Evaluating Performance of Cattle Fed Steam-Flaked Corn Based Finishing Diets fed Increasing Inclusions of Wet or Modified Distillers Grains

Braden C. Troyer
Levi J. McPhillips
Mitchell M. Norman
Galen E. Erickson

Summary with Implications

A finishing trial using 560 calf-fed steers was conducted to evaluate the effect of distillers type and inclusion on finishing cattle performance and carcass characteristics in steam-flaked corn based diets. Treatments were applied in a 2 × 3 + 1 factorial arrangement, with the first factor being distillers type (modified distillers grains plus solubles or wet distillers grains plus solubles) and the second factor being distillers grains inclusion of 10%, 20%, or 30%, as well as a control diet containing no distillers. There was an interaction between inclusion and type of distillers for feed conversion. A linear improvement in feed conversion was observed as wet distillers inclusion increased but no change in feed conversion was observed with increasing modified distillers inclusion. Cattle fed distillers grains had greater intake, gain, and carcass weights. Cattle fed modified distillers had greater intake but poorer feed conversion compared to cattle fed wet distillers. Feeding wet distillers in steam-flaked corn-based finishing diets improved gain and feed conversion while feeding modified distillers increased gain but not feed efficiency.

Introduction

Steam-flaked corn (SFC) has been widely used in feedlots in the southern United States to improve feed conversion (F:G) by increasing total tract starch digestibility. Research has shown that feeding SFC results in a 12% improvement in F:G compared to feeding dry-rolled corn based diets when no byproducts are fed. Distillers grains has become a common ingredient in feedlot diets in the Midwest. Adding distillers to feedlot diets is largely due to availability and a competitive price relative to the performance benefits associated with feeding distillers in dry-rolled corn or high-moisture corn based finishing diets. The relationship between SFC and distillers grains is not well understood. Research has shown no change in feed efficiency when wet distillers grains plus solubles (WDGS) were fed in SFC based diets (*2007 Nebraska Beef Cattle Report*, pp. 33–35; *2012 Nebraska Beef Cattle Report*, pp. 70–72) and similar feed efficiency was observed when modified distillers grains plus solubles (MDGS) were fed with SFC (*2022 Nebraska Beef Cattle Report*, pp. 53–56). Steam flaking in the Midwest is increasing in prevalence, so understanding response to distillers in SFC diets is important. The objective of this study was to compare the effect of feeding MDGS or WDGS at increasing inclusions in SFC-based finishing diets on feedlot performance and carcass characteristics.

Procedure

A feedlot study was conducted at the University of Nebraska-Lincoln Eastern Nebraska Research and Extension Center (ENREC) near Mead, Nebraska. Crossbred calf-fed steers (n=560; initial BW = 658 ± 3.8 lb) were used in a 2 × 3 + 1 factorial design with factors consisting of two distillers types (MDGS or WDGS) fed at 10%, 20%, or 30% of diet dry matter (DM) replacing SFC. A 0% distillers treatment was used for a control diet and was considered the 0% inclusion for both distillers types when determining type by level interactions. Corn silage was used as the roughage source in all diets (Table 1). Supplements were formulated to meet metabolizable protein and rumen degradable protein requirements for each diet. A branded corn gluten meal (Empyreal, Cargill, Blair, NE) was added at 2.0% and 1.0% DM-basis for the control diet and the 10% distillers diets, respectively. Urea was added at 1.2, 0.8, and 0.4% DM-basis for the control diet, 10% distillers diets, and 20% distillers diets, respectively. No additional protein was added to the diets containing 30% distillers. All supplements were formulated to supply 30 g/ton Rumensin (Elanco Animal Health) on a DM basis and to provide 90 mg/steer daily of Tylan (Elanco Animal health). All cattle were stepped up to their respective diet over 25 d with SFC replacing grass hay and corn silage. Initially grass hay and corn silage were included in all diets at 26% and 30%, respectively. Steam-flaked corn averaged 29.6 lb/bu and was delivered three times per week from Raikes Feedlot near Memphis, Nebraska. Initial body weight (BW) was determined based on an average of 2-day BW following 5 days of limit feeding a 50% alfalfa 50% sweetbran diet at 2.0% of BW to equalize gut fill. Three blocks were used with 4 replications on the light block, 3 replications on the mid block, and 1 replication on the heavy block for a total of 56 pens and 8 replications per treatment (10 steers/pen).

Cattle were implanted on day 1 with a Revalor IS (Merck Animal Health). Steers on the mid/heavy blocks were reimplanted on day 70 and steers on the light block were reimplanted on day 75. Cattle were on feed for 174 and 188 d for the mid/heavy and light blocks, respectively. Cattle were slaughtered at a commercial abattoir (Greater Omaha Packing, Omaha, NE). One day final BW were collected on the day that cattle shipped to the plant. Hot carcass weight (HCW) and liver scores were collected on the day of slaughter and LM area, USDA marbling score, and 12th rib fat thickness were collected following a 48-hour chill. Final live BW was calculated using the pen average final live BW shrunk 4% to adjust for fill. Carcass adjusted final BW was calculated by dividing HCW by a common dressing percentage of 63%.

Data were analyzed using GLIMMIX procedure of SAS as a 2 × 3 + 1 factorial design with main effects of distillers grains type and distillers grains inclusion, and the appropriate interactions. Orthogonal

Table 1. Composition of steam-flaked corn based finishing diets with increasing inclusions of wet distillers grains plus solubles or modified distillers grains plus solubles.

	Treatments						
Ingredient	Control	10% MDGS	20% MDGS	30% MDGS	10% WDGS	20% WDGS	30% WDGS
SFC[1]	79.0%	69.0%	59.0%	49.0%	69.0%	59.0%	49.0%
MDGS[2]	-	10.0%	20.0%	30.0%	-	-	-
WDGS[3]	-	-	-	-	10.0%	20.0%	30.0%
Corn Silage	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Supplement[4]	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
FGC[5]	0.45%	1.89%	3.43%	3.83%	1.89%	3.43%	3.83%
Limestone	1.66%	1.63%	1.63%	1.63%	1.63%	1.63%	1.63%
Tallow	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%
Urea	1.20%	0.80%	0.40%	-	0.80%	0.40%	-
Empyreal	2.00%	1.00%	-	-	1.00%	-	-
Salt	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%
Trace Mineral	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Vit ADE	0.015%	0.015%	0.015%	0.015%	0.015%	0.015%	0.015%
Rumensin	0.017%	0.017%	0.017%	0.017%	0.017%	0.017%	0.017%
Tylan	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%

[1]SFC—steam-flaked corn (29.6 lb/bu)

[2]MDGS—modified distillers grains plus solubles (45.6% DM)

[3]WDGS—wet distillers grains plus solubles (29.6% DM)

[4]Supplment—formulated to target 30 g/ton Rumensin and 90 mg/steer Tylan

[5]FGC—fine ground corn

Table 2. Effect of modified distillers grains plus solubles or wet distillers grains plus solubles inclusion in steam-flaked corn based finishing diets on performance characteristics.

	Control	10% MDGS	20% MDGS	30% MDGS	10% WDGS	20% WDGS	30% WDGS	SEM	Level X Type	Type	MDGS Linear	MDGS Quad	WDGS Linear	WDGS Quad
Initial BW, lb	659	657	657	658	656	658	659	33.3	0.23	0.68	0.53	0.16	0.53	0.06
Live Final BW, lb	1350	1382	1375	1394	1376	1407	1402	42.4	0.33	0.28	0.03	0.60	<0.01	0.21
Final BW[1], lb	1338	1382	1395	1400	1375	1408	1409	38.7	0.44	0.66	<0.01	0.13	<0.01	0.17
DMI, lb/d	20.5	21.3	21.7	21.9	21.0	21.5	21.1	0.76	0.06	0.04	<0.01	0.24	0.04	0.08
ADG, lb	3.80	4.06	4.13	4.15	4.02	4.20	4.19	0.12	0.52	0.69	<0.01	0.10	<.001	0.11
F:G	5.39	5.25	5.25	5.28	5.22	5.12	5.04	-	0.02	0.03	0.26	0.24	<0.01	0.58
HCW, lb	843	871	879	882	866	887	888	24.4	0.42	0.63	<0.01	0.13	<0.01	0.17
LM Area, in^2	14.0	14.4	14.4	14.4	14.2	14.1	14.1	0.36	0.20	0.05	0.08	0.15	0.69	0.33
Fat, in	0.54	0.54	0.57	0.61	0.56	0.57	0.63	0.02	0.86	0.46	<0.01	0.31	<0.01	0.37
Marbling[1]	450	447	458	437	446	459	436	11.1	0.99	0.99	0.51	0.36	0.51	0.35
Dressing, %	62.6	63.1	64.1	63.2	62.9	63.1	63.6	0.4	0.21	0.39	0.07	0.06	0.05	0.86

[1]Final BW—calculated as HCW/a common 63% dress

[2]400 = small, 500 = modest, 600 = moderate

contrasts were used to analyze linear and quadratic effects. The control diet was analyzed as a common 0% distillers inclusion. This control diet was considered the 0% inclusion in both WDGS and MDGS diets. Significance was declared at a $P \leq 0.05$ and tendencies at $P \leq 0.10$.

Results

There were no interactions between DGS inclusion and DGS type (Table 2) for initial BW, final live BW, carcass adjusted final BW, ADG, HCW, *logissiums* muscle (LM) area, fat, marbling, or dressing percentage ($P > 0.20$). However, an interaction was observed for dry matter intake (DMI; $P = 0.06$) and feed conversion (F:G; $P = 0.02$). Dry matter intake linearly increased as inclusion of DGS increased; however, DMI for steers consuming MDGS increased more dramatically than those consuming WDGS. Dry matter intake of steers fed increasing inclusion of WDGS tended to increase quadratically ($P = 0.08$) with the greatest intake observed at 20% inclusion. Steers fed MDGS had similar F:G as the cattle fed 0% distillers grains on the SFC control diet ($P > 0.24$), whereas F:G improved linearly as WDGS increased in the diet ($P < 0.01$).

Final live BW, adjusted final BW, HCW, and backfat increased linearly ($P \leq 0.03$) as inclusion of distillers grains plus solubles (DGS) increased, regardless of type. Additionally, a tendency for a quadratic increase in ADG ($P \leq 0.11$) from 0% DGS to 30% DGS was observed. The control diet had an ADG of 3.80 lb/d which improved to 4.15 lb/d and 4.19 lb/d at the 30% inclusion of MDGS and WDGS, respectively. Feeding MDGS resulted in an increase in LM area by 0.3 in^2 compared to WDGS ($P = 0.05$).

Conclusion

Overall, feeding distillers grains in SFC based finishing diets resulted in improved HCW, ADG and F:G, but DMI also increased compared to diets without distillers. Interactions between level and type of distillers were observed for F:G and a tendency for an interaction for DMI. Feed efficiency was similar for MDGS compared to the control diet, but linearly improved as WDGS inclusion increased, which was a result of a larger increase in DMI for the cattle fed MDGS and a more subtle increase in DMI when WDGS were used. Wet distillers grains out performed MDGS by maintaining ADG and consuming less feed, resulting in improved F:G, which has been observed in other finishing diets when comparing WDGS and MDGS. Increasing distillers grains, regardless of type, resulted in increased fat depth and tended to increase HCW and FBW. These data suggest that feeding distillers in SFC-based finishing diets will improve cattle ADG, regardless of type. Additionally, feeding WDGS improves F:G when replacing SFC.

Braden C. Troyer, research technician

Levi J. McPhillips, feedlot manager

Mitchell M. Norman, feedlot manager

Galen E. Erickson, professor, Animal Science, University of Nebraska–Lincoln