

Dry Matter

Burning significantly decreased the dry matter content of the bluestem grass in June, September, and November (Table 1). In July and October there were no significant differences. Although not shown, fertilization and fertilization plus burning had no additional effect on the dry matter content of the grass. No species differences were detected.

Crude Fiber

Table 1 shows the crude fiber content of the bluestem grass. The general trend is for crude fiber to gradually increase as the growing season advances. The August 1 clipping showed a decline in the fiber content of the grass. Increased production of new plant tissue (low in crude fiber) after 2.54 inches of rainfall in July may explain the fiber decline.

Burning significantly lowered the crude fiber content of the grass throughout the study period (Table 1). That likely explains why beef cattle on burned range outperforms cattle on range not burned. Although not shown, fertilization had no effect on crude fiber content of the grass.

Big Bluestem was significantly lower in crude fiber, 32.28%, than Little Bluestem, 33.16%.

Cell Walls

Cell wall percentages followed the same trend as crude fiber (Table 2). Cell walls increase as the season advances. Burning

compared to not burning significantly decreased cell wall percentages June through August; no differences were detected in the September or October clippings but the burned pastures had significantly lower cell wall percentages in November than the nonburned pastures did.

As with crude fiber, Big Bluestem had significantly lower percentages of cell walls than Little Bluestem did. Table 2 shows cell wall percentages for each species during the study. Big Bluestem was consistently lower. Although not shown, fertilization did not influence cell wall percentages.

Protein

Table 3 shows effects of treatment on protein levels of the grass. Burning or fertilization alone did not significantly affect protein levels but burning and fertilization together significantly increased protein content. This difference was only a .57% and of little practical importance.

Table 4 shows the average protein levels at monthly intervals throughout the study. The protein levels dropped from 11.62% in June to 2.89% in November.

Lignin

The average lignin content of the bluestem grass is shown in Table 5. Lignin gradually increases as the growing season advances. Both burning and fertilization significantly influenced lignin content of the grass plant (Table 6).

Table 1. Dry Matter and Crude Fiber Percentages of Big and Little Bluestem grass (Combined dry matter basis), June 1-November 1, 1972.

<u>Month</u>	<u>Dry Matter, %</u>		<u>Average</u>	<u>Crude Fiber, %</u>	
	<u>Not burned</u>	<u>Burned</u>		<u>Not burned</u>	<u>Burned</u>
June	30.44 ^e	24.35	30.48 ^b	32.62 ^{c d}	28.33
July	31.77 ^{d e}	34.07 ^{c d}	32.82 ^a	34.47 ^a	31.16
August	- - -	- - -	30.80 ^b	32.22 ^d	29.36
September	40.88 ^b	34.59 ^c	33.98	34.50 ^a	33.47 ^{b c}
October	43.17 ^{a b}	43.89 ^a	33.36	33.90 ^{a b}	32.83 ^{c d}
November	79.59	70.41	34.90	36.52	33.28 ^{b c}

Least Square Means

Values followed by the same superscript do not differ significantly (P<.05)

Table 2. Cell wall percentage of Bluestem Grass (dry matter basis), June 1-November 1, 1972

<u>Month</u>	<u>Big and Little Bluestem Combined</u>			<u>From all treatments</u>	
	<u>Average</u>	<u>Not burned</u>	<u>Burned</u>	<u>Big Bluestem</u>	<u>Little Bluestem</u>
June	72.54	75.76 ^{b c}	69.31	72.01	73.06
July	75.38 ^c	76.19 ^b	74.57 ^c	74.46 ^e	76.30 ^{c d}
August	76.25 ^{b c}	78.22 ^a	74.28 ^c	75.11 ^{d e}	77.39 ^{b c}
September	77.77 ^a	78.35 ^a	77.20 ^{a b}	76.20 ^{c d}	79.34 ^a
October	76.99 ^{a b}	77.21 ^{a b}	76.77 ^{a b}	75.31 ^{d e}	78.67 ^{a b}
November	79.25	80.71	77.79	79.24 ^a	79.26 ^a

Least Square Means.

Values followed by the same superscript do not differ significantly (P<.05).

Table 3. Protein percentages in Bluestem Grass
(dry matter basis) June 1-Nov. 1

	Not fertilized	Fertilized
Not burned	5.41 ^{c b}	5.19 ^c
Burned	5.73 ^{a b}	5.98 ^a

Least Square Means
Values followed by the same superscript do
not differ significantly ($P < .05$)

Table 4. Averaged Percent Crude Protein, (dry
matter basis) June 1-Nov. 1

	Crude Protein, %
June	11.62
July	5.96
August	4.47 ^a
September	4.31 ^a
October	4.22 ^a
November	2.89

Least square means
Values followed by the same superscript do
not differ significantly ($P < .05$).

Table 5. Percent Lignin in Bluestem Grass by Months
June-November, 1972

June	4.66
July	5.88
August	6.61 ^b
September	7.32 ^a
October	6.92 ^{ab}
November	8.49

Least Square Means

Values followed by same superscripts do not differ significantly ($P < .05$)

Table 6. Lignin Percentages in Bluestem grass,
June-November, 1972

	Not fertilized	Fertilized
Not burned	7.13 ^a	6.97 ^{ab}
Burned	5.89	6.59 ^b

Least Square Means

Values followed by same superscripts do not differ significantly ($P < .05$).