2016

Impact of a Newly Developed Direct- Fed Microbial on Performance in Finishing Beef Steers

Laura F. Prados  
*University of Nebraska-Lincoln*

Nirosh D. Aluthge  
*University of Nebraska-Lincoln*

Robert G. Bondurant Bondurant  
*University of Nebraska-Lincoln, robby.bondurant@unl.edu*

Samodha C. Fernando  
*University of Nebraska-Lincoln, samodha@unl.edu*

Galen E. Erickson  
*University of Nebraska-Lincoln, gerickson4@unl.edu*

Follow this and additional works at: [http://digitalcommons.unl.edu/animalscinbcr](http://digitalcommons.unl.edu/animalscinbcr)

Part of the [Meat Science Commons](http://digitalcommons.unl.edu/animalscinbcr)

Prados, Laura F.; Aluthge, Nirosh D.; Bondurant, Robert G. Bondurant; Fernando, Samodha C.; and Erickson, Galen E., "Impact of a Newly Developed Direct- Fed Microbial on Performance in Finishing Beef Steers" (2016). *Nebraska Beef Cattle Reports*. 904.  
[http://digitalcommons.unl.edu/animalscinbcr/904](http://digitalcommons.unl.edu/animalscinbcr/904)

This Article is brought to you for free and open access by the Animal Science Department at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Beef Cattle Reports by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.
Impact of a Newly Developed Direct-Fed Microbial on Performance in Finishing Beef Steers

Laura F. Prados, Nirosh D. Aluthge, Robby G. Bondurant, Samodha C. Fernando, and Galen E. Erickson

Summary

An individual feeding experiment (n = 60) was conducted to evaluate the effects of feeding a direct-fed microbial (DFM) or not on performance of finishing steers fed 0 or 40% modified distillers grains (MDGS) in a 2 × 2 factorial design. Gain and F:G were improved when cattle were fed MDGS compared to the corn diet. No significant differences (P ≥ 0.23) were observed between cattle fed DFM or not for DMI and ADG. However, numeric advantages were observed for F:G when cattle were fed a DFM, with a 5% improvement in feed efficiency for steers supplemented with DFM.

Introduction

Direct-fed microbial (DFM) have been defined as single or mixed cultures of live organisms, which, when fed to animals, beneficially affect the host. Available DFM have been used to increase animal productivity and to improve health. For beef cattle, some DFM have shown improved feed efficiency and ADG; however, these responses have been variable. Some researchers suggest that feeding DFM to feedlot cattle results in a 2.5 to 5% increase in ADG and approximately 2% improvement in feed efficiency. Several dietary and management factors may have an influence on the effect of DFM’s. Gain and efficiency responses to DFM have been variable, with this variation typically being attributed to differences in culture and/or dosage of DFM. A new DFM was isolated from cattle feces that may impact food safety or shedding of *E. coli* O157:H7.

Thus, the objective of this study was to determine the effect of this newly developed DFM in beef steers fed with either a dry-rolled corn-based or MDGS-based diet.

Procedure

Sixty yearling steers (initial BW = 848 lb, SD = 76 lb) were utilized in a completely randomized design experiment at the University of Nebraska–Lincoln at the Agricultural Research and Development Center (ARDC). A 2 × 2 factorial design consisting of two diets (factor 1; Table 1) with or without direct-fed microbial (DFM; factor 2) was used in this study. Yearling steers were previously trained to the Calan gates. Steers were limit-fed a common diet of 50% alfalfa hay and 50% Sweet Bran® (Cargill, Blair, Neb) at 2% of BW for 5 days prior to the start of the trial to minimize gut fill variation and then weighed on three consecutive days (d-1, 0, and 1) and the average was used to establish initial BW. On d 1, steers were implanted with Ralgro® (Merck Animal Health) and reimplanted with Revalor-S (Merck Animal Health).

Steers were housed in open front barns with 30 steers in a common pen (i.e., barn). Steers within each pen received their respective basal diet consisting of dry-rolled corn (CON) or 40% MDGS (40MDGS) treatments (Table 1). Each barn was given either no DFM or was dosed daily with DFM grown in lab. The DFM treatment was dosed based on barn to avoid any possible contamination of bunks within a barn or contamination of the housing environment with the DFM and subsequently inoculate steers not getting DFM. Steers were adapted to finishing diets using limit feeding by starting cattle on finishing diets provided at 2% of BW and increased by 0.5 lb/d (DM basis) until reaching *ad libitum* intake of finishing diets (approximately 20 days).

The DFM bacteria were isolated from cattle fecal matter which were identified on a previous study as low-shedders beef steers (2014 Nebraska Beef Report, pp.101–102) in August 2011. The bacteria were of the genera *Bacteroides* and *Anaerovibrio*. Each bacterium was grown separately in broth media (5 days at 42°C in anaerobic media). At the end of the growth period, the optical densities (OD) of the broth cultures were measured and the cells were harvested by centrifugation (3000 g). The DFM bacteria were identified as low-temperature bacteria and these bacteria were dosed based on barn to avoid any possible contamination of bunks within a barn or contamination of the housing environment with the DFM and subsequently inoculate steers not getting DFM. Steers were adapted to finishing diets using limit feeding by starting cattle on finishing diets provided at 2% of BW and increased by 0.5 lb/d (DM basis) until reaching *ad libitum* intake of finishing diets (approximately 20 days).

Table 1. Diet composition fed to finishing steers to evaluate feeding DFM in diets based on corn only or with 40% modified distillers grains (DM basis)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Corn</th>
<th>MDGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry-rolled corn</td>
<td>87</td>
<td>47</td>
</tr>
<tr>
<td>Modified distillers grains plus solubles</td>
<td>—</td>
<td>40</td>
</tr>
<tr>
<td>Sorghum silage</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Supplement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine ground corn</td>
<td>1.670</td>
<td>2.885</td>
</tr>
<tr>
<td>Limestone</td>
<td>1.315</td>
<td>1.600</td>
</tr>
<tr>
<td>Urea</td>
<td>1.500</td>
<td>—</td>
</tr>
<tr>
<td>Salt</td>
<td>0.300</td>
<td>0.300</td>
</tr>
<tr>
<td>Tallow</td>
<td>0.125</td>
<td>0.125</td>
</tr>
<tr>
<td>Beef trace minerals</td>
<td>0.050</td>
<td>0.050</td>
</tr>
<tr>
<td>Rumensin-90</td>
<td>0.016</td>
<td>0.016</td>
</tr>
<tr>
<td>Vitamins A-D-E</td>
<td>0.015</td>
<td>0.015</td>
</tr>
<tr>
<td>Tylan-40</td>
<td>0.009</td>
<td>0.009</td>
</tr>
</tbody>
</table>

*MDGS = modified distillers grains plus solubles. Cattle with DFM were fed with 1 × 10⁹ cells of each culture per day.

*Supplement formulated to be fed at 5% of dietary DM.

*Formulated to supply: Rumensin-90 = 375 mg/steer daily; Tylan-40 = 90 mg/steer daily.*
rpm, 15 min at 4°C). Subsequently, the cells were diluted with sterile 20% glycerol/an-
aerobe basal broth so that each culture had a
cell density of 1 × 10⁶ cells/ml (based on the
OD reading of each bottle). After the
dilution, the same volume of each culture
was mixed in a sterile polypropylene tube
and ‘snap-frozen’ in liquid nitrogen (thus, each
tube contained 1 × 10⁶ cells/ml of
each bacterium). Frozen DFM tubes were
stored at −80°C until transport in liquid
nitrogen to ARDC, where they were kept in
the freezer at −4°C. Samples were stored in
dailly aliquots (30 tubes) and transferred to
the refrigerator and allowed to thaw for 24
hours prior to each feeding.

Feeds were sub-sampled and analyzed for
DM content weekly. Feed refusals were
weighed back, sub-sampled, and analyzed for
DM content to determine DMI of each
steer. Steers were fed once daily and DFM was
top-dressed by emptying tubes into
each individual bunk.

After 132 d, cattle were weighed and
transported to a commercial abattoir
(Greater Omaha Pack, Omaha, Nebraska),
where HCW, and after 48 hours, LM area,
marbling score, and 12th rib fat thickness
were recorded. Yield grade was calculated
from following formula: 2.5 + (2.5 × 12th
rib fat) − (0.32 × LM area) + (0.2 × 2.5
[assumed KPH]) + (0.0038 × HCW).
With the use of a common dressing percent-
age (62%), final BW, ADG, and F:G were
calculated.

Intake, performance, and carcass char-
acteristics were analyzed as a 2 × 2 factorial
using the MIXED procedure of SAS (SAS
Institute, Inc., Cary, N.C.) using
P = 0.05 as the significance level for type I error. Steer
was the experimental unit. Main effects of
diets and DFM were tested, as well as the
interaction between these factors.

Results

There were no significant interactions
(P ≥ 0.23) between the diets and DFM for
DMI, ADG, fat, and USDA yield grade
in this study (Table 2). However, LM area
(P = 0.09) and marbling score (P = 0.13)
tended to have an interaction between diet
and DFM supplementation. Main effects of
basal diet and DFM are presented (Table 2)
and discussed.

For the main effect of basal diet, DMI
was not affected (P = 0.92; Table 2) by
whether steers were fed 40MDGS or CON.
In contrast, some variables (ADG, F:G,
fat, and USDA yield grade) were affect-
ed by basal diet, which were generally
improved when cattle were fed with 40% MDGS compared to corn. Gain was 11.4%
greater (P < 0.01) for steers fed 40MDGS
compared to CON. Feed efficiency was
improved by 10% for cattle fed 40MDGS,
which agrees with previous trials. Steers
fed 40MDGS had greater (P ≤ 0.04) fat and
USDA yield grade compared to steers fed
the corn control diet. Research has shown
that the MDGS has a greater feeding value
when compared to corn, and improves
ADG and F:G, which supports results from
this study.

For the main effect of supplementing
the DFM, no significant differences (P ≥ 0.23)
were observed for performance. However,
numeric advantages were ob-
served for DMI and F:G when cattle were
fed with DFM supplementation. Steers
supplemented with DFM had 4% numeri-

cally lower DMI (P = 0.23) compared
for non-supplemented steers, but similar
ADG (P = 0.80). While not significant
statistically (P = 0.29), there was a 5%
numerical improvement in F:G with steers
supplemented with DFM having lower F:G
compared to steers not receiving the DFM.

Table 2. Main effects of diet or feeding a new direct-fed microbial on performance and carcass
characteristics.
<table>
<thead>
<tr>
<th>Item*</th>
<th>Diets</th>
<th>DFM</th>
<th>SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Corn</td>
<td>MDGS</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>852</td>
<td>844</td>
<td>846</td>
<td>850</td>
</tr>
<tr>
<td>Initial BW, lb</td>
<td>1282</td>
<td>1323</td>
<td>1303</td>
<td>1303</td>
</tr>
<tr>
<td>Final BWb</td>
<td>22.5</td>
<td>22.4</td>
<td>22.0</td>
<td>22.9</td>
</tr>
<tr>
<td>DMI, lb/d</td>
<td>3.26</td>
<td>3.63</td>
<td>3.46</td>
<td>3.42</td>
</tr>
<tr>
<td>ADGc</td>
<td>7.00</td>
<td>6.30</td>
<td>6.49</td>
<td>6.82</td>
</tr>
<tr>
<td>F:Gd</td>
<td>8.4</td>
<td>0.14</td>
<td>0.98</td>
<td>0.75</td>
</tr>
<tr>
<td>HCW, lb</td>
<td>795</td>
<td>820</td>
<td>808</td>
<td>808</td>
</tr>
<tr>
<td>LM area, in²</td>
<td>12.9</td>
<td>13.0</td>
<td>13.1</td>
<td>12.9</td>
</tr>
<tr>
<td>Marbling²</td>
<td>447</td>
<td>448</td>
<td>433</td>
<td>462</td>
</tr>
<tr>
<td>12th rib fat, in</td>
<td>0.51</td>
<td>0.60</td>
<td>0.54</td>
<td>0.56</td>
</tr>
<tr>
<td>USDA Yield grade</td>
<td>3.29</td>
<td>3.59</td>
<td>3.38</td>
<td>3.50</td>
</tr>
</tbody>
</table>

*Diets = main effects of diets (corn or modified distillers grains with solubles) in steers. DFM = main effects of direct-fed microbial supplementation in steers. Diets * DFM = interaction between diets and direct-fed microbial supplementation.

²Calculated from carcass weight, adjusted to 62% common dressing percentage.

³Analyzed as G:F, reported as F:G.

²Marbling score: 400 = Small°; 500 = modest°; etc.

df = degrees of freedom.