Use of DDGS as the Primary Source of Supplemental Crude Protein in Calf Receiving Diets[1]

Robbi H. Pritchard[2] and Donald L. Boggs[3]
Department of Animal and Range Sciences

BEEF 2006 – 02

Summary

This experiment was designed to determine whether DDGS could be used as the primary source of supplemental crude protein in receiving calf diets. Diets included 45% oat hay and rolled corn. The control diet included 11.8% SBM as the source of supplemental crude protein. The DDGS was fed at 18.9% of diet replacing SBM. There was 1.3% SBM included in the DDGS diets. Diets were formulated for 13% CP and 48 Mcal/cwt NE_G. The 47-d experiment began at arrival at the feedlot and involved 294 steer calves (604 lb). Calf gains (2.49 vs 2.54 lb/d) and F/G (5.76 vs 5.61) were similar for SBM and DDGS diets, respectively. The steers fed the DDGS consumed slightly less feed (14.34 vs 14.17). Overall morbidity rate was low (2.4%) with no apparent influence from diet. The use of DDGS as a primary source of supplemental CP in calf receiving diets appears to be acceptable in spite of a calculated deficiency in ruminally degradable crude protein.

Key words: Receiving, Calves, DDGS, DIP

Introduction

Feedlots oftentimes use an elevated concentration of crude protein (CP) to allow for depressed intake by newly received calves. The DDGS, now plentiful in this region, provide an attractively priced source of CP. The DDGS also provide readily fermentable fiber and crude fat that would be useful during calf and ruminal acclimation to the feedlot environment. The potential limitation is that DDGS may not provide sufficient levels of ruminally available CP (DIP) to support optimal rumen function. This could lead to depressed intake and inadequate energy balance during this period of stress.

This experiment was designed to determine whether DDGS, substituted for dry rolled corn and soybean meal used in receiving calf diets, would support comparable intake, growth rate, and health.

Materials & Methods

Steer calves (n = 294) received in three drafts were used to quantify the suitability of using DDGS as a major contributor to dietary CP. Receiving diets were based on oat hay (9% CP, 66% NDF) and dry rolled corn (DRC). The control diet (SB) used soybean meal as the source of supplemental CP needed to provide 13% CP diets. The test diet (DG) involved substituting 18% DDGS for 7.6% points DRC and 10.2% points SBM to produce a similar 13% CP diet. The actual formulation of these diets, based upon weekly ingredient sampling and feed batching records, is depicted in Table 1.

[1] This project was funded by MBI and the SD Ag Experiment Station.
[2] Distinguished Professor
[3] Professor

Table 1. Diet formulations and compositions

Item	Diet SB[a]	DG[a]	SEM
Oat hay, %	45.13	45.28	0.53
Rolled corn, %	41.46	29.93	0.33
DDGS, %		18.91	0.23
Supplement, %[b]	13.41	5.88	0.11
SBM[c]	11.84	1.30	
TM salt[c]	0.30	0.25	
Limestone[c]	0.96	0.88	
Monocalcium PO_4	0.30		
Ground corn[c]		3.44	
DM, %[d]	80.7	81.5	0.84
CP, %[d]	12.9[f]	13.4[g]	0.12
NDF, %[d]	34.8[f]	40.8[g]	0.80
NE_m[e]	80.5	80.6	
NE_G[e]	48.0	48.6	

[a] Refers to primary source of supplemental CP; SB = SBM, DG = DDGS.
[b]Provided as a pelleted supplement to target diet levels of: Ca 0.57%, P 0.38%, K 1.6%, Zn 50 ppm, Cu 10 ppm, Vitamin A 1000 IU/lb, Vitamin E 10 IU/lb and monensin 20g/T.
[c] Diet contribution as proportion of supplement actually fed.
[d] Determined.
[e] Calculated assuming DDGS at 103% NE_G content of corn.
[f,g] Means differ (*P* < 0.05).

Calves were managed and maintained as the individual drafts that arrived and all calves received were used in the experiment. After allowing an overnight rest with access to long hay and water, calves were processed. This involved tagging, weighing, vaccinating for clostridial (Ultrabac-7[4]) and viral (Resvac 4[3]) diseases and treating for parasites (Cydectin[5]). The body weight (BW) recorded while processing was used to stratify all calves within a draft by BW before randomly assigning to diet and subsequently to replicate. The diet replicate classification represented a pen of 9 or 10 steers. Pen assignments were made such that treatments were uniformly distributed across the 30 pens used in the experiment.

Cattle were fed twice daily at an amount intended to minimize feed carryover but not restrict intake. Diets were top dressed on long hay for 2 d to facilitate calf adaptation to the feedlot environment. Individual feed ingredients were sampled weekly for proximate analysis. Actual diet formulations and compositions were reconstructed from these analyses and feed batching records. These data were compiled at 7-d intervals.

The initial BW was the weight obtained during processing. Interim and final BW were recorded in the morning prior to feeding. Interim weight data were collected at 22 d on feed for drafts 1 and 2 and at 26 d on feed for the third draft of calves. Final weights were recorded after 47 d on feed for all calves. To calculate cumulative performance, the final body weight was assessed 3% shrink. Pen was considered the experimental unit in a statistical model that included draft, diet, and replicate. Diet effects on production variables were tested using the error term diet within draft.

Results & Discussion

Actual dietary CP was slightly higher (*P* < 0.05) for the DG diet (Table 1). This was in part due to variability of CP content of corn, which comprised less of the DG diet and in part to DDGS that had lower moisture content than anticipated. When actual dry inclusion levels of ingredients and assayed CP values for those ingredients were used in the NRC Model, the estimated DIP balances were -52 g/d and -177 g/d for SB and DG diets, respectively. If the DIP

[4] Pfizer Animal Health
[5] Fort Dodge Animal Health

level was inadequate to support ruminal function, a reduction in intake would be anticipated. Over the 47 d period, DMI tended (*P* = 0.08) to be lower for steers fed the DG diet, but this was only a 1.2% difference. The effect on DMI was expressed in the latter half of the test (Table 2). The growth rate and efficiency of growth were not affected by this slight reduction in DMI.

Table 2. Receiving period (47-d) calf performance by diet

		SB[a]	DG[a]	SEM
Initial BW		601	593	4.0
Interim BW		668	662	3.5
Early[b]	ADG	2.68	2.79	0.069
	DMI	12.30	12.12	0.059
	F/G	4.62	4.38	0.144
D 47 BW		743	737	4.5
Late[c]	ADG	3.40	3.39	0.43
	DMI*	16.62	16.46	0.027
	F/G	4.89	4.91	0.063
Cumulative[d]				
Final	BW	721	715	4.4
	ADG	2.49	2.54	0.031
	DMI‡	14.34	14.17	0.034
	F/G	5.76	5.61	0.081

[a] Refers to primary source of supplemental CP; SB = SBM, DG = DDGS.
[b]Early interim period of 26 or 22 d.
[c] Late interim period of 21 or 25 d.
[d] Includes 3% shrink of d 47 body weight for all cumulative production variables.
* Means differ *P* = 0.05.
‡ Means differ *P* = 0.08.

The possibility exists that intake was also lower than optimum in the SB diet due to the small but negative DIP value associated with that diet. If this occurred, it may have marginalized the impact of the greater deficiency of DIP for the DG diet. However, intake expressed relative to metabolic mass was 111 $g/kgW^{0.75}$ during the last 12 d of the study. This would be an expected DMI if crude protein needs were being met. The NRC Model predicted DMI at 93 $g/kgW^{0.75}$ for these conditions. Based on these comparisons, DIP was probably not limiting intake.

Health problems were minimal with no mortalities and an overall morbidity rate of 2.4%. This infers that the negative DIP in this DG diet did not adversely affect the health status of calves experiencing the stressful transitions of weaning and shipping to the feedlot. However, it would not be appropriate to presume CP adequacy of these diets in higher risk cattle based solely on this experiment.

Diets containing 13% CP appeared to be adequate for the feedlot receiving period in calves. A more negative DIP diet including DDGS did not affect production efficiencies adversely. The DDGS supplemented diet provides an alternative source of crude protein that can be used to reduce feed costs.