

Project Summary

Effect of Distiller's Grain on Performance and Meat Quality in Steers at 70% Inclusion

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Background

Ethanol production increased 232% from 2003 to 2007 and is continuing to rise such that an estimated 98 billion pounds of dry distiller's grains (DG) will be produced from 15 billion gallons of ethanol by 2015. Historically, both wet and dry DG have been used in the beef industry as a protein source [15% - 20% dry matter (DM)]. However, due to competitively priced DG and increased corn costs, producers may utilize DG at higher inclusion rates and little research is available on the effects of DG at inclusion rates above 50%.

The objective of this project was to determine the effects of DG, both dry and wet, at 70% inclusion (DM basis) and the effect of nutrient (isonitrogenous and isocaloric) on growth performance, carcass characteristics, meat quality and lipogenic activity.

Methodology

Three hundred and four Angus steers [399 kg \pm 87 kg initial body weight (BW)] were stratified by body weight and assigned to feedlot pens. Pens (n = 48) were randomly assigned to one of six treatments: 1) 80% corn:5% SBM:15% corn silage, fed as a negative control (**CON**); 2) 40% DG:45% corn:15% corn silage, fed as positive control (**PCON**); 3) PCON switched mid-trial to 70% DG:15% corn:15% corn silage till finish (**40/70**); 4) 70% DG:15% corn:15% corn silage switched mid-trial to PCON till finish (**70/40**); 5) CON + soybean meal to contain the same amount of nitrogen as PCON (**N40**); 6) CON + corn oil to contain the same amount of fat as PCON (**E40**). Steers at Southern Illinois University received dried DG while steers at Illinois State University received wet DG.

Steers had *ad libitum* access to water and feed and were fed daily at 0700 hours. Steers were harvested on day 168 or day 213 at a commercial abattoir. Hot carcass weight and liver scores were recorded on day of harvest. *Longissimus* muscle area and fat thickness were measured after a 24-hour chill. Marbling score was called by a trained USDA grader and yield grade was determined by formula calculation. Prior to harvest, two steers per pen were randomly selected for meat quality and lipogenic analysis. A three-rib section (rib 10-12) was taken from the *longissimus* and evaluated for Minolta color, Warner-Bratzler shear force (WBSF), cooking loss percentage, and total fatty acid profile. On day of harvest, an approximately 5 g sample of adipose tissue was collected from the brisket area on the same 96 head of steers utilized for meat quality analysis and analyzed for Acetyl-CoA carboxylase, acyl-coenzyme A, carnitine palmitoyltransferase-1 or stearoyl-CoA desaturase.

Findings

There were no effects due to feeding dry versus wet DG thus, all data was pooled for statistical analysis. Increased inclusion rate of DG did not affect growth performance of steers. All treatments had similar dry matter intakes and feed efficiency. However, it was observed that nitrogen (N40) decreased average daily gains compared to PCON steers but the decreased average daily gain did not affect feed efficiency between these two treatments. The endpoint of growth performance was when 80% of the steers graded Choice or better by visual appraisal. To accomplish this endpoint, there were two harvest dates on day 168 and 213 and an equal number of steers were selected from each pen on these days.

Besides rib fat, neither increasing the inclusion of DG in the diet or nutrient had an effect on carcass characteristics. Rib fat was greater for CON steers compared to PCON steers and PCON steers had similar amounts of rib fat compared with 40/70 and 70/40 steers. Both nitrogen (N40) and energy (E40) did increase rib fat compared to PCON steers but the amount of rib fat was similar to CON, 40/70 and 70/40 steers.

Meat quality according to Minolta color (lightness, redness and yellowness) was not affected by inclusion level of DG but energy (E40) increased redness and yellowness compared to PCON steers. Nutrient did not affect tenderness but 40/70 and 70/40 steers were more tender (lower WBSF values) compared to PCON steers and similar compared with CON steers. It has been documented that the U.S. consumer threshold for “slightly tender” in retail and foodservice ranges between 3.9 and 4.6 kg of shear force; however, some consumers have found beef with WBSF values of 2.3 kg to be unacceptable. Therefore, even though increased inclusion level of DG decreased WBSF (more tender), it still falls below U.S. consumer tenderness thresholds.

All fatty acids (total PUFA, total MUFA, total SFA and CLA isomers) were unaffected by level of DG in the diet or nutrient. Moreover, neither treatment nor nutrient had an effect on acetyl-CoA carboxylase, acyl-coenzyme A, carnitine palmitoyltransferase-1, or stearoyl-CoA desaturase.

Implications

The composition of distiller’s grains varies not only within ethanol plant but among plants across the U.S. Additionally, differences in feedlot cattle performance with the inclusion of distiller’s grains may be due to corn processing (i.e. dry-rolled vs. steam flaked corn vs. shelled corn). It is possible to feed distiller’s grains at an inclusion level of 70% on a dry matter basis utilizing shelled corn in IL without adverse negative effects on growth performance, carcass characteristics, meat quality or lipogenic activity. However, the results of this study may be due to the effect of region thus, caution should be taken and further research should be done before nutritionists can confidently recommending an inclusion rate of 70% distiller’s grains in all feedlot rations.

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