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Escape Protein Supplementation of Yearling Steers and Summer Born Calves on Native Sandhills Range

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Escape protein supplementation improved pasture gains for yearling steers and summer born calves. Yearling steers were unable to maintain increased summer gain throughout the finishing period.

Summary

A trial was conducted to evaluate the effects of escape protein supplementation on pasture gains and subsequent finishing performance of cross-bred yearling steers and summer-born calves. Yearling steers and calves were assigned to one of two summer treatments: escape protein supplement or unsupplemented control. Escape protein supplementation improved pasture gains in supplemented steers and calves. Forage dry matter intake during summer grazing was lower for supplemented than unsupplemented steers and calves. Improved gains on range from escape protein were maintained in the feedlot by summer-born calves but not yearling steers.

Introduction

Actively growing forage may be limiting in escape or undegraded intake protein (UIP) when used by growing cattle (1991 Nebraska Beef Report, pp. 27-28). If limiting, supplementation with UIP should increase gains in growing cattle on summer range.

Digestible protein needs in high producing ruminants are separated into two categories: microbe and metabolizable protein needs. Protein needs for microbes must be met with a source of rumen-degradable protein (DIP) in order for microbial protein synthesis to occur. A response to metabolizable protein from UIP occurs primarily when degradable protein requirements of microbes are met, because reduced microbial growth decreases energy digestion in the rumen and limits animal growth. Native summer Sandhills range generally supplies a sufficient level of degradable protein to growing cattle. Therefore, UIP supplements for yearling steers and summer born calves grazing native summer range may be beneficial. Our objectives were to determine the effects of UIP supplementation on grazing performance and compensatory growth and to evaluate the effect of age on the response to supplementation.

Procedure

Sandhills range consisting of a mixture of warm and cool season species was used from June 1 to Sept. 8, 1998. Forty-eight yearling steers (745 lb) were used in a completely randomized design. Yearling steers were previously wintered at four rates of gain: 1.43 lb/day (fast), .54 lb/day (slow), .85 lb/day (fast/slow and slow/fast). Fast/slow and slow/fast steers are assigned to fast or slow treatments for half of the wintering period and then moved to the alternate treatment for the remainder of the winter. Thirty-two summer born (June-July 1997) steer calves (517 lb) from the Gudmundsen Sandhills Laboratory (GSL, Whitman, NE) also were used. Yearling steers (14 mo age) and summer-born calves (11 mo age) were assigned to one of two summer treatments, UIP supplement or unsupplemented control and grazed on 640 acres of Sandhills range as one group. Three days each week steers were gathered and fed their respective supplement in individual feeding stalls. The supplemented steers were fed 2.9 lb of supplement to supply .44 lb of UIP per day. Supplement consisted of 78.5% treated soybean meal, 18.5% feather meal and 3% molasses (DM basis).

Forage samples were obtained biweekly with ruminally fistulated steers and were analyzed for CP, UIP and in-vitro dry matter disappearance. All yearling steers and 12 of the summer-born calves were given a chromium-releasing Captec bolus to estimate fecal output. Fecal output was calculated by dividing amount of chromium released by the Captec bolus by chromium concentration in the feces. Forage intake was calculated by dividing fecal output by indigestibility of the forage. Total chromium output from the bolus was verified using total fecal collection of six steers.

All animals were placed in the feedlot (ARDC, Ithaca, NE) following summer grazing. Animals were sorted according to previous winter treatment (fast, slow, and slow/fast, fast/slow), summer treatment (supplemented or unsupplemented) and summer-born calves. All steers were stepped up to the finishing ration over a 20-day period using four steps. The final ration contained 7% alfalfa hay, 40% wet corn gluten feed, 48% high moisture corn and 5% supplement (DM). Yearling steers were fed 92 days and summer-born calves were fed 141 days until they reached about .45 inches of back fat.

Results

UIP supplementation on summer range improved (P = .0001) gains over unsupplemented control yearling steers and calves (Table 1). The effect of winter treatment was significant (P = .0001). However, there were no winter gain by

Table 1. Summer gains of supplemented and unsupplemented steers

Winter treatment	Summer Treatment			
	Unsupplemented		Supplemented	
	ADG, lb	SEM	ADG, lb	SEM
Fast[a]	1.57	.09	2.08	.09
Fast/Slow[a]	1.80	.09	2.03	.09
Slow/Fast[a]	1.77	.09	2.04	.10
Slow[a]	2.02	.09	2.34	.09
Summer born calves[b]	1.46	.06	1.78	.06

[a]Winter treatments were Fast 1.43 lb ADG, Fast/slow, Slow/fast .85 lb ADG, and Slow .54 lb ADG; winter by summer interaction (P = .6), summer (P = .0001), winter (P = .0001)
[b]Summer born calves were wintered at Gudmunsen Sandhills Laboratory on native range with supplement.

Table 2. Forage intake of supplemented and unsupplemented steers.

Winter treatment	Summer Treatment			
	Unsupplemented		Supplemented	
	Intake % BW	SEM	Intake % BW	SEM
Fast[a]	2.53	.15	2.59	.14
Fast/Slow[a]	2.84	.15	2.59	.15
Slow/Fast[a]	3.02	.13	2.73	.15
Slow[a]	3.13	.15	2.54	.14
Summer born calves[b]	3.02	.11	2.95	.18

[a]Winter treatments were Fast 1.43 lb ADG, Fast/slow, Slow/fast .85 lb ADG, and Slow .54 lb ADG; winter by summer interaction (P = .31), summer (P = .08), winter (P = .004)
[b]Summer born calves were wintered at Gudmunsen Sandhills Laboratory on native range with supplement.

Table 3. Crude protein, undegraded intake protein, and in-vitro dry matter disappearance of the summer range (DM basis).

Date	CP %	SEM	UIP %	SEM	IVDMD %	SEM
June	12.4	.55	2.6	.14	70.2	.8
July	10.1	.41	1.9	.10	64.1	.6
August	9.4	.51	1.6	.13	60.3	.8
September	11.1	.72	1.7	.19	54.3	1.1

Table 4. Feedlot average daily gain, DMI and F/G.

Winter trt.[a]	Summer trt.[b]	ADG[c]	DMI[c]	F/G
Fast	Unsupp.	5.18	32.2	6.2
Fast	Supp.	4.88	32.7	6.7
Slow	Unsupp.	4.94	31.3	6.3
Slow	Supp.	4.06	29.7	7.3
Summer born calves	Unsupp.	3.90	24.0	6.1
Summer born calves	Supp.	3.87	24.0	6.2
SEM		.36	1.1	.16

[a]Winter treatments are Fast 1.43 lb ADG, Slow .54 lb ADG, and summer born calves wintered on native range with supplement
[b]Summer treatments were supplemented with escape protein or unsupplemented control.
[c]ADG and DMI are expressed in lb.

summer supplement interactions (P = .6). Steers on the slow winter treatment had higher ADG on range than steers on the fast winter treatment. This higher ADG allowed slow-gaining steers to compensate for a portion of the winter weight deficit.

Slow gaining steers compensating for the winter weight deficit did not gain better as a result of supplementation. This is shown by a numerically lower response in weight gain to supplementation. Slow gaining supplemented steers showed a positive response of .32 lb/day over slow unsupplemented controls. Fast-gaining supplemented steers had a positive response of .5 lb/day over unsupplemented fast-gaining steers. Summer-born calves showed increased average daily gains on range of .32 lb/day from supplementation when compared to the unsupplemented control.

Crude protein content of the forage was variable during the grazing trial with the average CP content being 10.8 % while UIP value was about 2 % of dry matter. The average in-vitro dry matter disappearance was 63.1 % (Table 3).

Forage intake determination using chromium-releasing Captec boluses is presented in Table 2. Intake determinations showed a significant effect (P = .08) of summer treatment; supplemented animals showed lower forage intakes than the unsupplemented controls. The effect of winter treatment was also significant (P = .004); slow-gaining steers showed higher intakes as a percentage of body weight when compared to fast gain steers. This increase in intake as a percent of body weight with compensating steers has been shown in previous research. There were no significant (P = .31) winter treatment by summer treatment intake interactions.

Feedlot data showed unsupplemented yearling steers gained faster and were more efficient when compared to supplemented yearling steers (Table 4). This increased gain allowed unsupplemented yearling steers to make up the weight difference created with summer supplementation. Carcass data showed no effects of summer treatment on fat, marbling or yield grade for yearling steers.

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The feedlot ADG of summer-born calves showed gains to be similar between supplemented and unsupplemented treatments. This allows for maintenance of summer supplementation gain. Dry matter intake, F/G and carcass traits were also similar between supplemented and unsupplemented summer-born calves. This means that summer born calves' efficiencies were similar in the feedlot regardless of summer treatment. Increased gain with summer supplementation, similar feedlot gain and efficiency resulted in heavier animals at the end of the feeding period.

Overall, the response to UIP is not increased with compensatory growth or with animals at younger ages. Compensation with yearling steers showed that slow-gaining (compensating) steers did not respond more to UIP supplementation than the fast gaining steers. Age showed no effect on response to UIP, summer-born calves' response to supplementation was equal to the average response of supplemented yearlings.

UIP supplementation improved summer gains on range but the improved gains were not maintained during the finishing period by yearling steers. The summer-born calves gained similarly during the finishing period, resulting in maintenance of summer gains.

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