# Evaluation of FluidQuip Fiber Stream Dried Distillers Grains plus Solubles on Performance and Carcass Characteristics in Finishing Diets

Aksel R. Wiseman
Bradley M. Boyd
Levi J. McPhillips
Galen E. Erickson
Andrea K. Watson
Scott L. Tilton

## Summary with Implications

*A finishing study was conducted to evaluate the effect of feeding dried distillers grains plus solubles (DDGS) from the MSC-fiber stream of the FluidQuip post-fermentation fiber separation process compared to conventional DDGS at two inclusion levels (20% and 40% of diet dry matter). Inclusion of DDGS from MSC or conventional processing methods resulted in increased dry matter intake and daily gain. Despite increased gain, feed conversion tended to be worse for MSC DDGS. Daily gain tended to respond quadratically with increasing inclusion of conventional DDGS with gain increasing from 0 to 20% inclusion, but decreasing from 20 to 40%. Inclusion of conventional DDGS resulted in a quadratic response for feed conversion with improved conversion from 0 to 20% inclusion and poorer conversion from 20 to 40%. Feeding MSC DGS resulted in increased gain but worse feed conversion compared to conventional DDGS when included at both 20% and 40% inclusion.*

**Table 1. Composition of dry-rolled and high-moisture corn finishing diets with FluidQuip fiber fraction dried distillers grains (MSC DDGS) or conventional dried distillers grains (CONV DDGS) at 20 or 40% diet DM inclusion**

| | Treatment[1] | | | | |
|---|---|---|---|---|---|
| | CON | 20MSC DDGS | 40MSC DDGS | 20CONV DDGS | 40CONV DDGS |
| *Ingredients* | | | | | |
| High Moisture Corn | 52.5 | 40.5 | 28.5 | 40.5 | 28.5 |
| Dry Rolled Corn | 35.0 | 27.0 | 19.0 | 27.0 | 19.0 |
| Alfalfa Hay | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 |
| CONV DDGS | - | - | - | 20.0 | 40.0 |
| MSC DDGS | - | 20.0 | 40.0 | - | - |
| *Supplement* | | | | | |
| Fine Ground Corn | 1.78 | 2.81 | 2.81 | 2.81 | 2.81 |
| Limestone | 1.3 | 1.68 | 1.68 | 1.68 | 1.68 |
| Tallow | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 |
| Urea | 1.4 | - | - | - | - |
| Salt | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Beef Tr. Min. | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Vit. ADE | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 |
| Rumensin-90 | 0.017 | 0.017 | 0.017 | 0.017 | 0.017 |
| Tylan-40 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 |
| *Nutrient Composition* | | | | | |
| DM | 75.3 | 77.9 | 80.6 | 77.9 | 80.6 |
| CP | 12.9 | 14.2 | 19.4 | 14.1 | 19.2 |

[1] CON: Corn-based control diet with 60:40 blend of high-moisture and dry-rolled corn; 20MSC DDGS: fiber fractionated dried distillers grains fed at 20% diet DM; 40MSC DDGS: fiber fractionated dried distillers grains fed at 40% diet DM; 20CONV DDGS; Conventional dried distillers grains fed at 20% diet DM; 40CONV DDGS: Conventional dried distillers grains fed at 40% diet DM

## Introduction

Technological changes in the ethanol production process have allowed for post-fermentation fiber separation techniques (Flint Hills Resources, Wichita, KS). Separation of fiber after fermentation allows for increased oil yield and ethanol plant efficiency providing incentive for adoption of these technologies. While the FluidQuip fractioning process allows for increased ethanol production, it creates byproducts that are different in composition from distillers grains previously produced. The removed fiber fraction, termed MSC dried distillers grains (MSC DDGS), can be used similarly to conventional dried distillers grains. Byproducts from different fiber separation technologies have been investigated in finishing diets, but the effects of MSC DDGS have not been evaluated. Thus, the objective was to determine the feeding value of MSC DDGS and compare that to conventionally produced dried distillers grains (CONV DDGS) in beef cattle finishing diets.

## Procedure

A 112-day finishing study was performed at the University of Nebraska feedlot near Mead, NE utilizing 240 crossbred yearling steers (initial BW = 1020 ± 76 lb) to evaluate the effect of feeding MSC dried distillers grains in comparison to conventionally produced dried distillers grains. Steers were long yearlings that were backgrounded through winter and grazed summer pasture prior to study initiation. Steers were limit fed a common diet 5 days

**Table 2. Performance and carcass characteristics of yearling steers fed a corn-based control (CON), FluidQuip fiber fraction dried distillers grains, or conventional dried distillers grains at 20 or 40% DM inclusion in finishing diets**

| | Treatment | | | | | | | *P*-values | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | MSC DDGS | | CONV DDGS | |
| | CON | 20MSC DDGS | 40MSC DDGS | 20CONV DDGS | 40CONV DDGS | SEM | F-test | Lin. | Quad | Lin. | Quad |
| *Performance* | | | | | | | | | | | |
| Initial BW, lb | 1022 | 1019 | 1019 | 1019 | 1019 | 2.2 | 0.52 | 0.14 | 0.63 | 0.15 | 0.44 |
| Final BW, lb | 1465 | 1479 | 1502 | 1497 | 1479 | 17.3 | 0.23 | 0.04 | 0.79 | 0.44 | 0.10 |
| DMI, lb/d | 30.5[c] | 31.9[b] | 35.0[a] | 31.9[b] | 33.0[b] | 0.57 | <0.01 | <0.01 | 0.11 | <0.01 | 0.69 |
| ADG, lb | 3.95 | 4.10 | 4.31 | 4.27 | 4.10 | 0.151 | 0.16 | 0.03 | 0.83 | 0.33 | 0.08 |
| F:G | 7.70[ab] | 7.78[ab] | 8.11[b] | 7.47[a] | 8.03[b] | - | 0.06 | 0.09 | 0.57 | 0.16 | 0.04 |
| Feeding Value | - | 95 | 87 | 115 | 89 | | | | | | |
| $NE_m$, Mcal/lb | 0.76[a] | 0.75[ab] | 0.72[c] | 0.77[a] | 0.73[bc] | 0.014 | 0.01 | 0.03 | 0.38 | 0.02 | 0.08 |
| $NE_g$, Mcal/lb | 0.48[a] | 0.47[ab] | 0.45[c] | 0.49[a] | 0.46[bc] | 0.012 | <0.01 | 0.03 | 0.38 | 0.01 | 0.06 |
| *Carcass characteristics* | | | | | | | | | | | |
| HCW, lb | 923 | 932 | 946 | 943 | 932 | 10.9 | 0.23 | 0.04 | 0.79 | 0.44 | 0.10 |
| Marbling [1] | 528 | 547 | 556 | 559 | 536 | 21.9 | 0.59 | 0.22 | 0.79 | 0.70 | 0.17 |
| Fat depth, in | 0.53 | 0.56 | 0.60 | 0.58 | 0.60 | 0.037 | 0.29 | 0.06 | 0.94 | 0.07 | 0.63 |
| REA, $in^2$ | 13.7 | 13.6 | 13.7 | 13.5 | 13.3 | 0.27 | 0.60 | 0.88 | 0.80 | 0.17 | 0.85 |
| Calc YG [2] | 3.44 | 3.58 | 3.72 | 3.72 | 3.77 | 0.155 | 0.23 | 0.08 | 0.98 | 0.04 | 0.40 |

[abc] Values within a row with unique superscripts are different ($P \leq 0.05$)

[1]300 = Slight, 400 = Small, 500 = Modest

[2]Calculated as 2.5 + (2.5 × 12th rib fat, in) + (0.2 × 2.5(KPH, %))—(0.32 × REA, $in^2$) + (0.0038 × HCW, lb)

prior to initiation of the trial to equalize gut fill. Steers were weighed three consecutive days (d-1, d 0, and d 1) to establish average initial BW. Steers were blocked by initial BW into one of three blocks, with two reps per block, stratified within block and assigned randomly to pens. Pens were assigned randomly to one of five treatments with 8 steers/pen and 6 pens/treatment. Treatments were arranged in a 2 × 2 + 1 factorial with distillers processing method (Conventional or FluidQuip) and inclusion (20% or 40% diet dry matter [DM]) being the factors, plus a corn-based control (CON; Table 1). The composition of MSC DDGS in this study was 91.0% DM, 34.5% CP, 33.7% NDF, and 7.8% Fat, while the conventional DDGS was 92.0% DM, 34.0% CP, 38.2% NDF, and 9.9% Fat. Byproducts replaced a 60:40 blend of high-moisture and dry-rolled corn. All diets contained 7.5% alfalfa hay and 5% supplement. Supplements were formulated to provide 30 g/ton Rumensin® (Elanco Animal Health) and 8.8 g/ton Tylan® (Elanco Animal Health).

Steers were implanted with Revalor-200 (Merck Animal Health) on day 1, fed for 112 d, and harvested at a commercial packing plant (Greater Omaha) where HCW and liver scores were collected on the day of slaughter. Ribeye area, marbling score, and 12th rib fat thickness were recorded after a 48 h chill. Final body weight, average daily gain (ADG), and feed conversion (F:G) were adjusted based on HCW using a 63% dress.

Data were analyzed using the GLIMMIX procedure of SAS (SAS Inst. Inc., Cary, NC) as a randomized block design. Pen was the experimental unit with block analyzed as a fixed effect. Orthogonal contrasts were used to analyze linear and quadratic effects of inclusion of each byproduct. Treatment means were compared when the F-test statistic for treatment was significant, with $P \leq 0.05$ considered significant and $P \leq 0.10$ considered as tendencies. Feeding values were calculated based on feed efficiency (F:G) using the following equation: $\{(((F{:}G_{TRT}-F_{CON})/F{:}G_{CON})/\text{byproduct inclusion, \%}) +1\} * 100$. Feed conversion of treatment is denoted as $F{:}G_{TRT}$, and $F{:}G_{CON}$ represents the feed conversion of the control treatment. Net energy for maintenance ($NE_m$) and net energy for gain ($NE_g$) values of the diets were calculated using actual intakes and performance.

## Results

Dry matter intake increased linearly ($P < 0.01$) with greater inclusion of DDGS from either processing method. Steers fed 40% MSC DDGS had the greatest DMI ($P < 0.01$), with all other byproducts being greater ($P < 0.01$) than the corn-based control. Inclusion of MSC DDGS resulted in a linear ($P = 0.03$) increase in ADG. A quadratic ($P = 0.08$) response was observed in ADG for steers fed CONV DDGS. As dietary inclusion of CONV DDGS increased from 0 to 20%, ADG increased from 3.95 to 4.27 lb/day, and as dietary inclusion increased from 20 to 40% ADG decreased from 4.27 to 4.10 lb/day. Feed:gain had a tendency to increase linearly ($P \leq 0.09$) with increasing inclusion of MSC DDGS, while a quadratic ($P \leq 0.04$) response was observed with increasing inclusion of CONV DDGS. Feed conversion decreased with increasing inclusion of CONV DDGS from 0 to 20% and increased with increasing inclusion from 20 to 40%. Feed conversion was lowest ($P = 0.02$) for CONV DDGS included at 20% (similar to CON and 20 MSC) with no significant differences between all other treatments ($P > 0.17$).

Carcass weight linearly ($P = 0.04$) increased with inclusion of MSC DDGS, and tended ($P = 0.10$) to respond quadratically with inclusion of CONV DDGS. Backfat tended to increase linearly ($P \leq 0.07$) with increasing inclusion of either byproduct. Calculated YG tended to increase linearly ($P = 0.08$) with inclusion of MSC DDGS and increased linearly ($P = 0.04$) for CONV DDGS. Marbling and ribeye area were not affected by dietary treatment ($P \geq 0.17$).

Feeding MSC DDGS and CONV DDGS resulted in differing effects based on their dietary inclusion. Based on feed conversion, MSC DDGS has a feeding value of 95% and 87% of corn when fed at 20% and 40% of the diet (DM), respectively. Feeding value of CONV DDGS was 115% and 89% of corn when fed at 20% and 40% of the diet (DM), respectively. There was a linear ($P \leq 0.03$) decrease in dietary $NE_m$ and $NE_g$ as MSC DDGS inclusion increased. Increasing inclusion of CONV DDGS also resulted in a linear ($P \leq 0.02$) decrease in dietary $NE_m$ and $NE_g$. Control and 20% CONV DDGS diets had the greatest dietary $NE_m$ and $NE_g$ while 40% MSC DDGS had the least and 20% MSC DDGS and 40% CONV DDGS were intermediate.

## Conclusion

Feeding MSC DDGS improved ADG, but was lower in feeding value when compared to a corn-based control diet. Inclusion of CONV DDGS at 20% improved ADG and F:G, while 40% improved ADG and provided worse F:G compared to the corn-based control. Both MSC DDGS and CONV DDGS tended to increase carcass weight, fat depth, and calculated YG over the corn-fed cattle. Use of MSC DDGS in finishing diets resulted in decreased feeding value when compared to CONV DDGS at 20% of diet (DM) (95% versus 115%), but was similar at 40% of diet (DM) (87% versus 89%).

Aksel R. Wiseman, graduate student

Bradley M. Boyd, research technician

Levi J. McPhillips, research technician

Galen E. Erickson, professor, University of Nebraska–Lincoln Department of Animal Science, Lincoln, NE

Andrea K. Watson, research assistant professor, University of Nebraska-Lincoln Department of Animal Science, Lincoln, NE

Scott L. Tilton, Flint Hills Resources, Wichita, KS