Effects of Distillers Dried Grains with Solubles Supplementation of Smooth Bromegrass Hay on Hay Intake and Digestibility

A.S. Leaflet R2272

Peter W. Lasley, graduate research assistant;
Jim R. Russell, professor of animal science

Summary and Implications

In fall 2006, a digestion trial was conducted to evaluate the effects of feeding increasing amounts of DDGS with smooth bromegrass hay on diet intake and digestibility. Three steers (737 lb) were placed in metabolism stalls in an environment controlled room and fed smooth bromegrass hay with DDGS at 0, 0.5, 1.0 and 1.5% BW in successive periods. Each period consisted of 10-day adjustment and 5-day collection phases. During the adjustment and collection phases, smooth bromegrass hay was fed at 110 and 100% of *ad libitum* intake, respectively, with water available at all times. During collection, feeds, total feces, and urine were collected and sub-sampled. Increasing the amount of DDGS fed increased total DM intake and digestibility, but decreased hay DM intake according to the equation: $y=-0.0017 + 0.9812x -0.4582x^2$ where y is the amount of forage intake substituted by DDGS intake and x is the DDGS intake as a percentage of BW. Supplementation of grazing cattle with DDGS can be used to increase diet digestibility while reducing forage intake and, thereby, extending pasture acres.

Introduction

With increased amounts of corn being used in ethanol production and increasing pastureland costs, feeding strategies need to be developed to reduce feed costs of grazing beef cattle. Supplementation of cattle grazing pastures with grains will reduce forage intake, but may be cost-prohibitive as the price of grains increase. Distillers dried grains with solubles (DDGS) are a plentiful energy and protein supplement that may be useful in extending forage utilization. However, little is known regarding how DDGS affect the intake and digestibility of forages. The objective of this study was to evaluate the effect of DDGS supplementation of cattle fed smooth bromegrass hay on total DM and hay intake and diet digestibility.

Materials and Methods

Three Angus steers were trained to lead, and acclimated to a smooth bromegrass hay diet in preparation for this study. Steers were placed in metabolism stalls and fed smooth bromegrass hay with DDGS supplemented at 0, 0.5, 1.0 and 1.5% BW in successive periods. In each period, steers received 10 days to adjust to new diets followed by 5 days for collection of feed, feces, and urine. During diet acclimation, steers were fed approximately 110% of *ad libitum* intake of smooth bromegrass hay with the DDGS supplement. During collection, steers were fed smooth bromegrass hay at 100% of *ad libitum* intake, as estimated during the 10-day adjustment phase, with DDGS fed at the same percentage of steer BW as during acclimation.

During the collection phase, orts of both hay and supplement were weighed and recorded, and total feces and urine were collected, measured, and subsampled at five percent by weight for feces and by volume for urine. Samples were composited by animal by treatment and frozen until analysis. Feed and supplement samples were taken each period and combined for analysis. Hay, supplement, and fecal samples were analyzed for ADF, NDF, and CP. Orts were considered to be so small to be inconsequential and were not analyzed. Urine samples were analyzed for N.

Results and Discussion

The smooth bromegrass hay used in this study contained 90.1 percent dry matter with CP, NDF, and ADF as 7.7, 66.1, and 37.5 percent of dry matter, respectively. The DDGS contained 95.1 percent dry matter with CP, NDF, and ADF as 25.4, 43.6, and 17.3 percent of dry matter respectively.

Total DMI were 9.3, 11.6, 12.8, and 15.7 lb/day for steers fed DDGS at 0, 0.5, 1.0, and 1.5% BW, respectively ($P<0.01$; Table 2). The amount of smooth bromegrass hay intake replaced by DDGS intake increased quadratically with increasing DDGS supplementation according to the equation: $y=-0.0017 + 0.9812x -0.4582x^2$ ($r^2 = 0.76$), where x was the DDGS intake, as a percentage of BW in the diet (Table 2, Figure 1). From this equation, it can be calculated that the maximum substitution rate of 0.53 lb forage DM intake for every pound of DDGS DM intake would occur when DDGS were supplemented at 1.07% BW. Intake of high forage diets may be controlled by the concentrations of fiber components. Neutral detergent fiber intakes were 0.84, 0.93, 0.90, and 0.99 % BW, ADF intakes were 0.48, 0.49, 0.44, and 0.45 % BW, and undigested NDF intakes were 0.36, 0.35, 0.33, and 0.36 %BW at DDGS intakes of 0, 0.5, 1.0, and 1.5% BW.

Dry matter digestibility of diets in which DDGS were fed at 0, 0.5, 1.0, and 1.5% BW were 54.9, 63.6, 65.8, and 67.0 ($P<0.01$) and were predicted as: $y = 55.2 + 18.86x - 7.43x^2$ ($r^2 = 0.95$) where x was the DDGS intake, as a percentage of BW. This equation implies that the maximum digestibility of 67.2 occurred when DDGS were fed at 1.26% BW and supplementing DDGS at a level great than this reduced DM digestibility. Although digestibility and

intake increased with increasing DDGS supplementation, total digestible DMI, as a percent of BW, across diets was 1.7 and did not differ between treatments (P=0.26). Nitrogen balance of steers fed DDGS at 0, 0.5, 1.0, and 1.5% BW were –0.01, 0.06, 0.10, and 0.14 lbs per day (P<0.01).

Supplementation of DDGS to steers fed smooth bromegrass hay increased total DM digestibility of consumed feed while increasing the total feed intake. Because of the substitution of DDGS for forage intake, supplementing DDGS at 1.0% BW should allow cattle producers to increase stocking rates approximately 20% assuming cows are consuming pasture forage at 2.5% of body weight. Because DDGS supplementation at 1.0% BW increased total DM digestion by 19.8%, this 20% increase would be appropriate whether the cows were fed the supplement with or without rationing of pasture forage.

Table 1. Composition of smooth bromegrass hay and DDGS fed in digestion trial.

Component	Hay	DDGS
DM	90.1	95.1
	% of DM	
CP	7.7	25.4
NDF	66.1	43.6
ADF	37.5	17.3

Table 2. Effects of supplementing DDGS with hay on intake and digestion.

	DDGS fed, %BW				
	0	**0.5**	**1.0**	**1.5**	**P=**
DM intake	9.3	11.6	12.8	15.7	0.0001
Hay (lb/hd/d)	9.3	8.1	5.6	4.4	0.0002
DDG (lb/hd/d)	0	3.5	7.2	11.3	0.0001
Apparent Digestion Coefficient (%)	54.9	63.6	65.8	67.0	0.0001
NDF intake (%BW)	0.84	0.93	0.90	0.99	0.2819
ADF intake (%BW)	0.48	0.49	0.44	0. 45	0.6529
Undigestible NDF (%BW)	0.36	0.35	0.33	0.36	0.7625
Hay substituted for DDG (lb/lb)	0	0.37	0.53	0.44	0.0079
Nitrogen Balance (lbs/day)	-0.01	0.06	0.10	0.14	0.0001

Figure 1. The substitution effect of DDGS on smooth bromegrass hay (Hay unit displaced per unit of DDGS consumed).