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EFFECTS OF GRAZING INTENSITY ON STEER GAINS[1,2]

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Summary

Range and pasture trials were conducted to compare cream grazing (the removal of one-third to one-half of currently available forage) vs continuous grazing. Thirty Hereford X Angus steers from previous high and low energy growth treatments were allotted to either cream or continuous grazing treatments on crested wheatgrass range. Data on steer performance, pasture production and pasture utilization were recorded. Effects of previous treatment on grazing management and the effects of grazing treatments on the finishing phase were evaluated. Range utilization was lower than desired (cream-19%, continuous-43%) due to above average forage production (130%) in 1978. However, cream grazing resulted in an increased ($P < .10$) ADG of .11 kg during the 105-day grazing period. Steers from the previous high energy treatment had an increased ($P < .01$) ADG of .18 kg from the cream grazing practice while the grazing program had little effect on the steers from the previous low energy treatment. No significant differences in ADG were noted between treatments during the finishing phase.

Forty yearling Hereford X Simmental steers were assigned to four irrigated pasture treatments to evaluate clover-fescue vs clover-orchardgrass mixes, level of supplementation and grazing practice. Treatments consisted of cream or continuous grazing of clover-fescue pasture with 1.4 kg daily supplement and continuous grazing of clover-orchardgrass pasture with either 1.4 or 2.3 kg daily supplement. Half of the steers in each treatment group received Tramisol to control internal parasites. Clover-orchardgrass steers had increased ($P < .05$) ADG of .17 kg over the clover-fescue steers during the 99-day grazing period. Cream grazing was of no value on the clover-fescue pasture while increased supplementation was of little value on clover-orchardgrass pasture. Tramisol treatment had no effect on steer gains. Following the grazing study, steers were grouped on clover-fescue pasture for a 75-day full feed finishing period. Steers from the previous clover-orchardgrass treatments had increased ($P < .05$) gains of .29 kg per day over the clover-fescue steers.

Introduction

Increasing world population and increased demand for cereal grains on the world market have led to an uncertainty of domestic grain supplies available for production of slaughter beef. Uncertain domestic grain supplies and interest in finishing beef with a minimum of grain will increase the importance of utilizing range and pasture forage to its maximum potential.

Digestible protein, followed by digestible energy are usually the first limiting nutrients for beef production on range. Both nutrients decrease rapidly with increasing forage maturity. Dry matter intake may also limit animal performance due to high moisture content in early spring or increasing crude fiber and decreasing digestibility with advancing maturity. Crested wheatgrass has an

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additional problem of a high stem to leaf ratio and development of stiff unpalatable culms with increasing maturity (Hyder and Sneva, 1963). The growing season for the eastern Oregon sagebrush-bunchgrass region is April, May and June. Raleigh (1970) reported digestible protein and energy values of range forage adequate to maintain 1.0 kg per day gains for yearling steers through mid-June.

A grazing management plan should consider seasonal quality of forage resources and adapt them to animal requirements to obtain maximum production. Sharp (1970) reported increased individual animal gains with light grazing intensity on crested wheatgrass, however, total animal production per ha was reduced. Increased average daily gain (ADG) is a result of increased forage availability which increases the animals ability to select the more palatable high quality forage parts. Sneva (1973) has shown that simulated heavy grazing in spring will reduce total forage production. A grazing plan (cream grazing) was designed to take advantage of controlled utilization by reducing pasture size and increasing stocking rate for short periods of time. Animals are moved to an ungrazed pasture after removing approximately one-third of the available forage.

Past unpublished research at the Squaw Butte Experiment Station has shown depressed yearling gains on clover-fescue pastures compared to yearlings on clover-orchardgrass pastures. Anderson and Safley (1967) found significantly higher calf gains on clover-orchardgrass vs old stand fescue pastures. However, no difference was found between a new stand of clover-fescue and clover-orchardgrass.

These studies were conducted to compare cream vs continuous grazing of crested wheatgrass range and irrigated pasture mixes of clover-fescue and clover-orchardgrass.

Materials and Methods

Range trial

Forty-four Hereford X Angus steers, born in the spring of 1977 and weaned on August 29 were assigned to two groups and fed alfalfa hay (IRN 1-00-063) ad libitum through October 14, as a post weaning adjustment period. On October 15, the steers were weighed and started on one of two winter treatments which continued on alfalfa ad libitum as the low energy treatment while the other group received alfalfa hay ad libitum plus supplemental grain as a high energy treatment. Rolled barley (IRN 4-07-939) was hand fed daily at .9 kg per head through February 18, then increased to 1.4 kg per head daily. Hay consumption was not recorded because steers were fed on the ground and recovery of orts was not possible.

Fourteen low energy steers and 16 high energy steers were assigned equally to two grazing treatments on May 2. One group of 15 steers was put on a continuous grazing program on 29 ha of crested wheatgrass (Agropyron desertorum) range through August 15. The other group of 15 steers was put on a cream grazing program designed to remove the top one-third of the available forage when they went onto a pasture and then moved to a fresh pasture. Five pastures ranging in size from 6.5 to 27.9 ha for a total of 61.9 ha were used for this treatment group. A daily supplement shown in table 1 supplied the protein and energy required to compensate for decreasing forage quality and therefore maintain the desired level of performance.

TABLE 1. DAILY SUPPLEMENT ON CRESTED WHEATGRASS RANGE

Period	Biuret	Barley
	g/hd/day	kg/hd/day
5/4 - 6/15	0	0.454
6/16 - 6/17	13.6	0.454
6/18 - 6/19	18.1	0.454
6/20 - 6/25	22.7	0.454
6/26 - 7/2	40.8	0.454
7/3 - 7/9	45.4	0.590
7/10 - 7/16	54.4	0.726
7/17 - 7/23	63.5	0.817
7/24 - 8/4	63.5	1.134
8/5 - 8/15	63.5	1.361

Forage production was sampled by hand clipping prior to grazing for determination of length of grazing period for each pasture in the cream grazing treatment. The estimated percent utilization was calculated from the amount of forage measured at the end of the grazing period and the estimated forage consumption by the steers. Remaining forage was utilized by dry cows as mature forage from August to November. Cow-days converted to animal unit months (AUM) were used as an estimate of remaining forage. Steer consumption was calculated on a .6 AUM basis and total forage production was obtained by the sum of cow and yearling AUM's.

Five steers from each grazing program were removed on August 16 and finished in a feedlot. Data from these steers are not available at this time.

The remaining 20 steers were combined on a crested wheatgrass range, implanted with 24 milligrams DES and brought up to a full feed of grain by increasing grain at the rate of .45 kg every other day. When grain reached 5.4 kg per head daily, twice-a-day feedings were adopted. The grain ration was supplemented with biuret to insure .9 kg per head daily crude protein equivalent and limestone to balance the calcium requirement.

Twelve steers were slaughtered on November 12 and the remaining eight steers on November 26. Carcass data are not available at this time.

Pasture trial

Forty yearling Hereford X Simmental steers were assigned to four irrigated pasture treatments on May 8 to evaluate clover-fescue (Trifolium-repens - Festuca arundinacea) vs clover-orchardgrass (Trifolium repens - Dactylis glomerata), level of supplementation and grazing practice. Treatments consisted of cream or continuous grazing of clover-fescue pasture with 1.4 kg daily supplement and continuous grazing of clover-orchardgrass pasture with either 1.4 or 2.3 kg daily supplement. Half of the steers in each group were treated with Tramisol to control internal parasites. The pasture trial continued through August 15.

On August 16, twenty steers representing the four treatment groups were moved into a feedlot. The remaining twenty steers were combined on a legume-fescue pasture and brought up to a full feed of grain by increasing .45 kg per head every other day. When the steers reached 5.4 kg per head daily, twice-a-day feedings were adopted. The steers were maintained on full feed until slaughter on October 29.

Data were analyzed statistically by use of least squares analysis of variance. Differences between means were tested for significance by use of the t test and Duncan's New Multiple Range Test (Steel and Torrie, 1960).

Results and Discussion

Range trial

Steer performance and supplement consumption data for the 168-day winter growth period are shown in table 2. Supplementing 1.1 kg barley daily increased ($P < .01$) ADG by .22 kg. This is a relatively efficient feed conversion of 5 kg barley per kg gain.

TABLE 2. RESULTS OF WINTER TREATMENTS, RANGE TRIAL

Item	Treatments	
	Low energy	High energy
No. of steers	22	22
Days	168	168
Initial wt, kg	175	175
Final wt, kg	237	274
Total barley intake, kg	-	182
Daily barley intake, kg	-	1.08
Gain, kg	63[a]	99[b]
Average daily gain, kg	0.37[a]	0.59[b]

[a,b] Means in the same row with different superscripts differ significantly ($P < .01$).

Table 3 shows the effects of cream grazing vs continuous grazing. Cream grazing resulted in a .11 kg increase ($P < .10$) in ADG during the 105-day grazing period. Although this is not a large gain it might be expected to increase in a more typical year. During 1978, an above average forage year, the continuous grazed steers were allowed increased selectivity as evidenced by the 43% utilization rate as compared to a more typical 60 to 80% utilization. The cream grazed steers averaged 19% utilization as shown in table 4.

Table 5 shows the effects of winter treatment on ADG during the grazing study. The grazing program had little effect on the steers from the low energy winter treatment. However, steers from the high energy winter treatments assigned to the cream grazing treatment had increased ($P < .01$) gains of .18 kg per day over those grazed on a continuous program. This demonstrates the opportunity of cream grazing steers to select the higher quality forage. Overall, steers from the low energy winter treatment gained .18 kg per day more ($P < .05$) than the high energy steers with most of this difference occurring in the continuous grazing group. The steers from the high energy winter treatment entered the grazing study at a significantly heavier weight and maintained a slight but nonsignificant weight advantage into the finishing phase. These results show that the poorer the subsequent feed, the more rapidly steers from the higher nutritional regimes will regress towards those from a lower plane of nutrition.

TABLE 3. PERFORMANCE DATA FOR CREAM VS CONTINUOUS GRAZING

Item	Cream grazing	Continuous grazing
No. of steers	15	15
Days	105	105
Initial wt, kg	280	281
Final wt, kg	385	375
Gain, kg	105[a]	94[b]
ADG, kg	1.00[a]	0.89[b]

[a,b] Means in the same row with different superscripts differ significantly ($P < .10$).

TABLE 4. ESTIMATED PERCENT UTILIZATION OF CRESTED WHEATGRASS RANGE[a]

Cream grazing			Continuous grazing		
Period	Hectare	% Use	Period	Hectare	% Use
5/3-5/10	9.11	16	5/3-5/30	29.14	15
5/11-5/20	9.11	17	5/31-6/30	29.14	11
5/21-5/31	6.48	22	7/1-8/1	29.14	11
6/1-6/14	9.31	18	8/2-8/15	29.14	6
6/1-8/15	27.92	19			
Overall	61.93	19	Overall	29.14	43

[a] Calculated from kg/hectare at end of grazing period and estimated consumption of steers.

TABLE 5. THE EFFECTS OF WINTER TREATMENT ON ADG AND WEIGHT OF CREAM VS CONTINUOUS GRAZING

Winter treatment	Cream grazing			Continuous grazing		
	No.	ADG	Wt.	No.	ADG	Wt.
		kg	kg		kg	kg
Low energy	7	1.05	373	7	1.04[a]	369
High energy	8	0.95	396	8	0.77[b]	379
All treatments	15	1.00	385	15	0.89	375

[a,b] Means in the same column or row with different superscripts differ significantly ($P < .05$).

Table 6 shows the total harvestable forage from the cream and continuous grazing treatments. The estimate of forage removed by the steers appears to be accurate. The continuous grazing treatment resulted in approximately double the stocking rate as on the cream grazing treatment. Therefore, it would be expected that approximately twice the forage would be removed from the continuous vs cream grazing treatments. The total forage production for the cream grazed pastures was increased by 1.2 AUM's per ha. These results may be explained by the work of Hyder and Sneva (1963). Total herbage yields of crested wheatgrass were determined by hand clipping and the effects of forage removal at seasonal intervals

were determined. Total herbage yields were the lowest from mid-May clippings and these reductions were greater on wet years. Sneva (1973) later reported that mid-May clippings represented 46% of the August 1 clippings which in turn represented total production. Heavier grazing from mid-May to mid-June would be expected to reduce total herbage yields. The cream grazed range had very light use averaging 17.9% for May and June with grazing on a sizeable portion being delayed beyond the point where a reduction in the production would be expected. The continuous grazed range had 26% utilization for the same period and was not given a rest as were the cream grazed ranges. In addition, 1978 production was the highest in 22 years of sampling at the Squaw Butte Station. This indicates a good regrowth year which would favor total production on the cream grazed ranges.

TABLE 6. TOTAL FORAGE PRODUCTION, CREAM VS CONTINUOUS GRAZING

Treatment	Range	Hectares	AUM's/ha		
			Cow	Steer[a]	Total
Cream grazing	A	9.1	5.77	.23	6.00
	B	9.1	5.77	.33	6.10
	C	6.5	6.83	.36	7.19
	D	9.3	6.31	.45	6.76
	E	27.9	5.52	.67	6.19
	Total	61.9	5.85	.50	6.35
Continuous grazing	F	29.1	4.08	1.07	5.15

[a] Yearling days/30 X .6 = AUM equivalents.

Gain and consumption data for the finishing phase are shown in table 7. No significant differences were found due to grazing treatment on gain or final weight during the finishing phase. No effects of winter treatment carried through to the finishing phase. However, the high energy steers entered the finishing phase at heavier weights and therefore required less time to reach the desired market weight. Feedlot and carcass data are not available at this time.

TABLE 7. GAIN AND CONSUMPTION DATA DURING FINISHING PHASE BY PREVIOUS TREATMENTS[a,b]

Item	Cream grazing	Continuous grazing
No. of steers	10	10
Initial wt, kg	386	376
Final wt, kg	481	477
Gain, kg	95	101
ADG, kg	1.00	1.05
Grain, intake, kg/hd	643	643

[a] 12 steers slaughtered 11/12/78, 89-day finishing period, and 8 steers by 11/26/78, 103-day finishing period.

[b] All steers were group fed so intake by previous treatment is not available.

Pasture trial

Results of the pasture study are shown in table 8. The clover-orchardgrass steers had increased ($P < .05$) ADG over the clover-fescue steers of .17 kg. The increased level of supplementation had little effect on steer performance on the clover-orchardgrass pastures. Cream grazing was of no value on clover-fescue pasture which possibly indicates that something inhibits gains on fescue rather than selectivity of higher quality forage.

TABLE 8. GAIN DATA DURING 99-DAY IRRIGATED PASTURE STUDY

Item	+ 1.4 kg supplement		Clover-orchardgrass	
	Continuous	Cream	1.4 kg supplement	2.3 kg supplement
No. of steers	10	10	10	10
Initial wt, kg	318	318	320	317
Final wt, kg	433	429	446	450
Gain, kg	115^{ab}	111^{a}	126^{bc}	133^{c}
ADG, kg	1.16^{ab}	1.12^{a}	1.28^{bc}	1.34^{c}

^{a,b,c} Means in the same row with different superscripts differ significantly ($P < .05$).

Tramisol treatment had no effect on gains which suggested that internal parasites were not a problem associated with the test pastures. There may also be an adverse effect on the rumen microbial population due to Tramisol treatment. Past unpublished research at Squaw Butte Experiment Station has also shown no effect on steer gains due to Tramisol treatment.

Results of the finishing phase on legume-fescue pasture are shown in table 9. The steers from the previous clover-orchardgrass treatments had increased ($P < .05$) ADG of .29 kg over the steers from the previous clover-fescue pastures. Since the clover-fescue steers entered the finishing phase at lighter weights, they would have been expected to outgain the clover-orchardgrass steers. No clear explanation for the reduced gains by steers on the clover-fescue pastures is available. Fescue is comparable to most grasses for nutrient composition and was found to be of high *in vitro* digestibility (Terry and Tilley, 1964). Yates *et al.* (1962) reported that weight loss and a general unthrifty appearance are common to animals grazing tall fescue pastures. Julien *et al.* (1974) infused extracts from known toxic fescues intraperitoneally and found reduced feed intake by calves. This suggests that a substance similar to those causing "fescue foot" may be responsible for the poor performance of steers grazing fescue pastures. Fescue may contain intake or growth inhibitors that accumulate over time and have a more deleterious effect on gain of animals left on fescue as opposed to those moved on for a short period of time.

TABLE 9. GAIN AND CONSUMPTION DATA DURING FINISHING PERIOD BY PREVIOUS TREATMENT

Item	Clover-fescue 1.4 kg supplement Continuous	Clover-fescue 1.4 kg supplement Cream	Clover-orchardgrass 1.4 kg supplement	Clover-orchardgrass 2.3 kg supplement
No. of steers	5	5	4	6
Days	75	75	75	75
Initial wt, kg	430	426	455	442
Final wt, kg	527[a]	522[a]	575[b]	558[ab]
Gain, kg	97[a]	96[a]	120[b]	116[b]
ADG, kg	1.29[a]	1.28[a]	1.61[b]	1.54[b]
Grain intake, kg	519	519	519	519

[a,b] Means in the same row with different superscripts differ significantly ($P < .05$).

[c] All steers were group fed so intake by previous treatment is not available.

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