TECHNICAL NOTES

Response of Sideoats Grama to Animal Saliva and Thiamine

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Highlight: *Sideoats grama plants clipped to various heights and frequencies were used to compare plant growth response to additions of animal saliva and thiamine. Comparisons were also made between plants which were either grazed or clipped. Results indicated that plants will respond to additions of thiamine when they are clipped at a moderate intensity (6 inches) and frequency (6 weeks). Plants did not respond to thiamine or saliva when clipped to three inches regardless of the frequency. Plants grazed by cattle, sheep or goats had significantly higher growth rates than clipped plants. Caution should be taken in interpreting data when mechanical clipping is substituted for grazing.*

Researchers have observed and studied the influence animals exert on grasses and grasslands for many years. Most of this research has been directed toward clarifying the influence of animal numbers, kind of animals, and management systems on range condition and secondary succession. Mechanical clipping is often substituted for actual grazing in this research. The grazing animal influences growth of individual grass plants, and this influence may differ from mechanical clipping (Carter, 1962; White, 1973). Reasons for different responses as a result of clipping or grazing are not clearly understood, but researchers have suggested several reasons this phenomenon may occur. One possibility is the effect of animals on the cycle of nutrients in the ecosystem. About 75 to 96% of the nitrogen and phosphorus and 90% of potassium in forage consumed by grazing animals is returned to the pasture in feces, but virtually all nitrogen, phosphorus and potassium in the forage are removed by mowing (Peterson et al., 1956; Sears, 1951). Another reason, first suggested by Vittoria and Rendina (1960) and later verified by Reardon et al. (1972), is that the grazing animal causes plant growth stimulation by deposition of saliva during grazing. Recent research (Reardon et al., 1972) showed that animal saliva contained thiamine (Vitamin B_1) at concentrations previously reported to stimulate a growth response in grass plants (Bonner and Greene, 1939). In a similar test Johnson and Bailey (1972) reported that the addition of bovine saliva to plants did not stimulate growth. Reardon et al. (1972), however, collected saliva from the animals' mouth, while Johnson and Bailey (1972) collected saliva directly from the rumen. Rumen saliva could be expected to contain detrimental contaminants such as bacterial enzymes and rumen microflora. The stimulation of plant growth by deposition of saliva may be a result of thiamine contained in the saliva. Jameson (1964) suggested the need for research on the application of thiamine and other materials to partially defoliated plants. This study was initiated to test: (1) the effects of adding thiamine and animal saliva to grass plants clipped at two heights and frequencies; and (2) compare growth responses to plants grazed by cattle, sheep, or goats to plants which were clipped.

Materials and Methods

Sideoats grama [*Bouteloua curtipendula* (Michx.) Torr.] seeds were germinated in sand flats and at 30 days of age were transplanted to an outdoor grass nursery on the Texas A&M University Agricultural Research Station at Sonora. The soil located in the grass nursery was a Tarrant silty clay. Thiamine at 10 parts per billion (pbb) and pure bovine saliva were used to treat the sideoats grama plants to determine their response to thiamine and saliva. Additions of thiamine at this concentration previously resulted in positive growth responses (Bonner and Greene, 1939). Table 1 lists and describes the treatments included in this study. Thiamine and saliva were applied with a pipette in a 0.2 ml aqueous solution to the freshly cut surfaces or at the rate of 250 ml of the same thiamine solution to the soil. The 0.2 ml treatment was the quantity of solution necessary to wet the cut leaf and stem tips. Likewise, 250 ml was found to be the quantity necessary to wet the soil in the

Table 1. Average forage yields (g) and increase over controls (%) for plants in treatments 1-16.

Treatment number	Treatment description	Forage yield (g)[1]	Forage yield increase over control (%)[2]
1	Control - 3 in x 3 wk	31 e	–
2	Control - 6 in x 3 wk	52 cde	–
3	Control - 3 in x 6 wk	60 cd	–
4	Control - 6 in x 6 wk	78 bc	–
5	Thiamine on plant, 3 in x 3 wk	36 de	16
6	Thiamine on plant, 6 in x 3 wk	72 bc	38
7	Thiamine on plant, 3 in x 6 wk	55 cde	- 8
8	Thiamine on plant, 6 in x 6 wk	109 a	40
9	Thiamine on soil, 3 in x 3 wk	36 de	16
10	Thiamine on soil, 6 in x 3 wk	72 bc	38
11	Thiamine on soil, 3 in x 6 wk	53 cde	- 12
12	Thiamine on soil, 6 in x 6 wk	111 a	42
13	Saliva on plant, 3 in x 3 wk	32 e	3
14	Saliva on plant, 6 in x 3 wk	75 bc	44
15	Saliva on plant, 3 in x 6 wk	65 c	8
16	Saliva on plant, 6 in x 6 wk	96 ab	23

[1] Numbers in a column followed by the same letter are not significantly different at the 5% level.

[2] Percent increase of forage yields over control plants clipped at the same height and frequency.

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root zone surrounding each plant. The addition of thiamine to the plant and soil was done primarily to relate the response of saliva and thiamine as well as exploring the use of thiamine on a commercial basis. Each treatment, including a control, was clipped at 3- and 6-week intervals and at 3- or 6-inch stubble heights.

Rates of growth were determined by accumulating forage yields of each plant in each treatment. The statistical design used in this study was a 2X2X4 randomized block design and the data were analyzed by analysis of variance procedures (Snedecor and Cochran, 1967).

To compare the effect of grazing to that of clipping on growth response, 15 of the sideoats grama seedlings were grazed once every 3 weeks by either cattle, sheep, or goats and 15 were mechanically clipped. The clipped plants were harvested to a height equal to the average stubble height of the grazed plants. The effect of clipping versus grazing was evaluated by measuring the height of foliage regrowth before each subsequent harvest.

Results

Results indicated there was a highly significant response to both height and frequency of clipping. Clipping height had the most profound effect on forage yields. Clipping to a 3-inch height at 6-week intervals was not as detrimental to a plant yields as clipping to 3 inches every 3 weeks. Plants clipped once each 6 weeks to 6 inches had the highest forage yields of the 16 treatments tested (Table 1). Clipping to 6 inches produced greater yields than clipping to 3 inches at all clipping frequencies.

Plants responded to additions of thiamine but not saliva. Thiamine added to the soil or the plant under a 6-inch X 6-week clipping schedule increased the forage yields of 40 and 42%, respectively, over that from control plants (Table 1).

Plants grazed by cattle, sheep, or goats all had significantly taller foliage growth than mechanically clipped plants (Table 2). There were no significant differences among plants grazed by cattle, sheep, or goats.

Discussion

The fact that thiamine exists in animal saliva in sufficient concentrations to stimulate plant growth lends support to the hypothesis that animal saliva, deposited on foliage during grazing, has a stimulating effect on plant growth (Reardon et al., 1972). Results from this study, however, did not necessarily show this. The good structure and high fertility of the soil used in this test could be one explanation for the lack of response. Woodhouse and Morris (1942) reported increases in plant growth only from plants grown in soils of low fertility. Certain workers (Robinson et al., 1936; Stapledon and Jones, 1927; White, 1973) feel that even though plant response to clipping and grazing are similar, it may not always be wise to substitute one for the other. An example of this was evident in this study since all grazed plants had significantly higher growth rates than clipped plants. Some grazing characteristics or possibly saliva deposited on the plant foliage during grazing may have caused the difference. Therefore, caution should be taken in interpreting data when mechanical clipping is substituted for grazing.

Mechanical clipping of selected plants at different frequencies and intensities is another technique used by researchers to relate plant vigor or production to various systems of grazing or additives. Results from this study indicate that clipping sideoats grama plants at a high frequency and high intensity will severely reduce plant vigor. Clipping plants on a more moderate schedule may allow them to absorb and utilize thiamine for accelerated plant growth.

Table 2. Average height (inches) of growth for plants grazed either by cattle, sheep, or goats or mechanically clipped.[1]

Treatment number	Method of harvest	Average height of growth
17	Grazed by cattle	29.5 a
18	Grazed by sheep	29.2 a
19	Grazed by goats	28.8 a
20	Mechanically clipped	22.3 b

[1] Numbers followed by the same letter are not significantly different at the 5% level.

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Radiant Temperatures of Hair Surfaces

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Highlight: *The radiant temperatures (T_r) of the surfaces of winter pelage of white-tailed deer, mule deer, snowshoe hare, cottontail rabbit, and red fox decrease with a decrease in air temperature (T_a) and an increase in wind velocity (U). The relationship between T_r and T_a is linear, but nonlinear for T_r:U. Changes in the lower velocities have a relatively greater effect than changes in the higher velocities. The variation between species results in considerable overlap; the use of thermal scanning techniques for censusing of these different species is doubtful under most field conditions.*

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