Chemical Composition of the Sandlily *(Leucocrinum montanum)*

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Abstract

At the Archer Substation near Cheyenne, Wyo., the leaves and flowers of the sandlily *(Leucocrinum montanum)* were collected separately between May 17 and 22 in 1976, 1977, and 1978 and their crude protein and mineral concentrations were determined. Average crude protein contents of leaves and flowers were 22.1 and 12.4%, respectively. The large difference in protein levels between the flowers and leaves may be a factor in the selective grazing of these parts by livestock. The mineral concentrations of Ca, Cu, Fe, K, Mg, Mn, Na, P, and Zn in flowers and leaves were adequate for livestock nutrition and did not differ greatly except the Ca and K contents of leaves were higher than those of flowers.

The sandlily *(Leucocrinum montanum* Nutt.), also known as "starlily," "sagelily," and "mountainlily", is a low-growing, showy perennial that produces flowers from mid-May to early June in the arid regions of the western United States. Dayton (1960) describes the sandlily as follows: "a low stemless plant from a short deep-seated rootstock with linear leaves and sheathed at the base with membranous or skinline bracts. The 3 to 8 white fragrant "starlike" flowers have a slender elongated basal tube and are borne in a sessile umbel."

The sandlily, of minor importance as a range plant, is grazed by livestock because of its early spring growth, high protein, and good mineral levels. Its distribution in nine eastern-most counties of Wyoming is shown in Figure 1. Sheep and cattle eat the leaves of the sandlily, but not the flowers (Fig. 2). Reppert (1960) reported that in eastern Colorado heifers showed a variable preference for different species at different times of the year and favor was also shown for leaves in preference to stems. The seasonal variation in the chemical constituents of the diet are a reflection of annual selective grazing and chemical composition of available foods (Rice et al. 1974).

This study was conducted to determine if crude protein and/or several mineral constituents of the leaves and flowers was related to their selective consumption by livestock.

Study Area and Procedure

The Archer Substation is located about 17 km east of Cheyenne, Wyo., at an elevation of 1,837 m. Soil is Ascalon fine sandy loam, a member of the fine loamy mixed mesic family of Aridic Arguistolls. The Ascalon soil has developed in alluvial sediments on level to nearly level alluvial fans and low terraces. The native vegetation is characteristic of the shortgrass plains. The dominant species are blue grama *(Bouteloua gracilis),* buffalograss *(Buchloe dactyloides),* and western wheatgrass *(Agropyron smithii).* Annual grasses and forbs account for only a minor portion of the composition and production.

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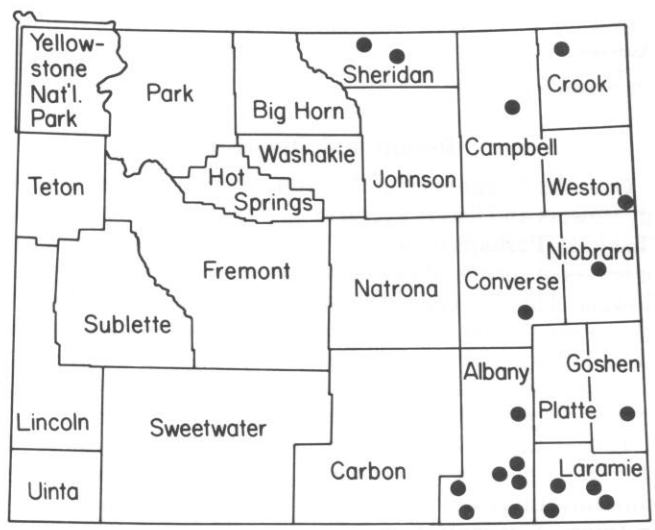

Fig. 1. *Distribution of the sandlily* (Leucocrinum montanum) *in eastern Wyoming (Courtesy of the Rocky Mountain Herbarium, University of Wyoming).*

Between May 17 and 22, 1976, 1977, and 1978, leaves and flowers of the sandlily were collected separately from a native rangeland pasture and composited. Thirty to 40 gm of leaves and flowers were collected each year from the same area. The plant material was air-dried, and ground in a Wiley Mill (with stainless steel chamber, screen, and blades) equipped with a 40-mesh screen. Crude protein was determined by using the micro-Kjeldahl procedure described by Schuman et al. (1973). Phosphorus (P) was determined by the vanadomolybdophosphoric yellow color method in a nitric acid system (Jackson 1958). Calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), iron (Fe), manganese (Mn), copper (Cu), and zinc (Zn) were determined by atomic absorption spectrophotometry on a perchloric acid digest. All data are reported on a dry-weight basis.

Fig. 2. *Sandlily (a) Nongrazed; (B) Grazed by sheep; (c) Grazed by cattle.*

Table 1. Crude protein, calcium, copper, iron, phosphorus, potassium, magnesium, manganese, sodium, zinc concentrations (%) of sandlily (*Leucocrinum montanum* Nutt.) flowers and leaves harvested between May 17 and 23 in 1976, 1977, and 1978 at Archer Substation, Wyoming.

Year and plant part	Crude protein	Calcium	Copper	Iron	Phosphorus	Potassium	Magnesium	Manganese	Sodium	Zinc
Flowers										
1976	11.8	0.22	0.008	0.04	0.38	1.49	0.14	0.006	0.07	0.003[1]
1977	12.9	0.28	0.010	0.04	0.43	2.24	0.17	0.003	0.08	0.003
1978	12.6	0.27	0.010	0.03	0.42	1.90	0.15	0.003	0.07	0.003
Average	12.4	0.26	0.009	0.04	0.41	1.88	0.15	0.004	0.07	0.003
Leaves										
1976	21.3	1.04	0.009	0.02	0.35	2.51	0.24	0.005	0.04	0.002
1977	21.1	1.10	0.011	0.03	0.32	3.09	0.29	0.006	0.06	0.003
1978	21.0	1.00	0.012	0.02	0.35	2.67	0.22	0.005	0.06	0.004
Average	21.1	1.05	0.011	0.02	0.34	2.76	0.25	0.005	0.05	0.003

[1] % ÷ .0001 = ppm

Results and Discussion

Over the 3-year period, the crude protein content of sandlily flowers and leaves averages 12.4 and 21.1%, respectively (Table 1). Perhaps because of the high crude protein content of leaves in spring, livestock selectively graze leaves over the flowers. The flowers of the sandlily were not eaten by livestock even though the crude protein was comparable to that of Sandberg's bluegrass (Rauzi unpublished data) and is slightly less than that of crested wheatgrass *(Agropyron cristatum)* (Rauzi 1975) at the same time of year.

Leaves had 30% more Ca, 47% more K, and 67% more Mg than did the flowers (Table 1). Phosphorus, Na, and Fe concentrations were 21, 40 and 100% higher in flowers than in leaves. Concentrations of these minerals in flowers and leaves were more than adequate for livestock nutrition (Natural Research Council 1975 and 1976).

Leaf and flower Zn concentrations were identical, whereas, the Mn concentrations were 25% higher in the leaves than in the flowers. The concentrations of Cu and Zn in leaves and flowers were adequate for livestock nutrition. Blincoe and Lambert (1972) stated that at least 20 ppm (0.0020%) Zn is necessary for grazing cattle and that 46 ppm (0.0046%) was probably adequate. Since cattle and sheep require Cu concentrations of 5 to 6 ppm (0.0005 to 0.0006%) in their diet (Hamilton and Gilbert 1972), Cu levels in the flowers and leaves were above the nutritional requirements for livestock. Hamilton and Gilbert (1972) found forages with 40 to 400 ppm (0.004 to 0.04%) Fe were adequate for cattle and sheep nutrition. They assumed that 50% of the Fe in the vegetation is available to the livestock. Therefore, the Fe content of sandlily leaves and flowers was more than adequate for livestock nutrition.

The K concentrations of sandlily flowers and leaves averaged 1.88 and 2.76%, respectively. The K requirements of sheep and growing finishing steers are 0.5 and 0.6 to 0.8% dry matter (National Research Council 1975 and 1976).

Differences among years in amounts of crude protein and minerals in the flowers and leaves were negligible. Some values obtained in 1976 were lower than those for 1977 and 1978 possibly because of lower 1976 precipitation. May precipitation in 1976, 1977, and 1978 was 42, 104, and 84 mm, respectively.

Grazing animals have the ability to select protein levels as shown by Vavra (1972), who found that crude protein content of steers' diet on shortgrass range heavily, moderately, and lightly grazed in June and August were similar. Thus, the 70% difference in crude protein between leaves and flowers may be why sheep and cattle did not eat the flowers.

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