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Meta-Analysis of UNL Feedlot Trials Replacing Corn with WCGF

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Summary

A meta-analysis of UNL feedlot trials was conducted to evaluate the effect of replacing dry-rolled or high-moisture corn with wet corn gluten feed (WCGF) on feedlot cattle performance and carcass characteristics. The feeding value of WCGF was dependent on ratio of steep to corn bran of the WCGF. The performance of cattle fed WCGF composed of wet bran and steep was similar to corn fed cattle. Feeding and carcass performance of cattle fed WCGF composed of dry bran, steep, and germ improved linearly as dietary inclusion increased.

Introduction

The availability of wet corn gluten feed (WCGF) generated from the wet milling industry is expected to increase as ethanol production increases. The actual composition of WCGF varies depending on the plant's capabilities. Steep, a combination of steep liquor and distillers solubles, contains more energy (136% the feeding value of corn) and CP than corn bran or germ meal (*1997 Nebraska Beef Report*, pp. 72-74). Plants applying more steep to corn bran or germ meal will produce WCGF higher in CP and energy.

In general, two types of WCGF are commonly used in the feedlot industry. The first (WCGF-A) is composed of wet bran and steep and contains 40% to 42% DM and 15% to 18% CP (DM basis). The second WCGF (WCGF-B) is composed of dry bran, steep, and germ meal and contains 60% DM and 22% to 25% CP (DM basis).

The feeding value of WCGF is dependent on its composition. In addition, the impact of WCGF inclusion level on quality grade has not been summarized. Therefore, the objective of our meta-analysis was to evaluate the effect of WCGF dietary inclusion on feedlot cattle performance and carcass characteristics.

Procedure

Treatment means (n = 35) from University of Nebraska feedlot experiments evaluating use of WCGF in finishing diets were compiled (WCGF-A, *1986 Nebraska Beef Report,* pp. 17-19; *1993 Nebraska Beef Report*, pp. 46-47; *1994 Nebraska Beef Report,* pp. 37-38; *1995 Nebraska Beef Report,* pp. 34-36; *2004 Nebraska Beef Report,* pp. 61-63; WCGF-B, *1995 Nebraska Beef Report*, pp. 26-28; *1997 Nebraska Beef Report,* pp. 70-72; *1998 Nebraska Beef Report,* pp. 50-53; *2001 Nebraska Beef Report*, pp. 59-63; *2007 Nebraska Beef Report*, pp. 25-26; *2007 Nebraska Beef Report*, pp. 27-28). Steers (n = 1,389; 509 WCGF-A; 880 WCGF-B) in these studies were predominantly black, crossbred steer calves or yearlings. Within experiment, cattle were blocked by initial BW, allocated randomly to pens, then pens assigned randomly to dietary treatments. Only studies that replaced dry-rolled corn, high-moisture corn, or a combination of the two types of corn with WCGF (0% to 40% of diet DM) were included in the analysis.

Steers across these experiments were fed for 111 to 169 days. In each individual experiment, cattle were fed the same number of days and marketed at a commercial abattoir. Hot carcass weight was recorded on day of slaughter. Fat thickness was measured after a 24- to 48-hour chill. USDA Marbling score was called by a professional USDA grader. Final BW, ADG, and F:G were calculated based on hot carcass weights adjusted to a common trial dressing percentage. The feeding value of each WCGF at different inclusion levels was calculated using feed efficiency. The F:G difference between each WCGF treatment and the individual experiment control (0% WCGF) was calculated, divided by the F:G of the control treatment, and divided by the percentage of WCGF in the individual diet to give a feeding value of WCGF relative to corn.

The two WCGF products were analyzed and summarized separately. An iterative meta analysis methodology was used to integrate quantitative findings from multiple studies using the PROC MIXED procedure of SAS.

Results

Dry matter intake of cattle fed increasing levels of WCGF-A was similar ($P > 0.38$) to cattle fed corn (Table 1). However, ADG increased linearly ($P = 0.10$) as more WCGF-A replaced corn in finishing diets. The improvement in ADG with similar DMI did not result in significant differences in feed conversion ($P > 0.59$) across WCGF-A inclusion levels. The feeding value of WCGF-A was 99% of corn. Because the feeding performance was similar to control fed cattle, the carcass characteristics of cattle fed WCGF-A were similar to cattle fed corn alone. There was no relationship between dietary inclusion level of WCGF-A and 12th rib fat thickness ($P > 0.46$). Marbling score decreased linearly ($P = 0.09$) as the level of WCGF-A increased in finishing diets, but the change was subtle with a decrease of 11 marbling score units between 0% and 40% inclusion.

The feeding value of WCGF-B was 112% of corn. The feeding value improvement is due to a linear increase ($P < 0.01$) in ADG as WCGF-B inclusion increased; however, DMI also increased linearly ($P < 0.01$). The replacement of corn with WCGF-B improved F:G linearly ($P = 0.03$) as dietary inclusion increased. The increased DMI and improved F:G sug-

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Table 1. Finishing steer performance when fed different dietary inclusions of wet corn gluten feed (WCGF).

WCGF Inclusion [a]:	0WCGF	10WCGF	20WCGF	30WCGF	40WCGF	Linear [b]	Quadratic [b]
WCGF-A[c]							
DMI, lb/day[d]	22.2	22.3	22.5	22.8	23.0	0.38	0.48
ADG, lb	3.44	3.47	3.50	3.54	3.57	0.10	0.90
F:G[d]	6.44	6.44	6.44	6.44	6.44	0.59	0.60
12th rib fat, in[d]	0.45	0.45	0.45	0.45	0.45	0.46	0.46
Marbling score[e]	504	501	498	495	493	0.09	0.60
WCGF-B[c]							
DMI, lb/day	21.8	22.3	22.9	23.4	24.0	< 0.01	0.35
ADG, lb	3.67	3.80	3.92	4.05	4.17	< 0.01	0.67
F:G	5.96	5.90	5.85	5.80	5.74	0.03	0.48
12th rib fat, in	0.46	0.47	0.49	0.50	0.52	< 0.01	0.87
Marbling score[e]	492	497	501	506	511	< 0.01	0.78

[a]Dietary treatment levels (DM basis) of wet corn gluten feed (WCGF), 0WCGF = 0% WCGF, 10WCGF = 10% WCGF, 20WCGF = 20% WCGF, 30WCGF = 30% WCGF, 40 WCGF = 40% WCGF.
[b]Estimation equation linear and quadratic term t-statistic for variable of interest response to WCGF level.
[c]WCGF-A composed of wet bran and steep, WCGF-B (Sweet Bran) composed of dry bran, steep, and germ meal.
[d]Reported values are variable of interest means due to no WCGF level differences ($t > 0.10$).
[e]400 = Slight 0, 500 = Small 0.

gest WCGF-B also reduced acidosis. Because ADG was greater for cattle fed WCGF-B, carcasses from cattle fed WCGF-B were fatter compared to cattle fed corn alone and marbling scores increased linearly ($P < 0.01$) as inclusion increased. Since WCGF-B diets had improved feeding values relative to corn, the cattle gained weight quicker than corn-fed controls and required fewer days to reach the same backfat and marbling endpoints.

The feeding value of WCGF is dependent on the ratio of bran to steep in the production process. Feeding as much as 40% WCGF will provide cattle performance similar to, or better than, corn-fed cattle. Our conclusion is that the increase in fat depth and marbling from feeding WCGF-B is related to improved animal performance. Feeding diets that increase ADG cause cattle to fatten more rapidly, which can improve the quality grade of feedlot cattle when cattle are fed the same number of days.

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