2012

Effect on Performance and Nutrient Mass Balance of Feeding Micro-Aid in Wet Distillers Grains Plus Solubles Diets

Annie J. Doerr
University of Nebraska-Lincoln, adoerr@live.com

Brandon L. Nuttelman
University of Nebraska-Lincoln

William A. Griffin Griffin
University of Nebraska-Lincoln, wgriffin2@unl.edu

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

Terry J. Klopfenstein
University of Nebraska-Lincoln, tklopfenstein1@unl.edu

See next page for additional authors

Authors
Annie J. Doerr, Brandon L. Nuttelman, William A. Griffin Griffin, Galen E. Erickson, Terry J. Klopfenstein, Joshua R. Benton, and Mike J. Rincker

Effect on Performance and Nutrient Mass Balance of Feeding Micro-Aid in Wet Distillers Grains Plus Solubles Diets

Annie J. Doerr
Brandon L. Nuttelman
William A. Griffin
Galen E. Erickson
Terry J. Klopfenstein
Josh R. Benton
Mike J. Rincker[1]

Summary

Finishing cattle performance and mass balance were evaluated when Micro-Aid® was fed in diets containing wet distillers grains plus solubles (WDGS). There was no difference in performance and carcass characteristics between treatments. In a WINTER experiment, cattle fed Micro-Aid had a greater amount of OM and DM removed in manure. Micro-Aid in the diet increased the amount of manure N and decreased N losses in the WINTER. There was no difference in N excreted in manure or lost via volatilization in the SUMMER experiment.

Introduction

When WDGS was fed at 30% of diet, N excreted was 84.6 lb/steer, with 45.5 lb N lost in WINTER and 58.4 lb N lost in SUMMER (*2008 Nebraska Beef Cattle Report,* pp. 53-56). Micro-Aid is a feed ingredient from an all natural plant extract, which contains saponins that have natural detergent and surfactant properties. Information suggests it is excreted along with feces and enhances the microbial population, which converts undigested nutrients into organic nitrogen compounds. The objective of the current study was to determine effect of feeding Micro-Aid in WDGS diets on performance and nutrient mass balance on the pen surface.

Procedure

Cattle Performance

Two experiments were conducted using 96 steers each. Calves (665 ± 24 lb BW) were fed 180 days from November to May (WINTER) and yearlings (708 ± 19 lb BW) fed 160 days from May to November (SUMMER) to evaluate feeding Micro-Aid in diets containing wet distillers grains with solubles (WDGS) on nutrient mass balance in open feedlot pens. Steers were blocked by BW, stratified within block, and assigned randomly to pen (8 steers/pen). Dietary treatments consisted of 35% WDGS, 55% corn fed at a ratio of 1:1 dry-rolled corn and high-moisture corn, 5% straw, and 5% supplement (CON), with Micro-Aid being added in the treatment supplement at an inclusion of 1g/ steer daily (TRT). Cattle were adapted to finishing diets over a 21-day period with the corn blend replacing alfalfa hay. Rumensin® was fed at 345 mg/head/day in both experiments.

Table 1. Growth performance and carcass characteristics for steers fed during the WINTER.

Variable	CON[1]	Micro-Aid	SEM	*P*-value
Performance				
Initial BW, lb	665	665	0.8	0.89
Final BW, lb[2]	1266	1255	13.5	0.58
DMI, lb/day	21.2	20.9	0.3	0.65
ADG, lb	3.33	3.28	0.07	0.66
Feed:Gain[3]	6.35	6.38	0.003	0.83
Carcass Characteristics				
HCW, lb	798	791	7.6	0.56
Marbling score[4]	547	560	12.7	0.48
12th rib fat, in	0.57	0.57	0.6	0.93
LM area, in²	12.5	12.1	0.2	0.09
Calculated YG[5]	3.40	3.40	0.7	1.00

[1]CON = Control.
[2]Final weight calculated as hot carcass weight divided by 0.63.
[3]Analyzed as gain:feed, reported as feed:gain.
[4]500 = Small 0, 600 = Modest 0.
[5]YG calculation = 2.50 + (2.5 * 12th rib fat thickness) – (.32 * LM area) + (.2 * KPH (2.5)) + (.0038 * HCW).

Table 2. Growth performance and carcass characteristics for steers fed during the SUMMER.

Variable	CON[1]	Micro-Aid	SEM	*P*-value
Performance				
Initial BW, lb	708	708	1.3	0.93
Final BW, lb[2]	1309	1302	11.3	0.67
DMI, lb/day	20.8	20.7	0.3	0.76
ADG, lb	3.75	3.72	0.07	0.71
Feed:Gain[3]	5.55	5.56	0.003	0.80
Carcass Characteristics				
HCW, lb	825	820	7.1	0.67
Marbling score[4]	546	537	14.4	0.66
12th rib fat, in	0.55	0.51	0.2	0.27
LM area, in²	13.0	13.1	0.2	0.67
Calculated YG[5]	3.13	3.01	1.1	0.72

[1]CON = Control.
[2]Final weight calculated as hot carcass weight divided by 0.63.
[3]Analyzed as gain:feed, reported as feed:gain.
[4]500 = Small 0, 600 = Modest 0.
[5]YG calculation = 2.50 + (2.5 * 12th rib fat thickness) – (.32 * LM area) + (.2 * KPH (2.5)) + (.0038 * HCW).

Table 3. Effect of Micro-Aid on nitrogen mass balance during WINTER[1].

Variable	CON	Micro-Aid	SEM	*P*-value
N intake	102.5	101.4	0.7	0.66
N retention[2]	12.1	12.0	0.1	0.76
N excretion[3]	90.3	89.4	0.7	0.68
Manure N[4]	40.9	56.6	2.2	0.03
N Run-off	2.36	2.25	0.3	0.92
N Lost	46.3	30.7	2.3	0.05
N Loss, %[5]	52.2	34.0	5.4	0.04
DM removed	6111	7852	292.6	0.09
OM removed	815	1178	42.7	0.02

[1]Values are expressed as lb/steer over entire feeding period (180 DOF).
[2]Calculated using the NRC net protein and net energy equations.
[3]Calculated as N intake – N retention.
[4]Manure N with correction for soil N.
[5]Calculated as N lost divided by N excretion.

Table 4. Effect of Micro-Aid on nitrogen mass balance during SUMMER[1].

Variable	CON	Micro-Aid	SEM	*P*-value
N intake	85.6	85.2	0.5	0.79
N retention[2]	12.0	11.9	0.1	0.73
N excretion[3]	73.7	73.3	0.5	0.83
Manure N[4]	17.7	16.9	0.7	0.78
N Run-off	3.00	2.40	0.2	0.20
N Lost	52.9	54.0	0.9	0.69
N Loss, %[5]	71.9	73.8	2.5	0.60
DM removed	1063	1050	96.3	0.97
OM removed	276	230	10.6	0.64

[1]Values are expressed as lb/steer over entire feeding period (160 DOF).
[2]Calculated using the NRC net protein and net energy equations.
[3]Calculated as N intake – N retention.
[4]Manure N with correction for soil N.
[5]Calculated as N lost divided by N excretion.

Steers in the WINTER experiment were implanted on day 1 with Revalor®-IS followed by Revelor®-S on day 80. Steers in the SUMMER experiment were implanted with Revalor-S on day 36. Steers were slaughtered on day 180 (WINTER) and day 160 (SUMMER) at a commercial abattoir (Greater Omaha, Omaha, Neb.). Hot carcass weight and liver scores were recorded on day of slaughter. Fat thickness and LM area were measured after a 48-hour chill, and USDA called marbling score was recorded. Final BW, ADG, and F:G were calculated based on hot carcass weights adjusted to a common dressing percentage of 63.

Nutrient Balance

Nutrient mass balance experiments were conducted using 12 open feedlot pens with retention ponds to collect runoff. When rainfall occurred, runoff collected in retention ponds, was drained and quantified using an air bubble flow meter (ISCO, Lincoln, Neb.). Before placing cattle in pens, 16 soil core samples (6 inch depth) were taken from each pen in both experiments. After cattle were removed from the pens, manure was piled on a cement apron and sampled (n = 30) for nutrient analysis while being loaded. Manure was weighed before it was hauled to the University of Nebraska–Lincoln compost yard. Manure was freeze-dried for nutrient analysis and oven dried for DM removal calculation. After manure was removed, additional soil core samples were taken from each pen to assess efficiency of pen cleaning.

Ingredients were sampled monthly and feed refusals were analyzed to determine nutrient intake using a weighted composite on a pen basis. Retained steer N and P were calculated using the energy, protein, and P equations (NRC, 1996). Nutrient excretion was determined by subtracting nutrient retention from intake (ASABE, 2005). Total N lost (lb/steer) was calculated by subtracting manure N (corrected for soil N content) and runoff N from excreted N. Percentage of N lost was calculated as N lost divided by N excretion. Dietary treatments were fed in the same pen for both experiments. Data were analyzed using the MIXED procedure of SAS (SAS Inst., Inc., Cary, N.C.).

Results

Feedlot Performance

Dry matter intake, ADG, and F:G were similar among treatments ($P > 0.65$) in both experiments (Tables 1 and 2). Feed efficiencies were not different ($P > 0.80$). Carcass characteristics were not influenced ($P > 0.05$) by the inclusion of Micro-Aid in the diet in either experiment.

Nutrient Balance

Nitrogen intake, retention, and excretion (Tables 3 and 4) were similar among treatments ($P > 0.10$) in both experiments. Total N in manure was greater ($P = 0.03$) for steers fed Micro-Aid in the WINTER, but was not different ($P > 0.10$) in the SUMMER. The amount of N lost via volatilization was greater ($P = 0.05$) for the CON cattle in the WINTER. The percent N loss expressed as a percentage of N excretion was greater ($P = 0.04$) for the CON group compared to the TRT diet. The inclusion of Micro-Aid in the diet fed in the SUMMER experiment had no affect ($P > 0.10$) on N lost, and no differences were found ($P > 0.10$) in the percent of N lost. Run-off N was not different ($P > 0.10$) among groups, and averaged 2.57% and 3.45% of total N excreted in the WINTER and SUMMER, respectively. In the WINTER, total dry matter removed was numerically greater ($P = 0.09$) for cattle fed Micro-Aid. Organic matter removed was greater ($P = 0.02$) for TRT cattle than the

(Continued on next page)

CON cattle. Dry matter and organic matter removed were similar ($P > 0.75$) between the CON and TRT group in the SUMMER.

Phosphorus intake, retention, and excretion were similar ($P > 0.10$) among treatments (Tables 5 and 6) in both experiments. Manure P was greater ($P = 0.02$) for cattle fed Micro-Aid than the CON cattle for the WINTER. Manure P was not different ($P > 0.10$) between the CON and Micro-Aid cattle during the SUMMER. Nitrogen to phosphorus ratios were similar ($P > 0.10$) in both experiments.

These data suggest inclusion of Micro-Aid in diets does not affect performance or carcass characteristics. When fed in WDGS diets in the winter, Micro-Aid increased the amount of DM and OM removed from pens. Additionally, N retained in the manure was greater for cattle fed Micro-Aid, as well as reducing the amount of N lost via volatilization. However, Micro-Aid in the diet showed no differences in nitrogen or phosphorus mass balance when fed in the summer.

[1]Annie J. Doerr, graduate student; Brandon L. Nuttelman, research technician; William A. Griffin, research technician; Galen E. Erickson, associate professor; Terry J. Klopfenstein, professor; Josh R. Benton, former research technician, University of Nebraska–Lincoln Department of Animal Science, Lincoln, Neb.; Mike J. Rincker, DPI Global, Porterville, Calif.

Table 5. Effect of Micro-Aid on P mass balance during WINTER[1].

Variable	CON	Micro-Aid	SEM	*P*-value
P intake	19.6	19.4	0.1	0.65
P retention[2]	2.96	2.93	0.03	0.81
P excretion[3]	16.7	16.5	0.1	0.67
Manure P	22.1	32.4	1.2	0.02
Run-off P	1.01	1.19	0.1	0.69
P manure+soil[4]	22.6	31.6	1.0	0.02
N:P ratio[5]	1.75	1.72	0.3	0.67

[1]Values are expressed as lb/steer over entire feeding period (180 DOF).
[2]Calculated using the NRC net protein and net energy equations.
[3]Calculated as P intake – P retention.
[4]Manure P with correction for soil P.
[5]Nitrogen to Phosphorus ratio, DM basis.

Table 6. Effect of Micro-Aid on P mass balance during SUMMER[1].

Variable	CON	Micro-Aid	SEM	*P*-value
P intake	17.4	17.4	0.1	0.79
P retention[2]	2.91	2.89	0.03	0.78
P excretion[3]	14.5	14.5	0.09	0.82
Manure P	2.85	3.73	0.5	0.57
Run-off P	1.21	1.04	0.07	0.48
P manure+soil[4]	7.48	7.83	0.5	0.82
N:P ratio[5]	1.90	2.01	0.8	0.48

[1]Values are expressed as lb/steer over entire feeding period (160 DOF).
[2]Calculated using the NRC net protein and net energy equations.
[3]Calculated as P intake – P retention.
[4]Manure P with correction for soil P.
[5]Nitrogen to Phosphorus ratio, DM basis.