

## Ruminant Nutrition: Beef: Dietary Effects and Additives

**736 Use of a pelleted corn residue complete feed for receiving feedlot cattle.** S. J. Peterson\*, B. L. Nuttelman, D. B. Burken, J. C. MacDonald, M. K. Luebbe, and G. E. Erickson, *University of Nebraska-Lincoln, Lincoln.*

The effects of feeding a complete pelleted feed versus a high quality receiving diet on feedlot performance and health of newly received calves was evaluated. The complete feed was made from 35% corn residue and a blend of grain byproducts and minerals and was designed to replace a conventional grain and forage diet. The study utilized 2 locations, Panhandle Research Center (PHREC) near Scottsbluff, NE, and the Agricultural Research and Development Center (ARDC) near Mead, NE. The calves were received over 2 d at PHREC (n = 500; BW = 267 ± 1.94 kg) and 4 d at ARDC (n = 818; BW = 264 ± 1.20 kg). Within location, steers were blocked by source within date received and assigned randomly to pens based on processing order (25 and 30 pens/treatment at ARDC and PHREC respectively). Pens were assigned randomly to a control diet consisting of 32% distillers grains, 32% dry rolled corn, 32% alfalfa, and 4% supplement (DM basis; CON) or the complete pelleted feed (PelCR). The PelCR contained a combination of plant extracts (RumeNext, ADM, Quincy, IL) whereas CON contained 150 mg/hd/d of monensin. Both diets were formulated to contain 125 mg/hd/d decoquinatate. Studies averaged 24 d at ARDC and 25 d at PHREC. Steers were fed ad libitum. A treatment by location interaction was observed for DMI ( $P < 0.05$ ). At PHREC, no difference in DMI was observed (5.8 vs. 5.9 kg/day for CON and PelCR respectively;  $P = 0.03$ ); however, DMI was greater for the pelleted diet at ARDC (6.7 vs. 7.0 kg/day for CON and PelCR respectively;  $P < 0.05$ ). No treatment by location interaction was detected for ADG or G:F ( $P > 0.15$ ). The pelleted feed decreased ADG (1.54 vs. 1.29 kg/day for CON and PelCR respectively;  $P < 0.01$ ) and G:F (0.246 vs. 0.198 kg/kg for CON and PelCR respectively;  $P < 0.01$ ) compared with CON. The number of calves treated for bovine respiratory disease was numerically less for steers fed PelCR (30.3% vs. 26.5% for CON and PelCR respectively;  $P = 0.13$ ). Receiving calves on PelCR may have a positive effect on DMI, but a negative effect on ADG and G:F compared with a high-quality receiving diet. However, feeding PelCR appears to be a viable option for receiving feedlot cattle.

**Key Words:** corn residue, health, receiving

**737 Growth and carcass characteristics of feed efficiency sorted cattle fed corn or roughage-based diets and finished with corn or byproduct-based diets.** J. R. Russell\*<sup>1</sup>, E. L. Lundy<sup>1</sup>, N. O. Minton<sup>2</sup>, W. J. Sexten<sup>2</sup>, M. S. Kerley<sup>2</sup>, and S. L. Hansen<sup>1</sup>, <sup>1</sup>*Iowa State University, Ames*, <sup>2</sup>*University of Missouri, Columbia.*

The objective was to determine effects of growing phase (GP) diet, GP feed efficiency (FE) ranking and finishing phase (FP) diet on FP growth and carcass characteristics of beef steers. Three groups (YR) of steers (439 hd) were fed whole shell corn (GPC) or roughage-based (GPR) diets during GP in GrowSafe bunks to facilitate individual FE determination and ranking [low (LFE), medium (MFE), high FE (HFE)]. Steers were blocked by GP diet and FE ranking to corn (FPC) or byproduct-based (FPB) diets during FP. Pen (6 steers/pen) served as FP experimental unit. The FP diets were fed to the first group (28 pens; 471 ± 10 kg) for 85 d, the second (14 pens; 402 ± 14 kg) for 115 d and the third (32 pens; 473 ± 16 kg) for 65 d. All diets included 200 mg ractopamine hydrochloride/steer/d (Optaflexx), for the final 28–30 d.

PROC MIXED of SAS was used to compare means with a Tukey test and YR as a random effect. For carcass traits and pre-Optaflexx period (PRE) growth, FP initial BW was used as a covariate. For Optaflexx period (OPT) growth, PRE ending BW was used as a covariate. Across the entire FP, LFE pens tended to have greater ADG than MFE ( $P < 0.09$ ). During PRE, FPB pens had greater ( $P < 0.05$ ) ADG and DMI versus FPC however during OPT the pens fed FPC had greater ( $P < 0.05$ ) ADG and DMI with a tendency for greater G:F ( $P < 0.07$ ) than FPB. The FPB pens had greater ADG ( $P < 0.05$ ) during PRE compared with OPT. There were no effects of FE rank ( $P > 0.1$ ) on G:F or DMI during FP. The GPR-FPB and GPC-FPB pens had greater HCW ( $P < 0.05$ ) compared with GPR-FPC, and the GPR-FPB pens also had greater HCW ( $P < 0.05$ ) than GPC-FPC. The FPB pens tended to have greater KPH ( $P < 0.06$ ) than FPC. Interestingly, within GPR pens LFE had greater ending BW and HCW ( $P < 0.05$ ) versus MFE. The GPR-FPB pens had greater ( $P < 0.05$ ) backfat (BF) and yield grade (YG) versus GPR-FPC. There were no differences ( $P > 0.3$ ) in ribeye area or marbling. In this study, GP FE rank had minimal effects on FP growth and carcass traits though GPR-LFE outperformed GPR-MFE pens. Regardless of GP diet, FPB increased HCW, BF and YG.

**Key Words:** byproduct, corn, feed efficiency

**738 Apparent total-tract digestibility of steers gradually adapted to a finishing diet or dosed with Lactipro and placed directly onto a finishing diets.** K. A. Miller\*<sup>1</sup>, C. L. Van Bibber-Krueger<sup>1</sup>, C. C. Aperce<sup>2</sup>, C. A. Alvarado<sup>1</sup>, and J. S. Drouillard<sup>1</sup>, <sup>1</sup>*Kansas State University, Manhattan*, <sup>2</sup>*MS-Biotec, Wamego, KS.*

Effects of 2 diet adaptation strategies on apparent total tract digestibility were evaluated in feedlot steers during the first 24 d on feed. Ninety steers (BW 399 ± 2.31 kg) were placed into concrete-surfaced pens (6 pens/treatment; 7 or 8 steers/pen) and assigned to a traditional step-up regimen consisting of 3 step-up diets followed by a finishing diet fed for 6 d each (Control), or were given a 100-mL oral dose of Lactipro at processing and placed directly onto the finishing diet (Lactipro). Diets were based on steam-flaked corn, wet corn gluten feed with corn silage (CS) as the roughage source. Transition diets contained 40, 30, and 20% CS, and were followed by a finishing diet with 10% CS. Feces and orts were collected from each pen daily, weighed, homogenized, subsampled, and composited into 6-d periods. Control steers had greater DMI (8.9 vs. 7.7 kg;  $P < 0.01$ ) and DM fecal output (2.3 vs. 1.7 kg;  $P < 0.01$ ) compared with Lactipro steers. Regardless of treatment, DMI and fecal output increased over the 24-d study ( $P < 0.01$ ). Apparent DM digestibility was greater for Lactipro steers during d 7 to 12 and d 13 to 18 ( $P < 0.01$ ), increased over time ( $P < 0.01$ ) for both treatments, but was not different ( $P = 0.11$ ) between treatments over the entire 24 d. Apparent CP digestibility was greater for Lactipro steers during d 1 to 6 and d 7 to 12 ( $P < 0.01$ ), peaked for both treatments during d 7 to 12 ( $P < 0.01$ ), and was greater ( $P = 0.05$ ) for Lactipro steers compared with Control steers over the entire 24 d. Apparent NDF digestibility was greater for Control steers during d 1 to 6 ( $P < 0.01$ ) and during the entire 24-d study ( $P < 0.01$ ) compared with Lactipro steers. Total forage consumption was less for Lactipro cattle (46.9 vs. 18.4 kg for Control and Lactipro, respectively;  $P < 0.01$ ). Dosing Lactipro at processing is an effective strategy for decreasing reliance on roughages without compromising diet digestibility.

**Key Words:** Lactipro, diet adaptation, roughage

**739 Effect of low-fat dried distillers grains inclusion in finishing diets on feedlot cattle total-tract digestibility and ruminal fermentation parameters.** I. Ceconi\*<sup>1</sup>, M. Ruiz-Moreno<sup>2</sup>, A. DiCostanzo<sup>1</sup>, and G. I. Crawford<sup>1</sup>, <sup>1</sup>University of Minnesota, Saint Paul <sup>2</sup>University of Florida, Marianna.

Excessive dietary fat can negatively affect growth of fiber-digesting ruminal microorganisms and consequently decrease OM total-tract digestibility (OMD), feed intake and overall performance in feedlot cattle. Compared with conventional dried distillers grains (DDG), the smaller fat and greater protein content of low-fat DDG (LF-DDG) may attenuate these effects. An experiment was conducted to evaluate the effect of LF-DDG inclusion in beef cattle finishing diets on OMD and ruminal fermentation. Six ruminally cannulated Holstein steers (317 ± 7 kg initial BW) were assigned randomly to a duplicated 3 × 3 Latin square design. Steers were fed ad libitum once daily 1 of 3 dietary treatments containing (DM basis) 84% dry-rolled corn (DRC), 10% ryegrass haylage, and 6% supplement (CON) or 53% DRC, 10% ryegrass haylage, 2% supplement, and 35% traditional DDG (TRAD) or LF-DDG (LF). Dietary CP and fat concentrations measured 12.1, 15.9, and 19.9% and 3.7, 6.7, and 4.5% for CON, TRAD, and LF, respectively. Steers were intra-ruminally dosed with chromic oxide and fecal grab samples collected to determine OMD. Ruminal fluid was collected to measure VFA and ammonia-N (NH<sub>3</sub>-N) concentrations. Ruminal pH was continuously recorded by ruminal probes. Intake of OM was greater for TRAD (8.26 ± 0.04 kg) and LF (8.31 ± 0.04 kg) than CON (8.09 ± 0.04 kg; *P* ≤ 0.01). Dietary treatment did not affect OMD (*P* = 0.12) or ruminal pH (*P* = 0.64; 69.7, 69.0, and 72.8 ± 1.2% and 5.78, 5.73 and 5.66 ± 0.09 for CON, TRAD and LF, respectively). Ruminal NH<sub>3</sub>-N concentration was smaller and ruminal VFA was greater for CON (2.74 ± 1.14 mg/dL and 92.8 ± 5.8 mM) and LF (2.69 ± 1.14 mg/dL and 92.4 ± 5.8 mM) than TRAD (3.75 ± 1.15 mg/dL and 74.6 ± 5.8 mM; *P* ≤ 0.04). Inclusion of LF-DDG resulted in smaller NH<sub>3</sub>-N concentration and increased ruminal VFA compared with traditional DDG. Partial replacement of DRC by LF-DDG led to no change in ruminal NH<sub>3</sub>-N and VFA concentration while that by conventional DDG led to increased NH<sub>3</sub>-N concentration and decreased ruminal VFA.

**Key Words:** digestibility, low-fat dried distillers grains, volatile fatty acids

**740 Effect of slow-release urea inclusion in diets containing wet distillers grains on total-tract digestibility and ruminal fermentation parameters in feedlot cattle.** I. Ceconi\*<sup>1</sup>, M. Ruiz-Moreno<sup>2</sup>, A. DiCostanzo<sup>1</sup>, and G. I. Crawford<sup>1</sup>, <sup>1</sup>University of Minnesota, Saint Paul <sup>2</sup>University of Florida, Marianna.

Inclusion of rumen degradable N in feedlot diets containing distillers grains (DG) may be beneficial, as degradability of CP in DG can be low. As opposed to the rapid ruminal N release of conventional urea, slow-release urea can provide a steady supply of ammonia-N (NH<sub>3</sub>-N) which may allow for improved N utilization by ruminal microbes. An experiment was conducted to evaluate the effect of supplementing urea (46% N) or 2 slow-release urea forms (41% N; Optigen and Nitroshure) on OM total-tract digestibility (OMD) and ruminal fermentation parameters. Four ruminally cannulated Holstein steers (588 ± 8 kg initial BW) were assigned randomly to a 4 × 4 Latin square design. Steers were fed ad libitum once daily one of 4 dietary treatments containing (DM basis) 8% corn silage, 20% wet corn DG with solubles, 30% corn earlage, 4.5% supplement, dry-rolled corn, and 0% (CON) or 0.6% urea (U), or 0.67% Optigen (O) or Nitroshure (NT). Estimated RDP concentrations were 6.7% for CON and 8.4% for U, O, and NT. Steers were intra-ruminally dosed every 12 h with chromic oxide and fecal

grab samples collected to determine OMD. Ruminal fluid was collected to measure VFA and NH<sub>3</sub>-N concentrations. Ruminal pH was continuously recorded by ruminal probes. Organic matter intake (13.9 ± 0.3 kg), ruminal VFA (107.6 ± 2.9 mM), and ruminal pH (5.84 ± 0.02) were not affected by treatment (*P* ≥ 0.53). Ruminal concentration of NH<sub>3</sub>-N tended to be affected by treatment (*P* = 0.06), being higher for U and NT (9.7 ± 2.0 mg/dL) than CON and O (7.5 ± 2.0 mg/dL; *P* ≤ 0.01). Digestibility of OM was similar among treatments (67.4, 67.9, 70.1 ± 2.5%, and 71.0 ± 2.9% for CON, O, NT, and U, respectively; *P* = 0.67). Supplementing RDP through inclusion of conventional or slow-release urea did not affect OMD and most ruminal fermentation parameters evaluated. More research is needed to evaluate the use of slow-release urea in diets containing highly digestible grains and dried DG, as highly fermentable carbohydrates and lower dietary RDP concentrations may result in RDP deficit.

**Key Words:** digestibility, distillers grains, slow-release urea

**741 Effects of feeding treated corn stover and distillers grains to beef cattle on performance, carcass traits, digestibility, and ruminal metabolism.** W. P. Chapple\*<sup>1</sup>, D. B. Faulkner<sup>1</sup>, M. J. Cecava<sup>2</sup>, P. H. Doane<sup>2</sup>, A. H. Grusby<sup>2</sup>, and T. L. Felix<sup>1</sup>, <sup>1</sup>University of Illinois, Urbana, <sup>2</sup>Archer Daniels Midland Company, Decatur, IL.

The objectives were to determine the effects of feeding chemically treated and thermo-chemically treated (extruded) corn stover (CS) in diets containing corn and modified wet distillers grain with solubles (MWDGS) on DMI, gain, carcass traits, digestibility, and ruminal metabolism in beef cattle. Exp. 1: Crossbred yearlings (n = 60; initial BW = 383 ± 28 kg) were allotted to 1 of 5 dietary treatments: 1) 55% corn and 5% untreated-ground CS on DM basis (control), 2) 5% calcium oxide (CaO)-treated (bagged) CS, 3) 5% CaO extruded CS, 4) 4% CaO: 1% sodium hydroxide (NaOH) extruded CS, and 5) 3% CaO: 2% NaOH extruded CS. For bagged CS, CS was hydrated to 50% moisture before treatment with CaO in a mixer wagon. For extruded CS, CS was hydrated to 50% moisture before treatment with CaO or combinations of CaO and NaOH, then extruded using a dual-shafted, encased processor. Treated CS diets contained 20% CS, 40% MWDGS, 35% corn, and 5% vitamin/mineral supplement (DM basis). There was no effect (*P* ≥ 0.13) of dietary treatment on ADG, G:F, marbling score, or LM area. However, cattle fed the control diet had increased (*P* ≤ 0.05) yield grade, DMI, and back fat thickness compared with cattle fed the treated CS diets. Exp. 2: Using the Exp. 1 diets, crossbred steers (n = 5; initial BW = 417 ± 21 kg) were fed for 90% of ad libitum intake in a 5 × 5 Latin square design. Apparent digestibility of NDF and ADF increased (*P* < 0.01) for all cattle fed treated CS diets compared with cattle fed the control diet. Mean ruminal pH from 0 to 3 h post-feeding decreased (*P* < 0.01) for cattle fed the bagged, treated CS diet compared with cattle fed all other diets. Diets containing 5% CaO (bagged or extruded) had the greatest (*P* < 0.01) mean acetate concentrations, resulting in increased (*P* = 0.01) total VFA concentrations. These data suggest inclusion of treated CS may increase fiber digestibility in finishing cattle diets without reducing feedlot cattle gain, feed efficiency, marbling score, or LM area. Therefore, treated CS could partially replace corn in beef cattle diets.

**Key Words:** calcium oxide, corn stover, distillers grains

**742 Effects of ractopamine hydrochloride on performance and carcass characteristics in finishing heifers: 16-trial summary.** N. A. Pyatt\*, G. J. Vogel, J. W. Homm, R. L. Botts, and C. D. Bokenkroger, Elanco Animal Health, Greenfield, IN.

A meta-analysis of published scientific data was conducted to quantify the effects of ractopamine hydrochloride (RAC; Optaflexx, Elanco Animal Health, Greenfield, IN) on growth performance and carcass characteristics in feedlot cattle. Selection criteria was pen-level studies evaluating a negative control and at least one (RAC) treatment, on-label dose (10–30 mg/kg DM basis and 70–430 mg/hd/d) and duration (28–42 d before slaughter), and incremental performance (last 28–42 d). This summary represents analysis of 16 feedlot heifer studies encompassing 12,342 feedlot cattle. All data were analyzed in SAS using mixed regression models with RAC intake (mg/hd/d) as the primary predictor. Within-trial variance was set equal to the squared inverse of the standard error, while a random intercept term accounted for between-trial differences. Cook's D statistics were used to identify influence on parameter estimates. Yield and quality grade distributions were evaluated using a random effects proportional odds cumulative logit model. Live weight, ADG and feed efficiency improved (linear;  $P < 0.01$ ) with increasing dose of RAC supplementation compared with controls. Dry matter intake was not affected ( $P = 0.97$ ) by RAC level. Increasing RAC level improved HCW (linear;  $P < 0.01$ ) and dressing percent (linear;  $P = 0.03$ ). Fat thickness, KPH fat, calculated yield grade, marbling score, conformation score, and lean or skeletal maturity were not affected ( $P \geq 0.08$ ), while longissimus muscle area increased (linear;  $P < 0.01$ ) with level of RAC. However, RAC shifted quality and yield grade distributions slightly lower (linear;  $P < 0.05$ ). Feeding an elevated level of RAC improves beef production efficiency with expected outcomes of 2.7, 5.4, and 8.1 kg live weight and 2.1, 4.3, and 6.4 kg carcass weight improvements in heifers fed 100, 200 or 300 mg/hd/d (respectively) relative to controls.

**Key Words:** heifers, Optaflexx, ractopamine

**743 Effects of feeding functional oils and high levels of glycerol in feedlot bull diets.** F. Zawadzki<sup>2</sup>, I. N. Prado<sup>2</sup>, and J. Torrent<sup>\*1</sup>, <sup>1</sup>Oligo Basics USA LLC, Wilmington, DE, <sup>2</sup>Department of Animal Science, Univ. Estadual de Maringa, PR, Brazil.

A 2 × 2 factorial design was used to evaluate the effects of the supplementation of a commercial mixture of functional oils (Essential, Oligo Basics, PR, Brazil) and the effects of corn substitution by glycerol on animal performance and carcass and meat characteristics of Puruna bulls. A total of 32 8 mo old bulls (206.1 ± 2.5 kg BW) were divided into 4 treatments: control, functional oil supplementation (3 g/animal/day), corn substitution by glycerol and corn substitution by glycerol plus functional oil supplementation. Animals were fed during 252 d a diet with 47.7% ground corn, 42.0% corn silage and 10.3% soybean meal, or a diet with 42.0% corn silage, 20.3% glycerol and 15.0% soybean meal. All diets were kept isonitrogenous. Longissimus dorsi and perirenal and subcutaneous fat samples were taken at the time of slaughter and stored at -20°C for later analysis. Although no differences were seen in ADG, both functional oil supplementation and corn substitution by glycerol increased hot and cold carcass weight ( $P < 0.01$ ) and dressing percentage ( $P < 0.02$ ). Longissimus dorsi temperature and pH at 0 and 24 h, area, texture, marbling and color characteristics were not affected by treatment. Whereas corn substitution by glycerol increased 15:0 pentadecanoic acid ( $P < 0.01$ ), 17:0 margaric acid ( $P < 0.01$ ), 17:1 n-9, *cis*-10-heptadecanoic acid ( $P < 0.02$ ) and 20:4 n-6, arachidonic acid ( $P < 0.05$ ) and decreased 20:5 n-3 eicosapentaenoic acid ( $P < 0.01$ ) in perirenal fat, functional oil supplementation tended to increase 18:1 n-11t, transvaccenic acid ( $P = 0.09$ ). Also, functional oil supplementation tended to increase saturated ( $P = 0.09$ ) and polyunsaturated fat ( $P = 0.08$ ) and tended to decrease ( $P = 0.07$ ) monounsaturated fat in the Longissimus dorsi. Summarizing, both the substitution of corn by 20%

glycerol and the supplementation of functional oils improved carcass weight and dressing percent of the supplemented animals. Also, the substitution of 20% of the corn by glycerol changed some of fatty acids deposited in the carcass of the animals.

**Key Words:** carcass characteristic, functional oil, glycerol

**744 Effects of propolis and functional oils on performance, digestibility and blood parameters of crossbred bulls.** M. V. Valero<sup>2</sup>, I. N. Prado<sup>2</sup>, and J. Torrent<sup>\*1</sup>, <sup>1</sup>Oligo Basics USA LLC, Wilmington, DE, <sup>2</sup>Department of Animal Science, Univ. Estadual de Maringa, PR, Brazil.

Some natural products such as functional oils and propolis have been shown to stabilize rumen fermentation and improve beef cattle performance. The objectives of this study were to evaluate the effects of propolis and functional oils on performance, feed intake, apparent digestibility and blood parameters of crossbred bulls. Thirty 18-mo-old bulls (321 ± 27 kg) were randomly assigned to a control, a commercial functional oil mixture (Essential, Oligo Basics, Cascavel, PR, Brazil) group (3 g/d) and a propolis group (3 g/d). Diets were formulated to be isocaloric and isonitrogenous. The animals were fed an ad libitum diet with 41.5% sorghum silage, 33.3% ground corn, 15.3 glycerol, 8.1% soybean meal, 1.0% vitamin-mineral premix and 0.8 urea during the 49 d of the study. Intake was recorded daily and bull BW every 2 weeks. Fecal samples were collected during 5 d starting on the 40th day to obtain apparent digestibilities using the indigestible DM as a marker. Blood samples from each animal were collected by jugular venipuncture into EDTA-coated vacutainer tubes the first and the last day of the experiment. Data was analyzed with an ANOVA. Functional oil supplementation improved ADG (1.53, 1.26 and 1.32 kg/d for the functional oil, control and propolis group, respectively;  $P < 0.05$ ) and G: F (0.147 for the control, 0.151 for the propolis and 0.172 for the functional oils group;  $P < 0.05$ ) when compared with the control and propolis groups. Apparent digestibilities of DM, OM, CP, EE, NDF or ADF were not affected by treatment. Although red cell counts were higher ( $P < 0.001$ ) and white cell counts ( $P < 0.001$ ), platelet counts ( $P < 0.001$ ) and plasma proteins ( $P < 0.05$ ) were lower at the end of the experiment, supplementation with either propolis or functional oils did not affect any blood parameter. In conclusion, supplementation of beef bulls with propolis did not affect any performance, digestibility or blood parameter. The supplementation with functional oils improved ADG and G: F but did not affect any other performance, digestibility or blood parameter.

**Key Words:** propolis, functional oils, digestibility

**745 Effect of urea inclusion in diets containing distillers grains on total-tract digestibility and ruminal fermentation in feedlot cattle.** I. Ceconi<sup>\*1</sup>, M. Ruiz-Moreno<sup>2</sup>, A. DiCostanzo<sup>1</sup>, and G. I. Crawford<sup>1</sup>, <sup>1</sup>University of Minnesota, Saint Paul, <sup>2</sup>University of Florida, Marianna.

A high proportion of CP in distillers grains (DG) is RUP. Therefore, addition of RDP to feedlot rations containing DG may be beneficial. An experiment was conducted to evaluate the effect of RDP supplementation in feedlot cattle finishing diets on total tract digestibility and ruminal fermentation. Four ruminally cannulated Holstein steers (347 ± 18 kg initial BW) were assigned randomly to a duplicated 2 × 2 Latin square design. Each period consisted of a 16-d adaptation and a 5-d collection phase. Steers were fed ad libitum once daily one of 2 dietary treatments containing (DM basis) 52% dry-rolled corn, 20%

dried corn DG with solubles, 12% high-moisture corn, 10% ryegrass haylage, mineral-vitamin supplement, and 0% (CON) or 0.6% (U) urea. Energy, CP, and RDP concentrations were 1.32 or 1.30 Mcal NE/g/kg, 14 or 15.6%, and 6.4 or 8.0% for CON or U, respectively. Steers were intraruminally dosed with chromic oxide from d 11 to 21 to determine OM digestibility. Fecal grab samples were collected from d 17 to 21. Ruminal VFA and ammonia-N (NH<sub>3</sub>-N) concentrations were measured in ruminal fluid samples collected on d 21 at multiple time points after feeding. Ruminal pH was continuously recorded by probes residing in the rumen for 5 d. Organic matter intake (9.9 ± 0.1 kg) and ruminal pH (5.86 ± 0.02) were not affected by treatment ( $P \geq 0.13$ ). Ruminal VFA and NH<sub>3</sub>-N concentration, and OM digestibility were higher for U than CON (119.1 and 89.3 ± 5.9 mM, 8.5 and 3.9 ± 1.1 mg/dL, and 72.3 and 69.1 ± 2.9% for U and CON, respectively;  $P \leq 0.04$ ). Results from this experiment agree with those from a concurrent feedlot finishing experiment by these authors where ADG and feed efficiency were improved by 11% and 7%, respectively, for U compared with CON. Increasing RDP through the inclusion of urea to dry-rolled and high-moisture corn-based feedlot diets containing 20% dried DG resulted in increased OM digestibility and concentration of NH<sub>3</sub>-N and total VFA without affecting feed intake and ruminal pH.

**Key Words:** dried distillers grains, urea, volatile fatty acids

**746 Seed orientation and row direction alter maize grain yield and composition.** T. D. Kaufman\*<sup>1</sup>, P. Walker<sup>1</sup>, L. Brown<sup>2</sup>, L. Nuzback<sup>2</sup>, and F. N. Owens<sup>2</sup>, <sup>1</sup>Illinois State University, Normal, <sup>2</sup>DuPont Pioneer, Johnston, IA.

By modifying interplant shading, the compass direction of maize rows and the orientation of planted maize seeds may alter grain yield. Effects of row direction and seed orientation were studied in central Illinois in 2 trials. In 2011 using a 2 × 2 × 2 factorial design, 2 Pioneer maize silage hybrids were planted in plots 12 rows (rows 76 cm apart) at 2 populations (69,000 and 84,000 plants/hectare) with seeds were planted at 3 orientations, either randomly (R) with a mechanical maize planter or manually with all kernel tips downward but with each kernel's germ facing either the other plants within the same row (W) or alternately toward plants in adjacent rows (A). R kernels were planted in rows oriented both in a North-South (NS) and an East-West (EW) direction. Based on GLM analysis of this factorial experiment, weight of shelled grain at maturity per hectare was greater ( $P < 0.05$ ) for kernels planted in W rows than in A rows; both were greater than for R (13.0 versus 11.9 and 10.9 t/ha;  $P < 0.05$ ) due to lighter kernel weights and fewer kernels per ear for R. Grain yields were 26% greater ( $P < 0.01$ ) for NS than EW rows due to heavier kernels and more kernels per ear ( $P < 0.01$ ). In 2012, using a 3 × 2 × 3 × 2 factorial design, 3 Pioneer silage hybrids were grown at 2 populations and these same 3 seed orientations in both NS and EW rows. Yields again were least ( $P < 0.05$ ) for R rows (12.2, 12.1, and 10.5 t/ha for A, W, and R). Kernels from R rows had the lowest kernel density but the highest percentage of starch. Grain yields were greater for NS than EW rows (12.0 versus 11.6 t/ha;  $P < 0.01$ ) due to 6.5% greater kernel weights ( $P < 0.01$ ). The higher plant population increased grain yield per hectare but decreased kernels per ear ( $P < 0.02$ ). Regressed across all samples, each 1% added starch displaced 0.38% oil and 0.44% protein. Grain yields were greater for kernels specifically oriented when planted and when grown in NS than in EW rows.

**Key Words:** maize grain, row direction, yield

**747 Influence of fines on the feeding value of steam-flaked corn in finishing diets for feedlot cattle.** M. Montano\*<sup>1</sup>, V. Gonzalez<sup>1</sup>, O.

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Two trials were conducted to evaluate the influence of fines on the feeding value of steam-flaked corn (SFC) in finishing diets for feedlot cattle. Three levels (0, 33.3 and 66.7%) of re-rolled SFC replaced standard SFC (0.31 kg/L) in a corn-based finishing diet (DM basis). Re-rolled SFC consisted of standard air-dry SFC that was passed through the rollers a second time. The intent of re-rolling was to simulate loss of flake integrity which can occur during feed-handling. In Trial 1, the influence of fines in SFC on growth performance was evaluated in 18 crossbred steers (294 ± 69 kg) in a replicated 3 × 3 Latin square design. Daily weight gain was similar ( $P > 0.10$ ) among treatments, averaging 1.31 kg/d. Dry matter intake tended to be greater (4.7%; quadratic effect,  $P = 0.06$ ) for diets containing re-rolled steam-flaked corn. Dry matter conversion and NE value of the diets were not influenced by dietary treatments ( $P > 0.10$ ). In experiment 2, 6 Holstein steers (205 kg) with cannulas in the rumen and proximal duodenum were used in a replicated 3 × 3 Latin square design to evaluate treatment effects on digestion. Reductions in particle size of corn grain due to re-rolling did not influence ( $P > 0.10$ ) ruminal or total tract digestion of OM, NDF, N, or starch ( $P > 0.10$ ). There were no treatment effects ( $P > 0.10$ ) on ruminal microbial efficiency, ruminal pH and ruminal VFA molar proportions. It is concluded that the effect of flake disintegration during mixing and further handling on performance of feedlot cattle and characteristics of digestion will be marginal, if appreciable.

**Key Words:** cattle, corn, fines

**748 Diet inclusion rate for leftover residual biomass in a beef heifer diet.** J. A. Tucker\*<sup>1</sup>, H. W. Harpster<sup>2</sup>, J. S. Moritz<sup>3</sup>, M. E. Wilson<sup>3</sup>, J. A. Carroll<sup>4</sup>, and D. L. Smith<sup>1</sup>, <sup>1</sup>Eastern New Mexico University, Portales, <sup>2</sup>The Pennsylvania State University, University Park, <sup>3</sup>West Virginia University, Morgantown, <sup>4</sup>USDA ARS, Lubbock, TX.

Leftover residual biomass algae have the potential to be used as a cattle feed. The objective of this experiment was to determine the amount of algae (CP 76.1; TDN 85.7; fat 6.1; and ash 9.6 as a percent of DM) that could be included in a beef heifer diet. Crossbred beef heifers (n = 16; 95 ± 5 kg) were randomly assigned to 1 of 4 treatments, control (C; n = 4); 5% algae inclusion (A5; n = 4), 10% algae inclusion (A10; n = 4), or 20% algae inclusion (A20; n = 4). The animals were individually housed in 1.5 × 3 m pens in a climate-controlled facility maintained at 21°C. The diets were constructed using a commercially produced cattle grower ration (Purina Growena) as a base feed. Either 0, 5, 10, or 20% algae was added to the base feed and commercially pelleted to prevent feed separation. Heifers had ad libitum access to treatments and water during the 6-d experiment. In addition, each animal was fed 10 percent of their total diet in alfalfa hay. Feed intakes were calculated from weigh-backs before the addition of treatments before the a.m. and p.m. feeding. Data were analyzed by ANOVA utilizing the general linear model (GLM) procedure of SAS. Means were considered different if p-values were less than 0.05. The C group showed an average daily feed intake of 1,235 g per d. Average daily feed intakes of treatments A5, A10, A20 were 1,773.48, 1,770.68, and 1,283.88 g per d, respectively. These data suggest an inclusion of 5, 10, or 20% algae can be fed in a cattle ration. Further, the A5 and A10 treatments increased consumption ( $P < 0.05$ ) over the C and A20 treatments. Our current research in the laboratory is to determine ADG and FE utilizing a ration containing 10% algae over a 30-d feeding period.