Moscow,

in both corn and barley groups. Back fat thickness increased (P < 0.05). Marbling scores tended to decline linearly (P < 0.05) for non-pasteurized than pasteurized PS diets. Maximum ruminal pH was greater (P < 0.05) for corn compared with barley treatments at 0200 and 2100 sample times. Ruminal fluid pH levels were lower for barley than corn diets. Treatment differences were not observed for starch digestibility. Ruminal fluid pH levels were lower for barley than corn treatments. Ruminal fluid pH less than 6.0 than barley diets. Ruminal fluid ammonia concentration was greater (P < 0.05) for non-pasteurized than pasteurized PS treatments and for corn than barley treatments. Pasteurizing PS increased ruminal fermentation but was generally not interactive with GT. Also, the effect of pasteurization of PS on ruminal fermentation did not impact total tract digestion.

Key Words: Feedlot, Byproduct, Fermentation

328 Replacing corn or barley with potato processing by-product in beef finishing diets improves feed conversion efficiency and alters carcass fat distribution. J. Duyvisveld1, E. Charmley2, I. Mandell2, and J. Albu3. 1 Agricultural and Agri-Food Canada, Napan, NS, Canada. 2 University of Guelph, Guelph, ON, Canada. 3 Agriculture and Agri-Food Canada, Lacombe, AB, Canada.

The effects of replacing corn or barley in beef finishing diets with potato processing by-product (PPB) on beef cattle performance, feed conversion efficiency, carcass traits and meat quality were examined using 100 cross-bred British × exotic steers. The PPB comprised steamed potato peel and pulp, cull French fries and potato starch. Ten pens of 10 steers each were assigned to one of five concentrate-grass silage diets comprised of a dry matter (DM) basis of 7.5%, 5.0%, 4.0%, 2.0% and 1.0% concentrate. The replacement of corn or barley with PPB did not affect (P > 0.05) average daily gain (ADG; 1.4 kg/d), however no differences in final weight (604 kg, P = 0.05) or feed efficiency (0.162, 0.177, 0.176, and 0.167). Improved feedlot performance was observed at the 25 and 50% PPB levels, without significant (P > 0.05) differences between 25 and 25% PPB inclusion. These results suggest that the BP utilization in feedlot diets up to 50% will enhance production performance.

Key Words: Cattle Feeding, Distillers Grains, Maize Byproducts


Two experiments using calves fed 167 d from November to April (WINTER) and yearlings fed 126 d from May to September (SUMMER) were fed to evaluate the effects of increasing digestibility of a finishing diet by replacing dry rolled corn (DRC) with corn bran and steep, on performance and nitrogen (N) balance in open feedlots. Calves were stratified by weight and assigned randomly to one of four treatments. Dietary treatments for both trials included Control (CON), 30% Corn Bran (30/0), 30% Corn Bran/15%Steep (30/15), and 45% Corn Bran/15% Steep (45/15) with byproducts replacing DRC in the diet (DM basis). WINTER calves were implanted with Synovex-S and re-implanted with Revalor-S, and SUMMER yearlings were implanted with Revalor-S on d 21. Pens were cleaned four times in WINTER and three times during SUMMER across all treatments. WINTER cattle on byproduct diets (10.5 kg/d vs. 11.1 kg/d, P = 0.06), however no differences in final weight (604 kg, P > 0.05) but CON yearlings had lower DMI than those on the byproduct diets (10.9 kg/d vs. 11.6 kg/d, P < 0.01) and cattle on 30/0 were less efficient than other treatments (0.135 vs. 0.144, P = 0.05). WINTER percent N losses from the pen floor surface were 63.9%, 50.7%, 51.9%, and 35.8% for CON, 30/0, 30/15, and 45/15, respectively (P = 0.01). SUMMER percent N loss of total N excreted was not different (P > 0.05) across treatments (averaging 60.1%) however, more N was removed in the manure from byproduct pens than CON pens (13.3 kg N/hd vs. 10.1 kg N/hd, P = 0.01). Adding steep with bran negates any negative impacts on animal performance while still reducing N losses from feedlot pens and increasing manure N removal. Byproduct diets may prove valuable in increasing N removal in manure and lowering percent N lost from the pen floor surface.

Key Words: Maize Byproducts, Nitrogen, Nutrient Management


An experiment was conducted with finishing beef heifers (n = 80: 365 kg initial BW) to determine the optimal time and duration for supplementation of ground flaxseed (0 or 5% of DM). Treatment periods included:

Ruminant Nutrition: Beef - Feedstuffs

ABSTRACT: An experiment was performed with the objective of evaluating the performance of beef steers on diets consisting of increasing levels of corn milling by-products (BP) (50% wet corn gluten feed, 50% wet distiller's dried grains and solubles, and 50% wet distiller's dried grains). Calves (370 kg BW) were blocked (3 blocks) by weight, stratified within block and assigned to 35 pens (8 steers/pens). Pens were assigned randomly to one of seven treatments (5 pens total/treatment) in a 3 × 2 plus 1 experimental design. Treatments consisted of a control diet (0%BP, 7.5% alfalfa) and three BP levels at 25%, 50% and 75% diet DM, in combination with two levels of alfalfa. Alfalfa level was kept constant at 7.5% of DM or formulated for equal cNDF of control, i.e., 7.5, 5.0, 2.5, and 0% alfalfa for the 0, 25, 50, and 75% BP, respectively. Steers were fed for an average of 113 d and harvested at a commercial abattoir. Interactions were only observed between BP and Alfalfa level (P < 0.05) for marbling and YG. Quadratic responses (P < 0.05) to the BP level (0, 25, 50, and 75%BP, respectively) were observed for DMI (11.1, 12.0, 11.7, and 10.6 kg DM/d), ADG (1.81, 2.10, 2.07, and 1.77 kg/d), and G:F (0.162, 0.177, 0.176, and 0.167). Improved feedlot performance was observed at the 25 and 50% BP levels, without significant (P > 0.05) differences between 25 and 50% BP inclusion. These results suggest that the BP utilization in feedlot diets up to 50% will enhance production performance.

Key Words: Cattle Feeding, Distillers Grains, Maize Byproducts

The effects of replacing corn or barley in beef finishing diets with potato processing by-product (PPB) on beef cattle performance, feed conversion efficiency, carcass traits and meat quality were examined using 100 cross-bred British × exotic steers. The PPB comprised steamed potato peel and pulp, cull French fries and potato starch. Ten pens of 10 steers each were assigned to one of five concentrate-grass silage diets comprised of a dry matter (DM) basis of 80% concentrate and 20% silage. The five concentrates comprised either, all barley, all corn, equal parts barley and PPB (DM basis), equal parts corn and PPB (DM basis) or all PPB. Cattle were supplemented with 500 IU α-tocopherol. Results were analyzed using mixed models procedure, examining linear and quadratic responses when PPB was substituted in barley- or corn-based concentrates. Linear declines (P < 0.05) in final weight (604 kg, P = 0.05) observed at the 25 and 50% BP levels, without significant (P > 0.05) differences between 25 and 50% BP inclusion. These results suggest that the BP utilization in feedlot diets up to 50% will enhance production performance.

Key Words: Beef, Potato, Carcass
used to simulate the experiment. The different time trends in the periodic observations of body weight (BW) gain and intake in treatments 1 to 5 could only be explained by including an adaptation time when potato was introduced into the ration. An adaptation time proportional to the amount of potato in the finishing ration resulted in predictions that accounted for 95% and 75% of the observed variance in DM intake and FCR, respectively (table). The adaptation time in treatment 5 could be explained by removing barley with potato in the background ration, in which case simulations (for 80% potato) predict an average BW gain of 1.86 kg/d, an average intake of 10.10 kg/d, and an FCR of 5.43. It is concluded that cattle should perform 10% better on potato by-product compared to barley (treatment 1).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
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<tr>
<td>Potato/barley (%)WDM</td>
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<td>20/60</td>
<td>40/40</td>
<td>60/20</td>
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<td>10.72&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>9.98&lt;sup&gt;b&lt;/sup&gt;</td>
<td>9.13&lt;sup&gt;c&lt;/sup&gt;</td>
<td>8.16&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>10.68</td>
<td>9.80</td>
<td>9.47</td>
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<td></td>
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<tr>
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<td>1.67&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.69&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>1.88&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>observed</td>
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<td>6.99&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.37&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>5.76</td>
<td>5.44</td>
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</table>

a,b,c,d Values in same row with different letter differ (P<0.05)

**Key Words:** Cattle, Potato, Adaptation

### 334 Digestion of pasture in response to fumarate in continuous culture, E. S. Kolver<sup>1</sup>, P. W. Aspin<sup>1</sup>, G. N. Jarvis<sup>2</sup>, K. M. Elborough<sup>3</sup>, and J. R. Roche<sup>1</sup>, 1Dexcel Ltd., Hamilton, New Zealand, 2VialLactia Biosciences (NZ) Ltd., Auckland, New Zealand.

This experiment tested the hypothesis that addition of an organic acid (fumarate) would increase energy capture from a pasture diet during ruminal fermentation. Pasture was fermented with 0, 10, 20, or 30 mM of fumarate constantly infused into four dual-flow continuous culture fermenters. Samples of digesta and gas emissions were collected during the last 3 d of four, 9-day experimental periods, according to a 4 x 4 Latin square design. Digestion characteristics responded linearly (P<0.05) as fumarate increased from 0 to 30 mM. Concentrations of propionate and total volatile fatty acids increased by 14% and 19%, respectively as fumarate increased from 0 to 30 mM. Increasing fumarate reduced the ratio of acetate:propionate (2.4 v.s. 1.5) and reduced (P=0.057) methane production by 38%. These results were consistent with fumarate acting as an electron-accepting intermediary in the succinate-propionate pathway. Although 30 mM fumarate increased ruminal pH by 0.16 units compared to 0 mM fumarate (pH 6.23), the digestibility of neutral detergent fibre and acid detergent fibre was not changed. Concentration of lactate was low (0.12±0.03 mM) and was not affected by fumarate supplementation. Fumarate did not influence nitrogen digestion, but true dry matter and organic matter digestibilities were reduced by 3.9 and 3.2 percentage units, respectively at 30 mM fumarate. The increased concentration of propionate appears to be a direct response to additional substrate (fumarate), rather than by an indirect improvement in lactate utilisation or fibre digestibility. The addition of fumarate increased energy capture from a pasture diet by improving the supply of glucogenic compounds and reducing losses to methane emissions.

**Key Words:** Fumarate, Pasture, Methane

### 335 Effect of gossypol from cottonseed meal consumption on performance of fallow does (Dama dama), S. Mapel<sup>*</sup>, D. Neundorff, A. Lewis, and R. Randel, Texas A&M University, Texas Agricultural Experiment Station, Overton, TX.

The objectives of this study were to determine the effects of gossypol ingestion on reproductive function and productivity of female fallow deer (Dama dama) by measuring endocrine function, pregnancy rates, and BW of does and fawns. A group of multiparous fallow does were randomly allocated by BW into three treatments and placed on separate 0.809 ha Coastal Bermuda grass pastures. Two bucks, fitted with marking harnesses in harem houses with each doe group for the duration of the experiment. The treatments varied the amount of free gossypol (FG) in the diet. Animals were fed daily from 6/16/03 until 11/20/03.
The soybean mean group (SBMG; n = 17) was supplemented daily with 362 g of soybean meal (SBM)/animal. The low cottonseed mean group (CSML; n = 17) was supplemented with a mixture including 181 g of SBM and 227 g of cottonseed meal (CSM; 0.09 % FG). The high cottonseed mean group (CSMH; n = 16) was supplemented with 454 g CSM/animal. The daily intake of FG/animal for SBM, CSM, and CSMH was 0.0, 0.20, and 0.41 g, respectively. Beginning 8/14/03, BW, BCS, and serum blood samples were collected weekly, until 11/20/03. Ultrasonography, for pregnancy detection, was performed for all does on 11/20/03 and 12/15/03. The SBMG (-49.83 ±0.48 g/animal/d) lost less (P < 0.01) BW than CSML (-73.84±0.48 g/animal/d) or CSMH (-77.01±0.48 g/animal/d). Average daily BW loss did not differ (P > 0.1) between CSML and CSMH. Body condition score (5.36 ±0.09), pregnancy rates (100%), and time between weaning and conception did not differ (P > 0.1) among treatments. Doe serum progesterone concentrations were reduced (P < 0.05) in CSMH relative to SBMG and CSM. Among lactating does, BW and BCS at weaning was correlated (P < 0.1, R= -0.50 and P < 0.05, R= -0.41, respectively) with time between weaning and conception. Despite reductions in BW gains and serum progesterone concentrations, consumption of CSM (8.1 mg FG/kg BW; 0.41 g FG/animal/d) did not affect reproductive performance of fallow deer.


Soyhulls (SH) have been used at high levels in goat diets, but feeding method has not been studied. Twenty-four wethers, at least 75% Boer (21 kg), were allotted to 4 treatments (trt). All trt used orchardgrass hay (10.5% CP and 65.9% NDF). The low cottonseed meal group (SBMG; n = 17) was supplemented daily with 362 g of soybean meal (SBM)/animal. The high cottonseed meal group (CSMH; n = 17) was supplemented with a mixture including 181 g of soybean meal (SBM) and 227 g of cottonseed meal (CSM; 0.09 % FG). The high cottonseed meal group (CSMH; n = 17) was supplemented with a mixture including 181 g of soybean meal (SBM) and 227 g of cottonseed meal (CSM; 0.09 % FG). Food intake, milk yield, and classification of dressing % for all trt to calculate ADG. The study showed that all conc trt outperformed hay, that HFSH was similar to HFSH, and that there was little difference between HFSH and FCSH. Therefore, SH are a viable feed for finishing goats, and can be fed free-choice.

337 Effects of parity and levels of protein on production response and n-balance in holsteins. S. A. Fis* and M. A. Wattiaux, University of Wisconsin-Madison.

Eight Holstein cows (4 primiparous and 4 multiparous) were used in a replicated 4x4 Latin square to determine milk production response and N balance when diets had no excess of RUP or RDP (C), 10% RUP excess (U), 10% excess RDP (D), or 10% excess of both RUP and RDP (UD) according to NRC 2001. Solvent soybean meal and soyPLUSTM made up 6.6 and 5.1 and 7.5, 11.8 and 1.2, or 11.3 and 4.1% for the C, U, D, and UD diets, respectively. Diets were fed as a TMR with 25% alfalfa silage, 25% corn silage (DM basis) and corn grain as the primary source of dietary starch. During each 21 day period, milk yield and DMI were recorded daily, and in the last 3 days of each period fecal and urinary N (UN) excretion were determined from total collection. Dietary CP averaged 17, 18, 17.6, and 18.7% for the C, U, D, and UD diets, respectively. DMI, milk and protein yield were lower in primiparous than in multiparous cows (P < 0.05). N intake (NI) was 555 and 782 g/d for primiparous and multiparous cows, respectively (P < 0.01). Total milk N (TMN g/d), fecal N and UN were lower for primiparous than for multiparous cows (P < 0.01), but N balance did not differ with parity (P = 0.2). Highest DMI and NI were in diets with excess RUP (see Table). Milk yield was lower on diets with excess RDP (D and UD) (P < 0.05). Fecal N, UN, and N balance (data not shown) were higher in diets with excess RUP. N balance was positive for all treatments. Through the trial little change in BW was observed. Results indicated that greater efficiency of N utilization on farm could be obtained by balancing rations for first and later lactation cows separately.

Ruminant Nutrition: Dairy - Protein & Amino Acids

338 Site of digestion in dairy cows fed different sources and amounts of crude protein. I. R. Ipharraguerre1, J. H. Clark1, and D. E. Freeman*, 1Department of Animal Sciences, University of Illinois, Urbana, 2Department of Veterinary Clinical Medicine, University of Illinois, Urbana.

Six multiparous Holstein cows cannulated in the rumen and duodenum that averaged 70 DIM were used in a 6x6 Latin square design with a 2x3 factorial arrangement of treatments. Two sources of CP (soybean meal (SBM) and a mixture of SBM and a commercial blend of high rumen-undergradable (RUP) CP sources) and three contents of dietary CP (about 14, 16, and 18%) were combined into six dietary treatments. Each source of CP supplied about 50% of the CP mixture used to formulate the high RUP diets. On DM basis, diets contained 25% corn silage, 20% alfalfa silage, 10% cottonseed, 26.7 to 37% corn grain, and 4 to 13.5% CP supplement. Diets were fed twice daily for ad libitum intake. Intakes of DM, OM, and NDF, and OM truly digested in the rumen were unaffected by treatments (P > 0.05; mean = 23.2, 21.7, 6.8, and 8.9 kg/d, respectively). As dietary CP increased from 14 to 18%, starch intake (8.0, 7.1, and 6.7 kg/d) and apparent ruminal (3.4, 2.8,