PHYSICAL FORM AND FREQUENCY OF ALFALFA SUPPLEMENTATION FOR BEEF CATTLE WINTER GRAZING NORTHERN GREAT BASIN RANGELANDS[1]

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SUMMARY: A performance/digestion study was conducted to determine the effects of physical form and frequency of alfalfa supplementation to beef cattle on a winter grazing program. Results from this study indicate that feeding alfalfa hay or pellets either daily or every other day does not affect performance, intake, digestion, or grazing behavior of winter grazing beef cows. However, weather conditions and the supply of available forage did have an impact in this study, and should be considered in the planning and implementing of any winter grazing program. Results to date indicate that winter grazing is a viable management plan in the northern Great Basin; however, year to year variations in climate and available forage are areas that require additional research.

Traditional grazing management programs in the northern Great Basin involve hay feeding on meadows during the fall and winter, with animals grazing native range during the spring and summer. Winter grazing is an alternative management plan, whereby animals graze native range from spring to late summer, graze meadows in fall, and then move back to native ranges during the winter. This program may be economical and beneficial to range condition and productivity, since the range is being used during a time of minimal plant growth and development. Grazing after fall dormancy is usually considered to have a minimal impact on subsequent growth and development of common cool-season perennial bunchgrasses, such as bluebunch wheatgrass; thus, winter grazing should minimally impact the forage resource. Protein supplementation is beneficial when animals are consuming low-quality roughages, such as dormant winter forage. Alfalfa is commonly fed as a supplement in the northern Great Basin because it is more available and economical than traditional concentrate supplements, such as soybean or cottonseed meals. Alfalfa has been found to be as effective as protein meal supplements in improving the performance of grazing animals. Pelleting alfalfa, while somewhat expensive, has been shown to increase the intake of dormant forage, increase weight gain, and reduce condition loss when compared to long-stem hay. Alternate-day feeding of protein supplements has been shown to be as effective as daily feeding and may offer economical advantages, such as reduced labor and travel associated with feeding. However, work done in this area has usually involved feeding protein meals or concentrates, not alfalfa. Therefore, the objectives of this study were to compare: 1) physical forms of supplemental alfalfa (pelleted vs. long-stem hay); and 2) frequency of alfalfa supplementation (daily vs. every-other-day) on beef cattle winter grazing northern Great Basin rangelands.

MATERIALS & METHODS

The study was conducted on the Squaw Butte Experimental Range, 42 miles west of Burns, at an elevation of 4,600 ft. Average

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annual precipitation is 11 in.; approximately 60 percent of this occurs as snow during the fall and winter, with only 25 percent as rain during the growing season. Approximately 9.7 in were received in the crop year (September-August) immediately preceding the study. Second cutting alfalfa was obtained in late July of 1991 from a field at the station headquarters. Alternate windrows were put up either as long-stem hay or sun-cured and made into pellets. In late October of that year, 60 mature, pregnant Hereford X Angus cows (avg. initial wt = 1,030 lb) were grouped by age, condition score (CS) and fetal age were 5.58 and 127 days, respectively) and randomly assigned within group to one of four treatments: 1) 4.4 lb/d of alfalfa pellets; 2) 4.4 lb/d of alfalfa hay; 3) 8.8 lb alfalfa pellets every other day (4.4 lb/d) and 4) 8.8 lb alfalfa hay every other day (4.4 lb/d). The 70 d study was initiated in early November and continued through mid-January. The trial was initially intended to cover 84 days. However, due to excessive snow cover and limited forage availability in January, the study was terminated at day 70. Two 1,000 acre native range pastures were used in the study; animals were moved to the second pasture at d 28. Species composition of the pastures included Wyoming big sagebrush, bluebunch wheatgrass, sandberg bluegrass, squirreltail, and needle-and-thread. All animals were gathered at 8 a.m. daily, sorted into individual pens, and fed their supplement. On days when only two groups received alfalfa supplement, the remaining two groups were returned to graze. Cow weights and condition scores (1-9 point scale) were obtained following overnight removal from feed and water on d 0, 28, 56, and 70. Two sampling periods (early December and mid-January) were conducted to obtain estimates of forage intake, digestibility, grazing behavior, and quality of diet selected. Ten days prior to the first sampling period, six groups of randomly selected cows were dosed with continuous-release chromic oxide capsules in order to obtain estimates of fecal output. The same cows were used for the second period. Fecal grab samples were taken once daily for eight days in period 1 and seven days in period 2. Six different groups of randomly selected cows were fitted with vibracorders and digital pedometers in order to monitor time spent grazing and distance travelled. Diet quality samples were obtained for four consecutive days during each sampling period by using five esophageally fistulated steers (avg. wt. 1,048 lb). During period 2, five ruminally fistulated steers (avg. wt. 696 lb) were fitted with total fecal collection bags in order to validate chromic oxide release rate. Fecal output estimates were 96 percent of actual fecal output as determined by total collection; therefore, fecal output estimates were not adjusted. All steers received 4.4 lb/d of alfalfa pellets.

Weather data were recorded daily at a station approximately .9 miles from the study pastures. All samples were dried at 55°C in a forced-air oven for 48 h, ground to pass a .04-in screen in a Wiley mill, then analyzed in duplicate for dry matter (DM), ash, and neutral detergent fiber (NDF). Indigestible acid detergent fiber (IADF) content of all samples was determined by a 144 h in vitro fermentation followed by ADF extraction. Supplement and esophageal samples were analyzed for ADF, acid detergent lignin (ADL) and acid detergent insoluble N (ADIN) as determined by Kjeldahl N analysis of ADF residue. These samples were also analyzed for in vitro digestibility. Fecal samples were analyzed for chromium (Cr) content. Estimates of forage and total organic matter (OM) intake and digestibility were calculated from in vitro digestibility values for esophageal samples and supplements, and fecal output estimates obtained via Cr analysis.

RESULTS

Estimates of diet quality obtained from esophageal collections are shown in Table 1. Nutritive value declined from period 1 to period 2 ($P<.01$), with the exception of crude protein (CP), which tended ($P=.08$) to be higher in period 2. Increasing concentrations of ADIN, with lesser changes in CP, illustrates a reduction in the amount of digestible protein available to the animal, due to changes in the plant. Forage quality typically decreases as the seasons advance,

due to increased concentrations of fiber and lignin and decreased leaf:stem ratios. However, forage was already dormant when this study was initiated; therefore, forage quality may not have been greatly changed. The decline in diet quality in period 2 may be due more to reduced forage availability. Forage was readily available during sampling in period 1, while in period 2, snow cover and limited availability may have forced animals to select a lower-quality diet.

Performance data are presented in Table 2. Since no treatment X period interaction was observed (P>.10), all results will be presented across periods. Changes in weight and body condition were similar among treatments (P>.10), averaging 3.1 lb weight gained and 1.34 units body condition lost across the 70-d trial. While treatments did not affect animal performance, the climate did. A significant (P<.01) difference was observed in pattern of weight loss. Cows lost weight during the first 28 days of the study, then gained during the next 28 and 14 days. Animals were moved to a new pasture with more available forage after day 28; this may have accounted for the observed pattern of weight changes. Condition losses were greater (P<.01) during the last 14 days of the trial than the two previous 28 d periods; losses were similar (P>.10) at day 28 and 56. Reduced forage availability and rapidly increasing fetal growth could be contributing factors, as cows began to mobilize their body reserves to meet the increased demands of the fetus.

Grazing behavior, intake and digestibility results are reported in Table 3. Distance travelled (6.2 miles/d) and time spent grazing (5.93 hr/d) were similar (P>.10) across treatments; however, cows grazed significantly longer in period 1 (6.68 vs. 5.18 hr/d; P<.01). Adverse winter weather conditions have been reported to reduce grazing activity, as animals try to reduce energy expenditures to conserve energy for heat production; colder temperatures and snow cover in period 2 may have contributed to a reduction in the time spent grazing. Cows grazed less on days in which all animals received supplement (5.66 vs. 6.30 hr/d; P<.01), due presumably to the increased time required for feeding. Approximately 3.5 hours were needed to gather and feed on days when all cows were fed; however, when only two groups were fed, only 2 hours were needed. Total forage and NDF intakes and digestibilities were similar (P>.10) across treatments. When providing a supplemental feed to grazing animals, the added feed should not substitute for the range forage; maximizing utilization of the range forage is the primary goal. Similar intakes in the current study indicate that if substitution of alfalfa for native forage was occurring, it was minimal. Both intakes and digestibilities of the total diet, forage, and NDF were lower in period 2 (P<.01). Reduced forage availability may have forced animals to consume a diet of lower quality, since cows were observed grazing bare sagebrush twigs during period 2. Consuming a lower quality diet could cause reductions in intake and digestibility; reduced grazing time could also decrease intakes. Calf birth weight and ADG was not affected by treatment (P>.10; data not shown). Subsequent cow performance (weight, condition, and reproductive) was also not influenced by treatment (P>.10; data not shown).

CONCLUSIONS

Results of this study indicate that feeding alfalfa pellets or hay on a daily or an alternate-day basis did not affect performance, intake, digestion, or grazing behavior of beef cattle winter grazing northern Great Basin rangelands. Weather conditions and supply of available forage did influence these parameters and should be considered in winter grazing of low-quality forages. This study indicates that alternate-day feeding of alfalfa hay does not negatively impact animal performance, and may offer the benefits of reducing labor and feed processing costs.

Table 1. Chemical composition of alfalfa supplements and forage selected by esophageal steers winter grazing northern Great Basin rangelands[a].

ITEM	ALFALFA		FORAGE		SE
	PELLETS	HAY	EARLY DECEMBER	EARLY JANUARY	
OM	88.50	90.06	72.48[b]	87.29[c]	1.43
ADF	36.41	35.08	77.32[b]	66.70[c]	1.68
NDF	43.85	49.46	83.90[b]	72.61[c]	1.40
IADF	20.06	27.60	24.43[b]	46.92[c]	1.10
CP[d]	18.08	19.86	5.09[b]	5.86[c]	.26
ADIN[e]	20.37	20.53	23.88[b]	50.62[c]	.97
In vitro OMD	67.25	63.62	58.44[b]	34.36[c]	1.13
ADL	8.32	9.10	9.79[b]	20.67[c]	.36

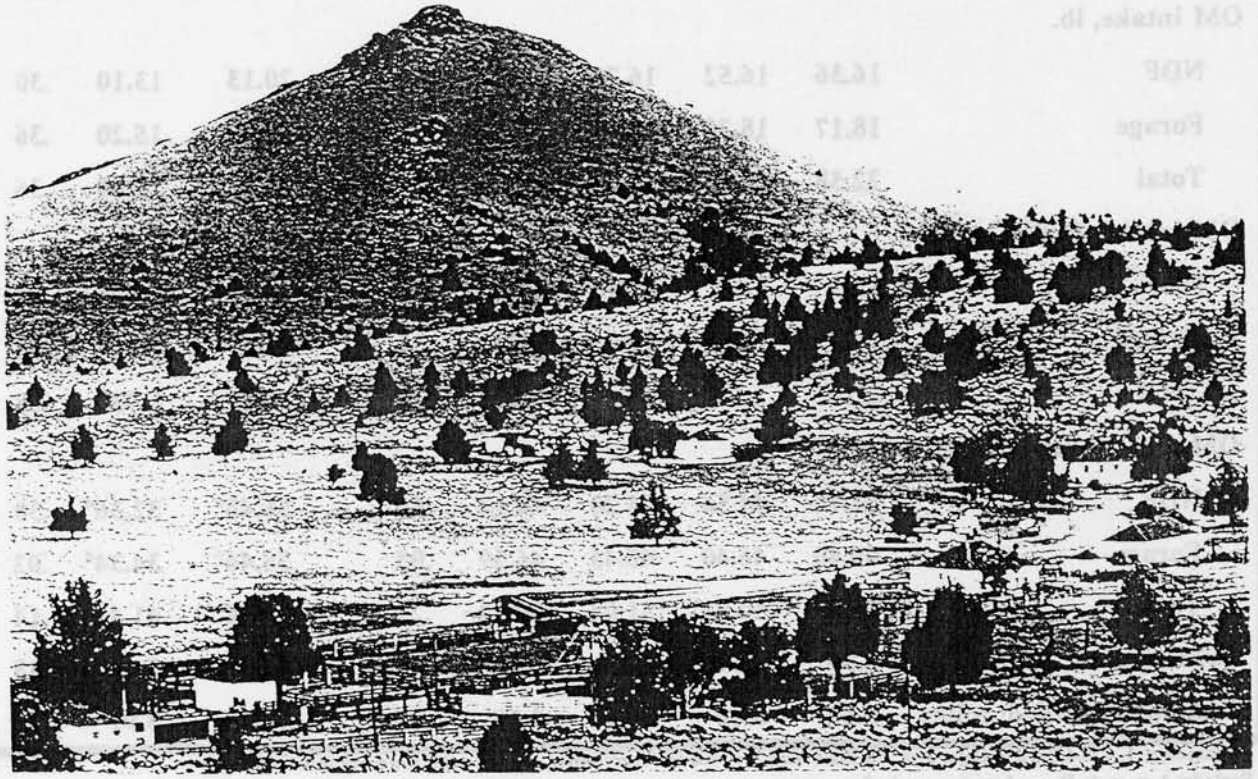

Table 2. Influence of physical form and frequency of alfalfa supplementation on weight gain and condition score of beef cattle winter grazing northern Great Basin rangeland.

Item	TREATMENT[a]					PERIOD[b]			
	1	2	3	4	SE	1	2	3	4
Weight gain, lb	3.10	-5.11	5.68	7.00	10.76	-81.85	80.77	10.66	3.20
Condition change, units	-1.20	-1.49	-1.30	-1.40	.10	- .40[c]	- .32[c]	- .63[d]	.60

[a] Treatments: 1 = 4.4 lbs pellets; 2 = 4.4 lbs hay; 3 = 8.8 lbs/every other day pellets; 4 = 8.8 lbs/every other day hay.
[b] Periods: 1 = day 0 to day 28; 2 = day 29 to day 56; 3 = day 57 to day 70.
[c,d] Period means with different superscripts differ (P<.01).

Table 3. Influence of physical form and frequency of alfalfa supplementation on intake, digestibility and grazing behavior of beef cattle winter grazing northern Great Basin rangelands.

ITEM	TREATMENT[a]					PERIOD[b]		
	1	2	3	4	SE	1	2	3
OM intake, lb.								
NDF	16.36	16.52	16.76	16.78	.52	20.13	13.10	.30
Forage	18.17	18.22	18.63	18.41	.64	21.52	15.20	.36
Total	22.58	22.62	23.04	22.82	.64	25.92	19.60	.36
OM intake, % BW								
NDF	1.59	1.60	1.71	1.68	.18	2.00[a]	1.29[d]	.07
Forage	1.77	1.76	1.90	1.84	.21	2.14[c]	1.50[d]	.08
Total	2.20	2.19	2.34	2.28	.23	2.57[c]	1.93[d]	.08
OM digestibility, %								
NDF	44.74	44.56	44.20	44.14	.60	56.46[c]	32.36[d]	.38
Forage	46.40	46.40	46.43	46.39	.05	58.46[c]	34.34[d]	.02
Total	51.03	50.01	51.04	50.22	.21	59.68[c]	41.47[d]	.14
Grazing time, hr/d	5.96	6.17	5.63	6.00	.30	6.69[c]	5.19[d]	.18
Distance travelled, miles	3.80	3.86	3.89	3.68	.36	3.71	3.91	.22

[a] Treatments: 1 = 4.4 lbs/d pellets; 2 = 4.4 lbs/d hay; 3 = 8.8 lbs/every other day; 4 = 8.8 lbs/every other day hay.
[b] Periods: 1 = early December; 2 = early January.
[c,d] Means between periods with different superscripts differ (P<.01).