

Herbage Yield and Quality of Threadleaf Sedge

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Highlight: An investigation of herbage yield, crude protein, and *in vitro* dry matter disappearance (IVDMD) levels of ungrazed threadleaf sedge (*Carex filifolia* Nutt.) was conducted over a 2-year period in western Nebraska. Threadleaf sedge contributed approximately 80% of the total herbage production on the study site. Crude protein varied from over 18% in late April to 5% or less in February. Levels of IVDMD varied from 69% in May to 51% in March. Levels of these quality factors were higher than those for most grasses throughout the year.

Threadleaf sedge (*Carex filifolia* Nutt.) is one of the most important grass-like range plants in the grasslands of the Great Plains (Weaver and Albertson 1956; Coupland 1961). Threadleaf sedge occurs on dry plains and hills from Manitoba to British Columbia, south to Texas, and as far west as California (Fernald 1950; Britton and Brown 1970). This species is commonly found growing in association with needleandthread (*Stipa comata* Trin. & Rupr.) and blue grama (*Bouteloua gracilis* (H.B.K.) Lag. ex Steud.), but can thrive on dry ridges and in places where little other vegetation can survive (Weaver and Albertson 1956).

Threadleaf sedge is a long-lived perennial which forms a tough sod. Threadleaf sedge is densely tufted with pale green glabrous culms and may reach a height of 8 to 36 cm. The leaves of threadleaf sedge are filiform and may be from 5 to 25 cm long and approximately 0.6 cm wide (Britton and Brown 1970).

Threadleaf sedge resumes growth in early spring and completes growth in late May. This plant is especially valuable for grazing during this period, because it maintains high palatability for all classes of livestock. By the end of June it becomes dry and tough. The low growth form of threadleaf sedge and the resistance of its tough, wiry roots enables it to withstand heavy grazing and trampling. Its roots are brown or black in color and form a tangled mat to a depth of 0.5 m, with some roots reaching a depth of 1.5 m (Weaver and Albertson 1956).

Although ranchers in the shortgrass prairie pay a premium for rangeland containing threadleaf sedge, little information is available on its herbage yield or quality. Research on other species of *Carex* in Canada has shown herbage yields ranging from 380 to 6,400 kg/hectare and an average crude protein percentage of 9.1 (Gorham and Sommers 1973; van Ryswyk et al. 1973). Goetz (1975) has shown that the crude protein percentage of threadleaf sedge growing in North Dakota compared favorably to that of blue grama, varying from 12.8% on May 15 to 6.4% on August 15. He stated that the high loss of "leaf material" greatly reduced the value of this species for summer grazing.

Our objectives were to determine (1) herbage yield and (2) herbage quality, measured as percentage crude protein and *in vitro* dry matter disappearance (IVDMD), of threadleaf sedge.

Study Area

The study site was located in western Nebraska, approximately 16 km south of Scottsbluff. Average annual precipitation at the study site is 366 mm, although precipitation levels during the 2-year study were below average at 328 and 269 mm for 1975 and 1976, respectively.

The soil at the study site was classified as Mitchell silt loam (Ustic Torriorthent), with a 3 to 5% slope. This soil is a deep, well-drained soil with a medium textured layer beneath a brownish gray surface layer (Yost et al. 1968). The study area was fenced to exclude domestic livestock and was classified as a silty range site. Threadleaf sedge occupied 79% of the basal herbage area of the study site, and plants growing in association with it included blue grama, needleandthread, and sand dropseed (*Sporobolus cryptandrus* Torr.).

Methods

A harvesting schedule was initiated on January 4, 1975, and completed on December 6, 1976. Twenty-four harvests were made during each year. Harvest frequency varied from weekly, during active growth periods, to monthly, during periods of dormancy. Four quadrats (2.3 m²) were clipped near the soil surface in each of four replications in a randomized complete block design. A series of plots was used, enabling the use of previously unharvested plots. All above-ground biomass was removed by clipping on March 10 of each year. Threadleaf sedge herbage was separated from other herbage, weighed, and dried in a forced air oven at 65°C until reaching a constant weight and weighed. Samples were ground to 40-mesh size and saved for nitrogen and IVDMD analyses. Percentage crude protein was determined by the Kjeldahl procedure (Assoc. Official Agr. Chem. 1960). The method outlined by Tilley and Terry (1963) was used for the IVDMD determinations.

Results and Discussion

Herbage Yield

Herbage yield decreased from the January sampling date through the early April sampling date both years (Fig. 1). This was due to winter loss of plant materials. Growth resumed in early April of both years, as indicated by an increase in moisture levels of the herbage.

Maximum herbage yield of 883 kg/hectare was recorded on June 27 in 1975, 1 week later than in 1976 (Fig. 1). Weaver and Albertson (1956) reported that threadleaf sedge in South Dakota completed growth approximately 1 month earlier than that reported here. Above-average precipitation (158 mm) was recorded from late May through June 1975, thus enabling the plants to reach a higher production level than in 1976.

Moisture levels of the herbage reached a maximum of only 64% in 1975 and 68% in 1976, considerably less than maximums generally recorded for other forage species (Table 1). Loss of plant material due to breakage of dry tissue from the ungrazed threadleaf sedge began in the spring. Regrowth occurred during September 1975, following closely the receipt of 53 mm of rainfall. Following a relatively dry period (May through

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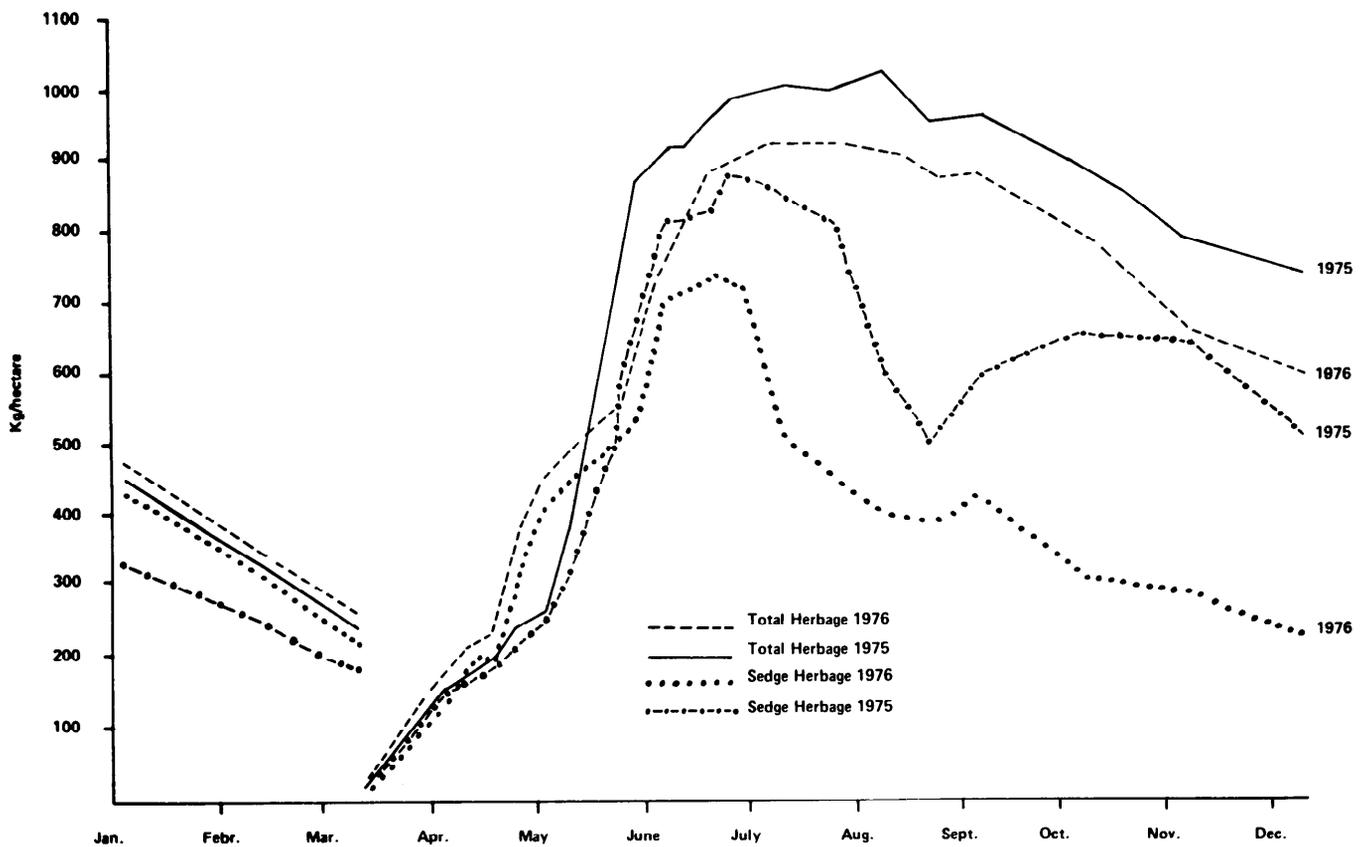


Fig. 1. Total and sedge herbage yields during 1975 and 1976.

July), only a small amount of regrowth occurred in September 1976.

Threadleaf sedge contributed a major portion of the herbage production on the study site (Fig. 1). Herbage yield of threadleaf sedge reached a maximum of 883 and 740 kg/hectare in 1975 and 1976, respectively. Total herbage yield reached 1,030 kg/hectare in 1975 and 925 kg/hectare in 1976.

Percentage crude protein was lowest during the late fall through early spring when averages ranged from 5 to 6% (Table 1). This crude protein range compares favorably with that reported for blue grama and is somewhat higher than that of other mature grasses (Williams 1953; Rogers and Box 1967; Nat. Acad. Sci. 1976). Burzlaff (1971) found that crude protein levels of little bluestem (*Schizachyrium scoparium* (Michx.) Nash.), prairie sandreed (*Calamolvifa* (Hook.) Scribn.), and sand bluestem (*Andropogon hallii* Hack.) grown at Fort Robinson in western Nebraska were 2%, or less, on November 1. This 2% level can be compared to the crude protein content of threadleaf sedge, which was approximately 6% on November 1.

Crude protein increased rapidly with resumption of spring growth (Table 1). Maximum crude protein was recorded in late April both years. Crude protein levels for the mid May sampling date were approximately 2.5 percentage units higher than those reported for threadleaf sedge during the same period in North Dakota (Goetz 1975). Crude protein declined from mid May until early July. Crude protein levels in late July were approximately 7%. Burzlaff (1971) reported crude protein levels of the three warm-season range grasses to be from 1 to 3 percentage units lower than threadleaf sedge during the same time period. Perry (1974) determined the crude protein levels of sand bluestem and prairie sandreed grown on the Panhandle Experimental

Range, near Scottsbluff. He found that the crude protein content was 5.5% for prairie sandreed in late July. A slight increase in crude protein content of threadleaf sedge occurred in conjunction with the regrowth during September 1975.

Table 1. Moisture content (%), crude protein (%), and IVDMD (%) of threadleaf sedge over a 2-year period at Scottsbluff, Nebr.

Harvest date	Moisture content		Crude protein		IVDMD	
	1975	1976	1975	1976	1975	1976
1975/1976						
Jan. 4/5	9	9	6.1	5.7	56	56
Feb. 4/5	9	9	5.8	4.7	55	55
March 4/5	9	9	6.2	6.2	51	51
April 4/5	28	28	6.8	6.8	57	57
April 11/12	38	57	10.6	10.6	62	63
April 18/19	50	62	16.4	16.1	67	65
April 25/26	55	68	18.0	18.6	67	67
May 2/3	60	67	17.7	17.9	69	68
May 9/10	62	66	16.5	16.6	67	69
May 16/17	64	65	15.3	15.5	66	66
May 23/24	60	62	14.8	14.4	65	67
May 30/31	60	62	13.6	13.5	64	63
June 6/7	60	60	12.4	11.8	63	61
June 13/14	54	57	11.0	11.0	62	62
June 20/21	48	54	9.7	9.3	62	61
June 27/28	36	52	8.4	8.3	62	62
July 11/12	38	45	7.9	7.5	61	59
July 25/26	38	40	7.0	7.4	59	56
Aug. 8/9	30	23	7.0	7.1	58	56
Aug. 22/23	24	14	7.0	6.7	57	56
Sept. 5/6	32	14	7.7	6.5	58	56
Oct. 5/6	23	12	6.2	6.5	55	56
Nov. 5/6	9	11	6.0	6.1	56	56
Dec. 5/6	9	10	5.9	5.7	56	56
LSD _{.05}	2		0.5		2	

Cows nursing calves (average milking ability during the first 3 to 4 months postpartum) require a total protein level of 9.2% (Nat. Acad. Sci. 1976). Threadleaf sedge met these requirements from resumption of spring growth until approximately June 20 (Table 1). Dry pregnant mature cows require 5.9% total protein in their diets (Nat. Acad. Sci. 1976). Threadleaf sedge essentially met these requirements throughout the year, with the possible exception of the months of December, January, and February. In addition, grazing animals are selective and generally consume forage of higher nutritive value than harvested total herbage.

In Vitro Dry Matter Disappearance

In vitro dry matter disappearance (IVDMD) values were lowest in March (51%) before resumption of spring growth (Table 1). This was considerably higher than IVDMD values for most dry, mature grasses (Streeter et al. 1968; Nat. Acad. Sci. 1976). Burzlaff (1971) found IVDMD levels on November 1 to be 38% for prairie sandreed, 37% for little bluestem, and 46% for sand bluestem. These values can be compared to the approximate 56% IVDMD of threadleaf sedge in early November. Percentage IVDMD increased rapidly during April and May. Percentages of IVDMD of more than 60% are not uncommon for immature range grasses, but these values rapidly decline in the summer (Burzlaff 1971; Perry 1974). Percentage IVDMD did not drop below 60% until July and remained above 55% until February.

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