

Ruminant Nutrition: General II

T316 Investigation on the nutritive value of *Vernonia amygdalina* leaves (bitter leaves) for ruminant animals. A. H. Ekeocha,*
University of Ibadan, Ibadan, Oyo, Nigeria.

An experiment was conducted to determine the proximate composition of *Vernonia amygdalina* (Va). Proximate composition of Va was determined according to AOAC (1990). The DM content of Va was high (88.7%) due to the air drying process the leaves were subjected before milling. The crude protein (CP) was 19.7% and this is commensurable when compared with tropical grass species which seldom exceed a CP level of 10%. It compared favorably with that of cassava leaf meal (16.7%), Sunflower leaf meal (16.6%) far exceeds the minimum protein requirement (10–12%), for ruminants. This value is not far from the CP levels of *Leuceana* sp. (22.2%) and *Gliricidia* sp. (22.5%). The crude fiber (CF) level of 15.7% for Va is low compared with that of tropical grass species, which may be as high as 45–50% at more matured stages of growth. It is comparable to the CF level of *Chromolaena odorata* leaf meal (16.0%), Cassava leaf meal (15.6%), deep litter manure (16.6%) and guava leaf (16.1%) but lower than the CF leaf of *Tithonia diversifolia* (21.8%). The ether extract content was low (5.6%). This value was lower than the value of 8.1% reported for *Chromolaena odorata* leaf but greater than the value of 2.8% reported for *Tithonia diversifolia* leaf. The total ash content 13.9% was high and this was comparable to the ash content of *Tithonia diversifolia* (14.7%) but greater than the value of 8.3% reported for *Acacia albida* used as a browse plant for sheep in the semi-arid region of Nigeria and greater than the value of 11.0% reported for *Leucaena* sp. to feed Yankassa sheep and 11.5% reported for *Chromolaena odorata* leaf meal but commensurable with the value reported for cassava leaves which has an ash content of 10.1%. The gross energy (GE) value was 2720.0kcal/kg. This is comparable with the GE value of Groundnut cake (2600kcal/kg). The nitrogen free extract level of 33.9% for Va is low compared with that of *Tithonia diversifolia* leaf (44.4%) used to feed West African Dwarf sheep. On average the chemical composition of Va appeared to be suitable as a protein concentrate for ruminants, a suitable replacement for *Gliricidia* and *Leuceana* sp.

Key Words: nutritive value, ruminant animals, *Vernonia amygdalina* leaves

T317 Screening of dairy cows for ketosis by routine analysis of β -hydroxybutyrate in DHI test milk samples. D. E. Santschi* and D. M. Lefebvre, *Valacta, Ste-Anne-de-Bellevue, Quebec, Canada.*

Fourier transform infrared analysis (FTIR) was used to determine β -hydroxybutyrate (BHB) concentration in DHI test milk samples, as a fast and inexpensive method to measure herd level subclinical ketosis incidence. Based on a previously published trial comparing blood and milk BHB concentrations, threshold levels were established as follows: cows with milk BHB concentrations ≥ 0.20 mM were declared ketotic (POS); cows with milk BHB concentrations below 0.15 mM were declared non-ketotic (NEG); and cows with intermediate BHB concentrations were classified as potentially ketotic (SUSPECT). Routine testing of DHI milk samples started in October 2011. Over 235,600 samples were tested, of which 23,577 were from cows between 1 and 35 DIM (7,825 primiparous and 15,752 multiparous cows). Results indicate an average subclinical ketosis incidence (POS and SUSPECT) of 27% over the first 5 weeks of lactation. Distribution of incidence in relation to week after calving was different between primiparous and multiparous cows. Highest incidence for primiparous cows (33.8%)

was in the first week postpartum but in the third week for multiparous cows (33.3%). By wk 5 after calving, incidence declined to 19.9% and 22.8% for primiparous and multiparous cows, respectively. Milk yield and composition were affected by the ketotic status of cows (see Table 1). Milk BHB concentration was inversely correlated to the protein:fat ratio ($R = -0.38$; $P = 0.0001$). Routine analysis of milk BHB among DHI test samples provides a fast and inexpensive tool for accurate screening of subclinical ketosis incidence at the herd level.

Table 1. Milk yield and composition according to ketotic status of cows between 1 and 35 DIM

	POS	SUSPECT	NEG	SE	P-value
Test-day milk yield (kg)	30.3 ^a	32.4 ^c	31.8 ^b	0.2	0.001
Fat (%)	4.92 ^c	4.48 ^b	4.05 ^a	0.01	0.001
Protein (%)	3.15 ^a	3.18 ^b	3.24 ^c	0.01	0.001
SCC (1000 cells)	365 ^b	349 ^b	243 ^a	14	0.001
Urea (mg N/dL)	8.6 ^a	9.5 ^b	10.0 ^c	0.1	0.001
Protein:Fat ratio	0.66 ^a	0.73 ^b	0.82 ^c	0.003	0.001
TCI ¹	-57 ^a	189 ^c	36 ^b	22	0.001

¹Transition cow index.

Key Words: ketosis, dairy cow, DHI

T318 Prediction of empty body weight of adult Pelibuey ewes. A. J. Chay-Canul¹, J. C. Ku-Vera*², A. J. Ayala-Burgos², J. G. Magaña-Monforte², and L. O. Tedeschi³, ¹*División Académica de Ciencias Agropecuarias, Universidad Juárez Autónoma de Tabasco, Villahermosa, Tabasco, México,* ²*Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Yucatán, Yucatán, México,* ³*Department of Animal Science, Texas A&M University, College Station.*

The aim of this work was to assess the relationships between shrunk body weight (SBW), empty BW (EBW), warm carcass weight (WCW) and cold CW (CCW), to develop prediction equations to estimate EBW in non pregnant, non lactating, adult Pelibuey ewes fed fibrous rations. Twenty four ewes with BW of 37.2 \pm 4.0 kg were randomly assigned to four groups of six animals each. Six ewes were slaughtered, for baseline measurements of carcass traits. The remaining, were randomly assigned to three groups of six animals each. Ewes were individually housed in metabolic crates, and were fed at levels of metabolizable energy intake (MEI): Low (L), Medium (M) and High (H) for 65 d, to achieve desirable changes in BW. Levels of feeding were established as proportions of ME energy requirement for maintenance (0.426 MJ/kg BW^{0.75}/d). Grass was offered in equal portions twice daily, supplying 44 g DM/kg BW^{0.75}/d for all treatments, and the concentrate at a rate of 0, 16 and 32 g DM/kg BW^{0.75}/d for treatments L, M and H, respectively. Before slaughter, SBW was taken after feed and water were withdrawn for 24 h, gastrointestinal tract (GIT) was weighed before and after emptying. EBW was computed as the difference between SBW and contents of the GIT. Data recorded at slaughter were weight of WCW, and then carcass was chilled at 6°C during 24 h. After refrigeration, the weight of CCW was recorded. Two ewes were removed of the experiment because of illness. Mean (\pm SD) values (kg) of SBW, WCW, CCW and EBW of adult Pelibuey ewes (n=22) were 35.63 \pm 5.02 kg; 14.95 \pm 2.40 kg; 14.52 \pm 2.50 kg and 27.92 \pm 4.19 kg, respectively. Relationships between BW, EBW, WCW and CCW were estimated by regression using PROC REG of SAS. Relationships between SBW, WCW and CCW between EBW, were all significant ($P < 0.0001$) and the R² ranged between 0.94 and

0.96. The regressions equation were, $EBW = -0.945 + 0.809 SBW$ ($R^2 = 0.94$; $RSD = 1.009$); $EBW = 2.219 + 1.718 WCW$ ($R^2 = 0.96$; $RSD = 0.812$) and $EBW = 4.363 + 1.622 CCW$ ($R^2 = 0.94$; $RSD = 1.070$). Data obtained, indicated that weight of GIT content was approximately 19% of SBW of adult ewes, additionally, WCW and CCW could be employed to predict reliable the EBW of adult Pelibuey ewes.

Key Words: Pelibuey ewes, empty body, carcass

T319 Increased lamb production by implanting melatonin to induce out of season breeding. T. Wuliji^{1,2}, ¹Lincoln University, Jefferson City, MO, ²University of Nevada, Reno.

A spring breeding program was evaluated at the Nevada Experiment Station (Reno) in sheep using melatonin or melatonin and progesterone implants. Yearling and mixed aged ewes (n = 120) were randomly allocated to 3 treatments, 40 animals in each group (control, C; melatonin implant, M; and melatonin and progesterone implant, MP). Melatonin implant (one dose contained 18 mg melatonin, released at 0.5 mg/d, Regulon, Schering Pty Ltd., Australia) and progesterone implants (Synchro-Mate-B, USA, gradual release 6 mg/dose) were implanted in accordance to the manufacturer's specifications. Ewes were managed under natural ambient light and grazed on small pastures for 5 weeks in isolation from rams. Pastures were mixtures of primarily fescue/clover with some winter forbs and native grasses. The M group received one melatonin pellet s.c. at the start of wk 1; the MP group received one pellet at the start of wk 1 and one progesterone implant at the start of wk 4. Ewes were bred with 3 rams randomly for 2 estrus cycles (5 weeks) beginning at wk 6 of the experiment. Data were analyzed by Chi-squared test. Blood melatonin concentration was greater ($P < 0.05$) for M than C group at weekly monitoring during melatonin implantation (Table 1). Number of ewes bred (40, 40 and 30), number of ewes lambed (34, 31 and 13), number of live births (54, 41 and 18), number of weaned lambs (42, 33 and 13), birth weight (4.44, 4.53 and 4.44 kg) and weaning weight (28.57, 29.93 and 28.12 kg) were compared for group C, M and MP, respectively. There was no difference between M and MP for any of measurements, however number of ewes bred, number of ewes lambed, number of live births, and number of weaned lambs were greater ($P < 0.05$) for M and MP compared with C group. This experiment indicated that out of season breeding using melatonin implants can increase sheep reproductive efficiency.

Table 1. Blood melatonin concentration (pg/mL) at weekly intervals

Group	Wk 1	Wk 2	Wk 3	Wk 4
C	12.6	13.1	12.6	14.2
M	83.7	78.7	89.9	109.50

Melatonin concentration was significantly ($P < 0.05$) higher for M group compared with C group at 4 intervals.

Key Words: sheep, breeding, melatonin

T320 Effects of different levels of quebracho tannins and sunflower oil on nutrients digestibility and milk fatty acids composition in dairy ewes. S. N. Al-Dobaib^{*1}, H. E. M. Kamel¹, M. A. M. M. Shehab-El-Deen¹, and M. Y. Al-Saiady², ¹Qassim University, Buriedah-51452, Saudi Arabia, ²Arabian Agricultural Services Company, Riyadh-11593, Saudi Arabia.

In a 3 × 3 factorial setup, the effects of different levels of quebracho tannins (T) and sunflower oil (F) on nutrients digestibility and fatty acids profile in milk fat of dairy ewes have been studied. The levels of both T

and F were 0, 2 and 4% of dry matter. Seventy two pregnant ewes were randomly allocated into 9 treatments. The appropriate diet was given to each treatment group from week 2 pre-partum until the end of the trial. In the digestibility trial, the effect of T was negative on the digestibility of organic matter, N, NDF ($P < 0.05$); and ADF ($P < 0.07$). However, digestibility of NDF tended to be reduced by F supplementation ($P < 0.07$). The interaction effect of F×T was negative and tended to reduce digestibility of NDF ($P < 0.06$). Retained N (RN) as a percentage of digested N (DN) enhanced with T supplementation ($P < 0.05$). The highest value of RN/DN detected in treatment group fed F 2% and T 4%. Diets supplemented with either F or T had the highest ratio of unsaturated to saturated fatty acids in milk fat ($P < 0.01$) (Table1). Moreover, the effect of F×T interaction on milk fat content of conjugated linoleic acid (CLA) was significant ($P < 0.05$) (Table1). In conclusion, diet supplementation with F 4% and T 2-4% could be used to increase unsaturated/saturated FA ratio and CLA content of ewes milk fat. The current research was funded by King Abdulaziz City for Science and Technology-Saudi Arabia (No.ARP-28-61).

Table 1. Effects of diet supplementation with quebracho tannins (T; 0, 2, and 4% of DM) and sunflower oil (F; 0, 2 and 4% of DM) on unsaturated (U) to saturated (S) fatty acids ratio and conjugated linoleic acid (CLA) in milk fat

Treatment	U/S FA	CLA (g/100 g FA)
F0-T0	0.52	0.61
F0-T2	0.80	0.69
F0-T4	1.00	0.89
F2-T0	0.72	1.76
F2-T2	0.68	2.46
F2-T4	0.71	2.43
F4-T0	0.90	2.20
F4-T2	1.10	3.15
F4-T4	1.16	2.89
SEM	0.006	0.024
<i>P</i> -values		
(F)	0.001	0.001
(T)	0.001	0.001
(F×T)	0.002	0.050

Key Words: dairy ewes, nutrition, fatty acids profile

T321 Relationships between residual feed intake and performance of Nellore bulls in feedlot. T. P. Guimarães¹, J. J. de Resende Fernandes^{*1}, K. K. G. Moreira¹, M. D. de Freitas Neto^{1,2}, V. R. M. Couto¹, B. J. M. Lemos¹, L. F. N. Souza², and É. G. Moraes², ¹Universidade Federal de Goiás, Goiânia, Goiás, Brazil, ²Nelore Qualitas, Goiânia, Goiás, Brazil.

The objective of this study was to evaluate performance and efficiency parameters of 114 Nellore bulls classified for residual feed intake (RFI). The animals, with an average of 24 mo of age, were located in individual pens and were weighed at the beginning of the trial and each 21 d, so the average daily gain (ADG) could be determined. The diet was composed by 18.0% corn silage, 5.0% sugar cane bagasse, 24.3% soybean hulls, 3.5% soybean meal, 46.8% sorghum, 0.8% urea and 1.6% mineral mix. Dry matter intake (kg/d) was determined weighing the orts every day. The animals were initially divided into 3 treatments: high RFI, medium RFI and low RFI. RFI was calculated as the difference between observed and predicted feed intake based on $LW^{0.75}$ and average daily gain (ADG). Animals were classified as high RFI (>0.66 standard deviation - less efficient, n = 38), medium RFI (± 0.66 standard deviation, n = 38), and low RFI (<0.66 standard deviation - more efficient, n = 38). The results were analyzed using the statistical software R (2011). There were differences

in initial and final LW, dry matter intake (DMI), NDF intake (NDFI) and crude protein intake (CPI) among RFI levels. The higher DMI observed in the group of low RFI animals may be due to the greater initial BW of these animals. Low RFI animals also were better in feed efficiency (FE) and feed conversion (FC). The average daily gain (ADG) did not differ among treatments. The RFI was positively correlated with FC (-0.25 ; $P < 0.05$), NDFI (0.50 ; $P < 0.05$), CPBI (0.59 ; $P < 0.05$) and negatively correlated with FE (-0.58 ; $P < 0.05$) and DMI (-0.39 ; $P < 0.05$). There were no significant correlations with initial and final BW and ADG. Significant correlations between feed conversion and initial LW (0.45 ; $P < 0.05$) and ADG (-0.65 ; $P < 0.05$) were detected. The bulls with low RFI can be up to 13.6% more effective than bulls with high RFI.

Key Words: beef cattle, efficiency parameters, selection

T322 Adipose tissue preferences for acetate in finishing steers.

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Increased marbling enhances the quality grade of beef, and as such, high starch diets are often used by feedlots to stimulate this type of fat deposition. In vitro studies suggest that adipocytes from intramuscular fat (IMF) and subcutaneous fat (SCF) may have different preferences for acetate and glucose, and thus may be vulnerable to strategic changes in feeding regimens. We hypothesized, however, that SCF, IMF, and visceral fat (VF) tissue have similar preferences for acetate in vivo. Therefore, the objective of this study was to assess acetate incorporation rates into adipose tissue from SCF, IMF, and VF depots. Four Angus \times Simmental steers had been fed corn silage based finishing ration for 120 d. They (513 ± 12 d age and 569 ± 35 kg BW) were infused continuously with [$^2\text{H}_3$] acetate (0.2 mol/h) over a 12 h period immediately before harvest. Blood samples were collected from each animal before and after infusion. Blood samples were collected at 1 h intervals from 2 animals during the first 11 h of the infusion, and every 15 min during the last 1 h of infusion. Plasma acetate enrichment levels were determined by GC-MS. Post-harvest tissue samples were collected from SCF, IMF and VF depots. Lipids were extracted from tissues and fatty acid methyl esters were prepared and analyzed in GC-MS for palmitate enrichment. Enrichment of acetate in blood and fat in each depot was used to calculate fractional synthesis rates (FSR, % per h) of palmitate in each depot. DNA concentration, palmitate enrichment in each tissue and FSR were analyzed for the fixed effect of tissue using the GLIMMIX procedure of SAS 9.2. DNA concentration in each tissue was used as a covariate for FSR analysis. A contrast statement was used to compare the VF and the average FSR of IMF and SCF. DNA concentration was different ($P = 0.003$) between IMF and VF, and SCF and VF. Enrichment of palmitate in adipose tissues was not different across depots nor was FSR, though a trend ($P = 0.09$) for a higher FSR was observed in VF as compared with IMF and SCF. These data show that differences in acetate preference by major fat depots do not exist in finishing feedlot steers.

Key Words: acetate, fat depot, fractional synthesis rate

T323 Effects of different amino acid patterns on the expression of four major milk protein genes in primary cultured bovine mammary epithelial cells. X. F. Zhang¹, M. Gao^{*2}, R. P. Du², D. X. Lu², C. J. Ao¹, K. Erdene¹, and H. Zhang¹, ¹Inner Mongolia Agricultural University, Hohhot, Inner Mongolia, China, ²Inner Mongolia Academy of Agricultural & Animal Husbandry Sciences, Hohhot, Inner Mongolia, China.

The objective of this study was to determine whether different amino acid (AA) patterns could affect milk protein gene ($\alpha\text{s}1$ -casein, $\alpha\text{s}2$ -casein,

β -casein, κ -casein) expression in bovine mammary epithelial cells. Mammary tissues were collected from a 3-yr-old lactating Chinese Holstein dairy cow (DIM 100-d), Primary mammary epithelial cells were isolated by modifications of the methods of Miranda et al., (2009). A completely random design was used with 4 AA patterns as treatments (Table 1), each treatment has 3 replicates, and all experiments were repeated 3 times. The expression of genes was determined by RT-QPCR method. Data were analyzed by the ANOVA using the GLM procedure of SAS (9.0). The concentration of total AA in each medium was 534 mg/L. The results showed that different patterns of AA can induce the expression of $\alpha\text{s}1$ -casein, β -casein and κ -casein genes differently ($n = 3$; $P < 0.05$), in contrast, the expression of $\alpha\text{s}2$ -casein gene was not significantly affected ($n = 3$; $P = 0.26$). The milk pattern, casein pattern and combination pattern of AA increased the expression of $\alpha\text{s}1$ -casein and κ -casein genes significantly ($n = 3$; $P < 0.05$) compared with blood AA pattern. The milk pattern, casein pattern and blood pattern of AA upregulate β -casein gene expression significantly ($n = 3$; $P < 0.05$) compared with combination AA pattern. The milk AA pattern might increase major milk protein genes expression, perhaps, an appropriate AA pattern will play a role in milk protein synthesis.

Table 1. Percentage of amino acids in different patterns

AA, %	Blood	Milk	Combination	Casein
Tyr	2.18	5.67	6.30	6.63
Ala	11.66	3.78	2.91	2.77
Gly	29.77	2.27	0.40	0.48
Glu	10.5	29.3	25.0	26.4
Cys	4.15	0.76	1.16	0.48
Phe	2.29	6.05	6.54	6.63
Leu	5.75	10.97	18.52	17.37
Ile	3.94	5.30	6.17	6.27
His	1.28	3.78	2.32	2.41
Lys	2.72	10.21	7.46	7.24
Met	0.80	2.27	3.65	3.74
Try	1.65	1.89	1.80	1.57
Thr	6.76	5.67	5.60	5.55
Val	8.25	6.05	6.22	6.39

Key Words: bovine mammary epithelial cells, amino acids pattern, milk protein genes expression

T324 Evaluation of equations to predict body composition in Nellore bulls.

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The equations developed by Hankins and Howe (1946), Valadares Filho et al. (2006), Marcondes et al. (2010) and Marcondes et al. (2011) were evaluate to predict the body composition from the 9-10-11th rib cut in Nellore bulls. These equations estimate the physical and the carcass chemical composition and empty body chemical composition. This experiment used a comparative slaughter technique. Thirty-seven Nellore bulls (14 mo old) with initial shrunk body weight of 259 ± 24.9 kg were used. The bulls were randomly divided into 3 groups: 5 bulls to the reference group, 4 bulls were fed at maintenance level and 28 bulls were fed ad libitum. The bulls fed ad libitum were separated into 4 groups, one of which was slaughtered every 42 d. The reference group was slaughtered at the start of the experiment. All the animals were fed with corn silage and concentrate (55:45). After slaughter, the 9-10-11th rib cut was dissected into muscle, fat and bone fractions. The remaining

carcass was similarly dissected. The others parameters evaluated were: empty body weight, dressing percentage, visceral fat percentage and organ and viscera percentage. The regression was evaluated according to the following statistical hypothesis: $H_0: \beta_0 = 0$ and $\beta_1 = 1$ and H_a : not H_0 . The equations obtained by Marcondes predicted correctly ($P > 0.05$) the carcass physical composition. However, the muscle and fat tissues were under- and overestimated ($P < 0.05$), respectively, by Hankins and Howe. The equations obtained by Marcondes predicted correctly ($P > 0.05$) the carcass and empty body chemical composition. The carcass water was underestimated ($P < 0.05$) by Hankins and Howe. The equations by Valadares Filho did not predict ($P < 0.05$) the carcass or empty body chemical composition. The carcass physical and chemical composition and empty body chemical composition can be predicted from the composition of 9-10-11th rib cut by equations obtained by Marcondes while the composition of these components cannot be predicted by Hankins and Howe in Nellore bulls.

Key Words: chemical composition, comparative slaughter, rib cut

T325 Performance of Holstein dairy cows under different feeding strategies in early lactation. M. Fajardo^{*1}, D. A. Mattiauda¹, A. Meikle², M. Carriquiry¹, J. Gil², G. Motta¹, G. Guala¹, G. Ortega¹, D. Pelaez¹, P. Sorhouet¹, F. Souza¹, and P. Chilibroste¹, ¹Facultad de Agronomía, Universidad de la República, Montevideo, Uruguay, ²Facultad de Veterinaria, Universidad de la República, Montevideo, Uruguay.

The objective of this study was to determine milk yield, body condition score and live weight changes of multiparous Holstein dairy cows ($n = 36$) subjected to contrasting feeding strategies during the first 10 weeks of lactation. A complete randomized block design was used that included initial BCS and BLW (3.2 ± 0.2 and 731 ± 73.5 kg). Three treatments were compared: TMR: 100% Total mixed ration, G1: 50% TMR + 50% pasture (one grazing session), and G2: 50% TMR + 50% pasture (2 grazing sessions). All the treatments were offered 30kg DM cow/d. TMR cows were always confined. G1 cows grazed from 0700 to 1400 staying confined with access to TMR after pm milking. G2 cows grazed exactly as G1 and had another grazing session from 1600 to 2000, staying thereafter confined with access to TMR. The TMR offered had 151 ± 2.6 g/kg DM of CP, 342 ± 5.0 g/kg DM of NDF and 187 ± 3.5 g/kg DM of ADF. Data were analyzed with a mixed model with repeated measures (GLIMMIX, SAS 9.2). TMR cows produced more milk than G1 and G2 (36.5 ± 0.3 vs. 33.0 ± 0.3 and 33.3 ± 0.4 L/d, $P < 0.05$). G1 cows had higher milk fat content than cows in TMR, but did not differ from G2 cows (3.97 vs. 3.67 and 3.87% , ± 0.08 respectively; $P < 0.05$). Fat production was not significantly different between treatments (1.3 kg/day ± 0.03). Treatments did not differ in milk protein content ($3.4 \pm 0.06\%$) but TMR cows had higher milk protein production than G2 and G1 (1.2 vs. 1.1 and 1.1 kg ± 0.03 respectively $P < 0.05$). TMR cows differed from G2 in BCS but not from G1 (2.9 , 2.7 and 2.8 ± 0.04 respectively; $P < 0.05$), and G1 tended to be different from G2 ($P < 0.13$). Treatment with one grazing session plus TMR (G1) achieved similar productive results as offering 100% TMR (TMR). On the other hand, treatment with 2 grazing sessions (G2) showed no productive advantages over G1 besides a lower BCS, probably due to the greater energy requirements for walking and/or grazing.

Key Words: autumn calving, nutrition, ruminants

T326 Effect of dietary cation-anion difference (DCAD) on beef tenderness. J. P. Schoonmaker,* K. T. Korn, K. N. Condrón, C. N. Shee, M. C. Claeys, T. D. Nennich, and R. P. Lemenager, *Purdue University, West Lafayette, IN.*

The manipulation of acid-base balance has been extensively investigated as a means of altering calcium homeostasis and managing milk fever in dairy cows. A low pre-partum dietary cation anion difference (DCAD) increases urinary Ca, blood-ionized Ca, and responsiveness to Ca-homeostatic hormones. Very little attention, however, has been focused on the possibility of using a low dietary DCAD to increase muscle Ca availability, calpain activity, and meat tenderness of beef cattle. Thus, 90 Angus \times Simmental crossbred steers were allotted by weight (590.1 ± 2.4 kg) and breed composition to 3 treatments (6 pens per treatment, 5 steers per pen) to evaluate the effects of DCAD on beef tenderness. Treatments were initiated 2 weeks before slaughter and consisted of 3 DCAD (mEq/100 g) concentrations: +16, 0, and -16. Hydrochloric acid treated soybean meal (PasturChlor, West Central, Ralston, IA) was added to diets to decrease DCAD and sodium bicarbonate was added to diets to increase DCAD. Basal diets (DM basis) were 62 to 64% corn, 6 to 9% soybean meal, and 20% corn silage and were formulated to contain similar concentrations of protein, energy and minerals, with the exception of sodium and chlorine. Performance before initiation of the study did not differ ($P > 0.22$) among treatments. Urine pH did not differ ($P > 0.57$) at the initiation of the study, but did decrease (linear and quadratic, $P < 0.02$) on d 7 (8.13, 7.69, 6.37) and d 14 (8.03, 7.66, 5.68) of the study as DCAD decreased from +16 to 0 to -16, respectively. ADG and feed efficiency responded quadratically ($P < 0.01$) to DCAD, increasing from +16 to 0 DCAD and decreasing from 0 to -16 DCAD. Hot carcass weight, dressing percent, fat thickness, longissimus muscle area, yield grade, marbling score, quality grade distribution, and 48 h muscle pH did not differ ($P > 0.16$) among treatments. In addition, DCAD did not affect ($P > 0.23$) Warner-Bratzler shear force among treatments after 7 and 21 d of aging. Although urine pH was decreased by lowering DCAD, potentially increasing calcium influx into muscle, beef tenderness was not affected.

Key Words: beef, DCAD, tenderness

T327 Performance of early lactation cows fed whole versus chopped sugarcane. J. E. P. de la Ossa^{*1,2}, R. Lana^{1,2}, and E. M. Balbino¹, ¹Universidade Federal de Viçosa, Viçosa, MG, Brazil, ²FAPEMIG, Viçosa, MG, Brazil, ³CNPq, Viçosa, MG, Brazil.

Eight crossbred Holstein-Gyr cows with 450 ± 30 kg body weight were used to evaluate the effect of whole sugar cane (WSC) compared with chopped sugar cane (CSC) on intake, milk yield and milk composition in early lactation dairy cows fed sugarcane plus 4 levels of supplement (600, 1200, 2400, and 4800 g/cow/day) containing 60% corn meal and 40% soybean meal as nitrogen source. One Latin square with 4 treatments based on level of concentrate comprised rations with WSC, and another Square comprised rations with CSC also differing in concentrates. Periods of 14 d consisted of 7 d of adaptation and 7 d of measurements. Dry matter and neutral detergent fiber (NDF) intakes decreased ($P < 0.05$) in WSC compared with CSC, with values of 25.12 kg/day versus 22.77 kg/day. Milk yield increased ($P < 0.05$) as a function of level of supplement, but not as a function of sugarcane processing. There was no significant difference ($P > 0.05$) for milk composition as a function of treatments. Therefore, sugarcane can be furnished in a whole form for dairy cattle after adaptation of ingestion, reducing production costs such as with machinery and labor, and without processing, the feed

decreases losses by fermentation and increases life time of conservation in the feed bunk.

Key Words: chopped sugar cane, whole sugar cane

T328 The relationship of feed efficiency and visceral organ size in growing lambs fed a concentrate or forage-based diet. R. A. Vraspir,* M. J. Ellison, K. M. Cammack, and A. M. Meyer, *Department of Animal Science, University of Wyoming.*

We hypothesized that a portion of individual differences observed for feed efficiency can be attributed to gastrointestinal tract (GIT) size, which would vary based on diet. Growing wethers ($n = 77$; 51.3 ± 1.2 kg BW) were fed a concentrate (CONC; 12.1% CP, 17.6% NDF, 2.98 Mcal/kg ME) or forage-based pelleted diet (FOR; 16.2% CP, 36.3% NDF, 2.31 Mcal/kg ME) for 49 d. Individual intake was measured with the GrowSafe™ System to determine residual feed intake (RFI). The 20% most (low RFI, $n = 8$) and 20% least (high RFI, $n = 8$) efficient lambs from each diet were slaughtered (66.6 ± 2.3 kg BW; $n = 32$ total), and the viscera was dissected and weighed. Data were analyzed as a 2×2 factorial with RFI class (low vs. high RFI), diet type (FOR vs. CONC), and the interaction in the model. Organ mass was not affected ($P > 0.10$) by the RFI class \times diet type interaction. Low RFI lambs tended to have greater ($P = 0.09$) pancreas and spleen mass than high RFI, although RFI class did not affect ($P > 0.15$) other organ actual (g) or proportional (g/kg BW) mass. Lambs fed FOR vs. CONC had greater ($P \leq 0.01$) actual and proportional reticulum, omasum, large intestine, and kidney mass and tended to have greater ($P \leq 0.09$) actual and proportional small intestine mass. However, CONC fed lambs had greater ($P \leq 0.05$) rumen, heart, liver, and proportional rumen mass than FOR fed lambs. All other visceral organs were unaffected ($P > 0.11$) by diet type. Proportional abomasum mass tended to be positively correlated ($P = 0.08$) with RFI, whereas pancreas and spleen mass tended to be negatively correlated ($P \leq 0.09$) with RFI. Intake was positively correlated ($P \leq 0.04$) with reticulum, omasum, abomasum, large intestine, kidney, and proportional omasum mass, and tended to be positively correlated ($P \leq 0.10$) with total GIT, small intestine, and proportional large intestine mass. Proportional spleen and heart mass tended to be negatively correlated ($P \leq 0.09$) with intake. Results of this study suggest that visceral organ size in growing lambs is more affected by diet type than individual feed efficiency.

Key Words: feed efficiency, feed intake, gastrointestinal tract

T329 Performance of Nellore young bulls grazing *Brachiaria brizantha* 'Xaraés' supplemented with different lipid sources. A. L. S. Valente,* R. A. Reis, T. T. Berchielli, T. Borgui, I. P. Carvalho de Carvalho, and L. G. Rossi, *Sao Paulo State University, Jaboticabal, Sao Paulo, Brazil.*

Dietary supplementation with different lipids source is not a common practice in livestock production in Brazil. However, this alternative may increase the energy balance of the supplementation, and improve the animal performance. So, an experiment was conducted at the forage sector of the São Paulo State University, Jaboticabal – SP, to evaluate the effects of concentrate supplementation with different lipids sources on the intake and animal performance of grazing animal during the period rainy seasons. Ninety Nellore young bulls with average BW of 347 kg were used in completely randomized design with 5 treatment, and 2 replications (paddocks) with 9 animals in each one. Three periods of 28 d were analyzed by repeated measures. The animals were housed in *Brachiaria brizantha* 'Xaraés' pasture in continuous stocking rate

grazing system and received one of the following supplements during the experimental period: ad libitum mineral (control) or 0.5 g/kg BW of concentrated supplements formulated with palm oil, linseed oil, soybean grain or Megalac E. All supplements presented the same content of crude protein, and total digestible nutrients (TDN), 260 g/kg DM, and 980 g/kg DM, respectively. The grazing animal behavior measure was taken during daytime (12 h) for 2 consecutive days. Supplements used did not affect the forage chemical composition; it was observed mean values of crude protein, neutral detergent fiber and acid detergent fiber of 89.4, 615.7, and 374.2 g/kg DM, respectively. Grazing time varied due to the supplements and periods ($P < 0.05$). Animals in the control treatment spent more time in grazing 5.7 h following for soybean grain and linseed oil treatment 4.5 h, and the animals in the palm oil treatment spent less time in grazing 3.7 h, and that Megalac E spent 4.1 h in grazing. There was effect of the treatments in the animals weight gain ($P < 0.05$). Animals of control group, and those supplemented with palm oil, soybean grain, linseed oil, and protected fat showed average daily gain of 0.724, 0.697; 0.780, 0.759, 0.864 g/day, respectively. Megalac E supplementation may improve animal performance.

Key Words: *Brachiaria*, lipid, Nellore

T330 Seminiferous tubule traits of lambs fed with cottonseed co-products (*Gossypium* spp.). T. Paim*¹, P. Viana², E. Brandão², S. Amador², T. Barbosa², C. Cardoso², A. Abdalla¹, C. McManus³, and H. Louvandini¹, ¹Center of Nuclear Energy in Agriculture, Piracicaba, SP, Brazil, ²College of Agronomy and Veterinary, University of Brasília, Brasília, DF, Brazil, ³Animal Production Department, University of Rio Grande do Sul, Porto Alegre, RS, Brazil.

This study aimed to evaluate the influence of supplementation with cottonseed co-products on testis structure of lambs. Twenty-four Santa Inês lambs (5 mo old and mean live weight 20.6 ± 1.9 kg) were used. The lambs were housed in individual pens and received 4 treatments: 20% of DMI (Dry Matter Intake) whole cottonseed, 20% of DMI cottonseed meal with low oil (MEAL), 20% of DMI cottonseed meal with high oil (CAKE) and a control without use of cottonseed. The concentrate:forage proportion in diet was 60:40. Coast Cross hay (*Cynodon dactylon*) was used as forage, and ground corn was used in the remainder of the concentrate. At the end of experimental period, the animals were slaughtered and samples of testis collected. These samples were fixed in paraffin and contrasted with hematoxylin and eosin for light microscopy analyses. Twenty-five photos of each animal testis were taken. Tubule and lumen diameters of 5 seminiferous tubules were measured in each photo. Seminiferous epithelium thickness was obtained by difference between tubule and lumen diameters. ANOVA was performed with SAS to verify the influence of independent effects (treatment, tubule by photo, animal weight at slaughter and squared animal weight at slaughter) on seminiferous tubule measurements. A factor analysis was used to verify the relation between seminiferous tubule measures, sperm concentration, animal weight at slaughter and gossypol level on diet. Animal weight at slaughter had a significant influence on all seminiferous tubule measures. The animals from the CAKE group had the lowest tubule diameter, lumen diameter and seminiferous epithelium thickness, while the animals that received MEAL had the largest tubule diameter and seminiferous epithelium thickness. The factor analysis showed that heavier animals had larger tubules measurements, as expected. The gossypol level in diet was not related to seminiferous tubule measures. Therefore, feed containing cotton co-products did not have a direct effect on seminiferous tubule measurements. Supported by CNPq and FAPESP.

Key Words: male reproduction, nutrition, testis

T331 Fatty acid profile of meat from lambs fed with cottonseed co-products. T. Paim¹, P. Viana², E. Brandão², S. Amador², T. Barbosa², C. Cardoso², B. Berencheim¹, C. McManus³, A. Abdalla¹, and H. Louvandini^{*1}, ¹Center of Nuclear Energy in Agriculture, Piracicaba, SP, Brazil, ²College of Agronomy and Veterinary, University of Brasilia, Brasilia, DF, Brazil, ³Animal Production Department, University of Rio Grande do Sul, Porto Alegre, RS, Brazil.

The amounts and type of fats in animal products is a topic of frequent public discourse. This study evaluated the changes in fatty acid profile of meat from lambs fed with cotton co-products, as well as, the impact of these diets on carcass traits. Twenty 4 lambs (5 mo old and mean live weight of 20.6 ± 1.9 kg), which received 4 diets: whole cottonseed (40% of concentrate (C)), meal cottonseed (40% of C), high oil meal cottonseed (Cake) (40% of C) and a control group without cottonseed co-products, were used. The concentrate:forage proportion in diet was 60:40. Soybean oil was added to concentrate in control, meal and cake diets, aiming to equalize the ether extract. After 90 d, the lambs were slaughtered and carcass traits were measured. Then, meat samples of Longissimus dorsi muscle at 12th rib were taken for fatty acid profile analyses. Carcass traits and fatty acid profile data were analyzed using GLM and FACTOR procedures in SAS®. The animals that received meal showed a higher hot carcass weight, carcass yield and rib eye area, being significantly greater ($P < 0.05$) than those that received whole cottonseed. This demonstrated that cottonseed meal is a good protein alternative source for lambs. The treatments not differ in fat content and proportion, nor ether extract in 12th rib. The meat from the group that did not received cotton co-products had higher n-3 fatty acid content, higher desirable fatty acids and better n-6 to n-3 ratio compared with others. The meat from animals that received whole cottonseed showed higher saturated fatty acids, related, principally, to higher palmitic acid (C16:0) and stearic acid (C18:0) levels. Animals that received meal and cake had the highest values to vaccenic acid (C18:2 t11) and conjugated linolenic acid (C18:2c9t11), demonstrating that these diets can produce a meat with high levels of CLA, which is good to human health. Therefore, aiming to reduce feed cost by using these cotton products, the recommendation is that the more processed cottonseed co-products (meal and cake) must be preferred for use in ruminant feed rather than whole cottonseed. Supported by CNPq and FAPESP.

Key Words: carcass traits, conjugated linolenic acid, muscle

T332 Inclusion of urea in spineless cactus diets for Girolando steers. R. A. S. Pessoa^{*1}, R. da Silva Lima², W. G. do Nascimento², I. Ferraz³, and P. C. Vasconcelos², ¹Universidade Federal Rural de Pernambuco, Animal Science Department, Recife, Pernambuco, Brazil, ²Universidade Federal Rural de Pernambuco, Unidade Acadêmica de Garanhuns, Garanhuns, Pernambuco, Brazil, ³Instituto Agrônomo de Pernambuco, Recife, Pernambuco, Brazil.

The objective of this study was to evaluate the effect of the substitution of cottonseed meal by urea in diets for Girolando steers (5/8 Holstein-Zebu) on the intake, apparent digestibility of nutrients, weight gain, feed conversion and efficiency of microbial protein synthesis. Eighteen animals were used with approximately 320 kg live weight and 24 mo of age, kept in feedlot system and assigned to a randomized block design, established in accordance with the weight of animals, being 3 treatments and 4 blocks. The treatments were 3 urea levels (0.0, 1.5 and 3.0%) in substitution of cottonseed meal (23.0, 11.5 and 0.0%) in diets based on spineless cactus with approximately 12.0% of crude protein and 65.0% of total digestible nutrients. The control diet was composed of 60.0% of spineless cactus, 15.0% of sorghum silage, 0.0% of urea:ammonium sulfate mixture (9:1), 23.0% of cottonseed meal and 2.0% of mineral

mixture, in dry matter basis. The experimental period lasted 84 d divided into 3 periods of 28 d. The data were submitted to ANOVA using the SAS. The intake and digestibility of dry matter were not influenced ($P > 0.05$) by the inclusion of urea in the diets (average of 7.9 kg/day and 69.0%, respectively). However, there was observed higher ($P < 0.05$) nonfibrous carbohydrate intake and neutral detergent fiber digestibility for control diet (0.0% of urea), being 2.89 kg/day and 48.0%, respectively. The feed conversion and weight gain were higher ($P < 0.05$) for the treatments with 0.0 and 1.5% of urea (average weight gain of 0.92 and 0.86 kg/day, respectively). The efficiency of microbial protein synthesis did not differ ($P > 0.05$) between treatments (average of 115.0g of microbial crude protein/kg of total digestible nutrient). The partial replacement of cottonseed meal by urea did not alter the performance parameters of Girolando steers feed diets based on spineless cactus.

Key Words: nitrogen, *Opuntia ficus indica*, performance

T333 Levels of roughage supplementation with cottonseed hull for cattle grazing during the rainy transition season: Performance.

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The objective was to evaluate levels of roughage supplementation with cotton hulls in the body weight of cattle grazing in the in the dry/rainy transition season on performance. Were used 20 Nelore steers with age and initial body weight average of 22 months and 366 kg, respectively. The experimental area consisted of four paddocks of 1.6 ha with *Brachiaria brizantha* 'Marandu' with forage mass for 1966.87 and potentially digestible dry matter of 1147.32 kg/ha. The experiment was structured in a completely randomized design in the levels of roughage supplementation with cottonseed hull as a function of body weight (BW) cattle, evaluated in relation to total weight gain and average daily gain (ADG) were: 3.6; 4.9 and 6.1 g / kg of the average body weight (BW). The roughage supplementation was given daily at 10 a.m. with the respective amounts: Cap1 - 1.5; Cap2 - 2.0 and Cap3 - 2.5 kg / animal and control animals (MM) were supplemented only with mineralized supplement (ad libitum). The performance was of 0.425 for MM and 0.438; 0.688 and 0.654 kg/animal/day for the respective levels of supplementation: 3.6; 4.9 and 6.1 g/kg of BW. There were differences ($P < 0.10$) between the levels of supplementation and the control group on average daily gain of animals, the level of 4.9 g/kg body weight, which provided better performance.

Key Words: coproducts, pasture, weight gain

T334 Blood cell and metabolic profile of Nelore bulls ranked by residual feed intake.

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The objective of this study was to evaluate the possible differences in metabolic and blood profile among the classes of RFI (residual feed intake; low, medium and high) in Nelore bulls. Therefore, 30 animals (BW = 407.71 kg ± 34.71), with average of 24 mo of age, were used, and housed in individual pens. The animals were fed the same diet

composed of 18.0% corn silage, 5.0% in natura sugarcane bagasse, 24.3% soybean hulls, 3.5% soybean meal, 46.8% sorghum, 0.8% urea and 1.6% mineral mixture. The animals were initially separated from a total of 120 in 3 treatments, high RFI (n = 10), medium RFI (n = 10) and low RFI (n = 10). RFI was calculated as the difference between observed and predicted feed intake based on LW 0.75 and average daily gain (ADG). Animals were classified as high RFI (>0.66 standard deviation - less efficient), medium RFI (± 0.66 standard deviation), and low RFI (<0.66 standard deviation - more efficient). The results were analyzed by Pearson correlation using the statistical software R (2011) and mean comparisons were carried out by Tukey test at 5% probability level. No significant correlations ($P > 0.05$) were found among RFI and the variables erythrocytes and platelets; however, there were significant correlations ($P < 0.05$) for hematocrit, hemoglobin and leukocytes (0.38, 0.36 and -0.32, respectively). Regarding the biochemical profile, positive correlation was observed among RFI and total protein (TP) and total cholesterol (0.50 and 0.29, respectively ($P < 0.05$)). The RFI was not correlated ($P > 0.05$) with the other metabolic variables aspartate transaminase (AST), alkaline phosphatase (ALT), urea, creatinine, albumin (Alb) and gamma-GT (GGT). Among the classes of RFI (low, medium and high), the amount TP was lower for the group of animals with low RFI, which suggests an increased synthesis of tissue protein as plasma proteins play a fundamental role in this synthesis; the other variables did not differ among treatments.

Key Words: beef cattle, efficiency parameters, metabolism

T335 Carcass evaluation of subjected to feed restriction. A. R. C. Lima,* M. H. M. da Rocha Fernandes, I. A. M. de Almeida Teixeira, K. T. de Resende, and R. G. Aparecido, *Sao Paulo State University, Faculty of Agriculture and Veterinary Sciences, Jaboticabal, Sao Paulo, Brazil.*

Diet significantly affects costs of goat production, then alternatives to minimize the costs have been studied to evaluate if these alternatives can influence animal responses, such as carcass traits. One of the studied alternatives to minimize meat goat production costs is the use of feed restriction, then. The aim of this study was to evaluate the effect of feed restriction on carcass traits of 18 male crossbred (3/4 Boer 1/4 Saanen) goat kids, with initial BW of 20 ± 0.24 kg. The kids were randomly allocated to 3 levels of DMI: ad libitum (0%) and restricted to 30 and 60% of the ad libitum) within 6 groups (blocks). A group was slaughtered when the ad libitum treatment kid reached 35 kg BW. The hot carcass was obtained after separation of the hands and feet in the carpal metacarpal and tarsal metatarsal joint respectively, and the removal of the kidneys, kidney fat and diaphragm. The data were analyzed in complete randomized block Feed restriction had no effect on carcass biological yield percentage and loss by cooling, however hot carcass weight (0% = 17.4 kg, 30% = 14.2 kg, 60% = 10.1 kg), cold carcass weight (0% = 16.95 kg, 30% = 13.82 kg, 60% = 9.8 kg) and ribeye area (0% = 13.56 cm³, 30% = 12.10 cm³, 60% = 9.21 cm³) decreased linearly ($P < 0.0001$) as level of feed restriction increased. Shoulder, neck and loin yields were not influenced by the level of feed restriction, on the other hand ribs yield decreased, while leg yield increased linearly with increasing level of feed restriction. It is concluded that increasing levels of feed restriction resulted in a reduction of hot and cold carcass weight, without affecting dressing percentage and cut yields, which are the main focus of the meat goat industry.

Key Words: Boer, intake level, prime cuts

T336 Carcass traits and meat quality of goats subjected to feed restriction. A. K. Almeida,* L. S. Fonseca, D. C. Soares, S. P. Silva, I. A. M. A. Teixeira, K. T. Resende, and H. Borba, *Universidade Estadual Paulista, UNESP, Jaboticabal, São Paulo, Brazil.*

The objective of this study was to evaluate the effect of feed restriction on carcass characteristics and meat quality of female, intact and castrated male goats. A total of 51 dehorned Saanen goats (18 intact males, 18 castrated males, and 15 females) were used. They were randomized allocated to one of 3 treatments (0, 25 and 50% restriction), the dry matter intake for the 0% restriction treatment animals determined the dry matter intake for the animals in the 25% and 50% restriction treatment. When the animals in the 0% restriction treatment group reached 44.1 ± 1.95 kg BW, the animals in the 25% and 50% restriction treatment groups were also slaughtered. After skinning and evisceration the hot carcass weight (HCW) was determined, the carcasses were placed in a chilled room for 24 h and chilled carcass weight (CCW) recorded. The carcasses were cut longitudinally into 2 halves and the left half was sectioned into retail cuts: neck, shoulder, brisket, 1-5 rib, 6-13 rib, chump and leg. The chump was stored for later analysis, after defrosting, the measures of pH, color ($L^* a^* b^*$), shear force and cooking losses were performed. The data were analyzed as a completely randomized blocks design in a factorial scheme. Dressing percentage was not affected by feed restriction (mean of 45.9 ± 1.98). Chilling losses (g/kg HCW) were not affected by feed restriction (mean of 34.2 ± 3.14 g/kg HCW). Females showed greater subcutaneous fat deposition (1.3 ± 0.12 mm) then intact (0.7 ± 0.13 mm; $P < 0.001$) and castrated males (0.9 ± 0.11 mm; $P = 0.01$). The retail cuts evaluated (g) were affected by feed restriction and intact males presented heavier 1-5 rib ($P = 0.01$) and neck ($P < 0.001$) than females and castrated males, as result of sexual dimorphism. Color lightness (L^*) and pH was influenced by the sex ($P = 0.03$ and $P = 0.04$, respectively). On the other hand meat redness (mean of 17.6 ± 0.38) and yellowness (mean of 6.3 ± 0.22), shear force (2.3 ± 0.08) and cooking losses (32.8 ± 1.69) were not affected by feed restriction neither sex. Despite of the changes caused by the level of restriction on goats BW, the extension of the changes did not affect goat meat quality. FAPESP process number: 2010/02482-4

Key Words: gender, kids, nutrition plan

T337 The relationship between feed efficiency and pancreatic α -amylase and trypsin activity in growing lambs. F. E. Doscher*¹, A. M. Meyer², M. J. Ellison², K. M. Cammack², and K. C. Swanson¹, ¹North Dakota State University, Fargo, ²University of Wyoming, Laramie.

The objective of this study was to examine pancreatic protein, as well as α -amylase and trypsin activities in lambs fed concentrate- or forage-based diets with differing feed efficiency as measured by using residual feed intake (RFI). Seventy-seven growing wethers (51.3 ± 1.2 kg BW) predominantly of Rambouillet, Suffolk or Hampshire breeds were fed either an ad libitum concentrate- (CONC; corn-based) or forage-based (FOR; alfalfa- based) pelleted diet for a period of 49 d. Individual feed intake was measured using the GrowSafe Feed Intake system. Residual feed intake was calculated as the actual feed intake - expected feed intake (expected feed intake calculated from regressing metabolic midweight and ADG on actual DMI). The lambs were then ranked based on their RFI and the 20% most efficient (n=8) and 20% least efficient (n=8) lambs from each diet type (forage or concentrate) were slaughtered. The pancreas was removed and weighed, and a tissue sample was taken and immediately flash-frozen on dry ice. The sample was stored at -80°C until further analysis for total protein concentration and trypsin and α -amylase activity. Data were analyzed as a completely randomized

design with a 2 × 2 factorial arrangement of treatments with RFI class, diet type, and the interaction in the model. No RFI × diet interactions ($P > 0.10$) were observed. Pancreatic weight (g) was greater ($P = 0.09$) in low RFI than high RFI lambs. Pancreatic protein (mg/g, g/pancreas, and mg/kg of BW), pancreatic α -amylase activity (U/g, KU/pancreas, and U/kg of BW), and pancreatic trypsin activity (U/kg of BW, U/pancreas, and U/kg of BW) did not differ ($P > 0.10$) between low and high RFI lambs. These results suggest that pancreatic weight may be greater in lambs with improved feed efficiency (low RFI), although α -amylase and trypsin activity are not associated with changes in feed efficiency in lambs fed concentrate- or forage-based diets.

Key Words: growing lambs, feed efficiency, pancreatic enzyme

T338 Effect of zinc concentration on performance and carcass characteristics of feedlot steers. E. Caldera^{*1}, J. J. Wagner^{1,2}, K. L. Neuhold¹, G. I. Zanton³, K. S. Sellins¹, and T. E. Engle¹, ¹Colorado State University, Fort Collins, ²Southeast Colorado Research Center, CSU, Lamar, ³Novus International Inc., St. Charles, MO.

Three-hundred sixty cross-bred steers (348.1 kg ± 28.9) were utilized to investigate the effects of Zn concentration on performance and carcass characteristics of feedlot steers. Steers were blocked by weight and randomly assigned to 1 of the 5 supplemental Zn treatments (8 pens per treatment; 9 hd per pen). Treatments consisted of: 1) Control (CON; 360 mg Zn/hd/d from ZnSO₄); 2) Methionine CON (360 mg Zn/hd/d from ZnSO₄ + MHA to equalize 2-hydroxy-4-(methylthio) butanoic acid (HMTBa) across all treatments; MHA contains 84% HMTBa and 12% Ca; 5.4 g/hd/d of HMTBa total); 3) 360 Zn (360 mg Zn/hd/d from Zn-HMTBa + MHA); 4) 720 Zn (720 mg Zn/hd/d from Zn-HMTBa + MHA); and 5) 1080 Zn (1080 mg Zn/hd/d from Zn HMTBa). All steers were fed a typical high concentrate steam-flaked corn based finishing diet twice daily. Steers were individually weighed on d -1, 0, 144, and 145 and pen weighed on d 28, 56, 84, and 111. Ractopamine HCl was fed for the final 29 d of the finishing period to all treatments. On d 145, steers were transported to a commercial abattoir for slaughter. Initial and final body weight, ADG, DMI, and feed efficiency (g/f), were similar across treatments. However, there was a trend ($P < 0.07$) for ADG to be increased when MHA® was added to the control diet when compared with 360 Zn, 720 Zn, and 1080 Zn treatments (4.01, 3.81, 3.79, and 3.93 ± 0.08, respectively). Fat thickness, longissimus dorsi area, hot carcass weight, KPH, marbling score, and dressing percentage were similar across treatments. Steers receiving 1080 Zn had a greater ($P < 0.01$) yield grade compared with steers receiving 360 Zn (2.99 vs. 2.76 ± 0.08; respectively). There was a trend ($P < 0.07$) for steers receiving MHA® to have a greater yield grade compared with controls (2.82 vs. 2.67 ± 0.08; respectively). These data indicate that under conditions of this trial, increasing Zn concentration in the diet above NRC recommendations has little impact on performance, however, may impact lipid partitioning in steers.

Key Words: feedlot performance, ractopamine HCl, zinc

T339 Effects of feeding corn- or legume/grass silage-based diets on ruminal bacteria and archaea communities. A. Lettat,* F. Hassanat, and C. Benchaar, *Agriculture and Agri-Food Canada, Dairy and Swine Research and Development Centre, Sherbrooke, QC, Canada.*

Nine lactating cows (DIM = 75 ± 19; BW = 688 ± 66 kg) were used in a triple replicated 3 × 3 Latin square (31-d periods, 14-d adaptation) to examine the effects of replacing legume/grass silage with corn silage in the TMR on bacteria and archaea communities. Cows were fed (ad

libitum) TMR (60:40, forage:concentrate ratio) with the forage portion being either legume/grass silage (0% CS), corn silage (100% CS) or a 50:50 mixture (50% CS). Total rumen content was sampled before and 4h after feeding and used for RNA extraction to target the metabolically active microbes. Changes in bacteria and archaea communities were monitored by quantitative and length heterogeneity PCR (qPCR and LHPCR) by targeting the *rrs* (bacteria and archaea) and *mcrA* (archaea) genes. To determine treatments effects, data were analyzed by the MIXED procedure of SAS with Tukey's adjustment. Significance was declared at $P \leq 0.05$. Quantitative PCR revealed that total bacteria, *Prevotella* spp. and archaea densities were greatest for 100% CS compared with 0 and 50% CS diets ($P < 0.05$), whereas the cellulolytic bacteria *F. succinogenes* and *R. albus* as well as the lactate-utilizer bacterium *M. elsdenii* populations remained similar among diets. Similarly archaea population number was greatest for 100% CS compared with 0% CS ($P < 0.05$) and 50% CS ($P < 0.1$), when the *mcrA* gene was targeted. The preliminary fingerprinting (LHPCR) results revealed that the diets changed the microbial structure. In a companion study, feeding 100% CS was associated with a decrease in enteric CH₄ emissions. This is in agreement with the increase in *Prevotella* spp. that favors propionate production which is a concurrent sink to methanogenesis. On the contrary, the increase in archaea population while CH₄ production was reduced with 100% CS clearly demonstrates that CH₄ production is not directly linked with the number of archaea (*rrs* gene) or their activity (*mcrA* gene). As a conclusion, quantification of both *rrs* and *mcrA* genes is not accurate enough to reflect changes in rumen methanogenesis. Characterization of the community structure could bring more accurate information.

Key Words: archaea, methanogenesis, rumen

T340 Biochemical blood parameters and liver enzymes of Saanen dairy goats fed with diets containing tannin and polyethylene glycol supplement. A. Rahimi¹, A. A. Naserian¹, R. Valizadeh¹, A. Tahmasbi¹, B. Saremi^{*2}, and A. R. Shahdadi³, ¹Ferdowsi University of Mashhad, Mashhad, Khorasan Razavi, Iran, ²Institute of Animal Science, Physiology & Hygiene Unit, University of Bonn, Germany, ³Agricultural Sciences & Natural Resources University of Gorgan, Gorgan, Golestan, Iran.

Consumption of feeds containing tannins might lead to lower absorption of nutrients such as glucose and amino acids into the blood. Polyethylene glycol (PEG) reacts preferentially with condensed tannins and prevents the formation of tannin-protein complexes, therefore could be increase absorption of nutrients into the blood. In this study, 9 multiparous dairy goats after the peak of lactation were used in a 3 × 3 Latin square design with 21-d periods, including 14 d of adaptation followed by 7 d of sampling. The individual animals randomly distributed into metabolic cages to evaluate the effect pistachio hull (PH, source of tannin) and PEG (source of tannin binding) on the blood biochemical parameters. Three treatments were formulated: T1) Control, without PH, T2) 30% PH (DM basis) that provided 18.1 g condense tannin per kg DM of diet and T3) 30% PH + 1% PEG (DM basis). In T2 and T3, PH was replaced with alfalfa hay. Blood samples were taken from the jugular vein before and 3 h after morning feeding. Data were analyzed as a repeated measurement design using PROC MIXED of SAS ($P < 0.05$). BUN (Blood Urinary Nitrogen) was significantly decreased at T2 and was compensated by addition of PEG in T3. Plasma concentration of triglycerides in T2 and T3 was higher than control, although significantly in T3. There were no differences between plasma concentrations of glucose, total protein, albumin, and cholesterol. Liver enzymes such as alanine aminotransferase (ALT) and aspartate aminotransferase (AST)

were stable. In conclusion, the negative effect of tannins on nitrogen metabolism can be covered by PEG supplementation.

Table 1.

Plasma metabolite	Experimental diets			SEM	P-value
	Alfalfa	30% PH	PH+PEG		
Glucose (mg/dL)	45.77	47.77	49.00	0.727	0.223
Total protein (g/dL)	8.21	7.97	8.03	0.064	0.312
BUN (%)	16.94 ^a	12.80 ^b	15.31 ^{ab}	0.491	0.014
Albumin (g/dL)	2.90	2.76	2.80	0.030	0.277
AST (U/L)	86.44	100.44	98.66	2.621	0.167
ALT (U/L)	57.66	62.05	60.50	2.284	0.599
Triglycerides (mg/dL)	1.88 ^b	2.44 ^{ab}	3.55 ^a	0.224	0.027
Cholesterol (mol/L)	2.83	2.99	3.08	0.103	0.723

^{a,b}Means within same row with different superscripts differ ($P < 0.05$).

Key Words: tannin, blood, goat

T341 Levels of concentrate for crossbred Holstein-Zebu cows under grazing. C. P. Ghedini¹, R. P. Lana¹, A. S. Oliveira², J. Perotoni⁴, D. C. Abreu^{*1}, R. L. Albino¹, J. E. P. de la Ossa¹, R. M. Paula¹, P. E. P. Barros³, and F. G. Silva¹, ¹Universidade Federal de Viçosa, Viçosa, MG, Brazil, ²Universidade Federal do Mato Grosso, Sinop, MT, Brazil, ³Universidade Federal de Lavras, Lavras, MG, Brazil, ⁴Universidade Federal de Santa Maria, Santa Maria, RS, Brazil.

This study investigated the effects of increasing levels of concentrate on milk yield and composition in lactating crossbred dairy cows. Eight crossbred Holstein-Zebu cows (second or third parity; BW = 493 ± 22kg; DIM = 110 ± 82) in pasture were distributed in 2 4x4 Latin squares, in 4 periods of 14 d (samples collected on the last 7 d of each period). All cows were fed on tropical pasture during the rainy season (*Brachiaria decumbens* with 70% of NDF and 8% of CP) as a foraging source (ad libitum) and 4 levels of concentrate (0.6, 1.2, 2.4 and 4.8 kg/day/cow) with 24% of crude protein. The results were analyzed using Minitab. None of the 4 levels of concentrate had any effect on milk production ($P > 0.05$), milk composition ($P > 0.05$), or body weight ($P > 0.05$) (Table 1). This suggests that crossbred Holstein-Zebu under grazing can meet their nutritional demand with only pasture supply and 0.6 kg/day of concentrate with 24% of crude protein in the rainy season, because higher levels of concentrate did not increase milk production, milk composition, or body weight. Supported by Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) and CNPq.

Table 1. Milk yield and milk composition as a function of increased concentrate levels for crossbred Holstein-Zebu in tropical pasture

Item	Concentrate (kg/d/cow)				Effect (P-value)		
	0.6	1.2	2.4	4.8	Linear	quadratic	SED ¹
Milk yield, kg/d	12.4	13.1	12.0	12.2	0.07	0.06	0.35
3.5% FCM yield, kg/d	15.3	14.4	13.5	14.4	0.14	0.17	0.63
Fat, %	5.2	4.1	4.6	4.3	0.07	0.07	0.30
Protein, %	3.1	3.2	3.4	3.4	0.36	0.65	0.04
Milk solids %	13.8	12.8	13.4	13.2	0.13	0.12	0.29
BW, kg	499	487	503	481	0.98	0.98	15.0

¹SED = standard error of the least squares means difference.

Key Words: crossbred milk cow, milk composition, milk yield

T342 The relationship between feed efficiency traits and fertility in young beef bulls. B. J. Awda^{*1}, S. P. Miller¹, Y. R. Montanholi¹, G. Vander Voort¹, T. Caldwell¹, M. M. Buhr², and K. C. Swanson³, ¹Department of Animal & Poultry Science, University of Guelph, Guelph, ON, Canada, ²Department of Animal and Poultry Science, College of Agriculture & Bioresources, University of Saskatchewan, Saskatoon, SK, Canada, ³Department of Animal Sciences, North Dakota State University, Fargo.

The objective of this study was to examine the relationship between feed efficiency traits and bull sperm fertility (sperm motility, viability and scrotal circumference (SC)). From a total of 328 crossbred beef bulls that were subjected to a performance test (112 d), SC was measured and semen collected from 110 bulls (average age ± SE = 417.28 ± 2.55 d). Sperm were extended, cooled, and frozen in liquid nitrogen. Two residual feed intake (RFI) measures were considered with different prediction models for dry matter intake (DMI), RFI_{Koch} included size and growth rate and RFI_{bktf} included the additional adjustment for backfat thickness (BKFT). At the end of the experiment, bulls were slaughtered and a complete carcass separation of a 21-cm rib section conducted. Data were analyzed using the CORR procedure and Tukey-Kramer multiple comparisons to test for trait effect. Body weight (BW) was positively correlated with SC ($P < 0.001$) and DMI was positively correlated ($P \leq 0.05$) with sperm viability, motility, and SC. Feed to gain ratio (F:G) was positively correlated with sperm viability, and progressive motility ($P \leq 0.01$). RFI_{Koch} was positively correlated with sperm viability ($P < 0.05$). RFI_{bktf} was positively correlated with sperm viability and motility ($P \leq 0.05$). The percentage of subcutaneous, intramuscular, and total fat relative to total rib weight were positively correlated with SC ($P < 0.01$). BKFT was positively correlated with sperm viability ($P < 0.01$). Sperm viability, motility and progressive motility of the 10 bulls with the greatest RFI_{Koch} (Hi-RFI_{Koch}) were greater than that of the 10 bulls with the lowest RFI_{Koch} (Lo-RFI_{Koch}; $P < 0.05$, 0.01, and 0.05 respectively). Sperm motility ($P < 0.01$), progressive motility and SC ($P < 0.05$) of the 10 bulls with the greatest RFI_{bktf} (Hi-RFI_{bktf}) were greater than that of the 10 bulls with the lowest RFI_{bktf} (Lo-RFI_{bktf}). F:G for Hi-RFI_{Koch} or Hi-RFI_{bktf} was greater ($P < 0.005$ and 0.05 respectively) than that of Lo-RFI_{Koch} or Lo-RFI_{bktf} groups. In summary, these data indicate that the young beef bulls in this experiment with greater efficiency (low RFI, Koch and bktf) and F:G have decreased sperm motility, viability and SC.

Key Words: beef cattle, fertility, RFI

T343 Influence of tannins extract addition on feedlot-performance of bulls fed sorghum-based diets. R. Barajas^{*1}, B. J. Cervantes², M. A. Espino^{1,3}, A. Camacho¹, M. Verdugo¹, L. R. Flores¹, S. C. Aréchiga¹, J. J. Lomeli¹, and J. A. Romo¹, ¹FMVZ-Universidad Autónoma de Sinaloa, Culiacán, Sinaloa, México, ²Ganadera Los Migueles S.A. de C.V., Culiacán, Sinaloa, México, ³Pronutrient Developers, León, Guanajuato, México.

Eighty *Bos taurus* × *Bos indicus* bulls 341 kg were used to determine the influence of tannins extract addition on feedlot-performance of bulls fed sorghum-based diets. Next day after arrival to the feedlot, bulls were weighed and blocked by initial weight, and in groups of 5 were placed in 16 ground floor pen (6 × 12 m). In agreement with a complete randomized block design, in each block, bulls were randomly assigned to one of next treatments: 1) Feeding with a finishing diet containing ground sorghum grain 61.83%, corn dry distiller grain 13.66%, peanut meal 1.77%, sugar-cane molasses 8.57%, mineral premix 2.86%, and corn straw 11.31% (Control); or 2) Diet similar to Control, added with

0.3% (dry matter basis) of a tannins extract (TE). Tannins extract was supplied as ByPRO (Pronutrient Developers; Mexico), a premix that contains 72% of a condensed (Quebracho tree) and soluble (chestnut) tannins-blend. In pens assigned to TE treatment, the corresponding amount of tannins extract was dispersed in 1 kg of ground sorghum that used as carrier and top dressed delivery in the feed-bunk. Pens in Control treatment received daily 1 kg of ground sorghum to equilibrate feeding conditions. Diet was offered ad libitum. Bulls were weighed in d 1 and 56. Day 28 blood samples were taken from jugular vein for plasma urea nitrogen (PUN) determination. Mean daily tannins extract intake was 33.6 g by bull, equivalent to 0.28% of the dietary DMI. At end of the experiment TE-fed bulls were 2.13% heavier ($P = 0.06$) than Control (452.13 vs. 461.75 kg). TE supplementation increased ($P = 0.05$) average daily gain 9.17% (1.972 vs. 2.153 kg/d). Tannin extract improved ($P = 0.02$) DMI 6% DMI (11.44 vs. 12.13 kg/d). Feed efficiency was not affected by treatments ($P = 0.30$). TE decreased ($P = 0.04$) the PUN concentration in 18% with mean values of 15.3 and 12.5 mg/dL for TE and Control bulls, respectively. Results suggest, that feeding an extract of condensed and soluble tannins in low dosage proximate to 0.3% of dietary DM, decreases PUN and increases feedlot-performance of bulls even when they are fed sorghum-based diets.

Key Words: bulls, feedlot-performance, tannins

T344 Performance of milking crossbred cows under pasture as a function of levels of concentrate in the diet. D. C. Abreu^{*1}, R. P. Lana¹, A. S. Oliveira², C. P. Ghedini¹, R. M. Paula¹, R. L. Albino¹, F. G. Silva¹, and E. M. Balbino¹, ¹Universidade Federal de Viçosa, Viçosa, MG, Brazil, ²Universidade Federal do Mato Grosso, Sinop, MT, Brazil.

The effects of 4 levels of concentrate (1.0, 1.5, 2.0 and 2.5 kg/cow/day) with 24% crude protein on performance of milking cows were evaluated. Four crossbred Holstein-Zebu cows with 453 ± 35 kg were distributed in a 4×4 Latin square in 4 14-d periods for evaluation of effects of treatments. The experiment was conducted on brachiaria grass (*Brachiaria decumbens*) pasture in the rainy season and the concentrates consisted of corn meal and soybean meal. The milk production, milk components, and body weight were not affected ($P > 0.05$) by levels of concentrate (Table 1). Cows on pasture during the rainy season and producing 11 kg of milk/day can receive 1.0 kg/day of concentrate. Supported by Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) and CNPq.

Table 1. Milk yield and milk composition as a function of increased concentrate levels in diets of crossbred Holstein-Zebu cows

Item	Concentrate (kg/d/cow)				Effect (P -value)		SEM
	1.0	1.5	2.0	2.5	Linear	Quadratic	
Milk yield, kg/d	10.6	11.1	8.7	10.7	0.33	0.31	0.3424
Milk fat 3.5%, kg/d	11.5	12.5	12.2	13.1	0.14	0.16	0.2798
Fat, %	4.04	4.11	4.74	4.45	0.32	0.37	0.1787
Protein, %	3.45	3.25	3.68	3.40	0.85	0.83	0.1453
Milk solids %	12.9	12.9	13.8	13.2	0.50	0.54	0.3615
BW, kg	458	459	446	449	0.76	0.78	2.1880

Key Words: milk composition, pasture, performance

T345 Effect of supplementation of tannin-extract in corn silage based-diets on performance of growing bulls under commercial feedlot conditions. M. A. Espino^{1,2} and R. Barajas^{*2}, ¹Pronutrient Developers, León, Guanajuato, México, ²Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Sinaloa, Culiacán, Sinaloa, México.

Three hundred and 14 *Bos indicus* × *Bos taurus* bulls $253.24 \pm SE 10.20$ kg were involved in an experiment to determine the effect of tannin-extract supplementation in corn silage based-diets on performance of growing bulls under commercial feedlot conditions. The study was conducted simultaneously in 3 feedlot yards in the State of Sinaloa in the Northwest of Mexico. In feedlot 1, 122 bulls were randomly placed in 2 ground floor pens; in feedlot 2, 120 bull-calves were allotted in 2 ground floor pens; and in feedlot 3, 72 bulls were positioned in 2 ground floor pens, in the 3 feedlots pens size was proximately 25×30 m, diets contained 40% of corn-silage, and dry-ground sorghum grain. Each feedlot integrated by 2 pens constituted a block, and the pen was considered as the experimental unit. In a completely randomized block design, inner each block, pens were randomly assigned to receive one of 2 dietary treatments: 1) Regular growing diets of the feedlot yard (Control); or 2) Diet similar to control supplemented with a tannin-extract (TE). Tannin-extract was supplied as ByPRO (Pronutrient Developers; Mexico), a premix that contains 72% of a condensed (Quebracho tree) and soluble (Chesnut) tannin-blend, and was included in proportion equivalent of 0.3% of dietary DM. The animals were weighed at the beginning (d 1) and at re-implant time, that mean was 57 d (47, 61 and 63 d for feedlot 1, 2 and 3, respectively). Results of ANOVA indicated that final weight was not affected by treatments ($P = 0.14$), period weight gain was 5.4% higher ($P = 0.05$) in Bulls that received tannin with mean values of 93.36 vs. 98.37 kg for Control and TE, respectively. Average daily gain was increased ($P < 0.01$) 4.1% by tannin-extract supplementation, with means of 1.659 vs. 1.727 kg/d for Control and TE, respectively. Dry matter intake and feed efficiency were not altered by treatments ($P > 0.15$). It is concluded that tannin-extract supplementation improves feedlot performance of growing bulls fed corn silage-sorghum grain based-diets, under commercial feedlot conditions.

Key Words: growing cattle, performance, tannin

T346 Effect of pasture type and dietary lipid supplementation on animal performance, carcass composition and fatty acid composition of muscle and adipose tissue in lamb. N. S. Brooks^{*1}, J. L. Duynisveld³, D. M. W. Barrett¹, Y. A. Papadopoulos^{1,4}, J. Wort², A. H. Fredeen¹, and K. E. Glover¹, ¹Nova Scotia Agricultural College, Truro, NS, Canada, ²AgraPoint, Truro, NS, Canada, ³Agriculture and Agri-Food Canada, Nappan, NS, Canada, ⁴Agriculture and Agri-Food Canada, Truro, NS, Canada.

Altering the fatty acid content of meat and other agricultural animal products has potential to benefit human health and create niche marketing opportunities for producers. The objective of this study was to determine the effects of red clover (RC) and tall fescue (TF) pasture types as well as different dietary lipid supplements on animal performance, carcass composition, and fatty acid content of muscle and subcutaneous adipose tissue (subQ) of the market lamb. Thirty-two Suffolk-cross ram lambs were randomly assigned to 1 of 2 pasture types for approximately 12 wk. Lambs were removed from pasture, transitioned to hay and grain and gradually introduced to 1 of 4 lipid supplements [soybean oil (SBO), 50% *c9t11* and *t10c12* conjugated linoleic acid (CLA) isomers + 50% SBO (C+S), enriched fish oil (FO) or control (no supplement)], receiving

50mL/d for 2 wk before slaughter. Lambs assigned to RC had 38.9% ($P \leq 0.01$) greater weight gains on pasture, 8.52% ($P \leq 0.08$) higher carcass weights and 20.7% ($P \leq 0.04$) higher fat depth measurements at the twelfth rib, when compared with lambs on TF. Lipid treatment had significant effects on carcass weight (SBO: 20.8, C+S: 21.6, FO: 19.6 and control: 21.7kg; $P \leq 0.001$). Fat depth at the twelfth rib was significantly affected by pasture type (RC: 11.9, TF: 9.42mm; $P \leq 0.05$) and lipid supplement (SBO: 10.5, C+S: 11.8, FO: 9.5 and control: 10.8mm; $P \leq 0.1$). In comparison to TF, RC tended to increase the fat content of the *longissimus dorsi* muscle from 11.3 to 12.3% ($P \leq 0.1$) while lipid treatment had no effect. There were significant effects of pasture on EPA (eicosapentaenoic acid) content of muscle (RC: 2.14%, TF: 1.61%; $P \leq 0.06$) and EPA and DHA (docosahexaenoic acid) content of subQ (RC: 0.08%, TF: 0.16%; $P \leq 0.03$ and RC: 0.10%, TF: 0.24%; $P \leq 0.05$, respectively), 5 wk post grazing. With no supplemental lipid, the EPA and DHA content of muscle and subQ tended to be greater in lambs that had grazed RC. Lipid supplementation significantly affected the EPA and DHA content of both tissues and the CLA content of subQ.

Key Words: lamb, pasture species, polyunsaturated fatty acids

T347 The effect of diet on feed intake traits and relationships with carcass traits in sheep. M. J. Ellison,* R. R. Cockrum, K. W. Christensen, R. A. Vraspir, L. Speiser, W. J. Means, A. M. Meyer, and K. M. Cammack, *Department of Animal Science, University of Wyoming.*

The objectives of this study were to 1) determine the effects of diet on feed intake traits, and 2) determine the relationship of residual feed intake (RFI) with carcass characteristics in lambs fed either a concentrate or forage-based diet. Growing wethers (initial BW = 51.3 ± 1.2 kg; n = 77) of Rambouillet, Hampshire, and Suffolk breed types were randomly allocated to receive a concentrate (CONC; 50% corn, 31% wheat middlings; 91.6% DM, 12.1% CP, 17.6% NDF, 2.98 Mcal/kg ME; n = 39) or forage-based (FOR; 67.7% alfalfa, 27.5% wheat middlings; 92.3% DM, 16.2% CP, 36.3% NDF, 2.31 Mcal/kg ME; n = 38) pelleted diet. Individual feed intake was measured by the GrowSafe System for 49 d, and BW was recorded weekly. The 20% most (n = 8) and the 20% least (n = 8) efficient wethers from each diet (n = 32 total) were slaughtered, and carcass data were recorded. The MIXED procedure of SAS was used to determine the effect of diet on feed intake, ADG, and G:F using data from all wethers (n = 77), and the effects of diet, RFI class (most or least efficient), and their interaction on carcass traits using data from selected wethers (n = 32); breed and pen were included as random effects. The CORR procedure was used to determine relationships between RFI and carcass characteristics. Overall, feed intake of CONC wethers varied less ($\sigma^2 = 0.08$) than intake of FOR wethers ($\sigma^2 = 0.21$); variation in ADG and RFI did not differ across diets. Feed intake and ADG were greater ($P < 0.001$) in FOR fed compared with CONC fed wethers, although G:F was not affected by diet type ($P = 0.23$). Boneless cut percentage tended ($P = 0.10$) to be greater in FOR versus CONC wethers; there were no other effects ($P > 0.13$) on carcass measures. Residual feed intake and USDA quality grade tended ($P = 0.10$) to be positively correlated, but no other relationships ($P > 0.17$) between RFI and carcass measures were found. These data suggest that feed intake and ADG are affected by diet type, and that greater variation in feed intake is associated with a forage-based pelleted diet. Furthermore, selection for RFI should not unfavorably affect carcass traits in sheep.

Key Words: carcass, residual feed intake, sheep

T348 Effects of roughage level and corn processing method on finishing performance of Nellore bulls. M. Caetano*¹, R. S. Goulart², P. M. Rizzo¹, S. L. Silva³, P. R. Leme³, J. S. Drouillard⁴, and D. P. D. Lanna¹, ¹University of Sao Paulo, ESALQ, Piracicaba, SP, Brazil, ²North Dakota State University, Fargo, ³University of Sao Paulo, FZEA, Pirassununga, SP, Brazil, ⁴Kansas State University, Manhattan.

The objective of this study was to investigate the optimal level of NDF from forage (NDFf) for finishing *Bos indicus* cattle with high-concentrate, corn-based diets. Nellore bulls (n = 112; 384.1 ± 29.5 kg) were used in a randomized complete block design in a 4 × 2 factorial arrangement. Four NDFf levels from sugarcane silage (3, 8, 13 and 18% of diet DM) were evaluated for 2 corn processing methods (CPrc): high moisture corn (HMC) and finely ground dry corn (FGC). Animals were offered ad libitum access to diets delivered twice daily in individual pens. Sugarcane silage contained 64.0% NDF, corn had 77.2% vitreousness, and corn geometric particle sizes were 1.30 and 5.84 mm for FGC and HMC, respectively. Bulls were adapted to the finishing diet over a 21-d period and fed a total of 81 d. To determine fecal starch (FS) concentration, each animal was sampled by rectal palpation on d 46 and 74 of the feeding period. The first derivative was solved of a 2nd order polynomial to determine optimal NDFf level. There was a quadratic effect of NDFf ($P < 0.01$) on final BW and ADG, with 13% NDFf yielding the highest final BW and greatest ADG ($P < 0.05$). Gain efficiency was 12.2% greater ($P < 0.01$) for animals fed HMC compared with those fed FGC (0.172 vs. 0.151, respectively). An interaction was observed between CPrc and NDFf ($P = 0.05$) for DMI; peak DMI occurred with 11.3 and 13.7% NDFf for FGC and HMC, respectively. An interaction between CPrc and NDFf also was observed for FS ($P < 0.05$). Bulls fed FGC had a linear decrease in FS with increasing levels of roughage, while there was no change in FS for bulls fed HMC with different levels of NDFf. Average FS were 13% and 3% for FGC and HMC, respectively. In conclusion, HMC improved growth efficiency of Nellore cattle by 12.2%, and the level of NDFf required to optimize performance was dependent on method of corn processing.

Key Words: fecal starch, feedlot, zebu

T349 Estimation of carcass and body fat composition using biometric measurements of grazing beef cattle. N. F. De Paula^{1,2}, L. O. Tedeschi², M. F. Paulino¹, H. J. Fernandes³, M. A. Fonseca^{1,2}, V. R. M. Couto¹, I. F. S. Maciel¹, and D. M. Almeida¹, ¹Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil, ²Texas A&M University, College Station, ³Universidade Estadual do Mato Grosso do Sul, Aquidauana, Mato Grosso do Sul, Brazil.

The objective with this study was to develop equations to predict carcass and body fat compositions using biometric measures (BM) and body postmortem measurements and to determine the relationships between BM and carcass fat (CF) and empty body fat (EBF) compositions of 44 animals. Animals were from different crossbred genetic groups (at least 50% Nellore breed) with initial age of 8.4±0.8 mo and shrunk BW (SBW) of 203±35 kg. Animals were grazing under tropical conditions and receiving supplementation. Animals were serially slaughtered in four groups at approximately 84 d (n = 4), 168 d (n = 8), 235 d (n = 8), and 310 d (n = 24) of growth. The day before each slaughter, animals were weighed and BM were taken, including hook bone width (HBW), pin bone width (PBW), abdomen width (AW), body length (BL), rump height (RH), height at withers (HW), pelvic girdle length (PGL), rib depth (RD), girth circumference (GC), rump depth (RuD), body diagonal

length (BDL), and thorax width (TW). Other measurements included were subcutaneous fat (SF), internal fat (InF), intermuscular fat (ImF), carcass physical fat (CF), empty body physical fat (EBF), fat thickness in the 12th rib (FT), and 9 – 11th rib section fat (HHF). The stepwise procedure was used to select influential variables. The r^2 and the root mean square error (RMSE) were used to select the equations. Results indicated that BM in association with SBW were precise in accounting for the variability of SF ($r^2 = 0.967$ and RMSE = 0.94 kg), InF ($r^2 = 0.984$ and RMSE = 1.26 kg), CF ($r^2 = 0.981$ and RMSE = 2.98 kg), and EBF ($r^2 = 0.985$ and RMSE = 3.99). The RD and GC were important in predicting CF and EBF variations. Results also suggested that approximately 70% of body fat was deposited as CF and 30% as InF. Furthermore, the equation with HHF and SBW as predictor of CF and EBF was more adequate than using HHF by itself. We concluded that the prediction of CF and EBF composition of grazing animals can be improved with BM.

Key Words: Adipose tissue, body composition, modeling

T350 Performance of dairy kids submitted to different sources of goat milk replacers. M. I. Marcondes,* L. S. Knupp, A. L. Silva, L. M. Carvalho, M. M. S. Santos, J. S. A. A. Santos, C. G. Vitor, and C. M. Veloso, *Universidade Federal de Viçosa, Viçosa, MG, Brazil.*

The health care and nutrition during suckling are essential for obtaining high productivity. During this period, attention should be given to diseases such as caprine arthritis encephalitis, which can be transmitted by goat milk and promote great morbidity, and decrease production. In addition, goat milk is expensive, and it is also the main source of income for producers. Thus, the objective was to evaluate the performance of kids fed alternative sources to replace goat milk. Forty-eight male kids of Saanen (24) and Alpine Brown (24) were randomly assigned to the treatments, and divided into age groups based on feeding milk for 60 or 90 d. They were offered coast-cross hay, starter ad libitum, and one liter of milk, or replacer, per day. The treatments were goat milk (GM), cow milk (CM), fermented cow colostrum (FC) and lactal - commercial milk replacer (LAC). The statistical analysis was conducted separately for animals fed 60 or 90 d. The data was analyzed as a completely randomized design, and a Tukey test was conducted when a P value less than 0.05 was observed. The average daily gain (ADG), empty body gain (EBG), and carcass weight gain (CWG) were measured after the slaughtering. Animals fed CM up to 90 d had greater ADG, and EBG, when compared with other treatments ($P < 0.05$). No differences were observed in CWG when comparing CM and GM ($P > 0.05$). The ADG, EBG, and CWG were not different for animals fed CM and GM up to 60 d ($P > 0.05$). The ADG in kg/day, for kids fed CM, GM, LAC, and FC up to 90 d, respectively, were 0.178, 0.145, 0.135, and 0.108; the EBG, in kg/day, were 0.143, 0.118, 0.106, 0.083, respectively, and the CWG,

in kg/day, were, 0.075, 0.063, 0.055, 0.041, respectively. The ADG in kg/day, for kids fed CM, GM, LAC and FC up to 60 d, respectively, were 0.151, 0.135, 0.110, 0.070; the EBG, in kg/day, were 0.127, 0.113, 0.088, 0.051, respectively, and the CWG, in kg/day, were, 0.067, 0.060, 0.044, 0.023, respectively. In conclusion, kids fed CM have best performance, while feeding FC provide the worst performance. Supported by CNPq/INCT-CA.

Key Words: average daily gain, goat, suckling

T351 Early feeding of low levels of fat supplement suppresses postprandial in vitro rumen metabolism. Q. Baptiste,* K. D'Souza, S. Simpson, S. Chavez, E. Nestor, M. Knights, and E. Felton, *West Virginia University, Morgantown.*

The effects of time of low level fat supplementation on postprandial rumen metabolism were investigated with in vitro rumen fermenters. All fermenters were fed a basal diet of orchard grass hay in unequal portions throughout the day, with the largest meals being fed at 0600h and 1800h. Soybean oil was the fat supplement and was fed to fermenters at 3% of total daily dry matter. Control (C) fermenters did not receive any supplement at any time. Three supplementation times were tested. Supplement was introduced to fermenters at either 0600h (AM), 1800h (PM), or in evenly divided doses at both times (AP). Fermenter effluent samples were collected at eight 3-h intervals over a 21-h period and were analyzed to determine concentration of rumen metabolites (ammonia nitrogen; [NH₃-N], and volatile fatty acid; [VFA]). Fermenter pH was measured each time effluents were collected. Individual VFA concentrations for each sample were summed and reported as total volatile fatty acid concentration [TVFA]. A quadratic postprandial time × treatment interaction ($P < 0.001$) was observed for ruminal pH, [NH₃-N] and [TVFA]. Feeding 3% soybean oil suppressed postprandial [TVFA] between 12 to 18 h (AM and PM) and [NH₃-N] between 15 to 18 h (AM), but did not have similar effects when oil was fed in split doses (AP). The magnitude of suppression in [TVFA] was apparently lower with PM treatment compared with AM treatment. Postprandial ruminal pH fluctuated greatest in AM treatment and least in PM treatment. In AM treatment, postprandial pH increased ($P < 0.01$) by 3h, remained elevated until 9 h, and then declined to lowest ($P < 0.01$) values by 18 to 21 h. In AP treatment, postprandial pH was generally flatlined except for lowest ($P < 0.01$) pH by 15h which was lower ($P = 0.04$) than the pH at 6 h. Control treatment postprandial pH essentially flat lined, but pH at 15 h was greater than at 12 h ($P = 0.04$). Postprandial PM treatment pH was also flat lined. Therefore, feeding low levels of soybean oil (3%) with the first meal fed to in vitro fermenters suppressed postprandial in vitro rumen metabolism.

Key Words: fat supplement, in vitro rumen, metabolism