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Comparison of Dry Distillers or Modified Wet Distillers Grains Plus Solubles in Wet or Dry Forage-Based Diets

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Summary

Modified wet distillers grains plus solubles (MDGS) or dry distiller grains plus solubles (DDGS) in combination with wet or dry forages were fed to growing steer calves (n=192). They were fed one of four treatments in a 2 x 2 factorial arrangement with factors as wet or dry forage and MDGS or DDGS for 105 days. Gain and feed-to-gain ratio (F:G) of steers fed MDGS were similar to those fed DDGS. Feeding wet forage significantly improved average daily gain (ADG) and F:G compared to feeding dry forage, which likely reflects forage quality in this study.

Introduction

Dry distillers grains plus solubles (DDGS) are completely dried from wet distillers grains plus solubles (WDGS) to 90% DM. Modified wet distillers grains plus solubles (MDGS), a modified wet product, are partially dried down from the traditional wet product (30-35% DM) to 46-48% DM.

These byproducts are often mixed with low quality forage and fed as a supplement in backgrounding operations. Our objective was to determine effects of feeding wet or dry distillers grains in a diet of wet or dry forage on growing calf performance.

Procedure

A 114-day growing trial utilizing 192 crossbred steer calves (642 ± 53 lb) in a randomized complete block design was conducted at the University of Nebraska–Lincoln Haskell Agricultural Laboratory near Concord, Neb. Steers were weighed on two consecutive days (day 0 and day

1) to obtain initial BW. Steers were assigned randomly to pen following stratification and blocking (by BW). Pen was assigned randomly to one of four dietary treatments with six pens per treatment and eight steers per pen. Steers were also implanted on day 1 with Ralgro[®] (Schering-Plough Animal Health). Steers were fed *ad libitum* once daily, with bunks read daily for intakes and adjusted accordingly. Steers were weighed on two consecutive days at the end of the trial for ending BW. From day 105 to day 114 all steers were fed a common ration to account for any differences in gut fill among treatments. Performance data were based on 105 days, assuming equal ADG of 1.5 for the last nine days on trial while consuming the common ration. Weekly feed samples were taken for 60°C forced-air oven DM analysis.

Dietary treatments (Table 1) consisted of DDGS or MDGS included at 32% of the diet on a DM basis. Corn silage constituted 59% of the diet DM for the wet forage diets. An oat hay and oat straw combination was used for the dry forage diets and constituted 16% and 13% of the diet DM, respectively. Dry rolled corn (DRC) was added at 35% of diet DM to the dry forage diets to account for the corn in the wet forage diets from corn silage. Liquid supplement was included at 4% of the diet DM. Diets were balanced to meet nutritional requirements for metabolizable protein, degradable intake protein and calcium-phosphorus ratio (Ca:P).

Lab analysis was conducted on all feedstuffs. Dry matter, organic matter (OM), crude protein (CP), fat, dry matter digestibility (DMD) and neutral detergent fiber digestibility (NDFD) were determined. Dry matter was determined in a 60°C forced-air oven for 48 hours. Organic matter was calculated from 6-hour ash at 600°C oven after lab-corrected DM (DM feed) was determined in 105°C oven for 24 hours. CP analysis was

conducted by the combustion method. Fat was analyzed using the gravimetric fat procedure modified by University of Nebraska. Dry matter digestibility and NDFD were determined utilizing a 28-hour *in situ* rumen incubation. Samples were weighed (1.5 g) into small (5 x 10 cm) *in situ* bags. Two bags of each ingredient were placed in the rumen of a steer being fed 75% grass hay, 20% DRC and 5% supplement. Two steers were used and bags were incubated for 28 hours. After rinsing the bags, DM was determined using 60°C forced air oven (DM residue), and DMD was calculated as $[100 * (DM\ feed - DM\ residue) / feed\ DM]$. Ankom analysis was conducted after the 28-hour *in situ* incubation to analyze NDF in the remaining residue. The sample NDF was determined using beaker NDF analysis. These two NDF values were used to calculate the NDFD values for each foodstuff.

Data were analyzed using MIXED procedures of SAS (SAS Inst. Inc.) as a randomized complete block design. Block was a fixed effect and pen was the experimental unit. Block, byproduct type and forage type were included in the model statement. Interactions for type of byproduct and type of forage were analyzed. If the interaction was significant, simple effects were analyzed using Differences of LS Means. If no significant interaction was observed, main effects are presented.

Results

No interactions were observed between byproduct type and type of forage. Likewise, type of byproduct was not significant. These results suggest there is no difference in feeding values of dry or modified wet byproduct in forage-based diets, agreeing with Nuttelmen et al. (2008 Nebraska Beef Report, pp. 29-30) who reported wet distillers grains plus solubles and DDGS had similar values.

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Table 1. Diet composition on a DM basis fed to growing steers.

Ingredient	Dry Forage		Wet Forage	
	DDGS	MDGS	DDGS	MDGS
DDGS ¹	32.0	—	32.0	—
MDGS ²	—	32.0	—	32.0
Corn silage	—	—	59.0	59.0
Oat hay	16.0	16.0	5.0	5.0
Oat straw	13.0	13.0	—	—
DRC	35.0	35.0	—	—
Supplement	4.0	4.0	4.0	4.0

¹Dry distillers grains plus solubles.²Modified wet distiller grains plus solubles (partially dried).**Table 2. Ingredient nutrient analysis on DM basis.**

	DM	OM	CP	Fat	DMD ¹	NDFD ²
DDGS ³	89.8	97.9	31.2	13.0	69.6	56.5
MDGS ⁴	46.9	95.9	28.2	12.8	62.8	54.6
Corn silage	41.4	94.9	8.3	2.8	65.0	37.1
Oat hay	78.4	93.1	11.3	2.3	52.1	39.5
Oat straw	75.4	94.3	5.1	1.0	34.8	32.3
DRC	87.8	98.3	9.5	6.5	82.4	43.0

¹Dry matter (DM) digestibility calculated from 28-hour rumen incubation.²Neutral detergent fiber (NDF) digestibility calculated from NDF analysis and 28-hour rumen incubation.³Dry distillers grains plus solubles.⁴Modified wet distiller grains plus solubles (partially dried).**Table 3. Performance results of feeding DDGS¹ or MDGS² in combination with wet or dry forage.**

Item ³	Dry Forage		Wet Forage		SEM	Interaction ⁴ P-Value	DGS ⁵ P-value	Forage ⁶ P-value
	DDGS	MDGS	DDGS	MDGS				
IW, lb	646	643	640	643	3	0.20	1.00	0.27
FW, lb	945	942	967	972	8	0.56	0.94	<0.01
DMI, lb/d	21.9	22.2	20.4	20.5	0.4	0.75	0.69	<0.01
ADG, lb	2.74	2.74	3.01	3.02	0.07	0.92	0.94	<0.01
F:G	8.07	8.15	6.82	6.80	0.87	0.76	0.83	<0.01

¹DDGS = dry distillers grains plus solubles.²MDGS= modified wet distillers grains plus solubles (partially dried wet product).³IW = initial weight; FW = final weight; DMI = dry matter intake; ADG = average daily gain; F:G = lb of feed consumed per lb of weight gained (calculated from total gain over total DMI, which is reciprocal of F:G).⁴Interaction between type of byproduct and type of forage fed.⁵Effect of type of byproduct (DGS) fed.⁶Effect of type of forage fed.

Forage type was statistically significant ($P < 0.05$) for all items except for initial BW (Table 2). Dry matter intake was lower for steers fed wet forage diets (20.4 lb/day, $P < 0.05$) compared to those fed dry forage diets (22.0 lb/day). Gain for steers fed wet forage diets was more at 3.01 lb/day and was statistically different than gain for steers consuming the dry forage diets (2.74 lb/day, $P < 0.05$). The wet forage fed steers had lower intakes and higher gains; therefore feed-to-gain ratio (F:G) was less (6.81; $P < 0.05$) for these steers compared to the dry forage fed steers (8.11).

Digestibility values helped explain the lack of difference in performance of steers fed DDGS versus those fed MDGS (Table 3). Byproducts had numerically similar DMD and NDFD values which would suggest similar utilization and performance. Forage feedstuffs varied in DMD and NDFD. The DMD of corn silage was higher than that of oat hay, which was higher than that of oat straw. Diet DMD showed that the dry forage diets (62.9% diet DMD) were slightly more digestible than the wet forage diets (62.1% diet DMD), although the difference was minimal. Even with the increased values contributed from the added DRC in the dry forage diets, oat hay and oat straw still did not result in steer performance comparable to that of the corn silage fed steers.

This study showed that when feeding growing calves, type of distillers grains (dry or modified wet) does not impact performance as much as the quality of forages.

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