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The Effect of Drying Distillers Grains on Nutrient Metabolism

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Summary

Ruminally cannulated steers were used in a 4 x 6 unbalanced Latin square. Treatments consisted of a corn-based control (CON), wet distillers grains plus solubles (WDGS), modified distillers grains plus solubles (MDGS), or dry distillers grains plus solubles (DDGS) included at 40% of the diet DM. There were no differences (P > 0.73) observed for DMI, or for DM, OM, or fat digestibility. Steers fed diets containing distillers grains had greater NDF intake compared to CON (P < 0.01). There were no differences in NDF digestibility between WDGS, MDGS, and DDGS (P > 0.37); however, CON diets had lower (P < 0.06) NDF digestibility than WDGS and DDGS. Average ruminal pH tended (P = 0.14) to be impacted by dietary treatment with steers fed DDGS having a greater pH than steers fed CON, MDGS, and WDGS, which were not different from one another.

Introduction

Differences in the feeding value between wet distillers grains plus solubles (WDGS), modified distillers grains plus solubles (MDGS), and dry distillers grains plus solubles (DDGS) have been reported (*2011 Nebraska Beef Cattle Report,* pp. 50-52). The previous report indicates the feeding value of distillers grains is negatively impacted during the drying process, even though the cause of the negative impact of the drying process is unknown. Therefore, the objective of this study was to determine the effects of drying distillers grains on intake and digestibility of the DM, OM, NDF, and fat, as well as ruminal pH measurements by evaluating WDGS, MDGS, and DDGS compared to corn.

Table 1. Effects of diet on nutrient intake and digestibility.

	Treatment[1]					
	CON	WDGS	MDGS	DDGS	SEM	*P*-value
DM						
Intake, lb/day	21.5	20.6	22.1	21.6	1.2	0.83
Digestibility, %	78.0	77.2	76.5	75.2	2.2	0.84
OM						
Intake, lb/day	20.1	18.7	20.3	19.7	1.1	0.74
Digestibility, %	79.7	79.2	78.4	76.8	2.2	0.81
NDF						
Intake, lb/day	3.4[a]	4.9[b]	5.0[b]	5.4[b]	0.3	< 0.01
Digestibility, %	35.8[a]	55.5[b]	48.0[a,b]	51.6[b]	5.5	0.10
Fat						
Intake, lb/day	0.8[a]	1.5[b]	1.4[b]	1.4[b]	0.1	< 0.01
Digestibility, %	85.9	89.3	88.2	87.4	2.1	0.73

[1]WDGS = wet distillers grains plus solubles; MDGS = modified distillers grains plus solubles; DDGS = dried distillers grains plus solubles.
[a,b]Means with different superscripts differ (*P* < 0.10)

Procedure

Six ruminally cannulated steers (BW = 1,150 lb) were used in a 4 x 6 unbalanced Latin square to determine the effects on nutrient metabolism when distillers grains are dried. An unstructured treatment design was used. Treatments consisted of a corn control and WDGS, MDGS, or DDGS included at 40% of the diet DM. Corn fed in all treatments was a 60:40 blend of high-moisture:dry-rolled corn and all diets contained 15% corn silage and 5.0% supplement. The feed ingredients were the same source as the feedlot study previously reported (*2011 Nebraska Beef Cattle Report, pp. 50-52*).

Period duration was 21 days, including a 14-day adaptation period followed by a 7-day pH data and a 5-day fecal sample collection period. Chromic oxide (7.5g/dose) was dosed intraruminally at 0800 and 1600 hour daily beginning on day 15 in each period to estimate fecal output. Fecal samples were collected daily at 0700, 1200, and 1600 hour on day 17 to day 20, composited by period, and analyzed for chromium content to determine nutrient digestibility. Steers were fed once daily at 0800 hours and feed refusals were collected at this time. Continuous pH measurements were taken using wireless pH probes placed in the rumen. Measurements were taken every minute and data were downloaded at the end of each collection period.

Data were analyzed as a unbalanced Latin square design using the MIXED procedure of SAS (SAS Institute, Cary, N.C.). Period was included in the model as a fixed effect, and the random effect was steer.

Results

Data for nutrient intake and digestibility are presented in Table 1. Treatment did not affect DMI or digestibility of DM or OM (*P* > 0.73). Steers fed diets containing distillers grains had greater NDF intake compared to CON (*P* < 0.01). There were no differences for NDF digestibility between WDGS, MDGS, and DDGS (*P* > 0.37). However, CON diets had lower NDF digestibility (*P* < 0.06) compared to WDGS and DDGS. Fat intake was greater for diets containing DG (*P* < 0.01); however, fat digestibility was not different (*P* = 0.73).

Rumen pH data are presented in Table 2. Average ruminal pH tended to be impacted (*P* = 0.14) by dietary treatment with steers fed DDGS having a greater pH (*P* < 0.09) than steers

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fed CON, MDGS, and WDGS, which were not different from one another ($P > 0.73$). Minimum pH was greatest for DDGS ($P < 0.01$). Diets containg WDGS and MDGS were not different, but WDGS was greater than CON ($P = 0.06$). Maximum pH was not different between diets ($P = 0.29$). Time below pH 5.6, pH magnitude, and pH variance were not different between treatments ($P > 0.11$). Diets containing WDGS had a greater area of pH below 5.6 compared to CON, MDGS, and DDGS ($P = 0.02$).

The lack of difference for intake and digestibility of DM, OM, NDF, and fat intake and digestibility between WDGS, MDGS, and DDGS does not explain the difference in the feeding value observed in the feedlot study (*2011 Nebraska Beef Cattle Report,* pp. 50-52). Minor differences in pH measurements do not explain differences in feeding value either. Additional research needs to be conducted to determine why the energy value of DG is negatively affected during the drying process.

Table 2. Effects of diet on ruminal pH.

	Treatment[1]					
	CON	WDGS	MDGS	DDGS	SEM	*P*-value
Average pH	5.73	5.70	5.69	5.92	0.08	0.14
Maximum pH	6.53	6.42	6.36	6.87	0.07	0.29
Minimum pH	5.05[a]	5.16[b]	5.13[a,b]	5.36[c]	0.07	< 0.01
pH Magnitude	1.46	1.29	1.20	1.16	0.13	0.27
pH Variance	0.139	0.087	0.096	0.097	0.019	0.11
Time < 5.6, min/day	496	695	560	309	127	0.23
Area < 5.6	106[a]	224[b]	128[a]	106[a]	38	0.02

[1]WDGS = wet distillers grains plus solubles; MDGS = modified distillers grains plus solubles; DDGS = dried distillers grains plus solubles.
[a,b]Means with different superscripts differ ($P < 0.10$)

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