

Ruminant Nutrition: Fats and Carbohydrates - Beef, Sheep, Misc. Ruminants

TH209 Effect of physical particle size on ruminal and post-ruminal disappearance of nutrients of a mixed concentrate in Holstein steers. H. H. Jahani-Azizabadi¹, M. Danesh Mesgaran^{*1}, and A. Rahmatimanesh², ¹*Ferdowsi University of Mashhad, Mashhad, Iran*, ²*Heram Talae Shargh Feed Mill Company, Nishabour, Iran*.

In situ ruminal and post-ruminal disappearance [dry matter (DM), crude protein (CP) and ether extract (EE)] of a mixed concentrate prepared as fine mesh (fm), fine pellets (fp) and coarse pellets (cp) were studied. All pellets were provided in a condition of 70°C with pressure of 3 bars in 7 seconds. Concentrate was composed of cereal grain, soybean meal, canola meal, fish meal, urea, wheat bran, beet pulp, bagasse, salt, sodium bicarbonate, mineral and vitamin premix, anionic salt, molasses, sugar, protected fatty acid and Mg oxide (318, 60, 150, 15, 3.6, 250, 33, 40, 6.7, 8.6, 8, 15, 55, 30, 5 and 2.1 g/kg DM, respectively). Four Holstein steers (430±50 kg, BW) fitted with ruminal fistulae and T-shaped intestinal cannulae were used. Steers fed (DM basis) 2.5 kg of alfalfa hay, 2.1 kg of corn silage, 1.5 kg of straw and 2.5 kg of concentrate (170 g CP/kg of DM). Approximately 5 g of sample (DM) was placed in polyester bag (12×19 cm, pore size of 48 µm, n=8), then incubated in the rumen for 12 h. After removal from the rumen, bags were washed and dried. Then, 1 g DM of un-ruminal disappeared sample was weighed into a mobile bag (3×6 cm, pore size of 48 µm, n=8) and inserted in small intestine, then removed from the voided feces and rinsed in cold tap water. DM, EE and CP of intact and incubated samples were determined. Data were analyzed using completely randomized design. Ruminal DM, CP and EE disappearance of fm was significantly (P< 0.01) lower than fp and cp. Ruminal DM, CP and EE disappearance of fp was significantly (P< 0.01) higher than cp (0.71, 0.61 and 0.65 vs. 0.67, 0.58 and 0.59, respectively). Post-ruminal DM, CP and EE disappearance of fm concentrate (0.45, 0.50 and 0.80, respectively) was significantly (P< 0.01) higher compared with fp (0.35, 0.38 and 0.68, respectively) and cp (0.39, 0.38 and 0.57, respectively). Results of the present study indicated that the physical particle size of a mixed concentrate might impact on ruminal and post-ruminal disappearance of DM, CP and EE.

Key Words: Physical Processing, Disappearance, Mobile Nylon Bag

TH210 Comparative effects of whole, reconstituted- rolled, reconstituted-whole, dry-rolled and ground sorghum grain on growth and carcass characteristics in lambs. P. Orozco, R. Lazcano, and L. Corona*, *Universidad Nacional Autónoma de México. Facultad de Medicina Veterinaria y Zootecnia. Departamento de Nutrición Animal y Bioquímica, Cd. Universitaria, D.F., México, 04510*.

A growth trial was conducted to simultaneously evaluate five methods of sorghum processing for sheep. Experimental diets contained 73% sorghum grain. Sorghum processing treatments were as follows: 1) whole sorghum (WS), 2) reconstituted-rolled sorghum (RRS), 3) reconstituted-whole sorghum (RWS), 4) dry-rolled sorghum (DRS) and 5) ground sorghum (GS). RRS and RWS were reconstituted to 30% moisture and ensiled for 30d. Treatments effects on performance were evaluated in a 45-d finishing trial involving 20 Pelibuey ram lambs (33 kg±4.7) housed in individual pens. The experimental design was completely randomized

and data were analyzed using PROC GLM (SAS) with initial BW as a covariable. Lambs fed WS had lower (190 vs. 246g; P< 0.05) ADG, DMI (1.19 vs. 1.33kg; P< 0.05), gain: feed ratio (160 vs. 190g; P< 0.10), hot carcass weight (21.2 vs. 22.7kg; P< 0.05), dressing percentage (49.8 vs. 52.8%; P< 0.01), leg weight (5.6 vs. 5.0 kg; P< 0.10), chest weight (1.3 vs. 1.5kg; P< 0.10) and greater loin weight (2.76 vs. 2.21kg; P< 0.05) than sheep fed RWS. No differences (P> 0.05) between treatments were observed in initial weight, back fat thickness, KPF, LM area and shear force. Animals fed RWS had greater (1.2 vs. 1.1kg; P< 0.05) DMI; hot carcass weight (22.7 vs. 21.5kg, P< 0.05) and leg weight (5.6 vs. 4.8kg, P< 0.001) than lambs fed RRS. Lambs fed WS had lower (P< 0.05) dressing percentage (49.8 vs. 51.5%) and loin weight (2.4 vs. 2.8kg) than animals fed processed sorghum treatments. It is concluded that RWS enhances the growth performance and carcass characteristics in feedlot lambs compared to WS.

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Key Words: Sheep, Growth, Sorghum Processing

TH211 Effects of non-fiber carbohydrates supplementation on some blood metabolites of Holstein steers. F. Rezaii, M. Danesh Mesgaran, A. Heravi Mousavi*, and M. Nasiri, *Ferdowsi University of Mashhad, Mashhad, Iran*.

The aim of this study was to evaluate the effect of diets containing different non-fiber carbohydrates (sucrose or starch) on plasma glucose, urea nitrogen (PUN) and insulin in Holstein steers. Four fistulated Holstein steers (BW=280 ± 15 kg) were assigned to a 4 × 4 Latin Square with 21d periods; 17 days of diet for adjustment and 4 days of sample collection. A basal diet was formulated to be contained of alfalfa hay, barley grain, soybean meal and sugar beet pulp (400, 290, 190 and 50 g/kg, respectively). Starch (St) or sucrose (Su) or a 1:1 mixture of starch and sucrose (St+Su) was added to the basal diet at the rate of 70 g/kg DM. Diets were offered as 2-2.5 times of maintenance requirements (7 kg DM/d). Animals were fed twice daily at 0830 and 1630. Blood samples were collected before (0) and 2, 4, and 6 h after the morning feeding in tube containing heparin and immediately were centrifuged at 3000 rpm for 15 minute. The plasma was analyzed for glucose and PUN using commercial kits in the 0, 2, 4 and 6 h samples. The plasma samples were also analyzed for insulin in the 0 and 4 h samples. The data were analyzed using the MIXED procedure of SAS (2001) for a Latin Square design. The model contained the effects of period, cow, and treatment. Plasma glucose significantly decreased after supplementation diet with the non-fiber carbohydrates (p=0.043; 86, 70, 78 and 76 ± 3.7 mg/dL for control, Su, St and St+Su, respectively). The non-fiber carbohydrate supplementation decreased PUN significantly in compare with the control (p<0.01; 19, 15, 14, 13 ± 0.85 mg/dL for control, Su, St and St+Su, respectively). Plasma concentrations of insulin were similar among the diets (p=0.3). The result of this study demonstrated that sucrose and starch supplementations had significant impact on plasma glucose and PUN.

Key Words: Dairy Cow, Non-Fiber Carbohydrate, Sucrose and Starch

TH212 Ruminal and hindgut *in vitro* fermentation and methane production in concentrate-fed lambs. M. J. Ranilla*, M. L. Tejido, S. Ramos, C. Saro, M. E. Martínez, and M. D. Carro, *Universidad de León, León, Spain.*

The objective of the experiment was to study the *in vitro* fermentation characteristics in the rumen and hindgut of growing lambs fed a concentrate diet. Ruminal and caecal contents were obtained from fifteen concentrate-fed lambs (25 ± 0.4 kg body weight), diluted with buffer solution, and used to inoculate batch cultures containing cellulose or starch as substrates. Cultures were incubated at 39°C for 4 h before measuring the production of volatile fatty acids (VFA), gas and methane. There were substrate \times inocula interactions ($P=0.03$ to <0.001) for all measured variables, except for methane production ($P=0.38$). When starch was incubated with ruminal fluid, total VFA production was higher ($P<0.001$) than that with caecal contents (2883 vs 1860 μmol , respectively), and lower ($P<0.001$) proportions of acetate and butyrate, and greater ($P<0.001$) of propionate were observed. With cellulose as substrate, both total VFA production and acetate/propionate ratio were higher ($P<0.01$) for caecal inoculum than for ruminal fluid (730 vs 328 μmol and 3.76 vs 2.05, respectively). Molar proportions of the main VFA followed the same trend than with starch. For both substrates, gas production was greater ($P<0.001$) in cultures inoculated with ruminal fluid compared to those inoculated with caecal content (2.21 vs 1.13 μmol). Methane production tended ($P=0.09$) to be lower for ruminal inoculum compared to caecal (192 vs 226 μmol , mean values for both substrates), and was greater ($P<0.001$) with starch than with cellulose (360 vs 57.8 μmol). These results were probably due to both the high-concentrate diet fed to lambs which could have negatively affected the growth of ruminal cellulolytic microbes, and the short incubation time, since cellulose degradation rate is lower than that of starch. Methane/VFA ratios were lower ($P=0.03$) for rumen than for caecum (0.116 vs 0.157 mol/mol, mean values for both substrates). The calculated hydrogen recoveries for caecum were lower ($P<0.001$) than those for rumen (0.85 and 0.62, respectively), which would indicate that there are alternative hydrogen sinks in the caecum not appearing in the stoichiometric equation used for calculations.

Key Words: Rumen, Hindgut, Fermentation

TH213 Effect of *Bacillus cereus* var. *toyoi* supplementation on performance, metabolism, and histological morphology of the digestive tract in young Holstein bulls fed a high-concentrate diet. S. Martí¹, A. Bach^{1,2}, and M. Devant^{*1}, ¹*Animal Nutrition, Management, and Welfare Group, IRTA-Unitat de Remugants, Barcelona, Spain,* ²*ICREA, Barcelona, Spain.*

Thirty-two Holstein bulls (initial BW of 383 ± 26.5 kg) were distributed by BW in 8 pens randomly assigned to control (CTR) or *Bacillus cereus* var. *toyoi* ($0.2 \cdot 10^9$ CFU BT per kg concentrate, Toyocerin[®], Rubinum, S.A., Spain, BT) treatments. Animal BW and concentrate and straw consumptions, both offered *ad libitum*, were recorded every 4 wk. At 0, 50, and 91 d of the study at 0800 and at 1500 during four consecutive days (16 animals per day) rumenocenteses were performed and rumen pH was measured immediately. On the same days, blood samples were obtained to determine glucose, insulin, cortisol, lipopolysaccharide binding protein (LBP), and alpha1-acid glycoprotein (AGP) concentrations

analyses. Bulls were slaughtered at day 98 of the study, and rumen, jejunum, and cecum content samples were immediately collected to measure pH, and to determine N-NH₃, and VFA concentrations, and BT counts. Tissue samples from these sections of the GIT (gastrointestinal tract) were collected for the histological analyses. Hot carcass weight was recorded and carcass was graded according to the UE classification system. Treatment did not affect performance, feed consumption, feed efficiency, rumen pH, or serum glucose, insulin, cortisol, LBP, and AGP concentrations. Carcass conformation ($P=0.02$) and fatness ($P=0.14$) improved in BT bulls in contrast to CTR bulls. Jejunum pH tended ($P=0.08$) to be greater in BT bulls (6.84) than CTR bulls (6.61). Rumen molar proportion of butyrate, jejunum villus height and crypt depth were greater ($P=0.02$, 0.01, 0.13, respectively) in BT than in CTR bulls. Although no changes were observed in metabolic hormones, BT supplementation improved carcass conformation and fatness. These improvements might have been related to changes in the postruminal GIT but more research is needed to further elucidate the repercussions of BT supplementation in young Holstein bulls.

Key Words: Beef, Direct-Fed Microbials, Digestive Tract Histology

TH214 Blood cell profiles and plasma concentrations of glucose and cortisol of Nellore steers and bulls selected for low and high residual feed intake before and following a mild stressor. R. C. Gomes^{*1}, M. A. Ballou², R. F. Siqueira¹, T. R. Stella¹, J. A. Negrão¹, R. D. Sainz³, and P. R. Leme¹, ¹*University of São Paulo, Pirassununga, Brazil,* ²*Texas Tech University, Lubbock,* ³*University of California, Davis.*

The objectives were to determine whether Nellore cattle stratified into low and high residual feed intake (RFI) influenced the profiles of red and white blood cells and plasma concentrations of glucose and cortisol before and following a 24 h feed and water deprivation. Twenty-month old Nellore steers ($n=72$, 313 kg initial BW) and bulls ($n=48$, 413 kg initial BW) were fed a finishing ration for 74 days. Cattle were weighed every 21 d, and the lowest and highest RFI steers ($n=7$) and bulls ($n=10$) were stratified. Following stratification, cattle were submitted to 24 h of food and water deprivation. Blood was sampled prior to and following the withdrawal period. Hematological analyses included total and differential white blood cell counts and red blood cell count and morphology. Plasma was analyzed for glucose and cortisol concentrations. Low RFI steers had lower serum cortisol concentrations than high RFI steers (19.4 vs. 21.1 ng/mL; $P<0.04$). The 24 h withdrawal of feed and water did not alter serum cortisol concentrations. Variation in RFI did not influence either plasma glucose concentration or blood cell profiles. There was an interaction between castration and stress on plasma glucose concentrations ($P<0.03$). Glucose concentrations in bulls decreased from 114 to 97 mg/dL before and following deprivation, respectively, whereas it remained unchanged in steers. An interaction was evident between castration and stress on the neutrophil to lymphocyte ratio ($P<0.05$). In bulls, the neutrophil to lymphocyte ratio increased from 0.39 to 0.57 before and following the mild stress, respectively; whereas it was not altered in steers. A 24 h feed and water deprivation was a mild stressor in Nellore bulls only. Low RFI steers had lower cortisol concentrations; suggesting a link between RFI and hypothalamic-pituitary axis.

Key Words: Blood Parameters, *Bos indicus*, Feed Efficiency

TH215 Nutritional assessment of banana (*Musa paradisiaca*) leaves and pseudostems for ruminants. E. González-García^{*2}, O. Cáceres¹, H. Archimède², J. Arece¹, Héctor Santana¹, and Ramón Delgado¹, ¹Estación Experimental de Pastos y Forrajes 'Indio Hatuey', Matanzas, Cuba, ²INRA UR143 Unité de Recherches Zootechniques (URZ), Centre INRA-Antilles-Guyane, Domain Duclos, 97170 Petit Bourg, Guadeloupe (French West Indies).

Banana entire plant is, in practice, one of the most important feed resources available for sustainable animal feeding systems in tropics. However, few data are available about the potential use that ruminants can make from its byproducts. This experiment was conducted in order to determine average chemical composition and to assess the nutritive value of banana leaves and pseudostems for ruminant nutrition. Fresh material was daily obtained and transported from a local banana plantation (nearly allocated to the experimental farm), manually chopped (3-4 cm piece size) and individually distributed into two equilibrated meals: 0800 and 1630. The trial lasted 21 d (14 d adaptation, 7 d data collection). Six adult castrated Pelibuey wethers (BW=33±1.9 kg) were used, randomly housed in individual metabolism crates and the INRA French system of *ad libitum* (10% of refusal from previous day) feed supply and total feces collection was implemented. The DM (20.0 and 6.5%) and CP (142 and 25 g/ kg DM) contents were considered acceptable and low for leaves and stems, respectively. The CF was relatively high (> 21%) in both plant fractions. It was noteworthy the high (2.5 mcals/kg DM) ME of pseudostems; however, its low DM, CP and PDIMN affected voluntary intake, hence indicating that high DM (i.e. rice straw) and CP (i.e. forage legumes) feedstuffs are recommended as accompanying components in the diet. Future research opportunities exist for the optimum use of these highly available feed resources, focusing on basic strategic concepts like level of incorporation, productive purpose (milk?, meat?), physiological stage, among others.

Table 1. Nutritive value of banana

Item	DM, %	CP, g/ kg DM	CF, g/ kg DM	ME, mcal/ kg DM	PDIMN, g/ g DM	PDIME, g/ kg DM	Ca, g/ kg DM	P, g/ kg DM
Leaves	20.0	142	231	2.19	85.8	77.7	14.3	1.7
Pseudostems	6.5	25	205	2.50	11.5	42.2	10.4	2.4

PDIMN, microbial protein to be synthesized from degraded dietary N when energy is not limiting; PDIME, microbial protein synthesized from rumen fermented OM when degraded N is not limiting

Key Words: Banana Plant, Ruminant, Nutritive Value

TH216 The effect of replacing corn with glycerol on rumen fermentation and fiber digestibility. A. A. AbuGhazaleh¹, S. Abo El-Nor², and R. Babu^{*1}, ¹Southern Illinois University, Carbondale, ²Egyptian National Research Center, Cairo, Egypt.

The objective of this study was to evaluate the effect of substituting corn with glycerol on rumen fermentation and feed digestibility under in vitro conditions using continuous fermenters. Four fermenters were used in a 4 × 4 Latin Square design with four 10 d consecutive periods. Treatment diets (60:40 forage to concentrate) were fed at 45 g/d dry matter (DM) in three equal portions. The forage consisted of alfalfa pellets. The grain mix contained corn, SBM, soy hulls, minerals and vitamins. Glycerol replaced corn in the grain mix at 0% (T1; control), 15% (T2), 30% (T3) and 45% (T4). 25% of the overflow was collected

from each fermenter on days 8, 9, and 10 of each period, composited into one sample, freeze dried, and then analyzed for chemical composition. On day 10 of each period, rumen samples were collected from each fermenter at 3 and 6 hr after the morning feeding and analyzed for volatile fatty acid (VFA). Rumen acetate (43.44, 39.50, 37.83 and 33.86 mole/100 mole for T1 to T4, respectively) decreased ($P < 0.10$) while rumen butyrate (21.11, 24.96, 26.01 and 26.96 mole/100 mole for T1 to T4, respectively) increased ($P < 0.10$) with glycerol diets when compared with control. Acetate to propionate ratios (1.67, 1.60, 1.40 and 1.22) decreased ($P < 0.10$) only with T3 and T4 when compared with control. Rumen propionate, total VFA, and pH were not affected ($P > 0.10$) by treatment diets. NDF (38.63, 38.86, 33.41 and 31.88 % for T1 to T4, respectively) and ADF (29.50, 29.81, 24.61 and 25.05 % for T1 to T4, respectively) digestibility were lower ($P < 0.10$) with T3 and T4 when compared with control. In conclusion, glycerol could be used to replace corn in ruminant animals' diet at 15% without adversely affecting fiber digestibility. Substituting glycerol at 30 or 45% adversely affected rumen fiber digestion negatively impacting acetate production.

Key Words: Glycerol, VFA, Digestibility

TH217 Effects of replacing barley with corn grain in finishing diets on blood and rumen metabolites of Holstein male calves. F. Fatehi, K. Reza-Yazdi, M. Dehghan-Banadaky^{*}, M. Moradi-Shahrabak, and H. Bahrami, *Tehran University, Karaj, Tehran, Iran.*

Twenty five Holstein Male calves (body weight: 276±79 kg) were used to determine the effects of five different ratios of barley to corn grain (100:0, 25:75, 50:50, 75:25, 0:100) in finishing diets on blood metabolites and rumen parameters for 110 days. Calves were allotted by weight to 5 groups and used in a completely randomized design. Blood and rumen liquor were sampled every 30 days. There were no differences among concentration of blood Beta hydroxyl butyrate (BHBA), cholesterol, total protein, Ca, P and AST of calves. But calves fed diets with ratio of 0:100 and 25:75 (high corn) had significantly higher concentration of blood glucose and insulin and lower blood urea nitrogen (BUN) than other diets. Calves fed diets with ratio of 75:25 and 100:0 (high barley) had more blood concentration of non esterified fatty acids (NEFA) than other calves ($P < 0.05$). There were no differences among calves in rumen ammonia nitrogen concentration, but calves fed the diet with a ratio of 100:0 had lower rumen pH compared with the other calves ($P < 0.05$). Varying the ratio of barley and corn can impact blood and rumen metabolites in calves.

Key Words: Barley, Corn, Calves

TH218 Nutritional and growth patterns of Nellore bulls, steers and heifers, fed diets containing two concentrate allowance levels. P. V. R. Paulino^{*1}, S. de C. Valadares Filho¹, M. A. Fonseca¹, M. I. Marcondes¹, E. Detmann¹, N. K. de P. Souza¹, and R. D. Sainz¹, ¹Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil, ²University of California, Davis.

The objective in this work was to assess the effects of gender and concentrate allowance level (0.6 and 1.2% of body weight, BW) on performance, intake, digestibility and body and carcass composition of Nellore cattle. Thirty five animals (12 bulls, 11 steers and 12 heif-

ers) from a same contemporary group were used, being individually fed during 112 days and slaughtered at the end of the trial. The diets had 12% CP, and were corn silage based. The bulls were more efficient and had heavier ($P<0.05$) BW, empty body weight (EBW) and carcass weight, as a result of their increased rate of growth in comparison with the heifers ($P<0.05$). Dry matter and nutrients intakes were superior in the heifers ($P<0.05$) when compared with the bulls, whereas the steers had intermediate values. The digestibilities of all the nutrients, except EE, were not affected by gender ($P>0.05$). Only DM and OM digestibilities were affected by concentrate allowance levels, being greater ($P<0.05$) for the diet in which the concentrate allowance was 1.2% of the BW. Bull's carcasses were heavier and leaner ($P<0.05$) than the heifer's, with steer carcasses obtaining intermediate values. The subcutaneous depot of fat in the heifers was more pronounced than that of the males ($P<0.05$). Visceral and subcutaneous fat in the EBW (%) were greater for the heifers ($P<0.05$), although the rates of fat deposition in the different body depots were not influenced by gender ($P>0.05$). Concentrate allowance level did not affect ($P>0.05$) carcass traits and body and carcass composition of the animals. Protein and ether extract contents of the EBW of the bulls were, respectively, greater and smaller ($P<0.05$), than that of the heifers, with the steers presenting intermediate values. The bulls had more pronounced accretion rates ($P<0.05$) of muscle in the carcass and protein in the EBW than the heifers and steers. The carcass yield of commercial cuts was not affected by concentrate allowance levels ($P>0.05$), but by gender ($P<0.05$). Heifers and steers had higher yields of hind quarter ($P<0.05$) than the bulls, which had fore quarters more developed.

Key Words: Beef Cattle, Performance, Digestibility

TH219 Polynomial regression between ruminal bacteria population and pH in beef steers fed high forage diets. S. J. Liu, J. Q. Wang*, D. P. Bu, S. Liang, L. liu, H. Y. Wei, L. Y. Zhou, and K. L. Liu, *Chinese Academy of Agricultural Sciences, Beijing, China.*

The objective of this study was to evaluate regressive relationship between population of ruminal *F. succinogenes*, *B. fibrisolvans*, *R. albus* bacteria and ruminal fermentation parameters including pH value and volatile fatty acids (VFA). Four steers with ruminal cannulas were fed a high forage diets (forage to concentrate ratio 65:35). Ruminal fluid was collected on d 26, 27 and 28 of experimental period, starting at 0730 pre-feeding and at 1130 and 1730 post-feeding from the anterior, dorsal, and mid-ventral region of the rumen and pooled. Subsequently, this mixture was filtered through four layers of sterile cheesecloth, and immediately stored at -70 degrees C. Residual ruminal fluid was used to determine pH at sampling. A 100 mL sample of residual ruminal fluid was analyzed for VFA. Bacteria population was determined by real-time quantity PCR method. All data were analyzed using the MIXED procedure of SAS 8.2, and regression analysis adopted the polynomial regression procedure of SAS 8.2. Significance was declared at $P < 0.05$.

Steers fed high forage diet had no significant change relative to time in rumen acetate, propionate and the ratio of acetate to propionate, while pH significantly decreased over time ($P<0.05$). Our study showed that there existed a polynomial regression between the sum of *F. succinogenes*, *B. fibrisolvans*, *R. albus* number and rumen pH ($y = 397.89421 + 124.9846x + 9.35447x^2$; $R^2=0.55$, $P<0.05$). The relationship between *F. succinogenes*, *B. fibrisolvans*, and *R. albus* population and ratio of propionate to acetate and butyrate content was not strong ($R^2=0.29$, $P>0.05$). These results indicate that pH value is a sensitive index to reflect change of ruminal bacteria population compared with VFA.

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Key Words: Ruminal Bacteria Population, Ferment Parameter, Beef Steer

TH220 Effect of substitution barley grain with dried sugar beet pulp on venous blood gas of Holstein steers. M. Mojtahedi, M. Danesh Mesgaran*, A. Heravi Moussavi, and A. Tahmasebi, *Ferdowsi University of Mashhad, Mashhad, Iran.*

The objective of the present experiment was to evaluate the effect of substitution of barley grain with dried sugar beet pulp (SBP) on venous blood gas (VBG) of Holstein steers. Four Holstein steers with initial body weight of 368 ± 8 kg fitted with ruminal fistulae were used in a 4x4 Latin square design (28 days of each period). Basal experimental diet consisted of 15% corn silage, 20% alfalfa hay, 33% barley grain, 17% soybean meal, 13.8% wheat bran, 0.5% calcium carbonate, 0.2% salt, and 0.5% mineral and vitamin premix on dry matter basis. Barley grain was substituted with SBP as 0.0%, 33%, 66% or 100% (SBP0.0, SBP33, SBP66, and SBP100, respectively). Steers were fed 9.5 kg of DM as total mixed ration twice daily at 0800 and 1600 h. At the last day of each experimental period, blood samples were taken from Jugular vein after 4 h the morning feeding. Samples were immediately analyzed using Stat Profile pHox Plus blood analyzer (Nova Biomedical, USA) for pH, CO₂ pressure (pCO₂), O₂ pressure (pO₂), oxygen saturation (O₂Ct), base excess of extracellular fluid (BE_{ecf}), base excess of blood (BE_b), bicarbonate (HCO₃⁻), total carbon dioxide (TCO₂), and total hemoglobin (Hb). Data were analyzed using the GLM procedure of SAS ($Y = \text{Mean} + \text{Treatment} + \text{Animal} + \text{Period} + \text{residual}$) and the means compared by the Duncan test ($P < 0.05$). There were no significant differences ($P > 0.05$) between treatments in any of the blood biochemical parameters studied. Means of pH, pCO₂, pO₂, O₂Ct, BE_{ecf}, BE_b, HCO₃⁻, TCO₂, and Hb were 7.335, 47.28 mmHg, 29.08 mmHg, 6.53 ml/dl, -0.56 mmol/L, 0.26 mmol/L, 25.47 mmol/L, 26.94 mmol/L, and 8.97 g/dl, respectively. Results of the present study demonstrated that partial substitution of barley grain with sugar beet pulp in Holstein steers did not significantly affect blood pH and VBG values.

Key Words: Sugar Beet Pulp, Venous Blood Gas, Steers

TH221 Ruminal, fecal and urine pH of Holstein steers fed diets containing barley grain and(or) sugar beet pulp. M. Mojtahedi, M. Danesh Mesgaran*, A. Heravi Moussavi, and A. Tahmasebi, *Ferdowsi University of Mashhad, Mashhad, Iran.*

The aim of this study was to investigate the effect of diets containing barley grain and/or dried sugar beet pulp (SBP) on ruminal, fecal and urine pH of Holstein steers. Four Holstein steers with initial body weight of 368 ± 8 kg fitted with ruminal fistulae were used in a 4x4 Latin square design (28 days of each period). Basal experimental diet consisted of 15% corn silage, 20% alfalfa hay, 33% barley grain, 17% soybean meal, 13.8% wheat bran, 0.5% calcium carbonate, 0.2% salt, and 0.5% mineral and vitamin premix on dry matter basis. Barley grain was substituted with SBP as 0%, 33%, 66% or 100% (SBP0, SBP33, SBP66, and SBP100, respectively). Steers were fed 9.5 kg of diet DM as total mixed ration twice daily at 0800 and 1600 h. At day 25 of each experimental period, rumen fluid samples were collected, by suction,

before the morning feeding and during 8 hours post feeding (every 30 minute). Fecal and urine samples were collected during the last 7 d of each period. Sample pH was immediately recorded using a portable pH meter (Metrohm 744). Data were analyzed using the GLM procedure of SAS ($Y = \text{Mean} + \text{Treatment} + \text{Animal} + \text{Period} + \text{Time} + \text{Time} \times \text{Treatment} + \text{residual}$) and the means compared by the Duncan test ($P < 0.05$). Mean rumen pH was improved by inclusion of SBP in the diets ($P < 0.05$). Rumen pH for SBP0, SBP66, SBP100, and SBP33 was 6.22, 6.35, 6.36, and 6.49, respectively (SEM= 0.02). Fecal pH of steers fed SBP66 (7.01) and SBP100 (6.93) was significantly higher than SBP0 (6.65) ($P < 0.05$). Additionally urine pH of steers fed SBP66 (8.28) and SBP33 (8.14) was markedly higher compared with those fed SBP0 (7.83) ($P < 0.05$). Results from this study suggested that the inclusion of sugar beet pulp might improve ruminal, fecal and urine pH of Holstein steers fed high level of concentrate.

Key Words: Sugar Beet Pulp, pH, Steers

TH222 Feedlot performance, carcass traits and meat tenderness of *Bos indicus* type bullocks fed high concentrate diets. T. de O. Cucki¹, M. D. B. Arrigoni¹, C. L. Martins¹, L. A. L. Chardulo¹, A. C. Silveira¹, H. N. de Oliveira¹, R. da C. Cervieri¹, D. D. Millen¹, R. D. L. Pacheco^{*1}, S. R. Baldin¹, J. P. S. T. Bastos¹, T. M. Mariani¹, L. M. N. Sarti¹, R. S. Barducci¹, T. C. B. de Silva², ¹FMVZ/UNESP, Botucatu, São Paulo, Brazil, ²Faculdade de Zootecnia/UNESP, Dracena, São Paulo, Brazil.

This study, conducted at São Paulo State University (UNESP) feedlot, Botucatu Campus, Brazil, was designed to evaluate the effect of *Bos indicus* breeds on performance, carcass traits and meat tenderness of bullocks fed high concentrate diet. It was used 96 8-mo-old bullocks (279.9±24.5 kg) of four *Bos indicus* based types (BT): 24 BNA (1/2 Brahman, 1/4 Nellore, 1/4 Angus), 24 PNA (1/2 Braunvieh, 1/4 Nellore, 1/4 Angus), 24 Brangus (5/8 Angus, 3/8 Brahman (BR)) and 24 Nellore (NE). BNA, PNA and BR were fed for 120 days, but NE was 184 days on feed. Rib eye area (REA) and back fat thickness (BFT) were taken by ultrasound. Meat samples were harvested between 12th and 13th ribs for shear force (SF), miofibrillar fragmentation index (MFI) and total lipids (TLIP) analysis. PNA and BR presented greater ($P < 0.05$) average daily gain in kilos (ADG) than BNA and NE (PNA=1.47, BR=1.52, BNA=1.28, NE=1.11). PNA, BR and BNA presented better ($P < 0.01$) feed conversion than NE (PNA=5.54, BR=5.35, BNA=5.43, NE=6.71). PNA and BR had greater ($P < 0.05$) dry matter intake (DMI) in kilos than BNA, but NE did not differ ($P > 0.05$) between BT (PNA=8.11, BR=8.14, BNA=6.98, NE=7.46). When analyzed as percentage of BW, PNA, BR and NE consumed ($P < 0.05$) more feed than BNA (PNA=2.14, BR=2.21, BNA=1.82, NE=2.15). NE presented heavier ($P < 0.05$) hot carcass weight in kilos than BR, but PNA and BNA did not differ between BT (PNA=250.04, BR=245.64, BNA=248.01, NE=252.48). No differences were observed ($P > 0.05$) for dressing percentage (PNA=53.45, BR=53.33, BNA=53.97, NE=56.11) and BFT in millimeters (PNA=5.06, BR=5.14, BNA=5.17, NE=5.05), but NE presented larger ($P < 0.05$) REA in cm² than PNA, BNA and BR (PNA=70.10, BR=72.65, BNA=69.10, NE=75.30). SF in kilograms (PNA=3.48, BR=3.15, BNA=3.75, NE=3.30), MFI (PNA=86.11, BR=78.41, BNA=69.80, NE=73.36) and TLIP in percentage (PNA=1.65, BR=1.65, BNA=1.85, NE=1.99) did not show differences ($P > 0.05$) between BT. Even presenting smaller REA, PNA and BR performed better than NE and BNA, but no effects on meat tenderness and fat deposition were observed.

Key Words: Carcass Traits, Feedlot, Performance

TH223 Frothy bloat-related shifts in the ruminal bacterial population in steers fed Bermuda grass hay and grazing wheat forage. W. E. Pinchak^{*1}, B. R. Min^{1,3}, C. Hernandez², and M. E. Hume², ¹Texas AgriLife Research, Vernon, TX, ²USDA-ARS, Southern Plains Agricultural Research Center, Food and Feed Safety Research Unit, College Station, TX, ³Ichthus Education Center, La Trinitaria, Chiapas, Mexico.

Seven strains of ruminal bacteria (*Streptococcus bovis* strain 26, *Prevotella ruminicola* strain 23, *Eubacterium ruminantium* B1C23, *Fibrobacter succinogenes* ssp. S85, *Ruminococcus flavefaciens* C94, *Selenomonas ruminantium*, and *Ruminobacter amylophilus*) were used to determine the relationships of select individual bacterial populations associated with changes in diet (Bermuda grass hay vs. wheat forage) and bloat severity on individual bacterial populations in the rumen of steers grazing wheat forage. Twelve ruminally cannulated steers grazing wheat forage for 70 day were used to evaluate the influence of bloat on the ruminal microbial biodiversity patterns. Steers were classified as non-bloat and bloat prone post-hoc after bloat was manifested and the classification applied retrospectively. The bacterial DNA density was greatest for *R. flavefaciens*, *S. bovis*, and *E. ruminantium* among tested strains when steers fed Bermuda grass hay (day 0). Steers grazed wheat forage for 50 days prior to the peak bloat period (day 50) resulted decreased density of six bacterial populations in non-bloated steers rumen fluid, but increased the bacterial density of 6 major rumen bacterial populations in bloated steers, indicating that frothy bloat may be associated with species-specific bacterial population. Steers grazed wheat forage over 70 days increased the density of *S. bovis* and *P. ruminicola* bacterial populations in non-bloated steers rumen fluid. The data collectively suggest that ruminal bacterial populations changed when steers experienced frothy bloat.

Key Words: Ruminal Bacteria, Frothy Bloat, Forages

TH224 Beef heifers performance fed with different forage sources. G. R. Siqueira^{2,1}, R. A. Reis^{*1,4}, R. P. Schocken-Iturrino^{1,4}, F. Dutra de Resende², T. T. Berchielli^{1,4}, M. de Toledo Piza Roth^{1,4}, and A. P. de Toledo Piza Roth^{1,3}, ¹São Paulo State University, Jaboticabal, São Paulo, Brazil, ²APTA Regional de Colina, Colina, São Paulo, Brazil, ³Fundaç o de Amparo Pesquisa do Estado de São Paulo, São Paulo, São Paulo, Brazil, ⁴Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brasília, Distrito Federal, Brazil.

This research aimed to evaluate the Nellore x Angus beef heifers performance fed with different forage: in nature sugar cane (*Sacharum officinarum* L)- ISC, and different silage: corn (CS), in natura sugar cane (ISCS), ISCS plus *Lactobacillus buchneri* NCIMB 40788 -LB (ISCS-LB), burned sugar cane (BSCS), and BSCS plus LB (BSCS-LB). On the CS, and sugar cane (in natura, or silage) diets it were utilized, respectively 44%, and 37% of forage. Total mixed ration content 70.0% TDN, and 13.5% protein was used on the experiment. The trial was conducted during 127 days, using 54 beef heifers 12 months old, distributed in six treatments. The data were analyzed according a randomized block design with nine replications. Burned sugar cane silage showed highest DM losses (47.3%), compared to the ISCS (33.4%). LB reduced the DM losses of the BSCS in 11 unities. The DM intake (Table 1) were highest in CS treatment (7.36a) compared to the silage ISCS (6.32 bc), ISCS-LB (6.56 bc), BSCS (6.23 c). On the other hand, the intake, expressed like % BW (Table 1), showed highest values on the CS (2.62 a), ISC (2.45 ab), and BSCS-LB (2.45 ab). The data related

to the daily weight, and feed efficiency, showed that CS (0.865 kg/day, 9.00 kg/kg WG) can be replaced by ISC (0.874 kg/day, 8.30 kg/kg WG), or sugar cane silage (0.910 kg/day, 7.80 kg/kg WG). However, burned sugar cane silage need to LB to avoid dry matter, and nutritive values losses, consequently intake reduction.

Table 1. Dry matter intake-DMI (kg/day), intake in relation to body weight (%BW), daily gain (ADG), and feed efficiency (FE- kg/kg of weight gain) of the heifers

	Forage ¹						se	P≤F
	CS	ISC	ISCS	ISCSLB	BSCS	BSCSLB		
DMI	7.36a	6.82abc	6.32bc	6.56bc	6.23c	7.04ab	0.273	*
Intake (%BW)	2.62a	2.45ab	2.24bc	2.31bc	2.20c	2.45ab	0.083	**
ADG	0.865	0.874	0.866	0.907	0.895	0.974	0.048	0.70
FE	9.00	8.30	8.05	7.90	7.80	7.48	0.425	0.26

I. CS: corn silage, sugar cane (ISC), ISC silage (ISCS), ISCS + L. bucheneri-LB (ISCS-LB), Burned sugar silage (BSCS), BSCS-LB

Key Words: Additive, *Lactobacillus buchneri*, Sugar Cane

TH225 Effects of hay restriction with additional co-product supplementation on cow and calf performance and hay disappearance during a winter feeding program. A. Brauch*, J. Sexton, B. Wiegand, M. Kerley, D. Wilson, D. Mallory, H. Smith, M. Ellersieck, and J. Williams, *University of Missouri, Columbia*.

Fifty-six fall-calving Angus and Angus-Simmental cows (initial BW 525.1 ± 9.4 kg) with calves were used to determine the effects of limiting time of access to round bales of hay on cow and calf performance and hay disappearance. Average quality hay (8.1% CP; 55.7% TDN) was provided either ad libitum (24-h/d access) or was restricted to 8 h/d. Cows provided with ad libitum access to hay were supplemented with 1.8 kg•hd⁻¹•d⁻¹ of dried distillers' grains with solubles (DDGS) for early lactation and 1.5 kg•hd⁻¹•d⁻¹ of DDGS for mid lactation. Cows provided with restricted access to hay were supplemented with the same amount of DDGS plus 2.7 kg•hd⁻¹•d⁻¹ and 2.3 kg•hd⁻¹•d⁻¹ of soy hull pellets for early and mid lactation, respectively. Cows were assigned to one of eight 0.8-hectare paddocks of grazed tall fescue based on BW, body condition score (BCS), days postpartum (DPP), and parity. This resulted in seven cow-calf pairs per paddock and four paddocks per treatment. Adequate bunk space was provided in each paddock. Electric fencing was used to restrict access to hay from 4:00 PM until 8:00 AM the following morning. Initial results indicate that BW was not affected by treatment ($P>0.92$), nor was back fat ($P>0.14$). Cows receiving ad libitum access to hay showed a trend to maintain greater BCS ($P<0.07$) than cows with limited access. Calf BW and ADG were not affected by treatment ($P>0.18$ and $P>0.29$, respectively). Hay disappearance decreased ($P<0.0001$) when time of access was limited. These results indicate that limiting time of access to hay and providing additional co-product supplementation is an acceptable method for wintering beef cows and for extending hay reserves.

Key Words: Beef Cows, Hay Restriction, Co-Products

TH226 Effects of corn processing method on performance and carcass characteristics of finishing beef cattle fed diets containing sorghum wet distiller's grains plus solubles. J. Leibovich*, J. T. Vasconcelos, J. P. McMeniman, K. E. Hales, R. R. Reuter, R. J. Rathmann, and M. L. Galyean, *Texas Tech University, Lubbock, TX*.

One hundred and sixty crossbred steers (BW = 397.6 kg) were used in a finishing experiment to evaluate the effects of corn processing method on performance and carcass characteristics in diets containing sorghum wet distiller's grains plus solubles (SWDGS). Treatments were: (1) a dry-rolled corn (DRC)-based diet with no inclusion of SWDGS (DRC-0); (2) a DRC-based diet with inclusion of 15% (DM basis) SWDGS (DRC-15); (3) a steam-flaked corn (SFC)-based diet with 0% SWDGS (SFC-0); and (4) a SFC-based diet with 15% SWDGS (SFC-15). All diets were formulated to contain 14.5% CP and equal concentrations of fat. No significant interactions ($P \geq 0.20$) were noted for performance and carcass characteristics, except for marbling score and % of carcasses grading Choice or greater. The ADG by steers fed the DRC-based diets did not differ ($P = 0.72$) from that of steers fed SFC-based diets, but DMI was greater with DRC-based diets, resulting in lower ($P < 0.01$) G:F with DRC-based diets. Steers fed SFC-based diets had greater fat thickness at the 12th rib ($P = 0.03$), greater yield grade ($P = 0.02$), and a smaller LM area ($P = 0.08$) than steers fed the DRC-based diets. Inclusion of 15% SWDGS resulted in lower ADG ($P < 0.01$) and G:F ($P < 0.01$) compared with diets that did not contain SWDGS. In addition, steers fed SWDGS had lower HCW ($P = 0.01$) and dressing percent ($P = 0.03$) than those fed 0% SWDGS. Marbling score was less ($P < 0.06$) for cattle fed the SFC-0 diets than for those fed the DRC-0 and SFC-15 diets. Percentage of steers that graded Choice or greater was less ($P = 0.06$) for SFC-0 than for DRC-0. Results suggest that the response to 15% (DM basis) SWDGS in finishing diets was not affected by corn processing method. The inclusion of 15% SWDGS decreased G:F to approximately the same extent as replacing SFC with DRC.

Key Words: Beef Cattle, Distiller's Grain, Grain Processing

TH227 Feeding behavior of feedlot cattle from different breed types fed high concentrate diets with different NDF levels. L. M. N. Sarti^{1,3}, M. D. B. Arrigoni¹, C. L. Martins¹, D. D. Millen¹, R. D. L. Pacheco^{*1}, S. A. Matsuhara¹, M. Parrili¹, M. V. Fossa¹, J. P. S. T. Bastos¹, T. M. Mariani¹, R. S. Barducci¹, T. C. B. da Silva², L. F. S. Niero¹, S. R. Baldin¹, H. N. de Oliveira¹, ¹FMVZ/UNESP, Botucatu, São Paulo, Brazil, ²Faculdade de Zootecnia/UNESP, Dracena, São Paulo, Brazil, ³Apoio FAPESP.

The objective was to evaluate the feeding behavior of feedlot cattle from different breed types (BT) fed high concentrate diets with different NDF levels. The experiment was conducted at the experimental feedlot of the Veterinary Medicine and Animal Science College, São Paulo State University, Botucatu campus (UNESP), Brazil. Twelve bullocks, weaned at 8 months of age (258.4±32.7 kg) were randomly assigned according to BT: 4 Nellore (NE), 4 Three-way-cross (1/2 Braunvieh, 1/4 Angus, 1/4 NE (TC)) and 4 Canchim (5/8 Charolais, 1/4 NE (CC)) evaluated in four different diets (DD) containing different levels of concentrate and NDF (Concentrate (%) = 58 (DD1), 73 (DD2), 82 (DD3) and 85 (DD4); NDF (%) = 38.1 (DD1), 30.9 (DD2), 27.7

(DD3) and 23.0 (DD4); respectively) constituting a split plot design. Visual appraisal was used each 5 minutes during 24 hours to collect feeding behavior data as follows: eating time (ET), ruminating time (RT) and idle time (IT) expressed in minutes. ET decreased ($P < 0.05$) in DD4 when compared to the others diets evaluated (DD1=202.08, DD2=207.50, DD3=181.25, DD4=135.00). BT effect was found, where TC presented ($P < 0.05$) shorter ET (151.87) than NE (198.44) and CC (194.06). There was not interaction between BT and DD for ET. RT decreased ($P < 0.05$) in DD4 when compared to the others diets evaluated (DD1=454.58, DD2=415.42, DD3=385.83, DD4=310.42). There was not a BT effect ($P > 0.05$), but an interaction was found ($P < 0.05$) between BT and DD for RT, where a linear decrease was presented for CC (DD1=438.75, DD2=432.50, DD3=410.00, DD4=321.25) and TC (DD1=505.00, DD2=446.25, DD3=378.75, DD4=263.75). There were not DD and BT effects for IT, but an interaction was found ($P < 0.05$), where TC, CC and NE presented longer IT in DD4 (TC – DD1=740.00, DD2=811.25, DD3=880.00, DD4=1022.50; CC – DD1=788.75, DD2=756.25, DD3=788.75, DD4=957.50; NE – DD1=742.50, DD2=831.25, DD3=895.00, DD4=943.75). Bullocks fed high concentrate diets presented shorter ET and RT and longer IT as levels of NDF in diet decreased. TC showed shorter ET than CC and NE during the study, but no differences in RT and IT were found.

Key Words: Behavior, NDF

TH228 Dietary inclusion of crude glycerol changes beef steer growth performance and intramuscular fat deposition. B. A. Verse-
mann*, B. R. Wiegand, M. S. Kerley, J. H. Porter, K. S. Roberts, and
H. L. Evans, *University of Missouri, Columbia*.

The objective of this study was to assess the optimum and maximum levels of crude glycerol for inclusion in beef cattle feedlot diets. Crude glycerol sourced from a biodiesel production facility was included at graded levels in feedlot diets of crossbred steers ($n=72$). Steers (225kg) were randomly assigned in pens of 6 steers each to one of four experimental diets. Diets were formulated to include 0, 5, 10, or 20% glycerol. Glycerol replaced corn at 0, 10, 20 or 40%. Each diet combination was replicated three times. Body weights were recorded at the start, finish, and on 21d intervals throughout the experiment. Calves were fed once daily following a clean-bunk protocol. Pen was the experimental unit. Growth performance data including ADG, feed intake, and feed efficiency were recorded. Steers were humanely slaughtered after reaching an average live weight of 537 ± 12 kg and an average 12th rib fat depth (as determined by ultrasound) of 1.18 ± 0.13 cm. Carcass data was collected and yield and quality grades were determined. Data analysis resulted in a quadratic effect for ADG with 1.34, 1.39, 1.43, and 1.20 kg (SEM = 0.059) for 0, 5, 10, and 20% glycerol, respectively. Feed intake was not significantly affected across the treatment groups. However, in assessing contrasts for gain to feed, significance ($P < 0.02$) was observed between 10% glycerol and control with 0.15 and 0.16 (SEM=0.005), respectively. Furthermore, feed efficiency tended to improve ($P < 0.08$) when glycerol and control diets were compared (0.150 and 0.163, respectively). Efficiency also tended ($P < 0.06$) to follow a quadratic response with 0.15, 0.16, 0.17, and 0.16 for 0, 5, 10, and 20% glycerol, respectively. Intramuscular fat as evaluated by marbling score was different ($P = 0.04$) and measured 522, 503, 562, and 458 (SEM = 27.4) for 0, 5, 10, and 20% glycerol diets, respectively. No other carcass characteristics differed among treatment groups. Feeding glycerol to

beef finishing steers seems to be optimized at 10% dietary inclusion when considering the combination of feed efficiency improvement and intramuscular fat deposition.

Key Words: Glycerol, Beef Cattle, Feed Efficiency

TH229 Supplementation programs for wheat straw-based wintering cow programs. K. M. Wood*, I. B. Mandell, and K. C. Swanson, *University of Guelph, Guelph, ON, Canada*.

Fifty-three individually-fed, multiparous crossbred beef cows were used to investigate feeding of free-choice haylage or use of supplemental haylage, soybean meal, or dried corn distiller's grains plus solubles on performance of dry pregnant cows fed wheat straw-based diets. Cows were randomly assigned to 1 of 5 dietary treatments: free choice haylage ($n=7$; hayFC), haylage offered at 1% of bodyweight (BW) plus free choice access to straw ($n=12$; haycon), haylage offered at 0.5% BW plus free choice access to straw ($n=11$; hayneg), haylage offered at 0.5% BW plus soybean meal and free choice access to straw ($n=12$; SBM), haylage offered at 0.5% BW plus corn dried distiller's grains and free choice access to straw ($n=11$; DDGS). The supplement in SBM and DDGS treatments was included to make the non-straw component isonitrogenous to the non-straw component of haycon. Cows were fed for 16 weeks leading up to parturition. Data were analyzed using Proc mixed in SAS and treatments compared using a Tukey-Kramer test. Parity and pen were included as covariates in the model. There were no significant differences ($P > 0.05$) between treatment groups for changes in backfat, intramuscular fat, plasma urea nitrogen, and glucose between week 0 and week 16. Cows on hayneg had lower ($P < 0.05$) average daily gain (ADG) than all other treatment groups. Cows fed haycon also had lower ($P < 0.05$) ADG than DDGS and hayFC. Change in body condition score was greater in hayFC than hayneg ($P=0.036$). Cows on hayFC had a lower ($P < 0.05$) total dry matter intake than other treatments. Straw intake was significantly ($P < 0.05$) lower for haycon compared to other treatments, and also was lower ($P < 0.05$) for hayneg than SBM. This data indicates that feeding wheat straw-based diets supplemented with haylage, SBM, or DDGS may be an acceptable alternative to minimize winter feed costs without negatively affecting cow performance.

Key Words: Winter Feeding, Beef Cows, Straw

TH230 Effect of n-3 PUFA supplementation on embryo recovery rate, quality and gene expression in beef heifers. S. Childs^{1,2}, F. Carter², C. O. Lynch^{1,2}, J. M. Sreenan¹, P. Lonergan², A. A. Hennessy³, and D. A. Kenny², ¹Teagasc Production Research Centre, Athenry, Co. Galway, Ireland, ²University College Dublin, Belfield, Dublin, Ireland, ³Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork, Ireland.

The objective was to examine the effect of dietary n-3 polyunsaturated fatty acids (PUFA) on embryo development and gene expression in cattle. Heifers ($n=36$) were individually fed barley straw and concentrate containing a partially rumen-protected source of either (i) palmitic acid (CON), or (ii) n-3 PUFA (n-3 PUFA; 140g of EPA and DHA combined). Diets were isolipid and isonitrogenous and fed for 50 days. Superovulation was induced using FSH, embryos were recovered on

day 7 post AI (day 50) and graded according to IETS guidelines. Grade 1 morula and blastocysts were snap frozen in liquid N₂ and stored for gene expression analysis. Plasma and uterine flushings were collected for fatty acid analysis. Fatty acid methyl esters were separated by gas chromatography. Gene expression was assessed by Q-RT-PCR and quantified using the comparative Ct method for six genes involved in embryo development and/or lipid metabolism: BAX, LIF, Cx43, E-CAD, PPAR- α and PPAR- δ . Data were analysed using the MIXED and GENMOD procedures of SAS. Fold Δ values in gene expression were analyzed using the student's t-test. Dietary n-3 PUFA increased ($P < 0.001$) plasma concentrations of EPA and DHA. Similarly, dietary n-3 PUFA increased EPA ($P < 0.001$) and reduced arachidonic acid ($P < 0.05$) concentration in uterine fluid. The number of degenerate embryo recovered ($P < 0.05$) was lower on n-3 PUFA but diet did not affect embryo recovery or embryo quality ($P > 0.05$). Moreover, there was no effect of diet ($P > 0.05$) on expression of any of the genes analysed. Increased uterine n-3 PUFA and reduced arachidonic acid may lead to a more luteotrophic uterine environment; however, with the exception of a reduction in degenerate embryo numbers, there was no further evidence of an effect on embryo quality or gene expression. Results suggest that any effect of dietary n-3 PUFA on cattle fertility is not mediated through a direct effect on the embryo *per se*.

Key Words: n-3 PUFA, Embryo Quality, Gene Expression

TH231 Qualitative aspects of the carcass and meat of Nellore cattle fed diet with different levels of fat. J. Duarte Messana^{*1}, T. T. Berchielli¹, R. Carrilho Canesin¹, A. Ferreira Ribeiro¹, P. Braga Arcuri², and P. Moura Dian¹, ¹Faculdade de Ciências Agrárias e Veterinárias / UNESP- Campus Jaboticabal, Jaboticabal, São Paulo, Brazil, ²CNPGL/ Embrapa, Juiz de Fora, Minas Gerais, Brazil.

With the objective to evaluate the carcass and the meat qualitative characteristics of Nellore steer, fed diet with different levels of fat, eighteen males were used, castrated, with average weight 320 kg in the completely randomized design. The animals were fed on feedlot during 84 days with diets with different levels of fat (3%, 5% and 7%). The steers were slaughtered weighting 480 kg. After 24 hours chilling the carcass dressing percentage (CDP), rib eye area (REA) and fat thickness (FT) were determined. Two samples of Longissimus dorsi this muscle were collected, of which analyzed for shear force (SF), total cooking loss (TCL), water holding capacity (WHC) determination and sensory evaluation. The results showed that, there were not significant differences ($P > 0.05$) for CDP, REA, FT, SF, TCL WHC. However the treatment with higher levels of fat (7%) showed higher meat tenderness, measured by the taste panel (7.51 vs. 6.64 points) as compared to treatment with 3% of fat, and of better flavor were observed in the steer meat which received diet with 5% of fat. There were differences significant, in the accept global of meat, of animals feeding with 3% of fat as compared to received diets with 5% and 7% of fat. The results show that higher tenderness, flavor and overall palatability meat can be function of higher levels fat of diet.

Table 1. Means value and coefficients of variance (CV) of CDP, RA, SFT, SF, WHC, TCL, F, T, AGM

	Treatment			CV
	3%	5%	7%	
CDP	53.2 ^a	53.2 ^a	52.6 ^a	2.5
RA	66.5 ^a	71.5 ^a	67.5 ^a	10.1
SFT	7.0 ^a	7.1 ^a	7.3 ^a	19.1
SF	4.0 ^a	4.1 ^a	4.1 ^a	19.8
WHC	74.4 ^a	72.4 ^a	73.7 ^a	4.8
TCL	30.5 ^a	30.7 ^a	29.7 ^a	11.0
F	6.51 ^a	7.48 ^b	7.2 ^{ab}	17.8
T	6.6 ^a	7.2 ^{ab}	7.5 ^b	18.7
AGW	6.4 ^a	7.4 ^b	7.3 ^b	19.9

Mean, within a row, followed by different letters are different ($P < 0.05$) by test Tukey. 3%, 5% and 7% = levels of fat of diet

Key Words: Meat, Fat, *Bos indicus*

TH232 Effects of glycerin supplementation on performance and meat quality of young Holstein bulls fed high-concentrate diets. N. Mach^{*1}, A. Bach^{1,2}, and M. Devant¹, ¹Animal Nutrition, Management, and Welfare Group, IRTA-Unitat de Remugants, Barcelona, Spain, ²ICREA, Barcelona, Spain.

Forty-eight bulls (335 \pm 29 kg initial BW) were randomly assigned to 4 glycerin levels (0, 4, 8, and 12% of concentrate DM) with the objective of evaluating the effects of glycerin on performance, ruminal fermentation, metabolism, and carcass and meat quality in young Holstein bulls fed high-concentrate diets. Concentrates were isonitrogenous and formulated to be isocaloric (assuming a glycerin ME content of 3.38 Mcal/kg of DM). Concentrate and straw were fed ad libitum. Animal BW and feed consumption were recorded monthly. Additionally, rumen and blood samples were collected every month. Bulls were slaughtered after 91 d of study (464 \pm 40 kg final BW). A rumen mucosa was excised, and HCW, carcass backfat, and conformation were recorded. The area, Warner-Bratzler Shear Force, and i.m. fat content of LM were determined. Glycerin level did not affect daily concentrate intake (7.1 \pm 0.5 kg/d DM), straw intake (1.37 \pm 0.3 kg/d DM), total DMI (8.3 \pm 0.4 kg/d DM), ADG (1.35 \pm 0.4 kg/d), or feed efficiency (0.17 \pm 0.06). Similarly, rumen molar proportions of propionic, acetic and butyric acids, rumen liquid osmolarity, and the papillae characteristics were unaffected by treatment. However, a lesser rumen pH ($P < 0.05$), and a greater rumen VFA concentration ($P = 0.09$), plasma insulin concentration ($P < 0.05$), and insulin to glucose ratio ($P < 0.05$) were observed in bulls fed 8% glycerin concentrate level compared with those receiving the 0, 4 and 12% levels. No changes were observed in carcass and meat quality. The ME content of glycerin can be assumed to be 3.38 Mcal/kg of DM in young Holstein bulls fed high-concentrate diets. In addition, glycerin supplementation to levels close to 10% of total DMI do not incur in detrimental effects on performance, ruminal fermentation, metabolism, and carcass and meat quality parameters.

Key Words: Beef, Glycerin, Rumen