INFLUENCE OF LOW-LEVEL FALL SUPPLEMENTATION WITH A SELF-FED, HIGH-PROTEIN SUPPLEMENT AND LEVEL OF WINTER SUPPLEMENTATION ON PERFORMANCE OF BEEF COWS GRAZING TALLGRASS-PRAIRIE RANGE

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Summary

An experiment was conducted to determine the effect of providing a small amount of a high-protein supplement during the fall and effects of increasing subsequent level of winter supplementation on cow-calf performance. One hundred-sixty spring-calving Hereford × Angus cows grazing tallgrass-prairie range were used. During the fall, cows either had access to a self-fed, high-protein supplement (30% CP) or were not supplemented. During the winter, range cubes (20% CP) were fed at a daily equivalent of 1, 2, 3, or 4 lb/head and all cows had access to the same self-fed supplement used during the fall period. Cumulative performance (as measured by changes in body condition score and body weight) tended to show limited response to low-level fall supplementation, but was significantly improved as level of winter supplementation increased.

(Key Words: Protein, Range, Beef Cattle, Supplementation, Self-Feeding.)

Introduction

During the period between weaning and initiation of winter supplementation, a spring-calving cow's nutrient demands are typically at their lowest, enabling cows to recover body weight and condition before entering winter. However, forage protein concentration during this period is often low enough to prevent optimum utilization of available nutrients, hampering the cow's ability to improve body condition. Previous research at Kansas State University demonstrated that utilization of low-quality forage is improved by protein supplementation, with the greatest improvements from the first increments of supplement. Our initial objective was to evaluate the capability of small quantities of a self-fed, high-protein supplement to improve forage utilization during the fall period, thereby increasing the cow's ability to recover condition during this period and enabling her to enter winter in better nutritional status. Improved condition and weight entering the winter period may reduce the amount of supplementation required to maintain desirable levels of performance. Therefore, an additional objective was to evaluate the response to increasing levels of winter supplement among groups of cows managed both with and without fall supplementation.

Experimental Procedures

During the fall and winter of 1999-2000, 160 Hereford × Angus cows were used to examine the effect of different fall and winter supplementation treatments on performance. Cows were weighed and body condition scored (1 = extremely emaciated, 9 = extremely obese) on October 4, 1999, stratified by body condition score and body weight, and assigned randomly within strata to one of four pastures. Initial condition score averaged 5.2 and initial body weight averaged 1,139 lbs.

Pasture groups were randomly assigned to two fall (10/4/1999 through 11/30/1999) treatments (two pasture groups per treatment); either free-choice access to a high protein (30% CP) self-fed, cooked molasses supplement or no supplementation. In addition, within each pasture group, cows were stratified by body condition and weight and randomly assigned within strata to one of

four winter (12/1/1999 to calving) supplementation treatments; free-choice access by all cows to the same self-fed supplement used during the fall period plus an average daily equivalent of 1, 2, 3, or 4 lb/head of a commercial range cube (20% CP). Range cubes were delivered on Monday, Wednesday, and Friday and were prorated to match the described daily intake averages. On supplementation days, all cows were gathered and sorted into their appropriate treatment groups and group-fed their supplement. Intake of the self-fed supplement was regulated throughout the fall and winter periods by manipulating container (250 lb tubs) placement and/or number. Our intended consumption was 0.5 – 1.0 lb/head daily. Consumption of the self-fed product was measured through both fall and winter periods, ending in late February with the beginning of the calving season.

After calving (average calving date = 3/5/00) all cows continued to graze tallgrass-prairie, but were switched to a common supplementation program (12 lb/head daily of high-quality alfalfa hay) until sufficient green grass was available (mid- to late-April). In addition to the initial weight and body condition measurement in early October, cows were weighed and body condition scored again on November 30, January 6, February 8, within 48 hours after calving, May 9, and at weaning (10/4/2000). Calves were weighed within 48 hours after calving, on May 9, and at weaning. Pregnancy rate was determined by rectal palpation at weaning.

Results and Discussion

Daily intake of the self-fed supplement by cows during the fall period averaged 1.40 lb/head, slightly higher than the targeted consumption level (Table 1). However, fall supplementation under our conditions did not significantly improve body condition score change or weight change. Daily intake of the self-fed supplement during the winter period was not affected (P=0.54) by previous fall treatment (approximately 0.95 lb/head). Increasing level of range cube supplementation decreased cumulative body condition loss and cumulative weight loss (linear, $P<0.01$) during the winter period (Table 2). Although cow performance during the fall period was not significantly altered by consumption of the self-fed supplement, body weight at calving for supplemented cows tended (P=0.08) to be heavier.

Only one interaction (P=0.05) was observed; BCS for the fall-supplemented group was slightly higher across all winter supplement levels except at the highest level of winter supplementation.

Changes in BCS and BW after calving tended ($P \leq 0.06$) to be inversely related to BW and BCS changes during the prepartum period. As a result, cows supplemented during the fall or those receiving more winter supplement tended ($P \leq 0.08$) to lose more body condition, or show less improvement in body condition, from calving through May 9. Increasing the level of winter supplementation linearly increased calf birth weight (P=0.02). Neither fall nor winter supplementation treatments elicited a response in calf ADG from birth until weaning (10/4/200). Fall supplementation had little effect on percent of cows pregnant at weaning. However, it is noteworthy that the lowest level of winter supplementation exhibited the lowest pregnancy rates, being at least nine percentage units lower (Table 5) than other treatments. Differences between winter supplementation treatments were significant (P=0.04).

This experiment indicated that although most performance characteristics were improved in proportion to level of winter supplementation, providing a limited amount of protein for a short period during the fall exerted only minimal effects on subsequent livestock response.

Table 1. Effect of Fall Supplementation and Subsequent Winter Supplementation Level on Changes in Fall Body Weight (BW), Condition Score[a] (BCS), and Self-Fed Supplement Consumption of Beef Cows Grazing Dormant, Tallgrass-Prairie Forage

	Treatment			
Item	No Fall Supplementation	Fall Supplementation	SE	P[b]
No. of Cows	80	80		
Initial BCS	5.20	5.21	0.038	0.89
Period BCS change				
4 Oct – 30 Nov	-0.16	-0.07	0.049	0.34
Initial BW, lb	1131	1147	5.8	0.20
Period BW change, lb				
4 Oct – 30 Nov	15	22	14.8	0.79
Self-fed supplement consumption, lb/d				
4 Oct – 30 Nov	--	1.40	--	--
1 Dec – 22 Feb	0.92	0.99	0.067	0.54

[a]Body condition scale: 1=extremely emaciated; 9=extremely obese.
[b]Probability of a greater F-value.

Table 2. Effect of Fall Supplementation and Subsequent Winter Supplementation Level on Changes in Cow Body Condition Score[a] (BCS), Cow Body Weight (BW), and Calf Performance for Beef Cattle Grazing Tallgrass-Prairie

	Treatment								
	No Fall Supplementation				Fall Supplementation				
	lb/head/day				lb/head/day				
Item	1	2	3	4	1	2	3	4	SE
No. of Cows	20	20	20	20	19	20	20	20	
Initial Cow BCS	4.98	5.05	5.08	5.09	5.15	5.16	5.21	5.09	0.081
Initial Cow BW, lb	1112	1172	1137	1165	1162	1168	1171	1175	12.3
Cow Performance - Cumulative Changes									
BCS 12/1 – Calving[b]	-1.55	-1.30	-1.01	-0.86	-1.47	-1.34	-0.84	-0.93	0.094
BW 12/1 – Calving[b]	-228	-201	-154	-152	-224	-207	-159	-138	12.5
BCS Calving[c]	3.43	3.75	4.06	4.23	3.70	3.83	4.38	4.13	0.061
BW Calving, lb[b]	879	972	983	1014	938	961	1012	1037	11.3
BCS Calving – 5/9	0.22	0.19	-0.13	0.14	0.13	0.06	-0.02	-0.19	0.126
BW Calving – 5/9[b]	-24	-48	-74	-52	-28	-47	-62	-87	10.1
Cow Weaning BCS	5.13	5.15	5.18	5.30	5.24	5.19	5.24	5.17	0.081
Cow Weaning BW, lb	1106	1172	1136	1188	1179	1151	1167	1183	21.1
No. of Cows Calving	19	20	19	20	18	20	20	19	
Calf Performance									
Birth wt, lb[d]	81.3	84.2	82.3	89.4	84.6	84.3	87.0	86.6	1.66
Calf Weaning BW, lb	514	516	548	542	534	533	550	538	11.9
Calf ADG, lb	2.04	2.03	2.13	2.14	2.13	2.12	2.18	2.13	0.040

[a]Body condition scale: 1 = extremely emaciated; 9 = extremely obese.
[b]Contrasts for supplementation level across fall supplementation treatments were linear (P<0.05).
[c]Interaction between fall and winter supplementation was significant (P<0.05); additionally, linear, quadratic, and cubic contrast for supplementation level across fall supplementation treatments were significant P<0.05).
[d]Contrasts for supplementation level across fall supplementation treatments were linear (P<0.05).

Table 3. Effect of Fall Supplementation and Subsequent Winter Supplementation Level on Changes in Cow Body Condition Score[a] (BCS), Cow Body Weight (BW) from October 4, 1999 to October 4, 2000 on Beef Cattle Grazing Tallgrass-Prairie

	Treatment								
	No Fall Supplementation				Fall Supplementation				
	lb cube/head/day				lb cube/head/day				
Item	1	2	3	4	1	2	3	4	SE
Initial Cow BCS	5.26	5.23	5.13	5.18	5.15	5.32	5.20	5.18	0.053
Initial Cow BW, lb[b]	1103	1158	1118	1147	1135	1147	1151	1155	8.9
Cow Performance - Cumulative changes									
Change in BCS[c]	-.14	-.08	.15	.12	.04	-.16	.04	-.05	0.068
Change in BW, lb	7	14	26	41	42	2	15	24	16.2
Ending Cow BCS	5.13	5.15	5.18	5.30	5.24	5.19	5.24	5.17	0.081
Ending Cow BW, lb	1106	1172	1136	1188	1179	1151	1167	1183	21.1

[a]Body condition scale: 1 = extremely emaciated; 9 = extremely obese.
[b]Contrasts for supplementation level across fall supplementation treatments were linear and cubic ($P<0.05$).
[c]Contrasts for supplementation level across fall supplementation treatments were cubic ($P<0.05$).

Table 4. Effect of Fall Supplementation on Pregnancy Rate of Beef Cows Grazing Tallgrass-Prairie Forage

	Treatment		
Item	No Fall Supplementation	Fall Supplementation	Chi-Square (P[a])
No. of Cows	74	74	
Pregnancy Rate, %	96	92	0.31

[a]Probability of a greater F-value.

Table 5. Effect of Winter Supplementation Level on Pregnancy Rate of Beef Cows Grazing Tallgrass-Prairie Forage

	Winter Supplement lb cube/head/day				
Item	1	2	3	4	Chi-Square (P[a])
No. of Cows	35	38	37	38	
Pregnancy Rate, %	86	95	97	97	0.04

[a]Probability of a greater F-value.