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LEVEL OF AVAILABLE FORAGE AND SUPPLEMENTAL PROTEIN AND ENERGY FOR COWS GRAZING WINTER RANGE

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Summary

A winter grazing trial at the SDSU Range and Livestock Research Station near Cottonwood was conducted to determine if the response to feeding a high starch supplement is dependent on the amount of protein fed and the amount of forage available. During December and January 126 Simmental-Angus crossbred cows grazing two pastures with differing amounts of available forage were fed four supplemental treatments that provided the following amounts of crude protein (lb) and metabolizable energy (Mcal) per cow daily: 1) .72 and 3.92, 2) .72 and 10.64, 3) 1.44 and 7.78, and 4) 1.44 and 10.91. Cows grazing the high available forage pasture gained 41 lb more than those grazing the low forage pasture. Increasing the amount of supplemental protein from .72 to 1.44 lb per cow daily increased cow gains. Increasing the amount of supplemental energy did not improve cow weight gains when the level of supplemental protein was .72 lb per cow daily. When the amount of protein was doubled, increasing the amount of supplemental energy increased gains by 21 lb. There was a tendency for a greater response to the higher protein, higher energy supplement for cows grazing the pasture with less forage available.

Key Words: Beef Cows, Winter Range, Supplement, Energy, Protein, Available Forage

Introduction

A commonly asked question is "Should I feed a small amount of more expensive high protein supplement or a larger amount of a less expensive low protein supplement to cows grazing winter range?" Numerous research studies indicate that the first consideration should be protein. Providing supplemental protein in the form of alfalfa hay or a high protein concentrate supplement will increase the digestibility of the forage and allow greater forage consumption resulting in more favorable cow winter weight change. Several studies show that providing grain as supplemental energy usually decreases digestibility of the forage and the amount of forage consumed. As a result, there may be no advantage in weight gain or even greater weight loss when the supplemental energy is in the form of a high starch, low protein supplement like corn. It has been assumed by some that if forage is limited, grain may be more beneficial.

Results from two previous cow winter grazing trials at the SDSU Range and Livestock Research Station near Cottonwood seem to conflict. In the first study higher levels of a soybean meal-corn supplement were detrimental to cow gains. This detrimental effect was greater for cow grazing the low forage available pasture. In the following winter trial, weight gain was the highest for cows receiving the most supplement. In an attempt to determine the factors that affect the response to level of supplementation, this trial was conducted

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to determine the effect of level of protein on the response to a high starch supplement for cows grazing pastures of differing available forage.

Materials and Methods

A winter grazing trial was conducted with 126 pregnant Simmental-Angus crossbred cows grazing native winter range at the SDSU Range and Livestock Research Station near Cottonwood, SD. Cows were allotted by age and weight to four soybean meal-corn supplement treatments (Tables 1 and 2) and grazed on a pasture of either high or low available forage during December and January. The low level of protein (.72 lb per cow daily) was calculated to provide NRC (1984) requirements for crude protein not provided by grazed forage as estimated by forage intake and forage protein analysis from previous studies. The high level of protein was calculated to supply twice the amount of supplemental crude protein as the low level. The level of high energy low protein supplement was calculated as the maximum amount of supplement possible using corn that would supply .72 lb crude protein. The high protein, high energy supplement was designed to supply a similar amount of energy but at the higher level of protein. Supplements were fed in pelleted form (3/8 in. diameter) and were balanced to exceed NRC (1984) requirements for phosphorous and potassium (Table 2).

Table 1. Supplemental treatments[a]

	Low protein		High protein	
Item	Low energy	High energy	Low energy	High energy
Soybean meal	82.18	--	96.28	23.89
Corn grain	--	95.04	--	72.39
Molasses	2.50	2.50	2.50	2.50
Dicalcium phosphate	7.92	.84	2.76	.40
Potassium chloride	7.40	1.61	2.06	.80

[a]Percentage on a dry matter basis.

Table 2. Composition of daily supplemental intake per cow[a]

	Low protein		High protein	
Item	Low energy	High energy	Low energy	High energy
Dry matter, lb	1.74	7.41	3.07	7.56
Metabolizable energy, Mcal	3.92	10.64	7.78	10.91
Crude protein, lb	.72	.72	1.44	1.44
Phosphorus, lb	.03	.03	.03	.03
Potassium, lb	.09	.09	.10	.10

[a]ME values are calculated from NRC feed tables. Other values are based on chemical analysis.

The two pastures used in the study were dominated by western wheatgrass. The low available forage pasture (270 acres) was grazed for 3,684 animal unit days during November just prior to the start of the trial to create differences in forage available. The high forage pasture (351 acres) had not been grazed since the previous April.

From December 5 to February 4, cows were gathered every morning, sorted into treatment groups and bunk fed their respective diets. At the beginning and end of the trial, cows were weighed in the morning on two consecutive days after overnight removal from feed and water. Initial and final cow weights were the average of the two consecutive weights. Condition scores (1 to 9, 1 = extremely thin, 9 = obese) were assigned by two people at the beginning and end of the trial.

Data were analyzed as a 2 x 4 factorial with two pastures and four treatments as main effects using the GLM procedure of SAS and treatment means separated by the PDIFF option.

Results and Discussion

Cows grazing the high forage pasture gained 41 lb more ($P<.01$) and had a greater condition score increase ($P<.01$) than cows grazing the low forage pasture (Table 3). Cows receiving the higher level of protein (1.44 lb) gained more than those receiving .72 lb crude protein per day to meet their NRC (1984) requirements. The two high energy treatments are the only direct comparison of two levels of protein at a similar energy content. In this comparison, gains were 67 lb greater for cows receiving the higher protein supplement ($P<.01$). For cows supplemented with the lower level of protein increasing the level of energy from 3.92 to 10.64 Mcal ME per cow daily (or 1.74 to 7.41 lb of supplement dry matter) did not increase weight gains. When cows received the higher level of protein, increasing the supplemental energy from 7.78 to 10.91 Mcal ME per cow daily (or 3.07 to 7.56 lb of supplement dry matter) increased weight gains by 21 lb ($P<.01$). There was a tendency for the response to the high protein, high energy supplement to be greater for cows grazing the low forage available pasture.

This and previous trials show that amount of forage available has a major effect on cow gains that may be even larger than the amount of supplement fed. When forage is abundant, cows are able to select a diet that is higher in protein and more digestible. In an earlier trial at the Cottonwood Station providing .7 lb of supplemental protein improved cow weight gains for a 60 day winter grazing trial by 76 lb. Additional results from subsequent trials show that the primary concern for a winter supplementation program should be protein. The weight change advantage of supplying additional energy in the form of a high starch supplement like corn has been mixed. In one trial increasing the amount of corn improved performance and in another trial cows receiving more supplement actually gained less weight than cows than cows fed less supplement. This trial would indicate that if higher gains are desirable, the amount of protein per day should be increased for higher levels of supplement to be effective. This situation would be most likely when cows are thin at the beginning of the winter, grazable forage is limited and hay is expensive relative to grain. Under most situations supplemental protein in the form of alfalfa hay or an all natural high protein supplement will provide the greatest benefit in minimizing winter weight loss and body condition.

After the 1994 calving season, reproductive performance of the cows in this trial will be analyzed. Future winter supplementation studies will be conducted to evaluate the response to low starch supplements fed to cows grazing pastures of varying available forage.

Table 3. Effect of available forage and supplement treatment on cow performance

Item	Forage available			Low protein		High protein		
	High	Low	SE	Low energy	High energy	Low energy	High energy	SE
No. of cows	63	63		30	32	32	32	
Initial wt, lb	1125	1122	11	1126	1124	1120	1124	15
Gain, lb	96[a]	55[b]	4	48[a]	47[a]	93[b]	114[c]	5
Initial condition score	5.7	5.7	.1	5.6	5.7	5.7	5.7	.1
Condition score change	.5[a]	.2[b]	.1	.1[d]	.3[de]	.4[de]	.5[e]	.1

[a,b,c]Means within main effect with uncommon superscripts differ (P<.01).
[d,e]Means wihtin main effect with uncommon superscripts differ (P<.05).