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Supplementing Dried Distillers Grains to Steers Grazing Cool Season Meadow

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Summary

Two experiments evaluated the performance response of supplementing dried distillers grains plus solubles (DDGS) to steers grazing cool season meadow. Steers were supplemented 0.0 or 0.6% of BW in Exp. 1, and 0.0, 0.6, or 1.2% of BW in Exp. 2. In Exp. 1, supplemented steers had 0.13 lb/day greater ADG. In Exp. 2, there was a linear response to supplementation level, with steers supplemented 1.2% of BW having greatest ADG. Diet samples indicate the differences were due to increased energy and not increased protein intake.

Introduction

Supplementation with dried distillers grains plus solubles (DDGS) has been well studied in grazing programs using native warm season pastures and cool season monocultures. DDGS is high in protein (30 to 33% CP), undegradable protein (65 to 70% of the CP), and energy. Supplementation of protein and energy in grazing programs has led to a cost effective increase in ADG leading to heavier cattle after the grazing season. The objectives of these two studies were to determine 1) the effect of supplementing DDGS to steers grazing cool season-dominated Sandhills meadow and 2) whether or not the response is due to increased metabolizable protein or energy intake.

Procedure

Experiment 1

Twenty-eight spring-born steer calves (640 ± 48 lb) located at the Gudmundsen Sandhills Laboratory (Whitman, Neb.) were used in a grazing study to determine effects of supplemental DDGS while grazing sub-irrigated meadow dominated by cool season grasses. Prior to trial initiation, steers were limit fed meadow hay at 2% of BW for 5 days and weighed on 3 consecutive days to determine initial BW. Steers were stratified by initial BW and assigned randomly to 1 of 2 treatments: unsupplemented or supplemented 0.6% of BW during the summer grazing season. Steers were allowed to graze 92 days and were managed as one group during the summer grazing period. The amount of DDGS supplemented per steer was determined by multiplying the initial BW by 0.6% (range = 3.2 to 4.4 lb of DDGS/steer). Supplementation was offered to each steer 6 days/week. Steers receiving DDGS were individually penned each morning (0700 hr) and not turned out until DDGS was consumed (approximately 1 hour). Each day of supplementation, unsupplemented steers were penned as a group and not allowed to graze until supplemented steers had consumed all of their DDGS. At the end of the grazing period, steers were limit fed meadow hay 5 days at 2% of BW. After limit feeding, steer BWs were collected on 3 consecutive days to determine final grazing BW.

Experiment 2

Forty-eight spring-born steer calves (617 ± 48 lb) located at the Gudmundsen Sandhills Laboratory were used in a grazing study to determine the effect of supplemental DDGS at two different levels while grazing sub-irrigated meadow dominated by cool season grasses. Prior to trial initiation, steers were limit fed meadow hay at 2% of BW for 5 days and weighed on 3 consecutive days to determine initial BW. Steers were stratified by initial BW and assigned randomly to 1 of 3 treatments: unsupplemented, low supplementation level (0.6% of BW), or high level of supplementation (1.2% of BW). Steers were allowed to graze 91 days, and during the summer grazing period steers were managed as one group. Amount of DDGS supplemented per steer was determined by multiplying the initial BW by 0.6% (range = 3.0 to 4.5 lb of DDGS/steer) or 1.2% (range = 6.1 to 8.5 lb of DDGS/steer) and delivered to each steer 6 days/week. Steers receiving DDGS were individually penned each morning (0700 hr) and not turned out until DDGS was consumed. Each day of supplementation, unsupplemented steers were penned as a group and not allowed to graze until supplemented steers had consumed all of their DDGS. At the end of the grazing period steers were limit fed meadow hay 5 days at 2% of BW. After limit feeding, steer BWs were collected on 3 consecutive days to determine final grazing BW.

In both experiments, steers were shipped to North Platte, Neb. (West Central Research and Extension Center) and finished in the feedlot. Final BW for steers at harvest was calculated using a carcass weight divided by a 63% dressing percentage.

During the grazing period, diet samples were collected weekly using 4 esophageally cannulated cows. Diet samples were analyzed for TDN (IVDMD), NDF (Ankom fiber analyzer), CP (Leco nitrogen analyzer), and undegradable protein (*in situ*) (Table 1). These data, along with average steer BW for the grazing period and measured steer performance, were used to determine animal intake and metabolizable protein balance using the 1996 NRC model.

Table 1. Nutrient analysis for cool season dominated meadow[1].

Item	Exp. 1[2]	Exp. 2[3]
TDN, %	63.1	58.7
CP, %	13.0	11.6
Undegradable protein, % of CP	11.1	10.3
NDF, %	64.6	65.8

[1]Nutrient profile for both experiments is the average of each variable for the entire grazing season.
[2]Reported nutrient value is the average of 62 samples taken over 14 weeks.
[3]Reported nutrient value is the average of 50 samples taken over 13 weeks.

Table 2. Results from experiment 1.

Item	Control	Supplemented[1]	SEM	*P*-value
Grazing Performance				
Initial BW, lb	639	640	13	0.94
Final grazing BW, lb	818	831	14	0.52
Grazing ADG, lb/day	1.94	2.07	0.06	0.16
Feedlot Performance				
Final BW, lb	1423	1420	26	0.94
Feedlot ADG, lb/day	3.96	3.85	0.12	0.53
Carcass Characteristics				
Carcass weight, lb	897	895	17	0.94
Marbling score[2]	596	576	20	0.47
Calculated YG[3]	3.12	3.20	0.14	0.69
Fat thickness, in	0.54	0.51	0.04	0.61
Rib eye area, in^2	14.21	13.64	0.21	0.06

[1]Calves supplemented at 0.6% of initial BW.
[2]Marbling score = 500 = $small^{00}$, 600 = $modest^{00}$, etc.
[3]USDA YG (yield grade) = 2.5 + (2.5*12^{th} rib fat thickness, in) – (0.32*rib eye area, in^2) + (0.2*2.5 KPH,%) + (0.0038*carcass weight, lb).

Table 3. Results from experiment 2.

Item	Control	Supplemented[1]		SEM	*P*-value	
		0.6%	1.2%		Linear	Quadratic
Grazing Performance						
Initial BW, lb	616	622	615	20	0.93	0.67
Final grazing BW, lb	794	828	852	14	< 0.01	0.79
Grazing ADG, lb/day	1.96	2.27	2.61	0.09	< 0.01	0.85
Feedlot Performance						
Final BW, lb	1422	1461	1521	21	0.02	0.79
Feedlot ADG, lb/day	4.08	4.11	4.34	0.16	0.19	0.60
Carcass Characteristics						
Carcass weight, lb	896	920	958	21	0.02	0.79
Marbling score[2]	655	685	667	22	0.66	0.35
Calculated YG[3]	2.67	2.89	2.88	0.17	0.32	0.58
Fat thickness, in	0.43	0.51	0.46	0.04	0.48	0.12
Rib eye area, in^2	14.68	14.97	15.01	0.40	0.51	0.80

[1]Calves supplemented as a % of initial BW.
[2]Marbling score = 500 = $small^{00}$, 600 = $modest^{00}$, etc.
[3]Calculated YG (yield grade) = 2.5 + (2.5*12^{th} rib fat thickness, in) – (0.32*rib eye area, in^2) + (0.2*2.5 KPH, %) + (0.0038*carcass weight, lb).

Both experiments were analyzed using the MIXED procedure of SAS with animal as the experimental unit. Treatment was included in the model statement and significance was determined when $P \leq 0.05$. Data from Exp. 2 also were analyzed using orthogonal contrasts to determine linear and quadratic effects of supplementation level.

Results

Experiment 1

Initial BW for both treatments was not different ($P = 0.94$; Table 2). Steer ADG was numerically 0.13 lb/day greater ($P = 0.16$) for the summer grazing period; however, BW at the end of the grazing period was not significantly different ($P = 0.52$), even though supplemented steers were 13 lb heavier than unsupplemented steers. When comparing feedlot performance for supplemented and unsupplemented steers, there were no differences in carcass weight, marbling score, calculated yield grade, or fat thickness.

Results from the 1996 NRC model suggest unsupplemented steers consumed 17.9 lb (DM-basis) of forage daily and were 43 g/day (7.7% of the total requirement) deficient in metabolizable protein. However, steers supplemented DDGS consumed excess metabolizable protein (287 g/day) due to supplementation and forage intake.

Experiment 2

Initial BW was not different across the three treatments ($P = 0.91$; Table 3). Steer BW at the end of the grazing period increased linearly ($P < 0.01$) with increasing level of supplementation because of a linear increase in ADG with increased level of supplementation ($P < 0.01$). When comparing feedlot performance for the supplemented and unsupplemented steers, final BW was increased with increased level of supplementation ($P = 0.02$). Interestingly, the increase in final BW observed after finishing was greater than the increase in BW observed after the summer grazing period. After the grazing period, supplemented steers were 34 and 58 lb heavier for low and high DDGS supplementation, respectively, compared to unsupplemented steers. At the end of the finishing period, low and high DDGS-supplemented steers were 39 and 99 lb heavier, respectively, when compared to unsupplemented steers

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because of a linear increase in carcass weight with supplementation level ($P = 0.02$). These results suggest that unsupplemented steers did not exhibit any compensatory gain during the finishing period. When comparing feedlot performance and carcass characteristics, there were no differences in marbling score, calculated yield grade, fat thickness, or rib eye area.

Results from the 1996 NRC model suggest that unsupplemented steers consumed 20.2 lb (DM-basis) of forage daily and were 22 g/day (3.9% of the total requirement) deficient in metabolizable protein when not supplemented. However, steers supplemented DDGS consumed excess metabolizable protein due to supplementation (low = 308 g/day and high = 638 g/day) and forage intake.

Results from both experiments suggest that added gain from supplementation was a result of increased energy intake and not because the diet was meeting a protein deficiency. This is supported by the lack of a significant response to DDGS supplementation in Exp. 1, and because the response in Exp. 2 was linear and not quadratic. In addition, metabolizable protein deficiency calculated by the 1996 NRC model was very small for both experiments and probably too small to measure. Therefore, results from this study indicate that steers grazing cool season dominated meadow during the summer are not deficient in metabolizable protein.

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