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Summary

In a 2 yr study 180 lactating cows (2 to 10 yr old) grazing pastures dominated by smooth bromegrass and Kentucky bluegrass near Brookings, SD received 3 supplemental treatments for 48 d beginning in mid May. Cows received 4.6 lb DM of dried distillers grains with solubles (DDGS), 4.3 lb corn DM, or no supplement daily, starting approximately 14 d prior to the start of the breeding season. Cows were bled weekly for 5 wk beginning 1 wk prior to the beginning of the treatment period. Serum was analyzed for progesterone concentration to determine the onset of cyclicity. While supplemented cows did tend to have higher ADG than cows that received no supplement, supplementation did not improve any measure of reproduction. Calf growth rate was not affected by supplementation. The results were similar when only 2 and 3 yr olds were included in the analysis. Under the conditions of this study, it is not beneficial to supplement cows with DDGS or corn to improve cow reproductive performance or calf performance.

Introduction

Grazed forage in the spring is typically high in crude protein (CP) but the high rumen degradability of the CP may result in inadequate metabolizable protein for lactating cows (Blasi et al., 1991). Anderson et al. (1988) reported improved performance in yearling steers supplemented with undegradable intake protein (UIP) grazing fresh forages. Wiley et al. (1991) reported heifers consuming diets that were isonitrogenous and isoenergetic had a greater percentage cycling prior to the breeding season and conceiving in the first 21 d of the breeding season when greater levels of UIP were fed. Blasi et al. (1991) found that cows grazing smooth brome grass supplemented with UIP produced more milk resulting in higher calf growth rate. Expansion of ethanol production has led to abundant supplies of distillers co-products. These products are high in CP with increased rumen escape value. The objective of this research was to determine the effect of supplementing cows grazing spring pasture with DDGS or corn on cow and calf performance.

Materials and Methods

Angus and Simmental x Angus cows (2 to 10 yr old; 2004, n=87; 2005, n=93) were allotted by age (2, 3, and 4 yr or older), breed, and calving date to one of three treatments. Cows grazing pastures dominated by smooth bromegrass and Kentucky bluegrass (Table 1), fertilized with 75 lb/acre N and 17 lb/acre P received 1) dried distillers grains with solubles (DDGS) at 4.6 lb DM/hd daily, 2) corn at 4.3 lb DM/hd daily, or 3) no supplement (Table 2).

Table 1. Forage composition, dry matter basis.[a]

	Year 1	Year 2	SE
Crude protein, %	14.8	17.0	0.5
NDF, %	55.2	54.3	0.6
ADF, %	28.6	28.7	0.4
EE, %	2.3	3.0	0.1
Ash, %	9.7	10.0	0.3

[a] average of weekly samples

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Table 2. Supplements.

	Year 1		Year 2	
	Corn	DDGS	Corn	DDGS
Corn, lb DM	4.31		4.27	
DDGS, lb DM		4.61		4.61
CP, lb/d	0.38	1.38	0.37	1.41
UIP, lb/d[a]	0.20	0.76	0.21	0.74
EE, lb/d	0.15	0.49	0.15	0.56
NEm., Mcal/d[a]	4.39	4.57	4.35	4.57

[a] based on NEm and RU values from NRC, 2000.

To eliminate differences associated with pasture effects, cows were rotated through 11 paddocks. Each treatment group was moved every third day just prior to feeding at approximately 0930.

At the beginning of each trial cows were weighed on 2 consecutive days following an overnight shrink away from feed and water. This procedure was repeated upon completion of the supplementation period, and again at weaning. Body condition scores (BCS) were recorded by the same two trained technicians, with determination of BCS reported as an average of the two estimates with 1 being extremely thin and 9 being extremely obese (Pruitt and Momont, 1988). Calf weights were determined on each of the above occasions as the average of 2 weights on consecutive days.

Beginning 1 wk prior to the start of supplementation, blood samples were collected weekly for 5 wk by jugular venipuncture. Blood was stored at 4°C for 24 h, and centrifuged at 1,200 x *g* for 30 min. Serum was harvested and stored at -20°C until analyzed. Samples were analyzed for progesterone by radioimmunoassay. Cows were considered cycling when they met 1 of 3 criteria: 1) progesterone > 1 ng/ml serum for two consecutive weeks; 2) progesterone > 1 ng/ml serum followed by standing estrus within 2 wk; or 3) standing estrus. All cows were injected with prostaglandin $F2_{\alpha}$ at the beginning of the breeding season and artificially inseminated 12 h after visual estrus detection. All cows not previously inseminated were re-administered prostaglandin $F2_{\alpha}$ 7 d after the first injection. Estrus detection and artificial insemination continued for 44 d. Cows were then exposed to bulls for 33 d in year 1 and 22 d in year 2. Pregnancy was determined by transrectal ultrasonography. Conception date was determined by a combination of transrectal ultrasonography, breeding records, and subsequent calving date.

Forage samples were collected weekly starting in mid-May and ending in early July by clipping samples at approximately 10 cm above ground level. Samples were frozen at -20°C following collection until further analysis could be performed. Forage samples were freeze dried, ground, and analyzed for CP, NDF, ADF, EE and ash.

Statistical analysis

Cow weight, average daily gain, BCS, and days from calving to cyclicity, and conception were analyzed using PROC GLM of SAS (SAS Institute, Cary, NC). Independent variables in the statistical model included supplement treatment, year, and cow age group (2, 3 and 4 yr and older). Treatment x year served as the error term. Means were separated by the PDIFF option of SAS.

Reproductive performance expressed as percentages were analyzed using PROC GENMOD of SAS. Independent variables were treatment, year, and cow age group.

Analysis one included all cows. Since young, thin cows are more likely to show a reproductive response to treatments, a second analysis was conducted with only 2 and 3 yr old cows.

Calf weights and average daily gain were analyzed using PROC GLM of SAS with treatment, year, cow age group, and calf sex serving as independent variables. Treatment x year was used as the error term to test treatment effects. Means were separated using the PDIFF option of SAS.

Results and Discussion

ADG tended (P = 0.09) to be higher for cows receiving supplement (Table 3). Cows consuming DDGS or corn gained at similar rates during the supplementation period. Since gain for the DDGS and corn groups were similar, the response to supplementation suggests an effect of energy rather than a response to crude protein or UIP.

Table 3. Performance of all cows.

	DDGS	SE	Corn	SE	No Supplement	SE	P=
No. of females	60		60		60		
Weight, lb							
Start	1225	6	1217	6	1223	6	0.65
End	1339	9	1326	9	1314	9	0.35
Weaning	1365	6	1361	6	1345	6	0.22
Cow ADG from initial weight, lb							
Supplementation Period	2.02[a]	0.06	1.93[ab]	0.06	1.62[b]	0.06	0.07
Start to weaning	1.12	0.04	1.15	0.04	0.97	0.04	0.12
End to weaning	0.39	0.08	0.52	0.08	0.45	0.08	0.60
Condition score							
Start	5.9	0.0	5.8	0.0	6.0	0.0	0.09
End	6.2	0.1	6.2	0.1	6.2	0.1	0.96
Weaning	6.1	0.0	6.1	0.0	6.1	0.0	0.57

[a,b] Means without a common superscript differ (P < 0.07).

Supplementation did not improve reproductive performance (Table 4) or calf ADG (Table 5). Wiley et al. (1991) reported greater weight gain and shorter postpartum interval for first calf heifers receiving supplemental protein postpartum in the form of rumen undegradable protein compared to rumen degradable protein. Milk production and calf gain was not affected by protein source. The base diet in their study was medium quality grass hay (10.1% CP, 55% NDF)

Table 4. Reproductive performance of all cows.

	DDGS	SE	Corn	SE	No Supplement	SE	*P*=
No. of females	60		60		60		
Cycling by beginning of breeding season, %	48.3		53.3		48.3		0.76
Cycling by day 21 of the breeding season, %	98.3		98.3		98.3		1.00
Calving to cycling, d	80.2	0.9	78.6	0.9	79.7	0.9	0.57
Conception in first 21 d of breeding season, %	53.3		63.3		65.0		0.37
Calving to conception, d	97.2	1.5	96.4	1.5	97.1	1.5	0.92
% Pregnant	96.7		93.3		96.7		0.60

Table 5. Calf performance from all cows

	DDGS	SE	Corn	SE	No Supplement	SE	*P*=
No. of Calves	60		60		60		
Weight, lb							
Start	245	3	238	3	241	3	0.39
End	396	4	380	4	387	4	0.17
Weaning	578	6	557	6	573	6	0.22
Calf ADG from initial weight, lb							
Supplementation period	2.68	0.03	2.50	0.03	2.58	0.03	0.12
Start to weaning	2.65	0.03	2.54	0.03	2.64	0.03	0.25
End to weaning	2.64	0.04	2.56	0.04	2.68	0.04	0.31

Typically 2 and 3 yr old females will be thinner at the beginning of the breeding season, have longer postpartum intervals and are more likely to respond to management affecting reproductive performance. In this study, the percentage of cows cycling at the beginning of the breeding season were 25.0, 46.2 and 72.2% for cows 2, 3 and 4 and older ($P < 0.001$). If the supplement treatments were going to affect reproduction, the effect would most likely be observed in young cows. Results for 2 and 3 yr old cows are presented in tables 6 through 8. Young cows receiving supplement gained more ($P = 0.05$) than cows receiving no supplement. Reproductive performance and calf gains were not improved by supplementation (Table 7). Although the added gain from supplementation did not translate to improved reproductive performance in this study, in other situations where young cows are extremely thin the added weight gain could impact reproductive performance.

Table 6. Performance of 2 and 3 year old cows.

	DDGS	SE	Corn	SE	No Supplement	SE	P=
No. of females	36		36		36		
Weight, lb							
Start	1136	8	1128	8	1146	8	0.47
End	1244	7	1238	7	1237	7	0.72
Weaning	1275	6	1287	6	1280	6	0.52
Cow ADG from initial weight, lb							
Supplementation period	1.93^{a}	0.04	1.95^{a}	0.04	1.61^{b}	0.04	0.05
Start to weaning	1.21	0.05	1.27	0.05	1.08	0.05	0.22
End to weaning	0.58	0.06	0.70	0.06	0.63	0.06	0.49
Condition score							
Start	5.8	0.1	5.6	0.1	5.8	0.1	0.46
End	6.0	0.1	6.0	0.1	6.0	0.1	0.96
Weaning	6.0	0.1	6.0	0.1	6.0	0.1	0.92

^{a,b} Means without a common superscript differ ($P < 0.05$)

Table 7. Reproductive performance of 2 and 3 yr old cows.

	DDGS	SE	Corn	SE	No Supplement	SE	*P* =
No. of females	36		36		36		
Cycling by beginning of breeding season, %	33.3		41.7		30.6		0.50
Cycling by day 21 of the breeding season, %	100.0		97.2		97.2		0.44
Calving to cycling, d	82.7	1.1	82.8	1.1	85.0	1.1	0.42
Conception in first 21 d of breeding season, %	50.0		69.4		66.7		0.19
Calving to conception, d	101.4[a]	0.1	100.3[b]	0.1	100.4[b]	0.1	0.01
% Pregnant	97.2		94.4		94.4		0.80

[a,b] Means without common superscript differ ($P < 0.01$)

Table 8. Performance of calves from 2 and 3 yr old cows.

	DDGS	SE	Corn	SE	No Supplement	SE	*P* =
No. of Calves	36		36		36		
Weight, lb							
Start	239	4	238	4	239	4	0.98
End	385	7	379	7	385	7	0.82
Weaning	561	8	552	8	566	8	0.54
Calf ADG from initial weight, lb							
Supplementation period	2.57	0.05	2.49	0.05	2.55	0.05	0.62
Start to weaning	2.57	0.03	2.50	0.03	2.60	0.03	0.29
End to weaning	2.55	0.02	2.50	0.02	2.63	0.02	0.07

Implications

Under the conditions of this study, it is not beneficial to supplement cows with DDGS or corn to improve cow reproductive performance or calf performance. Supplementation of extremely thin cows to improve weight gain has potential to increase reproductive performance.

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