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Evaluation of Levels of Wet Corn Gluten Feed and Addition of Tallow

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Summary

One feedlot trial evaluated the effect of level of wet corn gluten feed and the addition of tallow on finishing performance. Wet corn gluten feed was fed to replace 0, 50, or 100% of the dry rolled corn and the molasses-urea supplement in the diet. All diets were fed with or without addition of tallow. Steers fed 50% gluten feed gained faster and more efficiently than steers fed dry rolled corn. Steers fed 100% gluten feed were more efficient than steers fed dry rolled corn without tallow. Feeding 3% tallow increased gain and feed efficiency when added to the dry rolled corn or 50% gluten feed diets. The energy value of wet gluten feed was 10 (100% gluten feed) to 20% (50% gluten feed) greater than the dry rolled corn and molasses-urea supplement replaced.

Introduction

Wet corn gluten feed (WCGF) is a byproduct of the wet corn milling industry and contains 90 to 110% of the relative energy value of corn in finishing diets. Wet corn gluten feed (Cargill) contains higher levels of protein (20%), phosphorus (1.0%), and potassium (1.2%) than corn. Wet corn gluten feed is higher in rumen degradable (80 vs 40%) and lower in escape protein (20 vs 60%) when compared with corn. The lipid contents of WCGF and corn are similar, at 5%.

Wet distillers byproducts (wet grains and thin stillage) are byproducts of the dry milling industry and have been shown to improve feed efficiency from 2 to 17% when fed at levels of 5.2 to 40% of the diet DM. Due to increased feed efficiency when added to the diet, wet distillers byproducts had a relative energy value of 153% compared to dry rolled corn. Wet distillers byproducts contain 29% crude protein, in which 50% is considered escape protein, and greater than twice the lipid content (12%) found in corn or WCGF.

If ruminal degradable and metabolizable protein requirements of the animal are met, differences in protein supplied should not account for differences in energy estimations between WCGF and wet distillers byproducts. Additional lipid in wet distillers byproducts when compared with WCGF may explain the differences in energy estimations. Therefore, the objectives of this trial were to determine the feeding value of WCGF when fed at different levels in the diet and determine the effect of adding tallow to WCGF finishing diets.

Procedure

Two hundred and forty steers (762 lb) were limit fed 15 lb (DM) of a 50% corn silage and 50% alfalfa hay diet (DM basis) for five days. Weights were taken on two consecutive days before feeding. Steers were blocked by weight (4 blocks) and randomly allotted within block to one of six treatments (10 steers/pen, 4 pens/treatment) in a 3 x 2 factorial arrangement of treatments. Wet corn gluten feed (Cargill, Eddyville, IA) was fed to replace 0, 50, or 100% of the dry rolled corn (DRC) and a molasses-urea supplement (DM basis). The various levels of WCGF and DRC were fed with or without the addition of 3% tallow (DM basis).

Final finishing diets (Table 1) were formulated (DM basis) to contain a minimum of 13% CP, .70% Ca, .30% P, .65% K, and included 30 g/ton Rumensin and 10 g/ton Tylan. The 100% WCGF diets contained 17% CP. Diets containing WCGF had 53 ppm added thiamine.

(Continued on next page)

Table 1. Composition of final finishing diets fed to steers

	Treatment[a]					
Item[b]	DRC	DRC + tallow	50%DRC: 50% WCGF	50% DRC: 50% WCGF + tallow	100% WCGF[c]	100% WCGF + tallow[c]
Dry rolled corn	82.0	78.9	43.0	41.4	—	—
Wet corn gluten feed	—	—	44.0	42.5	86.6	84.7
Molasses-urea supplement	5.0	5.0	—	—	—	—
Tallow	—	3.0	—	3.0	—	3.0
Corn silage	5.0	5.0	5.0	5.0	5.0	5.0
Alfalfa hay	5.0	5.0	5.0	5.0	5.0	5.0
Dry supplement[d]	3.0	3.1	3.0	3.1	3.4	2.3

[a]DRC = dry rolled corn; WCGF = wet corn gluten feed.
[b]% DM basis.
[c]100% WCGF treatments re-randomized on day 42 and placed on a 50% DRC:50% WCGF or 100% WCGF treatment.
[d]Contained urea, minerals, vitamins, feed additives, and thiamin. Additional copper supplement was added on day 42 to all diets containing WCGF.

Table 2. Effect of wet corn gluten feed and tallow on finishing steer performance

	Treatment[a]					
Item	DRC	DRC + tallow	50% DRC: 50%WCGF	50% DRC: 50% WCGF + tallow	100% WCGF[b]	WCGF-DRC/WCGF[b]
DM intake[c], lb/day	24.57	24.15	23.89	24.01	22.71	23.65
Daily gain[de], lb	3.44	3.60	3.76	3.97	3.50	3.60
Feed/gain[defg]	7.06	6.63	6.29	6.01	6.41	6.53
MP supply[fhij], lb/day	1.96	1.87	1.86	1.81	1.63	1.86
DIP[dfik], lb/day	2.07	2.08	2.22	2.26	3.33	2.20
Fat thickness, in	.38	.37	.36	.40	.36	.38
Quality grade[l]	18.6	18.4	18.4	18.8	18.1	18.1

[a]DRC = dry rolled corn; WCGF = wet corn gluten feed.
[b]100% WCGF treatments re-randomized on day 42 and placed on a DRC/WCGF without tallow or 100% WCGF without tallow treatment.
[c]DRC without tallow vs 100% WCGF (P<.05).
[d]DRC vs 50% DRC:50% WCGF (P<.01).
[e]0 vs 3% tallow (P<.05).
[f]DRC without tallow vs 100% WCGF (P<.01).
[g]Feed/gain analyzed as gain/feed. Feed to gain is the reciprocal of gain/feed.
[h]DRC vs 50% DRC:50% WCGF (P<.10).
[i]WCGF-DRC/WCGF vs 100% WCGF (P<.01).
[j]Metabolizable protein supplied was calculated excluding TDN from tallow. Requirement (Ainslie et al., J. Anim. Sci. 1993) of a 980 lb steer gaining 3.97 lb/day = 1.87 lb/day.
[k]Degradable intake protein. Requirement (TDN × .081) of a 86% TDN diet with a DMI of 24.57 lb/day = 1.71 lb/day.
[l]18.0 = high select, 19.0 = low choice.

All steers were adapted to final diets in 21 days by feeding 45, 35, 25, and 15% roughage diets for 2, 5, 7, and 7 days, respectively. Revalor implants were given on day 1 and the lightest replication received a second implant on day 78. The trial began December 21, 1994 and steers were fed for an average of 121 days.

On days 19, 23, and 40, one steer each day was removed from a 100% WCGF treatment because of polio-like symptoms (blindness, muscle tremors, weakness). In an attempt to identify feeding scenarios that may be solutions to these health problems, steers on both 100% WCGF diets were re-randomized on day 42 and half of the steers were fed 100% WCGF diet without tallow and the remainder were fed the 50% DRC:50% WCGF diet without tallow (WCGF-DRC/WCGF). In addition, steers from the 100% WCGF treatment gaining less than 3 lb/day were injected with 4 ml of thiamine (500 mg/ml thiamine HCL), and all cattle receiving WCGF (50 and 100% levels) were fed a supplement (1% DM basis) containing an additional 5000 ppm of copper as copper oxide to increase the dietary copper level by 50 ppm.

At slaughter, hot carcass weights and liver scores were recorded. After a 48-hour chill, 12th rib fat thickness, quality grade and yield grade were evaluated. Final weights were calculated from hot carcass weight using a constant dressing percentage of 62%.

Because of the re-randomization of cattle on day 42, the 100% WCGF treatment was statistically compared with the WCGF-DRC/WCGF treatment and the DRC without tallow treatment. The remaining four treatments were evaluated as a 2 × 2 factorial treatment arrangement.

Results

Steers fed the 50% DRC:50% WCGF diets gained faster (P<.01) and more efficiently (P<.01) than steers fed DRC diets (Table 2). Daily gains of steers were higher (P<.05) and more efficient (P<.05) when 3% tallow was included in the diets. The 100% WCGF and WCGF-DRC/WCGF treatments produced similar (P>.10) gains and efficiencies. The steers fed the 100% WCGF treatment consumed more feed (P<.05) and were more (P<.05) efficient than the steers fed DRC without tallow. No significant differences (P>.10) in 12th rib fat thickness, liver score, quality grade, or yield grade were observed among treatments.

The 50% DRC:50% WCGF diets supplied more (P<.01) degradable intake protein (DIP) than the DRC diets. The 100% WCGF diet had a greater amount of DIP than the DRC without tallow diet (P<.01) or the WCGF-DRC/WCGF diet (P<.01). However, the calculated DIP requirement was exceeded for all six treatments. Metabolizable protein (MP) supply of steers fed the DRC diets was greater (P<.10) than steers fed the 50% DRC:50% WCGF diets. Steers fed the DRC without tallow diet (P<.01) and WCGF-DRC/WCGF diet (P<.01) received more MP than steers consuming the 100% WCGF diet. All diets except the 100% WCGF diet appeared to have met the calculated MP requirement for these steers. The 100% WCGF diet was calculated to have a deficiency in MP, assuming a 20% escape protein value for the WCGF, but feed/gain was similar to the WCGF-DRC/WCGF treatment and lower than the DRC without tallow treatment. Therefore, we may have underestimated the amount of MP supplied with the WCGF diet or overestimated the requirement of the steers. An underestimation of the MP supplied may be due to an under estimation of the escape protein content in WCGF or a greater efficiency of microbial growth with a highly digestible fiber source.

The improved feed conversion (10.2%) of the 50% DRC:50% WCGF

diets compared with the DRC diets indicates that the energy value of WCGF was 120% of the net energy value in the DRC and the molasses-urea supplement replaced. When the 100% WCGF diet was compared with the DRC without tallow, feed conversion improved 9% and the relative net energy value of WCGF was calculated to be 110% of the DRC and supplement. Addition of tallow to the DRC and 50% DRC:50% WCGF diets increased feed conversion 6 and 4.5%, respectively. Compared with the DRC without tallow diet, the 50% DRC:50% WCGF with tallow diet had a 15% greater feed efficiency and a relative energy value for the WCGF and tallow that was 30% greater than the DRC and the molasses-urea supplement. This energy value approached the value (153%) previously observed with wet distillers byproducts.

The procedures followed for the 100% WCGF treatment on day 42 were to prevent further health problems. We cannot determine the degree of success of the different procedures. Thiamine addition has been previously included in diets containing greater than 40% (DM) WCGF. Thiamine injections have been reported to be beneficial for clinical cases of polio, but have also been used for other health problems. Addition of copper oxide, to supply an additional 50 ppm of copper was used based on literature values with sheep experiencing polio. The copper was fed in an attempt to precipitate high sulfur levels (.8%) that were present in the WCGF (.8%) at day 42. Sulfur levels of the WCGF ranged from .40 to .95%. After dietary changes were made, no further signs of polio occurred, nor were brain lesions observed at slaughter.

Results of this trial indicate that the addition of WCGF (50% of the concentrate DM) or tallow (3% DM) to DRC finishing diets resulted in improved gains and feed efficiencies. The combination of WCGF and tallow improved feed efficiency similar to that previously calculated using wet distillers byproducts.

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