# Evaluation of Wet and Dry Distillers Grains with Solubles for Finishing Holstein Steers

## A.S. Leaflet R1883

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**Summary**

One hundred ninety-two 430 lb Holstein steers were allotted to 32 pens and fed eight diets in a 299-day trial to evaluate the responses of feeding wet or dry distillers grains (DGS) to growing and finishing dairy steers. The dry rolled corn, corn silage and chopped grass hay diets were supplemented with urea, soybean meal, 10, 20 & 40% dry DGS and 10, 20, & 40% wet DGS. During the initial 91 days of the trial, representing a growing period, steers fed soybean meal or dry DGS gained faster than those fed the diet with urea. Feed cost of gain was reduced by feeding dry or wet DGS, but increased by feeding soybean meal. It was concluded that the calves were not gaining enough (3 lbs/d) to obtain a large response to increasing metabolizable protein above that provided by supplementing the basal diet with urea. Calves fed 40% wet DGS consumed less feed and had slower gains. During the entire trial, feeding wet or dry DGS did not affect performance except steers fed 40% wet DGS consumed less feed and had less gain, and steers fed 10% wet DGS consumed less feed with the same gain and improved feed efficiency. Except for the steers fed 40% wet DGS that had lighter carcasses, feeding wet or dry DGS did not affect carcass weight, area of ribeye, thickness of backfat, marbling, quality grades or yield grades. Value of the carcasses was not affected by feeding DGS when the value was based on grade and yield or a grid with premiums and discounts for quality and yield grades. Wet or dry DGS can be fed to dairy beef steers without affecting performance or carcass value. Depending on relative prices of DGS, corn and protein supplement, feeding DGS might reduce feed cost of gain.

**Introduction**

Production of fuel ethanol is a growing industry in the United States and is projected to increase to five billion gallons per year resulting in greater availability of coproducts. The primary coproducts of ethanol production by the dry milling process are distillers grains and distillers solubles. Condensed solubles can be added with distillers grains to produce distillers grains with solubles (DGS). These coproducts are available to the feed industry as wet or dry products. The fiscal viability of the dry milling industry is dependent on the coproducts providing revenue in addition to ethanol. Based on studies with growing and finishing beef cattle and lactating dairy cows, DGS is considered to be an excellent feed for cattle. A large portion of the ethanol production from corn grain in the United States occurs in the upper Midwest, which coincides with a relatively large population of dairy cows and substantial feeding of dairy beef steers. Because many of the dairy beef steers are sold on a grade and yield basis the effects of nutrition and management systems on carcass quality are important considerations. Based on the studies with growing and finishing beef steers and lactating dairy cows, we hypothesized that dry DGS would have value as a source of escape protein for young dairy steers, that wet DGS would have greater energy value than dry DGS for growing and finishing dairy steers and that feeding DGS to dairy steers would not affect carcass value. The objectives of this study were to establish the value of wet and dry distillers grains (DGS) as a feed for finishing long-term fed Holstein steers and the effects of feeding distillers grains on carcass quality of Holstein steers.

**Materials and Methods**

Holstein steer calves weighing about 400 lbs were purchased in August 2002 from a farm in southern Minnesota. The calves had been procured at a few days of age during late March at auctions in Wisconsin. The calves were grown at the farm until the time of purchase for this study. The calves had been preconditioned for health, castrated, dehorned, implanted with Synovex S (June 5) and started on feed with self-feeders prior to purchase. At the experimental farm, the calves were allowed to recover from the transportation, to adjust to the new pens and to being meal fed from bunks rather than self-feeders before being weighed for the experiment. The calves were housed in a building on a concrete slab and open to the south with pens (12 x 40 feet) extending south beyond the building. The portion of the pens under the roof was bedded with extracted residue of rosemary. Concrete bunks located under the roof provided 24 inches of bunk space per animal. The north side of the building was closed during the winter but could be opened to provide additional ventilation during the summer.

In early September the calves were weighed on two consecutive days and allotted at random from weight outcome groups to 32 pens of six steers per pen. The steers were individually identified with numbered ear tags. The two initial weights were averaged for the starting weight (429.6 ± 2.1 lbs.) Four pens were assigned at random to each of eight diets. Because considerable bloat occurred in the calves during the first two weeks of the experiment, the diets were modified to include 3% (on a dry basis) chopped grass hay (Table 1). On days 91, 140 and 224 of the experiment the diets were changed to contain less urea and soybean meal to reduce the concentration of protein in the diets as the steers increased in weight. The diets fed the last

75 days are shown in Table 2. The crude protein in the diets fed initially were approximately 14.4, 16.5,16.5, 16.5 and 16.6 percent in the urea, soybean meal, 10% DGS, 20% DGS and 40% DGS diets respectively. The crude protein in the final diets were approximately 11.5, 11.5, 11.5, 12.5 and 16.6 percent in the urea, soybean meal, 10% DGS, 20% DGS and 40% DGS diets respectively.

The ingredients in the concentrate portion of the diets were mixed together and later mixed with DGS, silage and chopped hay in a mixer wagon equipped with electronic scales and delivered to the steers. The steers were fed total mixed diets twice per day and had ad libitum access to water. The quantity of feed given the cattle was initially limited and gradually increased until they were on full feed.

All calves were implanted with Component ES on days 32, 119 and 224 of the study. Wet and dry DGS were purchased from a commodity broker in Minneapolis, MN and were delivered from a dry mill ethanol plant in southern Minnesota. Each load of wet DGS was sampled two times for determination of dry matter. Two loads of dry DGS were delivered and sampled once a month for determination of dry matter. The silage, chopped hay and mixed portions of the diets were sampled at two-week intervals for determination of dry matter.

In mid July the steers were weighed on two consecutive days and the two weights averaged to provide the final live weight (1334.9 ± 19.9 lbs.). The steers were harvested as one group at Packerland, Green Bay, WI. The cattle were delivered to the packing plant the afternoon prior to harvest early the following morning. Weights of hot carcasses were taken after removal of the kidney knob, and measurements on the carcasses were obtained after 48-hr postmortem chill. The federal grader called marbling score and yield grades. The longissimus muscle and backfat between the $12^{th}$ and $13^{th}$ ribs on the left side of the carcass was photographed with a digital camera. Thickness of backfat and area of ribeyes were measured from the digital images using a calibrated computer program. Yield grades were calculated from the carcass data using the standard yield grade equation assuming 3% KPH for each carcass. The distributions of yield grades shown in Table 7 are yield grades called by the Federal grader. Carcass dressing percentage was calculated from the hot carcass weight without the kidney knob and the final live weight taken at the research farm.

The data for feedlot performance were summarized at 91 days to represent a growing period ranging from 430 to 700 lbs of body weight. The data from 1 to 299 days were summarized to represent a growing and finishing program. The following ingredient costs were used to calculate feed cost per unit of gain: corn grain, $2.25/bu; corn silage, $22/ton; hay, $65/ton; urea, $340/ton; soybean meal, $225/ton; molasses, $100/ton; dry DGS, $85/ton; wet DGS, $28.33/ton and supplemental ingredients ranged from $5 to $60/100 lbs. Two programs were used to establish a value for the carcasses. Program I was based on the price received for the cattle, which was $1.16/lb for Prime and Choice carcasses, $1.06/lb for Select carcasses and a $10/lb discount for yield grade 4 carcasses. Program II was based on a grid with the following prices: $1.16/lb for Choice$^{-}$ YG 3 carcasses with premiums of $6.00/lb for Prime, $3.00/lb for Choice$^{+}$ and Choice$^{0}$, $3.00/lb for YG 1 and $2.00/lb for YG 2 and discounts of $10/lb for Select carcasses and $10/lb for YG 4.

Pen means were used as the experimental unit in the statistical analysis. Data were analyzed by analysis of variance with diets as the treatment. Standard error of the means was calculated and significance difference among means was determined by calculation of least significant differences. The data were also analyzed with linear and quadratic regression analysis.

**Table 1. Composition of diets (Dry matter basis) fed during the first 91 days.**

| Ingredient | Control 1 Urea | Control 2 SBM | DGS[a] 10 | DGS 20 | DGS 40 |
|---|---|---|---|---|---|
| Cracked corn | 82.52 | 66.15 | 72.46 | 63.27 | 44.71 |
| Distillers grains (DGS) | | | 10.00 | 20.00 | 40.00 |
| Corn silage | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Chopped grass hay | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Molasses | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Soybean meal (SBM) | | 18.76 | | | |
| Urea | 2.12 | | 2.21 | 1.46 | |
| Limestone | 0.92 | 0.92 | 0.92 | 0.92 | 1.05 |
| Sodium chloride | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Potassium chloride | 0.20 | | 0.16 | 0.13 | 0.07 |
| Vitamin A premix | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Trace minerals[b] | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 |
| Rumensin premix[c] | 0.0195 | 0.0195 | 0.0195 | 0.0195 | 0.0195 |
| Elemental sulfur[d] | 0.071 | | 0.071 | 0.047 | |

[a]There were diets containing wet and dry DGS for a total of eight diets that were compared in the experiment.
[b]The premix contained 3.85 million IU of vitamin A (as retinyl palmitate) per kg, providing 1,400 IU of vitamin A per pound of dry matter in the diet.
[c]The trace mineral premix contained: (%) Ca 13.2, Co 0.10, $Cu^{++}$ 1.5, $Fe^{++}$ 10.0, $Fe^{+++}$0.44, I 0.20, $Mn^{++}$ 8.0, S 5.0, and Zn 12.0.
[d]The premix contained 176.2 g sodium monensin per kg, providing 15.6 mg of sodium monensin per pound of dry matter in the diet.

**Table 2. Composition of diets (Dry matter basis) fed the last 75 days.**

| Ingredient | Control 1 Urea | Control 2 SBM | DGS[a] 10 | DGS 20 | DGS 40 |
|---|---|---|---|---|---|
| Cracked corn | 83.40 | 81.81 | 74.27 | 64.66 | 44.71 |
| Distillers grains (DGS) | | | 10.00 | 20.00 | 40.00 |
| Corn silage | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Chopped grass hay | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Molasses | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Soybean meal (SBM) | | 2.00 | | | |
| Urea | 1.16 | 0.83 | 0.38 | | |
| Limestone | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Sodium chloride | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Potassium chloride | 0.23 | 0.16 | 0.16 | 0.17 | 0.12 |
| Vitamin A premix[b] | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| Trace minerals[c] | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 |
| Rumensin premix[d] | 0.0195 | 0.0195 | 0.0195 | 0.0195 | 0.0195 |
| Elemental sulfur | 0.037 | 0.027 | 0.012 | | |

[a]There were diets containing wet and dry DGS for a total of eight diets that were compared in the experiment.
[b]The premix contained 3.85 million IU of vitamin A (as retinyl palmitate) per kg, providing 1,400 IU of vitamin A per pound of dry matter in the diet.
[c]The trace mineral premix contained: (%) Ca 13.2, Co 0.10, $Cu^{++}$ 1.5, $Fe^{++}$ 10.0, $Fe^{+++}$0.44, I 0.20, $Mn^{++}$ 8.0, S 5.0, and Zn 12.0.
[d]T premix contained 176.2 g sodium monensin per kg, providing 15.6 mg of sodium monensin per pound of dry matter in the diet.

## Results

The occurrence of bloat slowed the rate at which the calves were brought up on full feed. We think the change from being fed from self-feeders to being meal fed from bunks and the corn silage containing about 2% more moisture than used to formulate the diets were two factors involved in causing the bloat. Carefully keeping the times constant when the calves were fed did not seem to reduce the incidence of bloat, so the decision was made to include 3% chopped hay in the diets. Addition of hay to the diets reduced the occurrence of bloat, and after several weeks of feeding the chopped hay, there was no occurrence of bloat. Three steers were removed from the study due to a chronic lung problem, a death and an injury, none of which seemed to be related to diet. The weights of the animals lost from the study were removed from the analysis and feed intake of the pen corrected for removal of the animal from the study.

Performance of the calves through 91 days is summarized in Table 3. Feeding soybean meal or 40% dry DGS increased feed intake compared with the urea supplemented control diet, whereas feeding wet DGS resulted in a linear decrease in feed consumption. During the initial 91 days, the calves fed soybean meal had greater gains than those fed the control diet supplemented with urea, 10% dry DGS, 20% wet DGS or 40% wet DGS. Adding dry DGS to the diet tended to linearly increase gain. Feeding wet DGS linearly reduced gains, primarily the result of decreased feed intake. The calves fed dry DGS had the same feed conversion as those fed the urea-supplemented diet. Calves fed SBM and 20% or 40% wet DGS had superior feed conversions compared with those fed the urea diet. Feed conversion of calves fed 20% or 40% wet DGS was superior to that of calves fed all levels of dry DGS.

Performance of the steers during the entire experiment is summarized in Table 4. At the end of the experiment (299 days), performance was similar for steers fed urea, soybean meal, all levels of dry DGS and 20% wet DGS. Feeding 10% wet DGS improved feed conversion compared with urea, soybean meal, all levels of dry DGS and 40% wet DGS. Feeding 40% wet DGS reduced feed intake and rate of gain without affecting feed conversion.

The carcass measurements are summarized in Table 5. Dressing percentage was linearly increased by feeding wet or dry DGS and dressing percentages of the steers fed 40% wet or dry DGS were improved compared with steers fed urea or soybean meal. There were no differences in carcass weight, marbling score, area of ribeyes or thickness of backfat among steers fed the eight diets. There were no consistent trends in the distribution of carcass quality grades (Table 6) or yield grades (Table 7) that could be attributed to diet.

Feed cost and carcass value are summarized in Table 8. Feeding soybean meal compared with all other diets increased feed cost per pound of gain during the first 91 days as well as the total experiment. During the initial 91 days feeding 20% wet DGS, 40% wet DGS or 40% dry DGS decreased feed costs compared with the urea-supplemented diet. During the total trial, feeding 10% wet DGS compared with urea or dry DGS decreased feed cost per pound of gain. Diet had no effect on value of the carcasses in program I or II, except carcasses from steers fed 40% wet DGS weighed less and had reduced value compared with carcasses from steers fed urea, soybean meal or 10% wet DGS.

## Discussion

Overall the cattle performed quite well. The gains averaged 3 lbs per day for the initial 91 days as well as for the total 299 days of the trial. Feed dry matter intake averaged 2.25% of body weight for the first 91 days and 2.21% for the 299 days. For the growing and finishing trial, feed costs averaged $29.84 per hundred pounds gain. Quality grades averaged 83% Choice (small$^0$ or more marbling), 46% average Choice or greater (modest$^0$ or more marbling) and 17% Select. Seventy five percent of the carcasses had yield grades 1 and 2.

Two diets without DGS, one supplemented with urea and the other with soybean meal, were included in this experiment to determine if the calves would respond to increased intake of metabolizable protein during the growing period. Based on the results for the first 91 days it seems the calves did respond to supplemental protein above urea (increased gain of steers fed SBM compared with urea). Dry DGS seemed to provide some of the same benefits as supplemental SBM, but not as effectively (increased intake and some increase in gain). Wet DGS did not provide any benefits above urea as a source of protein (no increase in feed intake or improvement in gain). This experiment was not a critical test of the protein value of DGS and soybean meal because rate of gain of the calves was about 3 lbs per day during the growing phase and remained at that rate during the remainder of the experiment. Supplementing the basal diet with urea furnished nearly adequate metabolizable protein for the rate of gain observed. From 91 to 299 days the steers supplemented with urea compensated for the somewhat poorer early gains resulting in no difference in gain compared with steers fed soybean meal or dry DGS. The diets were formulated to replace corn protein and urea with protein from DGS. The results indicate that protein in DGS had no additional value compared with corn and urea for growing and finishing Holstein steers.

The second objective was to establish an energy value for wet and dry DGS compared with corn grain. Previous trials with beef steers indicated that wet DGS had an apparent energy value about 20% to 25% greater than dry rolled corn on a dry basis. The results at 91 and 299 days indicated that dry DGS had energy values similar to corn grain. At 91 days, feeding wet DGS seemed to improve feed conversion compared with the urea supplemented control diet suggesting that wet DGS maybe had somewhat greater energy than the corn replaced. However at 299 days, only the 10% wet DGS diet had improved feed conversion. Calculations indicate that at this level wet DGS had an energy value greater than corn grain on a dry basis. At higher levels wet DGS had relative energy values similar to corn grain. At 40% of diet dry matter, wet DGS depressed feed intake and reduced gain of the Holstein steers. It is not clear why wet DGS had less value in growing and finishing Holstein steers than reported for beef steers.

The third objective was to assess the effects of feeding DGS on economic value of the carcasses in a value-based marketing system. Feeding wet or dry DGS did not change carcass measurements. Steers fed DGS had 1 to 1.5 percentage unit improvements in dressing percentage. Feeding wet or dry DGS did not affect carcass value based on a grade and yield market or on a market providing premiums for high quality and higher yielding carcasses. Based on these results carcasses from Holstein steers should not be discounted because they were fed DGS.

## Implications

The results of this study indicate that wet or dry distillers grains can be fed to growing and finishing Holstein steers at 10% or 20% of the diet dry matter without affecting performance or value of the carcass in a value-based market. The decision to replace corn and supplemental protein in a diet for finishing Holstein steers should be based on cost of distillers grains relative to corn and protein supplement.

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**Table 3. Performance of Holstein steers fed wet or dry distillers grains during the initial 91 days of the study.**

| Diet | Starting Wt, lbs | Wt, 91 days, lbs | Daily gain, lbs | Feed DM, lbs/d | Feed/gain |
|---|---|---|---|---|---|
| Urea | 434 | 709 | 3.02 | 13.3 | 4.40 |
| Soybean meal | 429 | 727 | 3.26 | 13.7 | 4.21 |
| 10% Dry DGS | 428 | 705 | 3.05 | 13.3 | 4.37 |
| 20% Dry DGS | 430 | 715 | 3.13 | 13.6 | 4.35 |
| 40% Dry DGS | 432 | 718 | 3.14 | 13.6 | 4.34 |
| 10% Wet DGS | 430 | 698 | 2.94 | 12.4 | 4.22 |
| 20% Wet DGS | 428 | 698 | 2.96 | 12.0 | 4.05 |
| 40% Wet DGS | 426 | 653 | 2.50 | 10.0 | 4.01 |
| Standard error of mean | 2.1 | 5.6 | 0.089 | 0.113 | 0.064 |

Analysis of variance, compared with urea control:

Adding 10, 20 and 40% wet DGS reduced feed intake ($P < .05$). Adding SBM and 40% dry DGS increased feed intake ($P < .05$).

Adding 40% wet distillers grains reduced daily gain ($P < .05$). Feeding SBM increased daily gain ($P < .05$) compared with urea, 10% dry DGS, 20% wet DGS and 40% wet DGS.

Feeding SBM or 20 or 40% wet DGS improved feed efficiency ($P < .05$). Feed efficiency of steers fed 20 or 40% wet DGS was superior to those fed all levels of dry DGS ($P < .05$).

Regression analysis using the urea control diet as zero DGS intake:

Feeding dry DGS increased feed intake ($P < .02$), tended to increase rate of gain ($P < .1$) and did not change feed efficiency.

Feeding wet DGS decreased feed intake ($P < .001$), decreased rate of gain ($P < .001$) and improved feed efficiency ($P < .001$).

**Table 4. Feedlot performance of Holstein steers fed wet or dry distillers grains during a 299 d feeding trial.**

| Diet | Starting Wt, lbs | Ending Wt, lbs | Daily gain, lbs | Feed DM, lbs/d | Feed/gain |
|---|---|---|---|---|---|
| Urea | 434 | 1375 | 3.15 | 19.4 | 6.18 |
| Soybean meal | 429 | 1370 | 3.14 | 19.4 | 6.17 |
| 10% Dry DGS | 428 | 1330 | 3.02 | 18.8 | 6.25 |
| 20% Dry DGS | 430 | 1317 | 2.97 | 18.8 | 6.35 |
| 40% Dry DGS | 432 | 1321 | 2.97 | 18.8 | 6.33 |
| 10% Wet DGS | 430 | 1367 | 3.13 | 18.5 | 5.90 |
| 20% Wet DGS | 428 | 1342 | 3.06 | 18.7 | 6.14 |
| 40% Wet DGS | 426 | 1258 | 2.78 | 17.2 | 6.19 |
| Standard error of mean | 2.1 | 19.9 | 0.066 | 0.33 | 0.079 |

Analysis of variance:

Feeding 40% wet DGS reduced feed intake compared with all other diets ($P < .05$).

Feeding 40% wet DGS decreased gain ($P < .05$) compared with urea, 10% dry DGS, 10% wet DGS, 20% wet DGS and SBM.

Feeding 10% wet DGS improved feed efficiency compared with urea, SBM, 10% dry DGS, 20% dry DGS, 40% dry DGS and 40% wet DGS.

Regression analysis using the urea control diet as zero DGS intake:

Feeding wet DGS decreased feed intake ($P < .001$) and gain ($P < .002$) with no effect on feed efficiency.

**Table 5. Measurements of carcasses from Holstein steers fed wet or dry distillers grains during a 299 d feeding trial.**

| Diet | Carcass Wt, lbs | Dressing percent | Marbling score[a] | Ribeye area, sq in | Backfat thickness, in |
|---|---|---|---|---|---|
| Urea | 798.2 | 58.1 | 565 | 12.25 | 0.25 |
| Soybean meal | 805.9 | 58.8 | 637 | 12.00 | 0.30 |
| 10% Dry DGS | 789.7 | 59.3 | 578 | 12.21 | 0.25 |
| 20% Dry DGS | 786.0 | 59.6 | 593 | 12.47 | 0.27 |
| 40% Dry DGS | 792.3 | 60.0 | 601 | 11.89 | 0.28 |
| 10% Wet DGS | 812.6 | 59.4 | 639 | 12.12 | 0.29 |
| 20% Wet DGS | 798.5 | 59.5 | 626 | 12.20 | 0.27 |
| 40% Wet DGS | 751.2 | 59.8 | 602 | 11.82 | 0.24 |
| Standard error of mean | 13.57 | 0.31 | 24.2 | 0.26 | 0.024 |

[a]Marbling score: Slight$^0$ = 400, Small$^0$ = 500, Modest$^0$ = 600.

Analysis of variance:

Steers fed 10%, 20% or 40% dry DGS or 10%, 20% or 40% wet DGS had higher dressing percentage compared with those fed urea ($P < .05$).

Steers fed 40% dry DGS or 40% wet DGS had higher dressing percentage compared with those fed soybean meal ($P < .05$).

Regression analysis using the urea control diet as zero DGS intake:

Dressing percentage improved for steers fed dry or wet DGS ($P < .01$). There was a significant quadratic response of carcass weight to feeding wet DGS ($P < .05$).

**Table 6. Quality grades of carcasses from Holstein steers fed wet or dry distillers grains during a 299 d feeding trial.**

| Diet | Choice$^-$ and greater, % | Prime No | Choice$^+$ No | Choice No | Choice$^-$ No | Select No |
|---|---|---|---|---|---|---|
| Urea | 83.3 | | 2 | 5 | 13 | 4 |
| Soybean meal | 91.3 | | 7 | 9 | 5 | 2 |
| 10% Dry DGS | 75.0 | | 3 | 8 | 7 | 6 |
| 20% Dry DGS | 83.3 | 1 | 4 | 4 | 11 | 4 |
| 40% Dry DGS | 73.9 | 1 | 5 | 3 | 8 | 6 |
| 10% Wet DGS | 91.3 | 2 | 6 | 4 | 9 | 2 |
| 20% Wet DGS | 83.3 | 3 | 7 | 4 | 6 | 4 |
| 40% Wet DGS | 83.3 | 2 | 2 | 5 | 11 | 4 |

**Table 7. Yield grades of carcasses from Holstein steers fed wet or dry distillers grains during a 299 d feeding trial.**

| Diet | Average call YG | Average calc YG | YG 1 No | YG 2 No | YG 3 No | YG 4 No |
|---|---|---|---|---|---|---|
| Urea | 2.00 | 2.87 | 3 | 18 | 3 | |
| Soybean meal | 2.25 | 3.09 | 2 | 13 | 8 | |
| 10% Dry DGS | 1.79 | 2.83 | 8 | 13 | 3 | |
| 20% Dry DGS | 2.17 | 2.76 | 2 | 16 | 6 | |
| 40% Dry DGS | 2.12 | 3.01 | 4 | 13 | 6 | |
| 10% Wet DGS | 2.45 | 3.04 | 1 | 12 | 9 | 1 |
| 20% Wet DGS | 2.21 | 2.89 | 4 | 11 | 9 | |
| 40% Wet DGS | 1.96 | 2.78 | 4 | 17 | 3 | |
| Standard error of mean | 0.16 | 0.11 | | | | |

**Table 8. Feed cost of gain and carcass value of Holstein steers fed wet or dry distillers grains during a 299 d feeding trial.**

| Diet | 1 to 91 d $/lb gain[a] | 1 to 299 d $/lb gain[a] | Program I $/carcass[b] | Program II $/carcass[b] |
|---|---|---|---|---|
| Urea | 0.214 | 0.297 | 912.74 | 932.47 |
| Soybean meal | 0.255 | 0.335 | 924.61 | 950.53 |
| 10% Dry DGS | 0.214 | 0.299 | 897.53 | 923.10 |
| 20% Dry DGS | 0.209 | 0.300 | 901.17 | 916.79 |
| 40% Dry DGS | 0.201 | 0.295 | 898.47 | 919.03 |
| 10% Wet DGS | 0.206 | 0.283 | 935.51 | 952.76 |
| 20% Wet DGS | 0.195 | 0.290 | 914.28 | 940.66 |
| 40% Wet DGS | 0.186 | 0.288 | 858.82 | 880.92 |
| Standard error of mean | 0.003 | 0.004 | 18.86 | 19.99 |

[a]Ingredient costs used to calculate feed cost per unit of gain: corn grain, $2.25/bu; corn silage, $22/ton; hay, $65/ton; urea, $340/ton; soybean meal, $225/ton; molasses, $100/ton; dry DGS, $85/ton; wet DGS, $28.33/ton and supplemental ingredients ranged from $5 to $60/100 lbs.

[b]Two programs were used to establish a value for the carcasses. Program I was based on the price paid for the cattle, which was $1.16/lb for Prime and Choice carcasses, $1.06/lb for Select carcasses and a $10/lb discount for yield grade 4 carcasses. Program II was based on $1.16 for Choice$^-$ YG 3 carcasses with premiums of $6.00/lb for Prime, $3.00/lb for Choice$^+$ and Choice$^0$, $3.00/lb for YG 1 and $2.00/lb for YG 2 and discounts of $10/lb for Select carcasses and $10/lb for YG 4.

Analysis of variance:

Feed cost during the initial 91 days were increased by feeding soybean meal (P < .05) and decreased (P < .05) by feeding 20% or 40% wet DGS or 40% dry DGS compared with the urea diet.

During the total feeding period feed costs were increased by feeding soybean meal (P < .05) and reduced by feeding 10% wet DGS (P < .05) compared with the urea diet.

In marketing programs I and II, carcasses from steers fed 40% wet DGS had lower value than steers fed urea (P < .1) and lower value than steers fed 10% wet DGS or soybean meal (P < .05).

Regression analysis using the urea control diet as zero DGS intake:

Feeding dry DGS during the initial period linearly reduced feed costs (P < .001) with a significant (P < .05) quadratic response.

Feeding wet DGS during the initial period reduced feed costs (P < .001) in a significant linear and quadratic response.

Feeding higher levels of wet DGS tended to reduce carcass value in programs I and II in a linear (P < .05) and quadratic manner (P < .1).