Effects Of Feeding A Combination Of Modified Distillers Grains Plus Solubles and Wet Corn Gluten Feed to Adapt Cattle to Finishing Diets

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Summary

Two 39-day metabolism trials were conducted using a combination of modified distillers grains and wet corn gluten feed (Synergy, ADM) to adapt beef cattle to finishing diets (SYNERGY). During adaptation, DMI expressed as % of BW tended to be greater for steers on traditional grain adaptation with forage (CON) compared to SYNERGY during the first period (steps 1), but was not different in subsequent adaptation diets (steps 2, 3, and 4). Average ruminal pH was lower for SYNERGY on steps 1 and 2 compared to CON in Experiment 1 with no difference observed in Experiment 2. No difference in ruminal pH was observed between treatments for steps 3 and 4. Both adaptation methods resulted in safe ruminal pH and H_2S concentrations (<36µmol/L gas). Significant difference was observed for DM digestibility (DMD) between treatments during step 1 with higher values for the SYNERGY treatment.

Introduction

Metabolism and feedlot research using wet corn gluten feed produced by Cargill (Sweet Bran®; Blair, Neb.) to adapt beef cattle found that decreasing Sweet Bran instead of forage is a viable method for adapting feedlot cattle to feedlot finishing diets (2009 *Nebraska Beef Cattle Report,* pp. 53-55, 56-58). A metabolism trial has been conducted using wet distillers grains plus solubles (WDGS) to adapt cattle, and the results suggest WDGS may be used instead of forage, but no performance data are available and DMI was lower for the WDGS treatment initially (2010 *Nebraska Beef Cattle Report,* pp. 66-67). Therefore, the objective of this study was to test a combination of modified distillers grains plus solubles (MDGS) and wet corn gluten feed (WCGF), and evaluate the responses in ruminal pH, intake, H_2S concentration, *in situ* fiber digestibility, and DM digestibility when compared to the traditional forage method of cattle adaptation to finishing diets. The combination of MDGS and WCGF was similar to a new feed produced by ADM (Synergy, Columbus, Neb.).

Procedure

Experiment 1

Six yearling crossbred steers (BW = 891 ± 44 lb) with rumen fistula were brought off pasture following summer grazing to represent yearlings that would enter a feedlot. Steers were assigned randomly into one of two adaptation treatments in a CRD with three steers per treatment. One week before the start of the experiment, the steers were fed 20 lb/day of grass hay (DM). Table 1 represents diets for the SYNERGY and CON treatments. SYNERGY steers were fed decreasing levels of the MDGS and WCGF combination (87.5% to 30%) while CON animals were fed the traditional grain adaptation diets with decreasing forage from 45% to 7.5%. In both adaptation schemes, dry-rolled corn increased (up to 57.5%). Cattle were fed *ad libitum* once daily. Five adaptation diets were used to increase corn with diets fed

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Table 1. Adaptation and finishing diets using a combination of WCGF and MDGS compared to forage during the adaptation period.

Days fed:	1 to 9	10 to 16	17 to 23	24 to 30	31 to 39
Adaptation:	Step 1	Step 2	Step 3	Step 4	Finisher
CONTROL					
DRC[1]	20	30	40	50	57.5
Alfalfa	45	35	25	15	7.5
MDGS[2]	18	18	18	18	18
WCGF[3]	12	12	12	12	12
Supplement[3]	5	5	5	5	5
SYNERGY					
DRC[1]	0	14.4	28.8	43.2	57.5
Alfalfa	7.5	7.5	7.5	7.5	7.5
MDGS[2]	52.5	43.9	35.2	26.6	18
WCGF[3]	35	29.2	23.5	17.7	12
Supplement[3]	5	5	5	5	5

[1]DRC: Dry-rolled corn.
[2]MDGS: Modified distillers grains plus solubles.
[3]WCGF: Wet corn gluten feed.
[4]Supplement formulated to provide 90 mg/head/day of tylosin, 360 mg/head/day of monensin and 150 mg/head/day of thiamine.

Table 2. Analyzed nutrient analysis for feeds fed, % DM.

Analysis	MDGS	WCGF	DRC	Alfalfa
DM	62.5	44.1	86.4	87.8
CP	32.5	21.3	7.9	18.6
Ether Extract	11.3	3.3	3.9	0.9
NDF	38.6	54.7	10.4	63.9
Sulfur	0.81	0.48	0.11	0.29
Ash	0.06	0.04	0.01	0.09

Table 3. Experiment1 results for DMI, ruminal pH, H_2S production, and total tract DM digestibility for the adaptation period when comparing forage and co-product diets to adapt cattle to a high grain finishing diet.

	Adaptation 1			Adaptation 2			Adaptation 3			Adaptation 4		
Treatments	Control	Synergy	*P*-value	Control	Synergy	*P*-value	Control	Synergy	*P*-value	Control	Synergy	*P*-value
DMI, % BW	2.32	2.05	0.09	2.72	2.37	0.18	2.93	2.67	0.34	2.98	2.79	0.37
Average pH	6.18	5.76	<0.01	6.07	5.75	<0.01	5.89	5.84	0.44	5.62	5.67	0.75
Maximum pH	6.38	6.54	<0.01	6.66	6.32	<0.01	6.52	6.41	0.11	6.27	6.36	0.63
Minimum pH	5.8	5.48	<0.01	5.48	5.4	0.24	5.31	5.36	0.53	5.1	5.26	0.36
pH variance	0.03	0.05	0.23	0.06	0.04	0.17	0.07	0.04	0.02	0.07	0.05	0.04
Area <5.6[1]	6.85	21.44	0.29	6.7	40.3	0.03	51.54	48.8	0.92	191.64	149.04	0.65
Time <5.6, min.	82.3	173.1	0.38	36.55	411.03	0.02	307.29	318.94	0.93	740.43	688.74	0.81
H_2S, µmol/L	24.81	13.94	0.2	24.49	6.11	<0.01	31.12	23.51	0.52	36.36	24.05	0.35
DM digestibility, %	57.69	67.96	0.05									

[1]Area under curve (magnitude of pH < 5.6 by minute).

9, 7, 7, 7, and 9 days, respectively. The last 9-day period consisted of a common finishing diet containing *Synergy* at 30% of diet DM. All diets provided 320 to 360 mg/steer of Rumensin, 90 mg/steer of Tylan, and 150 mg/steer of thiamine daily. Steers were fed once daily at 0800, and feed refusals were collected and dried to calculate DMI. Intake and pH (wireless pH probes) measurements were collected every minute during the entire study. Ruminal gas samples were collected eight hours post feeding on the last two days of each period, and H_2S concentrations were analyzed. Dacron bags (50 mm pore size) containing alfalfa and corn bran were incubated for 24 and 32 hours each to determine *in situ* NDF digestibility. Chromic oxide (Cr_2O_3) was intraruminally dosed at 7.5g at 0700 and 1700 hour daily during the first and last period of the study to determine total tract digestibility. Fecal samples were collected at 0600, 1200, and 1800 hour on days 6, 7, 8, and 9 (step 1) and also days 36, 37, 38, and 39 (finisher period). Fecal composites were analyzed via atomic absorption spectrophotometer for quantification of chromium.

Table 4. Experiment 1 results for DMI, ruminal pH, H_2S production and DM digestibility during finishing diet.

Treatments	Control	Synergy	SEM	P-value
DMI, % BW	2.85	2.80	0.11	0.74
Average pH	5.61	5.80	0.19	<0.01
Maximum pH	6.23	6.41	0.09	0.13
Minimum pH	5.36	5.18	0.06	0.02
pH variance	0.06	0.04	0.006	0.02
Area <5.6[1]	170.61	39.67	50.49	0.06
Time <5.6, min.	731.21	320.29	149.90	0.05
Area <5.3[1]	26.61	0.18	12.68	0.10
Time <5.3, min.	242.47	8.57	97.67	0.07
H_2S, µmol/L	22.44	22.14	12.79	0.98
DMD, %	67.89	70.68	2.77	0.51

[1]Area under curve (magnitude of pH < 5.6 by minute).

Experiment 2

Six fistulated calf-fed steers (BW = 564 ± 30 lb) were used to repeat Experiment 1 for DMI, ruminal pH, and total tract DM digestibility.

The same methods of data collection and statistical analyses described for Experiment 1 were applied to Experiment 2, except H_2S concentration and *in situ* NDF digestibility were not measured on Experiment 2.

Data were analyzed using the GLIMMIX procedure of SAS. Steer was considered the experimental unit, and the residual was used to test for treatment effects. Variables were DMI, ruminal pH, ruminal H_2S concentration, *in situ* fiber digestibility and total tract DM digestibility, for the first adaptation diet and the finishing diet.

Results

Experiment 1

During adaptation, DMI expressed as % of BW tended ($P = 0.09$) to be greater for steers fed CON compared to SYNERGY during step 1, but was

Table 5. Experiment 2 results for DMI, ruminal pH, H_2S production, and total tract DM digestibility for the adaptation period when comparing forage and co-product diets to adapt cattle to a high grain finishing diet.

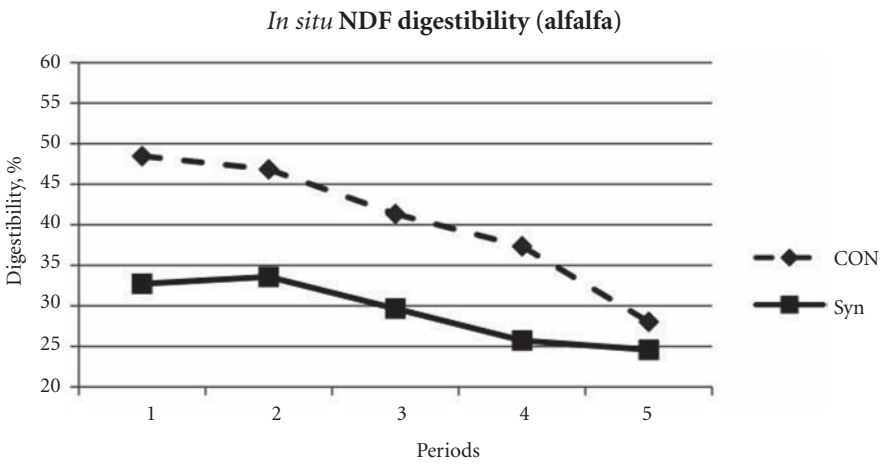
	Adaptation 1			Adaptation 2			Adaptation 3			Adaptation 4		
Treatments	Control	Synergy	*P*-value	Control	Synergy	*P*-value	Control	Synergy	*P*-value	Control	Synergy	*P*-value
DMI, % BW	2.33	1.95	0.14	2.68	2.76	0.64	2.93	2.71	0.08	3.15	2.8	0.32
Average pH	6.1	6.61	0.29	6.22	6.15	0.59	6.23	6.13	0.33	6.06	5.95	0.31
Maximum pH	6.75	6.75	0.99	6.88	6.65	0.33	6.92	6.5	0.16	6.87	6.46	0.18
Minimum pH	5.53	6.31	0.19	5.17	5.27	0.88	5.61	5.78	0.13	5.54	5.53	0.95
pH variance	0.24	0.18	0.15	0.27	0.21	0.25	0.29	0.15	0.07	0.27	0.19	0.22
Area <5.6[1]	2.63	5.33	0.49	7.23	4.77	0.71	2	0	0.15	3.54	4.91	0.77
Time <5.6, min.	38.29	108.84	0.28	9.5	6.53	0.73	28.16	0	0.14	52.39	10.22	0.26
DM digestibility, %	57.58	68.64	0.27									

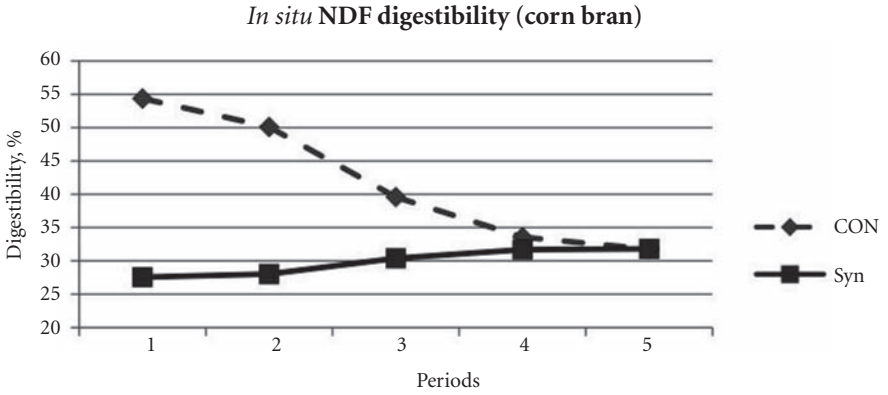
[1]Area under curve (magnitude of pH < 5.6 by minute).

Table 6. Experiment 2 results for DMI, ruminal pH, H_2S production and DM digestibility during finishing diet.

Treatments	Control	Synergy	SEM	P-value
DMI, % BW	3.17	3.08	0.21	0.66
Average pH	5.91	6.14	0.06	0.03
Maximum pH	6.36	6.88	0.05	<0.01
Minimum pH	5.47	5.62	0.05	0.05
pH variance	0.18	0.26	0.02	0.03
Area <5.6[1]	6.88	0.96	3.32	0.17
Time <5.6, min.	92.11	19.97	43.87	0.20
DMD, %	56.64	73.07	4.03	0.02

[1]Area under curve (magnitude of pH < 5.6 by minute).





Figures 1 and 2 represent the *in situ* digestibility during the four adaptation steps and finishing diet for forage and byproduct treatments for alfalfa and corn bran NDF digestibility (32 hour time frame).

not different in subsequent adaptation diets ($P > 0.20$). Average pH was lower ($P < 0.01$) for SYNERGY on step 1 and 2 compared to CON (5.76 vs. 6.18; 5.75 vs. 6.07, respectively). No difference ($P > 0.44$) was observed between treatments for ruminal pH during steps 3 and 4. Average pH was lower ($P < 0.01$) for CON on the last period when both treatments were being fed the same diet (5.61 vs. 5.80), suggesting that SYNERGY adaptation treatment may have a positive effect with finishing diets containing 30% of the *Synergy* product. Area and time below pH 5.6 followed the same pattern with greater values (21.44 and 173.10 vs. 6.85 and 82.30) on the second period ($P < 0.03$) and lower values (39.67 and 320.29 vs. 170.61 and 731.21) during the finisher period ($P < 0.06$) for the SYNERGY compared to CON. Variance of pH was significantly different on the last three periods with higher values for animals fed the CON diets. Both adaptation methods resulted in average ruminal pH (> 5.6). H_2S concentrations observed were always lower than 36µmol/L gas with the SYNERGY treatment group being less than the CON group. Statistical difference ($P < 0.10$) was observed for DM digestibility between treatments for step 1, with higher values for the SYNERGY treatment, and no difference was observed during the finishing diet. A three-way interaction was observed for the *in situ* DMD for type of feed (alfalfa and corn bran), time (24 and 32 hours) and whether incubated in CON or SYNERGY steers. One time was chosen (32 hours) to represent the trends observed for NDF digestibility, and it is presented in Figure 1. Corn bran was more digestible during all adaptation periods compared to alfalfa.

Experiment 2.

DMI expressed as % of BW was greater for steers fed CON compared to SYNERGY during the third period, but was not different during other adaptation periods ($P > 0.14$). Average pH was only different ($P < 0.03$) during the finishing period with greater values for SYNERGY (6.14 vs. 5.91). No difference ($P > 0.29$) was observed between treatments in ruminal pH for adaptation 1, 2, 3, and 4. Area and time below pH 5.6 were not significantly different among treatments during Experiment 2 in any of the periods. Variance of pH was significantly different in Adaptation 3 with higher values for animals fed the CON diets. However, DM digestibility was numerically greater ($P < 0.27$) for the SYNERGY treatment compared to CON (68.64 vs. 57.58) during step 1, and significant in the finisher.

Results suggest that decreasing inclusio of a combination of distillers grains and gluten feed was as effective as the traditional method using forage for adapting feedlot cattle to high-concentrate diets.

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