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Wet Distillers Grains and Ratios of Steam-Flaked and Dry-Rolled Corn

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Summary

Feeding different ratios of dry-rolled corn (DRC) and steam-flaked corn (SFC) in diets that contain 0 or 35% wet distillers grains plus solubles (WDGS) was evaluated. As SFC replaced DRC in diets containing no WDGS, F:G improved. Varying SFC and DRC ratio in diets containing 35% WDGS did not impact F:G. Feeding WDGS increased hot carcass weight, and fat depth while feeding different ratios of corn impacted marbling deposition. Wet distillers grains appears to reduce the positive impacts of feeding SFC in finishing diets when included at 35% of diet DM.

Introduction

Numerous studies have examined effects of feeding wet distillers grains plus solubles (WDGS) in combination with steam-flaked corn (SFC). Results from one of those studies indicated an interaction between SFC and WDGS (2007 *Nebraska Beef Cattle Report*, pp. 33).

Few data exist examining effects of feeding combinations of corn processed by different methods fed with WDGS. Therefore, the objective of the current study was to determine effects of feeding different ratios of dry-rolled corn (DRC) and SFC in diets that contain 35% (DM) WDGS on finishing performance and carcass characteristics.

Procedure

Yearling British x Continental steers (n = 480; initial BW = 779±51 lb) were used in an experiment conducted at the University of Nebraska–Lincoln (UNL) Panhandle research feedlot. Prior to the start of the experiment, cattle were given Bovi-Shield® Gold, Vision® 7, Safe-Guard®, Revalor® XS, and an electronic and visual ID. Cattle were limit fed (2% of BW) a 50% forage, 50% WDGS diet for a total of five days before the initiation of the trial. Steers were individually weighed two consecutive days (day 0 and day 1) after the limit feeding period to obtain an initial BW. Cattle were stratified by BW within three weight block (light, medium, and heavy) and assigned randomly to 40 pens (12 steers/pen). Dietary treatments (n = 10; four replications) were assigned randomly to pens within BW block. Treatments were ratio of SFC:DRC (SFC:DRC 0:100, 25:75, 50:50, 75:25, 100:0, % of corn DM) with or without 35% (DM) WDGS. Cattle were individually weighed at the end of the trial. Carcass adjusted performance was calculated using carcass weights adjusted to a common dressing percentage of 63%. Cattle were on feed for 160 days.

Incremental percentages of corn

Table 1. Experimental diets (DM basis).

	SFC:DRC									
	0 WDGS					35% WDGS				
Ingredients	100:0	75:25	50:50	25:75	0:100	100:0	75:25	50:50	25:75	0:100
DRC[1]	—	20.4	40.7	61.1	81.47	—	12.1	24.3	36.4	48.5
SFC[2]	81.47	61.1	40.7	20.4	—	48.5	36.4	24.3	12.1	—
WDGS[3]	—	—	—	—	—	35	35	35	35	35
Corn Silage	7	7	7	7	7	7	7	7	7	7
Alfalfa	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Urea	1.07	1.07	1.07	1.07	1.07	—	—	—	—	—
SBM	2.03	2.03	2.03	2.03	2.03	—	—	—	—	—
Supp.[4]	6	6	6	6	6	6	6	6	6	6
Lab Analyzed Nutrient Composition										
CP %	12.3	12.2	12.2	12.2	12.2	16.1	16.1	16.1	16.1	16.1
NDF %	12.6	12.3	12.0	11.8	11.5	22.6	22.4	22.3	22.1	21.6
Fat %	2.8	2.8	2.9	2.9	3.0	5.6	5.6	5.6	5.7	5.7
Starch %	61.5	61.5	61.4	61.4	61.3	37.6	37.6	37.7	37.6	37.5
S %	0.12	0.13	0.13	0.13	0.13	0.26	0.26	0.26	0.27	0.27
Formulated Nutrient Composition										
Ca %	0.61	0.61	0.61	0.61	0.61	0.68	0.68	0.68	0.68	0.68
P %	0.29	0.29	0.29	0.29	0.29	0.47	0.47	0.47	0.47	0.47
K %	0.65	0.65	0.65	0.65	0.65	0.73	0.73	0.73	0.73	0.73

[1]DRC=dry-rolled corn.
[2]SFC=steam-flaked corn.
[3]WDGS=wet distillers grains plus solubles.
[4]Formulated to provide 30 g/ton Rumensin and 90 mg/steer/day Tylan®.

Table 2. Effect of corn processing ratio and wet distillers grains with solubles (WDGS) on finishing performance.

	0 WDGS					35 WDGS					*P*-value		
Item	0:100	25:75	50:50	75:25	100:0	0:100	25:75	50:50	75:25	100:0	W x R	WDGS	SFC:DRC[1]
Carcass Adjusted Data													
Initial BW, lb	778	776	781	780	779	783	774	779	781	778	0.80	0.89	0.45
Final BW, lb	1392	1405	1404	1424	1397	1483	1443	1466	1463	1450	0.17	<0.01	0.37
DMI, lb/day	25.3	24.8	23.7	24.1	23.0	25.9	25.2	25.6	25.4	24.4	0.15	<0.01	<0.01
ADG, lb/day	4.30	4.40	4.37	4.50	4.33	4.90	4.68	4.79	4.77	4.70	0.13	<0.01	0.43
F:G	5.88	5.62	5.43	5.35	5.29	5.29	5.41	5.35	5.32	5.18	0.03[2]	<0.01[2]	<0.01[2]

[1]SFC:DRC = steam-flaked corn:dry-rolled corn.
[2]*P*-value calculated from G:F.

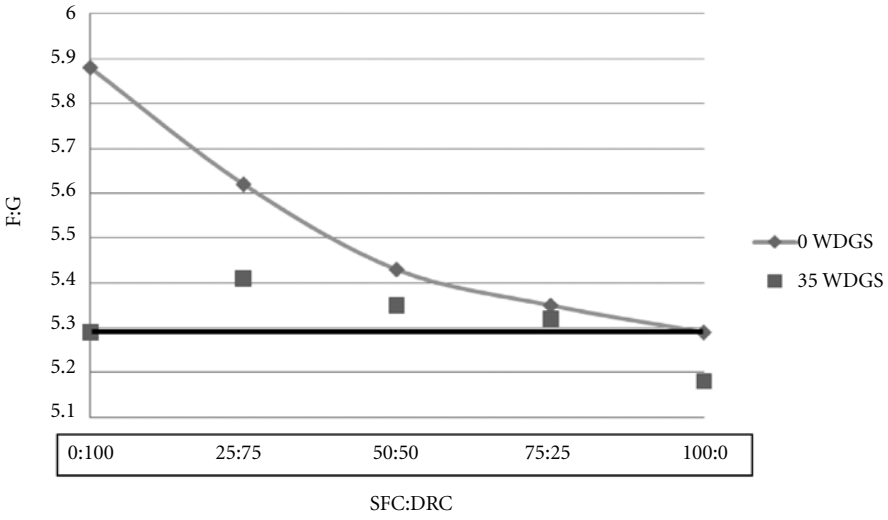

Figure 1. Effect of corn processing ratio and wet distillers grains with solubles (WDGS) on feed efficiency. Data indicate an interaction ($P = 0.03$) between WDGS and ratio. Both WDGS and steam-flaked corn:dry-rolled corn (SFC:DRC) impacted F:G ($P < 0.01$). A cubic and quadratic effect ($P < 0.01$) due to SFC:DRC was detected for F:G.

grain (SFC:DRC) replaced alfalfa hay during a 21-day period to acclimate cattle to the final finishing diet. The SFC utilized in the current study was procured from a local commercial feedlot (Panhandle Feeders, Morrill, Neb.) and was shipped into the Panhandle research feedlot three times weekly. Bushel weight and DM measurements were taken on each load of SFC. The average flake density for SFC utilized in the current feeding trial was 31.5 lb/bu. Steam-flaked corn was processed by a Ferrell-Ross mill which utilized 18 x 36 in. corrugated rollers. The experimental diets (Table 1) consisted of 7% corn silage, 3.5% alfalfa hay, 6% liquid supplement (DM basis), and varying proportions of SFC and DRC. Soybean meal (2.03%) and urea (1.07% DM) were included in the diet in order to meet the metabolizable protein needs with 0% WDGS.

Cattle were divided into two separate slaughter groups and slaughtered at a commercial abbatoir (Cargill, Fort Morgan, Colo.). Hot carcass weight and liver score data were collected on the day of slaughter. Carcass 12th rib fat, calculated yield grade, percentage of PYG, marbling score and LM area were recorded following a 48-hour chill. Yield grade was calculated using the USDA yield grade equation (yield grade = 2.5 + 2.5 (Fat thickness, in.) – 0.32 (LM area, in^2) + 0.2 (KPH fat, %) + 0.0038 (hot carcass weight, lb).

Intake variation was measured across week for each pen. Measurements were taken over a 13 week period. Since bushel weight measurements were collected on each load of SFC (n = 39) delivered to the feed yard, the relationship between bushel weight variation and DMI variation was also analyzed.

Animal performance, DMI variance, and carcass data were analyzed using the mixed procedure of SAS (SAS Inst. Inc., Cary, N.C.) as a randomized complete block design with pen serving as the experimental unit. Factors included in the model were corn processing ratio, WDGS, corn processing ratio x WDGS, with BW block as a fixed variable. If the corn processing ratio x WDGS interaction was significant ($P < 0.05$), simple effect means and *P*-values were reported and if a significant interaction was not detected, only main effect means and *P*-values were reported. Orthogonal contrasts were used to detect linear, quadratic, cubic, or quartic effects of corn processing ratio. The Proc Glimmix procedure of SAS was used for determining differences in liver score data.

Results

There was a significant corn processing ratio x WDGS interaction for carcass adjusted F:G ($P = 0.03$; Table 2). Steers fed diets containing WDGS exhibited heavier final BW, greater ADG, and DMI ($P < 0.01$). Gain for steers fed diets containing no WDGS tended ($P = 0.07$) to increase linearly as SFC replaced DRC. Feed conversion improved quadratically ($P < 0.01$) as SFC replaced DRC in diets containing no WDGS (Figure 1). In this study, the numerically optimal ADG for cattle fed corn diets with no WDGS appeared to be diets with 75% SFC, 25% DRC (% of corn DM). Cattle

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Table 3. Effect of corn processing ratio and wet distillers grains with solubles (WDGS) on carcass characteristics.

	SFC:DRC[1]					WDGS			*P*-value[2]		
Item	100:0	75:25	50:50	25:75	0:100	0	35	SEM	WxR	WDGS	SFC:DRC
Carcass Data											
HCW, lb	897	909	904	897	906	885	920	7.7	0.17	<0.01	0.42
Marbling[3,4]	538	555	540	558	569	556	547	11.8	0.65	0.22	0.06
12th rib fat, in	0.64	0.65	0.63	0.64	0.62	0.62	0.65	0.02	0.83	0.01	0.54
LM area, in^2	13.0	13.1	13.0	12.9	13.0	13.1	12.9	0.19	0.51	0.25	0.96
Yield grade[5]	3.74	3.82	3.78	3.77	3.77	3.63	3.91	0.07	0.70	<0.01	0.89
PYG[6]	3.59	3.61	3.60	3.59	3.60	3.54	3.65	0.03	0.61	<0.01	0.94
Liver Score											
A	10.42	2.13	9.57	11.46	5.38	7.98	8.05				
A+	6.25	2.13	1.06	4.17	2.15	3.36	2.97		0.14	0.95	0.06
0	83.33	95.74	89.36	84.38	92.47	88.61	88.98				

[1]SFC:DRC = steam-flaked corn:dry-rolled corn.
[2]*P*-values for liver score data were generated in Glimmix and came from the protected F test.
[3]Marbling score: 400 = Slight, 450 = Slight50, 500 = Small.
[4]Linear effect of SFC:DRC ratio (P = 0.02).
[5]Calculated as 2.50 + (2.5*fat depth, in) - (0.32*LM Area, in^2) + (0.2*2.5 KPH) + (0.0038*HCW, lb).
[6]PYG = Preliminary yield grade.

fed diets containing all SFC with no WDGS experienced a 12.3% improvement in F:G compared to steers fed all DRC and no WDGS. This response in F:G is fairly typical. Feed conversion was not different ($P > 0.05$) across the different corn processing ratios for cattle fed WDGS; however, steers fed diets with all SFC had 4.3% better feed conversion compared to cattle fed all DRC with WDGS.

There were no corn processing ratio x WDGS interactions ($P = 0.14$) for carcass characteristics (Table 3). Cattle receiving the 35% WDGS treatment diets had heavier carcasses (920 lb; $P < 0.01$) compared with steers that were fed no WDGS (885 lb). Marbling was not impacted by WDGS ($P = 0.22$). Cattle fed WDGS diets had greater back fat thickness ($P = 0.01$) compared with cattle fed 0 WDGS. Steers consuming finishing rations with 35% WDGS had greater calculated yield grade and preliminary yield grade ($P < 0.01$) compared with cattle fed control diets with no WDGS. Data indicate no effect ($P = 0.95$) of WDGS inclusion on liver abscesses. Marbling increased linearly as DRC replaced SFC ($P = 0.02$). Fat depth was unchanged ($P = 0.54$) across the different corn processing ratios. There was a tendency for cattle fed diets containing DRC to have numerically ($P = 0.06$) less severe abscessed livers (A+, adhered) compared with cattle fed rations with 100% SFC. This is likely due to a dilution effect of DRC in reducing the level of highly fermentable starch coming from SFC and presumably acidosis. Longissimus muscle area was not different for cattle fed WDGS or among corn processing ratios.

No interaction ($P = 0.95$) between corn processing ratio and WDGS was observed for DMI variation. As SFC replaced DRC, intake variation was not different ($P = 0.73$) across the different corn processing ratios. Lack of intake variation suggests that flaking had little impact on inducing subacute acidosis. In this study, simple correlation between SFC bushel weight variance and intake variance was measured. Steam-flaked corn bushel weight averaged 31.5 lb/bu and had an average weekly standard deviation of 1.6 lb with a minimum flake density of 27.5 lb/bu and a maximum of 34.5 lb/bu. There was a very low correlation ($r \leq 0.17$) between SFC bushel weight variance and intake variance. Most of the bushel weight variation was attributed to two loads of SFC (27.5 lb/bu) that were delivered on two consecutive loads and were fed over a five-day period. Intakes for all SFC treatments during this five-day period did not decrease in response to the more heavily processed SFC. Cattle fed diets containing 35% WDGS experienced less DMI variation ($P < 0.01$; 0.39 lb) than steers fed diets without WDGS (0.64 lb), which would suggest that steers fed WDGS experienced lower incidence of acidosis compared with steers not fed WDGS.

In summary, an interaction between corn processing ratio and WDGS occurred. Including WDGS in the finishing ration increased final BW, ADG, and DMI. Also, feed conversion was significantly improved by the addition of 35% WDGS in the diet. Feed conversion improved 4.3% when cattle were fed all SFC and 35% WDGS compared to steers fed all DRC and 35% WDGS. Cattle fed 0 WDGS experienced a quadratic improvement in F:G which resulted in a positive associative effect. The reason why F:G responded quadratically in steers fed diets with no WDGS is likely due to the reduction of acidosis by the addition of DRC which is less prone to induce sub-acute acidosis than SFC.

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