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# COMBINATIONS OF WET CORN GLUTEN FEED AND STEAM FLAKED CORN IN FINISHING CATTLE DIETS

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## Summary

A 152-day experiment was conducted using 615 crossbred steers to evaluate cattle performance when steam-flaked corn in finishing diets was replaced partially with wet corn gluten feed (CGF). Finishing diets contained no wet CGF (0CGF) or 30 and 60% CGF on a dry matter basis (30CGF and 60CGF). Ruminal and fecal pH increased linearly (P<.01) as the proportion of wet corn gluten feed increased. Cattle fed 60CGF gained less than those fed 30CGF (P<.01) and were less efficient than cattle fed 0CGF or 30CGF (P<.05). Dressing percentage was lower (P<.03) for cattle fed 60CGF compared to cattle fed 30CGF. Incidence of liver abscesses increased linearly (P<.01) as the level of CGF increased. Replacing steam-flaked corn with wet CGF at 30% of the diet did not alter performance.

(Key Words: Wet Corn Gluten Feed, Steam-Flaked Corn, Finishing Cattle.)

## Introduction

Corn gluten feed (CGF) is the major by-product produced from the wet milling of corn for production of starch and corn sweeteners. It contains a high percentage of fiber and, therefore is ideally suited for use in cattle diets. Previous studies have identified optimal substitution levels of gluten feed in finishing diets composed of dry rolled or high-moisture grain. In Kansas, however, steam flaking is the predominant method of grain processing in feedlots. Steam flaking improves energy availability of grains; however, the heat associated with flaking induces cross-linking reactions that reduce availability of grain protein. Therefore, high protein levels in CGF may be more complementary to flaked corn than to high-moisture or dry-rolled grain. Additionally, rapid ruminal degradation of steam-flaked corn predisposes cattle to digestive disorders such as acidosis. The fibrous nature of CGF and the resulting slower rates of digestion may provide an opportunity to minimize this condition.

## Experimental Procedures

Six hundred fifteen crossbred beef steers (average wt 649 lb) were used in a 152-day experiment to evaluate finishing performance when steam-flaked corn was replaced partially with wet CGF. Steers were blocked by previous treatment and randomly allocated, within block, to each of three diets (4 pens per diet, 48 to 53 steers per pen). Dietary treatments included no CGF (0CGF) or 30 and 60% wet CGF on a dry matter basis (30CGF and 60CGF). Diet compositions are shown in Table 1.

Steers were implanted with Component® TE-S on day 1 and were adapted to the final finishing diets within 23 days. Respective diets were provided once daily, and cattle had ad libitum access. Unconsumed feed was collected, weighed, analyzed for dry matter content, and subtracted from the amount of feed offered to determine actual feed intakes.

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On days 114 to 118, samples of rumen fluid and feces were collected from 180 steers (60 per treatment) for determination of ruminal and fecal pH. Rumen fluid was obtained via rumenocentesis using a 4-inch, 16-gauge needle. Fecal grab samples were collected concurrently.

Final shrunk weights were determined by dividing carcass weight by a common dressing percentage (64.0%). Ribeye area, fat thickness, percentage kidney, pelvic and heart fat, marbling score, incidence of dark cutters, and USDA quality and yield grades were evaluated 24 hours after slaughter.

## Results and Discussion

A linear increase was observed for both ruminal and fecal pH as the proportion of wet CGF in the diet increased (Figure 1). This suggests that increasing the percentage of CGF in the diet potentially could reduce metabolic disorders by elevating ruminal pH.

Performance during the finishing trial is summarized in Table 2. Dry matter intake tended to increase (P<.14) as the proportion of CGF increased. Average daily gain during the finishing phase was greater (P<.01) for steers fed 30CGF than steers fed 60CGF. This resulted in more efficient (P<.05) gains for cattle fed 0CGF or 30CGF than cattle fed 60CGF. Dressing percentage was lower (P<.03) for cattle fed 60CGF compared to cattle fed 30CGF. Incidence of liver abscesses increased linearly (P<.05) as the level of CGF increased. This suggests that metabolic disorders may not be reduced by adding CGF to the diet, in spite of the observed differences in ruminal pH among the diets.

Replacing steam-flaked corn with wet CGF at 30% of the diet dry matter yielded performance similar to that with steam-flaked corn. However, when wet CGF was increased to 60% of the diet dry matter, performance was reduced modestly. Moderate levels of wet CGF are suitable as a replacement for steam-flaked corn in cattle finishing rations. Use of higher levels of wet CGF may be a justifiable alternative, if the opportunity is available to lower costs of gain.

**Table 1. Composition of Experimental Diets (% of diet dry matter)**

| | Dietary Wet Corn Gluten Feed | | |
|---|---|---|---|
| Ingredient | 0% | 30% | 60% |
| Flaked corn | 81.60 | 58.37 | 30.21 |
| Alfalfa hay | 6.71 | 6.82 | 6.97 |
| Molasses | 3.72 | - | - |
| Tallow | 2.01 | 2.05 | 2.09 |
| Wet corn gluten feed | - | 28.64 | 58.51 |
| Soybean meal | 2.83 | 1.44 | - |
| Urea | 1.21 | .79 | .36 |
| Limestone | 1.18 | 1.28 | 1.39 |
| Sodium chloride | .29 | .29 | .30 |
| Potassium chloride | .04 | .02 | - |
| Ammonium sulfate | .19 | .10 | .10 |
| Calcium phosphate | .12 | .06 | .06 |
| Vitamin/trace mineral premix[1] | .10 | .10 | .10 |
| Nutrient | | | |
| Dry matter, % | 83.4 | 65.0 | 53.0 |
| Crude protein, % | 14.9 | 15.2 | 15.4 |
| Calcium, % | .66 | .70 | .75 |
| Phosphorus, % | .29 | .35 | .41 |
| Thiamin, ppm | - | 7.5 | 15 |
| Copper, ppm | 8.3 | 12.2 | 16.0 |

[1]Vitamin/trace mineral premix formulated to provide (total diet dry matter): 1,200 IU/lb vitamin A, .10 ppm cobalt, .52 ppm iodine, 50 ppm manganese, .25 ppm selenium, 50 ppm zinc, 30 grams/ton Rumensin®, and10 grams/ton Tylan®.

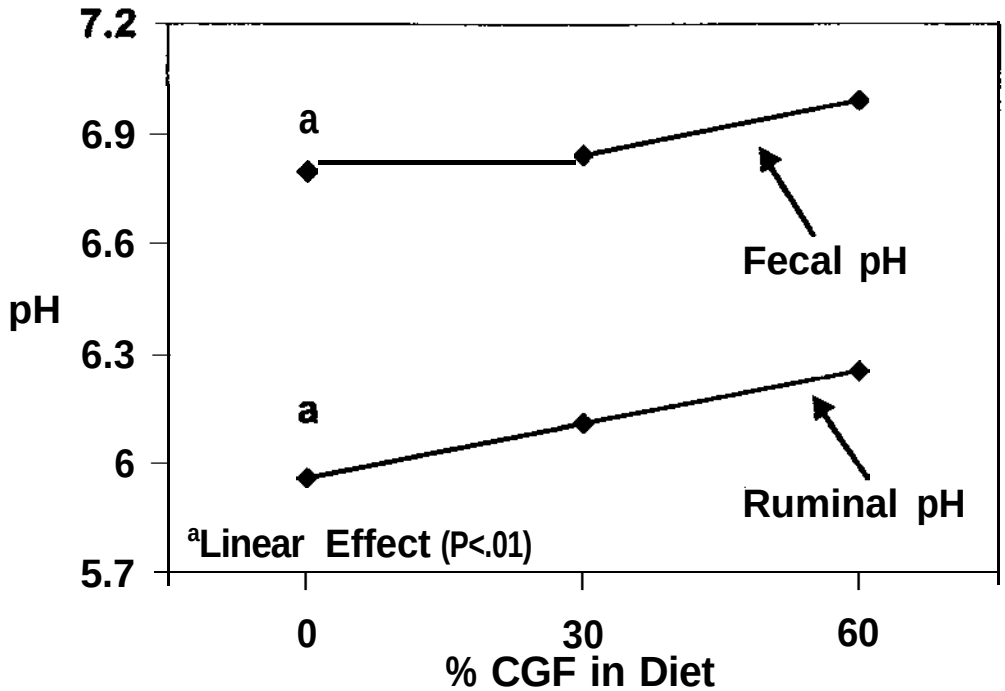


**Figure 1. Effect of Increasing Dietary Proportions of Wet Corn Gluten Feed on Ruminal and Fecal pH of Finishing Cattle**

**Table 2. Finishing Performance and Carcass Characteristics of Steers Fed 0,30, or 60% Wet Corn Gluten Feed (dry matter basis)**

| | Dietary Wet Corn Gluten Feed | | | |
|---|---|---|---|---|
| Item | 0% | 30% | 60% | SEM |
| No. of steers | 206 | 202 | 207 | |
| Initial weight, lb | 655 | 645 | 647 | 12.8 |
| Final weight, lb | 1183 | 1181 | 1173 | 11 |
| Dry matter intake, lb/day | 19.1 | 19.2 | 19.9 | .26 |
| Average daily gain; lb | 3.14[ab] | 3.22[a] | 3.05[b] | .032 |
| Gain:feed | .165[a] | .168[a] | .154[b] | .0026 |
| Hot carcass weight, lb | 725 | 726 | 711 | 6.9 |
| Dressing percentage | 61.3[ab] | 61.5[a] | 60.7[b] | |
| Ribeye area, $in^2$ | 12.0 | 11.9 | 11.6 | .17 |
| Kidney, pelvic, & heart fat, % | 2.1 | 2.1 | 2.1 | .083 |
| Fat thickness, in | .46 | .42 | .43 | .020 |
| % USDA yield grade l,% | 5 | 7 | 5 | 2.2 |
| % USDA yield grade 2,% | 31 | 35 | 32 | 3.9 |
| % USDA yield grade 3,% | 56 | 47 | 56 | 4.1 |
| % USDA yield grade 4 & 5,% | 9 | 12 | 8 | 2.5 |
| Marbling score[c] | SI[58] | SI[52] | SI[45] | 8.0 |
| USDA Choice, % | 31 | 29 | 26 | 5.2 |
| USDA Select, % | 57 | 59 | 58 | 4.8 |
| USDA Standard, % | 12 | 13 | 14 | 3.2 |
| Dark cutters, % | 0 | 1 | 2 | .50 |
| Liver abcesses, % | 1.5[a] | 2.0[ab] | 3.9[b] | .58 |

[a,b]Means within same row with uncommon superscripts differ (P<.05).
[c]Sl=Slight.