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Effects of Using Wet Distillers Grains with Solubles to Adapt Cattle to Finishing Diets on Feed Intake, Ruminal pH, and Ruminal Hydrogen Sulfide Concentration

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Summary

An adaptation strategy with wet distillers grains with solubles (WDGS) fed at decreasing levels (87.5 to 35%) was compared to a traditional grain adaptation with decreasing forage (45 to 7.5%) when adapting steers to a common finishing diet. Traditionally adapted steers had higher intake in steps one through three compared to steers adapted with distillers grains. However, DMI was not different between the two adaptation systems in step four, or when steers were on the finishing diet. Ruminal pH was higher for traditionally adapted steers compared to steers adapted to distillers grains in adaptation diets two and three. Ruminal hydrogen sulfide concentration did not appear to be a problem.

Introduction

Huls et al. (*2009 Nebraska Beef Report*, pp 53-58) reported that decreasing wet corn gluten feed instead of forage is a viable method for adapting feedlot cattle to high-concentrate diets. Despite this, little research has been done to determine the effects of using wet distillers grains with solubles (WDGS) during grain adaptation, primarily because when WDGS is fed at high levels in finishing diets, dietary sulfur levels may exceed nutritional guidelines, and the risk of inducing polioencephalomalacia becomes a concern. Nonetheless, the objectives of this research were to 1) determine if decreasing the level of WDGS and increasing corn is a preferred method for grain adaptation when compared to a traditional adaptation diet using forage, and 2) determine the effect of WDGS on ruminal hydrogen sulfide concentration (H_2S) during adaptation.

Procedure

Eight ruminally fistulated steers (766 ± 74 lb) were assigned randomly to one of two adaptation systems: 1) decreased alfalfa hay and increased dry rolled corn while supplement and WDGS were constant (CON); and 2) decreased WDGS and increased dry rolled corn while supplement and alfalfa were constant (TRT). Four 7-day adaptation diets (steps 1 to 4) were fed within each adaptation system followed by 7 days on a common finishing diet. Table 1 provides diet composition for both adaptation systems.

Steers were individually housed in free box stalls (8.5'x10'), and diets were fed in feed bunks suspended from load cells. Constant data acquisition of feed disappearance was obtained through use of computer software connected to feed bunks. Feed weight in each bunk was recorded once every minute and data were continuously stored for each steer throughout the day. Bunks were read once daily at 0700 hr and feed offerings were adjusted accordingly for feeding at 0730 hr. All feed refusals were weighed to accurately measure DMI.

Wireless submersible pH probes were placed into the rumen of each steer for the duration of the trial. Each pH electrode was enclosed in a weighted, PVC material cover that maintained the electrode in the ventral sac of the rumen. Ruminal pH was recorded once every minute continuously for 7 days. On day 7 of each step, the probe was briefly removed from the rumen, pH data were downloaded, pH electrodes were recalibrated, and then the self-contained pH probe was reinserted into the rumen.

Ruminal hydrogen sulfide concentration was measured through gas collection devices inserted via the ruminal cannula prior to feeding on day 7. Gas samples were collected 8 hours post feeding on day 7 for each step. Four gas samples were taken from each steer at each time point.

Data were analyzed by adaptation system to show the effect of the two adaptation systems throughout the adaptation period using the MIXED procedure of SAS. Fixed model effects were adaptation diet, adaptation system, and adaptation diet x adaptation system interaction. Animal nested within adaptation system was

Table 1. Dietary treatments used to compare two grain adaptation systems (% DM basis).

Days fed	1-7	8-14	15-21	22-28	29-35
Adaptation	1	2	3	4	5
CON[1]					
DRC[2]	15.0	25.0	35.0	45.0	52.5
WDGS[3]	35.0	35.0	35.0	35.0	35.0
Alfalfa hay	45.0	35.0	25.0	15.0	7.5
Supplement[4]	5.0	5.0	5.0	5.0	5.0
TRT[1]					
DRC[2]	0	13.13	26.25	39.38	52.5
WDGS[3]	87.5	74.38	61.25	48.13	35.0
Alfalfa hay	7.5	7.5	7.5	7.15	7.15
Supplement[4]	5.0	5.0	5.0	5.0	5.0

[1]Adaptation systems where CON = decreasing forage and increasing corn through adaptation periods; TRT = decreasing wet distillers grains with solubles and increasing corn through adaptation periods.
[2]DRC = dry rolled corn.
[3]WDGS = wet distillers grains with solubles.
[4]Dry supplement formulated to provide 90 mg/hd/day of tylosin and 300 mg/hd/day monensin; TRT adaptation system formulated to provide 150 mg/hd/day thiamine.

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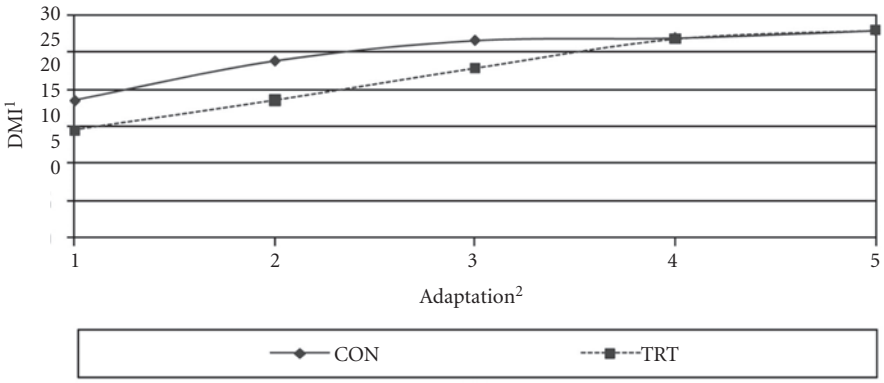

Figure 1. Effect of two grain adaptation systems on DMI.

[1]DMI expressed in lb/d.
[2]Adaptation systems where CON = decreasing forage and increasing corn through adaptation periods; TRT = decreasing wet distillers grains with solubles and increasing corn through adaptation periods. Cattle were on a common finishing diet in adaptation five.

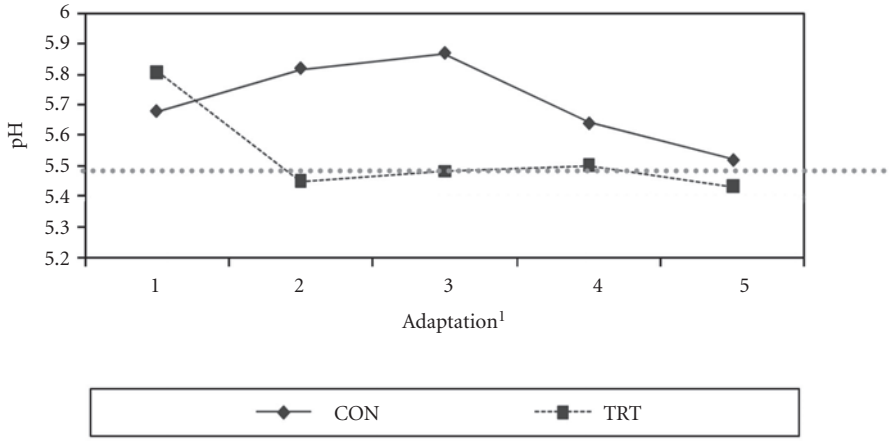

Figure 2. Effect of two grain adaptation systems on average ruminal pH.

[1]Adaptation systems where CON = decreasing forage and increasing corn through adaptation periods; TRT = decreasing wet distillers grains with solubles and increasing corn through adaptation periods. Cattle were on a common finishing diet in adaptation five.

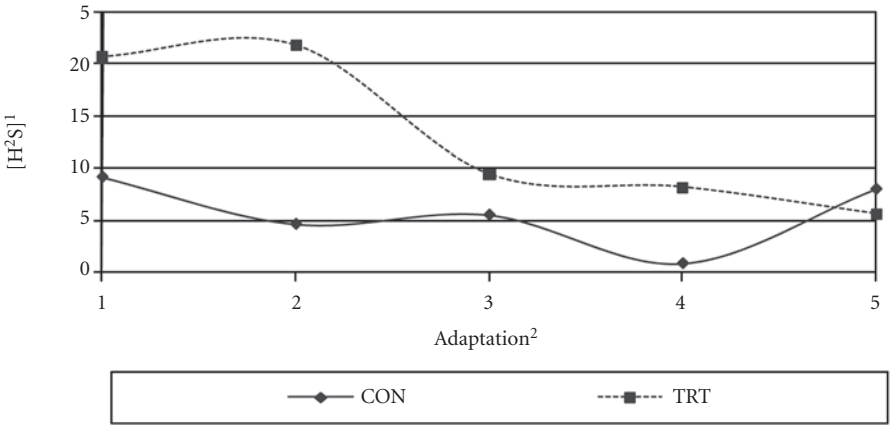

Figure 3. Effect of two grain adaptation systems on ruminal H_2S concentration.

[1][H_2S] = ruminal hydrogen sulfide concentration expressed in µmol H_2S gas /L rumen gas collected.
[2]Adaptation systems where CON = decreasing forage and increasing corn through adaptation periods; TRT = decreasing wet distillers grains with solubles and increasing corn through adaptation periods. Cattle were on a common finishing diet in adaptation five.

considered a random effect. A protected F-test was used during analyses where numbers represent *P*-values for variation due to adaptation diet or adaptation system.

Results

Figures 1, 2, and 3 show the effect of the WDGS adaptation system compared to the traditional adaptation for DMI, ruminal pH, and H_2S, respectively. During the first adaptation diet, no differences in ruminal pH were observed; however, TRT steers had lower DMI ($P = 0.01$) than CON steers. During adaptation diet two, steers on TRT had lower DMI ($P = 0.01$) and lower average pH ($P = 0.01$) when compared to CON steers. Likewise, during the third adaptation diet, TRT steers had lower DMI ($P = 0.06$) and average pH ($P = 0.01$) when compared to CON steers.

No differences in DMI, pH, or H_2S were observed between TRT and CON steers on the finishing diet ($P > 0.36$). No drastic decreases in DMI or ruminal pH (SD similar to CON) were observed in steers adapted with TRT, with lowest average pH (5.43) on the finishing diet. However, the average pH of both CON and TRT steers on the finishing diet (pH = 5.48; Figure 2 dotted line) supports the conclusion that the TRT adaptation system did not trigger acidosis (pH < 5.3).

Steers on TRT tended to have greater H_2S ($P = 0.05$) only during the second adaptation diet, with the greatest concentration being 21.8 µmol H_2S gas/L rumen gas collected. Despite this finding, previous research (*2009 Nebraska Beef Report*, pp 81-85) and visual appraisal indicate that dietary sulfur levels were not a problem.

Adapting cattle to finishing diets with WDGS may lower both DMI during the first phases of adaptation and pH, but appear to "adapt" cattle to corn, since no differences were observed on the finishing diet.

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