TH126 The response of prepubertal Holstein heifers to altering the ratio of dietary crude protein to metabolizable energy. H. R. Motalebei, K. Rezayazdi, M. Dehghan-Banadaky*, and H. Kohram, *Department of Animal Science, University of Tehran, Karaj, Tehran, Iran.*

Twenty 4 Holstein heifers with a mean age of 210 d and the average weight of 217 kg were used. Heifers were randomly assigned to 3 rations: (1) ration which includes 10% crude protein (CP) less than NRC (2001) (49.35 g of CP per Mcal ME); (2) control ration which crude protein based on NRC (2001) (54.93 g of CP per Mcal ME); 3) ration with includes 10% crude protein more than NRC (2001) (60.64 g of CP per Mcal ME). Metabolizable energy (ME) in all rations was based on NRC requirements (14 Mcal in day). All heifers were housed in individual pens. Experimental and adaptation periods were 140 and 14 d respectively. Blood samples were collected at the beginning and at the end of the experimental period, at every 28 d and in end experimental ruminal fluid samples were collected using an oro-ruminal probe and a suction pump for pH and N-NH_3 determination. Plasma urea nitrogen (PUN) and N-NH_3 was affected by rations ($P < 0.05$) and PUN and N-NH_3 were higher in ration 3 than rations 1 and 2, but no significant differences were observed in pH ruminal, glucose, total protein and albumin blood between rations. We concluded that 10% crude protein less than NRC (2001) was suitable for prepubertal heifer nutrition.

Table 1. Effects of different ratio of CP to ME on ruminal and blood parameters

	CP/ME (g/Mcal)				
Item	49.35	54.93	60.64	*P*-value	SEM
Glucose (mg/dL)	70.32	66.33	66.20	NS	2.611
Total protein (g/dL)	9.22	8.77	9.37	NS	0.336
Albumin (g/dL)	6.05	5.64	5.90	NS	0.242
PUN (mg/dL)	9.49^{c}	10.14^{b}	12.1^{a}	0.03	0.692
Rumen N-NH_3 (mg/dL)	7.09^{c}	9.53^{b}	11.94^{a}	0.001	0.804
Rumen pH	6.72	6.75	6.66	NS	0.064

Key Words: blood, protein-energy ratio, rumen

TH127 Effect of replacing soybean meal with whole soybean on digestibility of the diet of grazing heifers. A. G. Silva*[1], M. F. Paulino[1], I. F. Smith[1], E. E. L. Valente[2], L. S. Martins[1], D. M. Almeida[1], A. L. Braga Netto[3], and G. Mendes Filho[4], *[1]Federal University of Vicosa, Vicoa, Brazil, [2]Federal University of Lavras, Lavras, Brazil, [3]State University of Mato Grosso do Sul, Aquidauana, Brazil, [4]Federal University of Tocantins, Araguanina, Brazil.*

The aim of this work was to evaluate the effect of replacing soybean meal with whole soybean grain in supplements on nutritional characteristics of growing heifers grazing in the transition dry-rainy season. A total of 40 heifers with at least 50% of Nellore breed weighing 290 ± 6 kg were used. Animals were assigned to an area composed of 4 paddocks of 5 ha, uniformly covered with *Uruchloa decumbens* grass. The experimental design was a completely randomized with 4 treatments and 10 replicates. The supplements contained approximately 30% of crude protein (CP) and progressive replacement of soybean meal with whole soybean grain at 0, 50 and 100%. Supplement was offered at the amount of 1.0 kg/animal/day except the control, which received only mineral mixture ad libitum. For the evaluation of nutritional characteristics a 9-d trial was carried out after adaptation. The 3-marker method was used. A manual grazing simulation was conducted for qualitative assessment of pasture. Supplementation improved the digestibility of dry matter (DM) and of all constituents of the diet ($P < 0.10$), except of the neutral detergent fiber corrected for ash and protein (NDFap) ($P > 0.10$). There was also a linear increase effect ($P < 0.10$) of the replacement of soybean meal with whole soybean grain on the coefficients of apparent digestibility of DM, organic matter (OM), ether extract (EE), and non-fibrous carbohydrates (NFC). The improvement in the digestibility of DM and of the dietary constituents of the supplemented animals may be due to the presence of compounds more easily digested in the diet of animals that received concentrate supplementation. According to Lazzarini et al. (2009), 7% of CP in the forage is sufficient to promote the appropriate use of fiber of low quality forage. This probably explains the lack of significant effect on the digestibility of NDFap since the nitrogen compounds in the forage would be sufficient for the proper use of pasture fibrous compounds. We concluded that the digestibility is optimized with the replacement of soybean meal with whole soybean grain in concentrate supplements.

Key Words: digestibility, grazing heifer, soybean

TH128 Comparison of omasal and reticular digesta samples to estimate the ruminal digestibility in cattle fed diets containing sugar cane in natura or ensiled sugar cane and corn silage. L. D. S. Mariz*, S. de C. V. Filho, E. Detmann, S. A. Santos, F. A. C. Villadiego, L. F. Prados, D. Zanetti, F. Sales, A. N. Nunes, and L. C. Alves, *Universidade Federal de Vicosa, Vicosa, Minas Gerais, Brasil.*

The aim of this study was to evaluate the ruminal digestibility of dry matter and other constituents in the diet using samples obtained from the omasum and reticulum in cattle. Five rumen-fistulated crossbred cattle with an average initial live weight of 333 ± 17 kg were used in the experiment, distributed in a 5 × 5 Latin square design. A total of 5 diets containing 60% forage and 40% concentrate based on dry matter and containing different forages were tested: corn silage; sugar cane in natura; a sugar cane silage control; sugar cane silage supplemented with 0.4% calcium oxide and sugar cane silage supplemented with 0.8% calcium oxide, based on natural materials. The crude protein (CP) in all of the forages was corrected to 11% based on dry matter (DM), using a mixture of urea/ammonium sulfate (9:1). Six collections of reticular and omasal digesta were performed in each experimental at 12 h intervals. At the end of each experimental period, these samples were to generate 2 phases: the filtrate, which corresponded to the liquid phase and small particles, and the residue, which corresponded to the large particle phase. There was no interaction ($P > 0.05$) between sampling location and the treatments for any of the analyzed variables. The ruminal digestibility for DM, organic matter (OM), CP, neutral detergent fiber (NDF) and non-fiber carbohydrates (NFC) was similar ($P > 0.05$) for the digesta collected in the omasum and the reticulum. There was an effect of the sampling site ($P < 0.05$) detected for the ruminal digestibility of ether extract (EE), which was lower in the digesta collected in the omasum. The intestinal digestibility of CP and EE was found to be higher ($P < 0.05$) in the omasal digesta than in the reticular digesta. Considering all diet constituents, the omasum is the preferred sampling location. Due to the ease of collection, additional studies should be conducted with reticular digesta because numerous nutrients in ruminal digesta are similar to those in omasal digesta.

Key Words: omasal digesta, reticular digesta, ruminal digestibility

TH129 Effect of replacing soybean meal with rumen-protected soybean meal on production performance and milk composition in early lactation dairy cows. C. G. Zhang[1], L. M. Huang[1,2], G. L. Liu*[1,2], X. K. Zhang[1], and G. Yang[1], *[1]State Key Laboratory of Dairy Biotechnology, Shanghai Bright Holstan Co. Ltd., Shanghai, China, [2]Shanghai Dairy Breeding Center Co. Ltd., Shanghai, China.*

The objective of this study was to evaluate the effect of replacing soybean meal (SBM) with rumen-protected soybean meal (RPSBM) on production performance and milk composition in early lactation dairy cows. According to the parity (P), days in milk (DIM) and milk yield (MY), Eighty-one dairy cows were selected randomly as control group (CK, n = 42, $P = 2.7 \pm 0.5$, DIM = 46.4 ± 3.5 d, MY = 42.5 ± 7.3 kg/d) and test group (TK, n = 39, $P = 2.5 \pm 0.4$, DIM = 44.4 ± 2.2 d, MY = 43.3 ± 6.7 kg/d). The basal diet was the control diet, whereas the diet replacing 17% SBM in control diet with RPSBM was the test diet. The trial lasted 69 d with a 7 d adaptation. Daily feed intake of TK and CK were recorded and converted into average dry matter intake (DMI) per cow, individual MY were recorded every 5 d, individual milk samples were collected at a 4:3:3 mixtures of morning, noon, evening milk by volume for detecting milk fat percentage and milk protein percentage at d 0, 30, and 60. Data were analyzed using ANOVA model of SAS 9.0. The results indicated that DMI of TK at all recorded days has an increasing trend ($P > 0.05$) compared with CK, average DMI (kg/d per cow) of TK and CK were 23.1 ± 5.8 and 22.3 ± 4.9 during entire trial period. Average MY (kg/d) at d 33, 38, 64 of TK (45.0 ± 6.3, 43.9 ± 6.7, 41.9 ± 7.0) was significantly higher ($P < 0.05$) than CK (42.3 ± 8.6, 41.3 ± 7.8, 39.2 ± 7.7), whereas there were no significant changes ($P > 0.05$) between CK and TK at other recorded days. Average MY (kg/d per cow) of TK and CK at 69 d trial were 42.8 and 41.6, respectively. The milk protein percentage and milk fat percentage of TK were not significantly changed ($P > 0.05$) compared with CK. The treatment increased milk yield but had no effect on milk composition in early lactation dairy cows.

Key Words: dairy cow, production performance, rumen-protected soybean meal

TH130 Effects of Chinese herbal medicinal formula supplementation on production performance and immune profile in late-lactation dairy cows. Y. J. Su[1], G. L. Liu*[1,2], C. G. Zhang[1], G. Yang[1], and Z. Liu[1], *[1]State Key Laboratory of Dairy Biotechnology, Shanghai Bright Holstan Co. Ltd., Shanghai, China, [2]Shanghai Dairy Breeding Center Co. Ltd., Shanghai, China.*

Traditional Chinese Medicine (TCM) has shown beneficial effects on the performance and immune system of humans and animals. In this study, Chinese herbal medicinal formula (CHMF) was a proprietary TCM additive containing 5 kinds of herbal extracts. to evaluate the effects of CHMF on the production performance and immune profile of dairy cows, 40 Chinese Holstein cows (DIM = 240 ± 13.4d; BW = 532 ± 42.3kg) were employed and randomly distributed to 2 groups involving 30 d periods: 20 cows were assigned to a conventional diet (CON) that contained corn silage, alfalfa hay, Chinese leymus and commercial concentrate, and the other 20 cows were fed the same diet supplemented with 50g cow^{-1} d^{-1} of CHMF (CH).The results showed that there was no difference in average DMI for cows fed the 2 diets (16.52 versus 16.54 kg/d, $P = 0.867$), but the CH cows tended ($P = 0.10$) to have a higher milk yield than CON cows (18.73 versus 18.24 kg/d, respectively). Milk protein, fat, lactose and solids not fat (SNF) percentage were not affected by addition of CHMF. Fat and protein yield (kg/d) were also not affected by the experimental diets. The somatic cell count (SCC) was numerically lower in CH group than in CTR group (640,000 versus 900,000 cell/mL, $P = 0.12$). On the other hand, blood analysis revealed that the CH group had significantly ($P < 0.05$) higher neutrophil activity and IgG levels than the CON group. In conclusion, supplementation of CHMF in diets not only had positive effects on milk production and composition, but can be useful for prevention of subclinical intramammary infection in late-lactation dairy cows.

Key Words: Chinese herbal medicinal formula, immune profile, production performance

TH131 Effects of wheat source and monensin level on intake and rumen fermentation in feedlot heifers. W. Z. Yang*[1], L. Xu[1,2], C. Li[3], S. Ding[1,4], and T. A. McAllister[1], *[1]Agriculture and Agri-Food Canada, Lethbridge, AB, Canada, [2]College of Animal Science, Inner Mongolia Agricultural University, Hohhot, Inner Mongolia, China, [3]College of Animal Science and Technology, Inner Mongolia University for the Nationalities, Tongliao, Inner Mongolia, China, [4]Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB, Canada.*

With adverse growing or harvesting conditions, abundant supplies of feed wheat become available in Canada. While many feedlot operators include wheat into the rations, few studies have documented the effects of wheat type on animal response. A study was conducted to examine rumen fermentation by substituting wheat grain (soft or hard) for barley and to determine whether increasing monensin (Mon) reduce incidence of rumen acidosis for feeding ruminal highly digestible wheat to feedlot heifers. Five ruminally cannulated beef heifers were used in a 5 × 5 Latin square with 2 × 2+1 factorial arrangement. Treatments were control (CON; 10% barley silage, 90% barley-based concentrate, and 28 ppm Mon), and diets substituting soft or hard wheat for barley combining with 28 or 44 ppm Mon. The CON is a standard feedlot diet in western Canada. DMI (kg/d) was greater ($P < 0.05$) for CON (8.4) than for wheat (averaged 7.7) diets. There was no difference in DMI between soft (7.6) and hard (7.8) wheat, whereas increased Mon reduced ($P < 0.05$) the DMI (8.1 vs. 7.3). Mean rumen pH was higher ($P < 0.05$) for CON (5.91) than for wheat diets (averaged 5.59). The duration of pH < 5.8 (9.9 vs. 16.2 h) and pH < 5.5 (4.3 vs. 11.5 h) was lower ($P < 0.01$) for CON than for wheat diets. However, rumen pH parameters were affected neither by wheat type nor by Mon level. Total VFA concentrations (mM) were lower ($P < 0.05$) for CON than for wheat diets (161 vs. 177). Molar proportion of propionate was higher ($P < 0.05$), thus ratio of acetate to propionate was lower ($P < 0.05$) with high Mon (1.39 vs. 1.11). These results indicate that substitution of wheat for barley grain in feedlot ration increased incidence of rumen acidosis regardless of soft or hard wheat. Increased Mon supplementation had no evident effect on alleviating rumen acidosis but may potentially alter rumen fermentation pattern with more propionate production.

Key Words: feedlot heifer, rumen fermentation, wheat source

TH132 Meat quality of Girolando steers fed spineless cactus. R. A. S. Pessoa*[1], J. R. C. Silva[1], A. S. C. Veras[1], M. A. Ferreira[1], I. Ferraz[2], and P. C. Vasconcelos[1], *[1]Universidade Federal Rural de Pernambuco, Recife, Pernambuco, Brazil, [2]Instituto Agronômico de Pernambuco, Recife, Pernambuco, Brazil.*

The objective of this study was to evaluate the effect of the substitution of cottonseed meal by urea on meat quality of Girolando steers (5/8

Holstein-Zebu). Eighteen animals, with average initial body weight of 320 kg and 24 mo of age were used, 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 experimental period lasted 84 d divided into 3 periods of 28 d. 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. After skinning and evisceration the carcasses were cut longitudinally into 2 halves and samples were taken from the longissimus dorsi muscle in the left half carcass of each animal. The samples was stored for later analysis. After defrosting, the measures of pH, color (L* a* b*), shear force, water-holding capacity (WHC) and cooking losses were performed. The data were submitted to ANOVA using the SAS. Color lightness, meat redness, yellowness, pH, shear force, water-holding capacity and cooking losses were not affected by the treatments ($P > 0.05$) (average of 35.67; 5.92; 4.93; 6.0; 3.99; 36.33 and 28.41, respectively). The replacement of cottonseed meal by urea did not alter the meat quality of Girolando steers feed diets based on spineless cactus. FACEPE process number: 2008/0979.

Key Words: *Opuntia ficus indica*, shear force, urea

TH133 Effects of replacing corn silage with alfalfa hay on blood metabolites of Holstein cows in early lactation. A. Akbari, A. Zali, M. Ganjkhanlou*, M. Dehghan-Banadaky, and A. Emami, *University of Tehran, Tehran, Iran.*

In present study, effects of replacing corn silage with alfalfa hay on blood metabolites of Holstein cows in early lactation were investigated. Fifteen Holstein cows (37 ± 10 DIM) were used in completely randomized design lasted for lasting 9 weeks. Three levels of hay and corn silage were used as treatment: (1) 10% alfalfa–30% silage corn, (2) 20% alfalfa–20% silage corn, and (3) 30% alfalfa–10% silage corn. The ratio of forage: concentrate was the same (40: 60) in all treatments. Cows were fed their feed as total mixed rations (TMR) twice daily. Dry matter intake of each cow was measured daily. To determine blood parameters, blood samples were collected all of the cows, at 3, 6 and 9 weeks experiment, 4 h after the morning feeding. Blood samples were taken from the tail vein and by vacuum tubes containing anti-coagulant (EDTA) was performed. Blood samples by centrifugation were centrifuged at 3000 rpm and 15 min and then obtained plasma was separated. Parameters such as glucose, total protein, NEFA, BHBA, and plasma urea nitrogen (BUN) were measured by using autoanalyzer system and test kits. Data were analyzed using the GLM model procedure (SAS Institute, 2003). Normality of distribution and homogeneity of variance for residuals were tested using PROC UNIVARIATE and adjust Tukey-Kramer (SAS Institute, 2003). Dry matter intake was higher ($P < 0.05$) when cows fed diet 2 (23.20 kg per day) compared with diet 1 (22.95 kg per day) and diet 3 (18.64 kg per day). Blood parameters were unaffected by treatment ($P > 0.05$), but then treatment effects on certain blood parameters were given. Although the amount of glucose in diet 1 (68.41 mg/dl) was higher than diet 2 (60.90 mg/dl) but a little difference had as diet 3 (65.55 mg/dl). Also in diets 1, BUN and total protein were less than the other 2 diets ($P > 0.05$). It is concluded that feeding alfalfa hay more than corn silage did not influence blood metabolites but, reduced dry matter intake.

Key Words: alfalfa hay, corn silage, milk production

TH134 Continuous measurement of methane production before and after feeding in continuous cultures fed bermudagrass. K. M. Young*, J. R. Burgess, C. T. McDonald, and T. C. Jenkins, *Clemson University, Clemson, SC.*

The objective of this study was to design a system that could detect gas concentrations continuously in ruminal continuous cultures to better assess changes in methane (CH_4) occurring before and after feeding. The custom-built system used CH_4 and CO_2 infrared sensors (Edinburgh Instruments, OEM Gas Sensors, UK) and an O_2 infrared sensor (KE Series, Figaro USA Inc., Arlington Heights, IL) calibrated with a zero and span gas to measure gas concentrations in 1 L of headspace. To evaluate the system, 30 g of Tifton 85 bermudagrass harvested at 35 d of maturity was fed daily in 2 equal amounts at 0800 and 1600 h for 3 7 d periods. Forage was harvested from plots at the University of Georgia, and freeze-dried and ground (2-mm sieve) before feeding. Gas readings were taken every minute throughout the day and captured on a spreadsheet. For statistical analysis, only hourly recordings were used between 0800 and 1600 h on d 5, 6 and 7. Data were analyzed by the Fit Model Procedure in JMP (SAS Institute) with time, day, and their interaction as main effects and period as random effect. Average CO_2 and O_2 concentrations before feeding were 77% and 0.5% respectively with fermenters kept under continuous flow of CO_2 at 20 mL/min. Methane production increased ($P < 0.01$) between 0800 and 1600 h (12.1, 12.6, 17.0, 21.9, 23.6, 26.4, 26.9, 27.1 and 28.1 mmol) when averaged across d 5–7. A decrease ($P < 0.01$) in methane production on d 7 (26.1, 23.7, 15.4 mmol/d for d 5–7) is thought to result from repeated opening of the culture vessel to obtain samples. Methane was estimated at 33.8 mmol/d using the Mills et al. (2003) equation adapted for use in continuous cultures using ADF, N, starch and DMI, which were comparable to values in the present system. The novel gas analysis system developed for continuous cultures in this study successfully measured changes in CH_4 concentration before and after feeding that were comparable to previously reported values.

Key Words: continuous culture, methane

TH135 In vitro screening of potential enzyme additives to enhance degradation of wheat dried distillers grains with solubles and barley silage. Z. X. He*[1,2], S. Ding[1], L. Xu[1,3], K. A. Beauchemin[1], and W. Z. Yang[1], *[1]Lethbridge Research Centre, Agriculture and Agri-Food Canada, Lethbridge, AB, Canada, [2]Key Laboratory of Agro-ecological Processes in Subtropical Region, Institute of Subtropical Agriculture, the Chinese Academy of Sciences, Changsha, Hunan, China, [3]College of Food Science and Engineering, Inner Mongolia Agricultural University, Hohhot, Inner Mongolia, China.*

The aim of this study was to identify potentially effective feed enzymes for wheat dried distillers grains with solubles (DDGS) and barley silage. In vitro batch cultures were used to examine the effects of exogenous enzymes (EE) on gas production (GP) and degradability of DM (DMD) and NDF (NDFD) after 6, 12, 24 and 48 h. Seven EE containing a range of xylanase, endogulcanase, exoglucanase and protease activities were used. Each was evaluated at 3 doses: 0 (control), 1 (low) and 2 (high) μL/g of DM. For DDGS, GP was higher ($P < 0.05$) during the first 12 h for E2 (143 mL/g OM), E4 (141 mL/g OM) and E6 (140 mL/g OM) compared with control (131 mL/g OM), whereas GP after 24 or 48 h was higher ($P < 0.05$) only for E2 at low dose. Degradability of DM was improved by 2 to 3 percentage units at 6 h and 3 to 4 percentage units at 24 h for most EE. However, at 48 h, only E2 (71%), E4 (72%) and E6 (72%) increased DMD compared with control (68%). There was a minimal effect on NDFD at 6 or 12 h, but at 24 h, the percentage unit increases compared with control (42%) were 7 (E4, low), 7 (E1

and E6, high), 5 (E2 and E3, low), and 5 (E5 and E7, high). At 48 h, the percentage unit increases compared with control (57%) for NDFD were 6 (E2, E4) and 5 (E5, E6) for high dose. For barley silage, GP was generally not affected by EE. Degradability of DM was greater ($P < 0.05$) for E2 (48%), E4 (49%) at low dose, and E6 (48%) at high dose compared with control (43%) at 24 h; it was greater ($P < 0.05$) for E2 (60%) at low or high dose, E4 (63%) at high dose, and E6 (59%) at high dose compared with control (54%) at 48 h. Similarly, NDFD tended ($P < 0.10$) to increase with E2 (26%), E4 (28%) and E6 (27%) compared with control (23%) at 24 h, and increased ($P < 0.05$) with E2 (41%), E4 (45%) and E6 (40%) compared with control (32%) at 48 h. The results indicate ruminal degradability of DDGS and barley silage can be improved using EE. However, the response to EE is often dose-dependent and differs with incubation time. The incubation at both 24 and 48 h are recommended to identify EE that consistently improve degradability.

Key Words: barley silage, exogenous enzyme, wheat DDGS

TH136 Replacing corn silage with chopped alfalfa hay on performance, apparent digestibility, and chewing activity of dairy cows. A. Akbari, A. Zali, M. Ganjkhanlou*, M. Dehghan-Banadaky, and A. Emami, *University of Tehran, Tehran, Iran.*

This study investigated replacing of long chopped alfalfa hay (AH) with corn silage digestive processes, chewing activity and performance of dairy cows in a long-term period (80 d). Fifteen Holstein dairy cows in the early lactation stages (37 ± 10 DIM) were designed in a completely randomized design. Treatment were diets with (1) 25% alfalfa hay plus 75% CS (CS75); (2) 50% alfalfa hay and 50% CS (CS50); and (3) 75% alfalfa hay plus 25% CS (CS25) on a forage-DM basis. Diets were fed ad libitum as TMR with a concentrate to forage ratio of 60:40. Cows were milked 3 times daily at 0200, 1000, and 1800 h by semi-automatic milking machines. Milk production was recorded at each milking during the experiment. Data were analyzed using the MIXED MODEL procedure and adjust Tukey-Kramer (SAS Institute, 2003). Partially replacing AH with CS resulted in increasing dry mater intake (DMI) fallowed with increasing intakes of net energy for lactation ($P < 0.05$), and peNDF without affecting apparent digestibility ($P > 0.05$). Total eating time and eating per kg intake of DM, NDF, peNDF > 1.18 and peNDF > 8 was quadraticlly affected by replacing AH with CS($P > 0.05$), resulting greater total chewingg time and total chewing time per kg DMI as well as actual milk production ($P < 0.05$). In contrast increasing AH level in the diet resulted in more milk protein percentage ($P < 0.05$). Surprisingly in our long-term consideration there were quadratic effect of replacing CS with AH was observed in rumination time per NDF intake as well as fat related (e.g., fat percentage and yield and FCM) ($P < 0.05$). On the other hand CS50 treatment in our study had a higher milk corrected fat production (29.51, 28.02 and 27.41 kg, for CS75, CS50 and CS25 respectively) due to saving energy at optimum point of chewing time. Therefore, according to our data and condition it may conclude that an equal ratio of CS and AH is resulted to best performance and health in dairy cow nutrition.

Key Words: chewing activity, forage, apparent digestibility

TH137 Impact of increased dietary grain inclusion on blood metabolites and rumen fermentation characteristics of prepubertal dairy heifers. T. S. Dennis*, J. E. Tower, H. Schmitz, A. Mosiman, and T. D. Nennich, *Purdue University, West Lafayette, IN.*

The objective of this study was to evaluate the effect of increasing dietary grain:forage ratio on blood metabolites and rumen fermentation characteristics of prepubertal dairy heifers. Seventy-eight Holstein heifers (133.1 ± 27.4 kg, 125 ± 22 d of age) were randomly allocated by body weight (BW) to 1 of 15 pens. Pens were randomly assigned to dietary treatments balanced for CP and ME containing grain:forage ratios of 80:20 (80%), 60:40 (60%), or 40:60 (40%) and fed for 56 d. Following the treatment period, all pens were switched to a common diet containing 40% grain and 60% forage and fed for an additional 56 d. Blood was collected from all heifers on d 0, 28, 56, 84, and 112. Rumen fluid was collected esophageally from 10 heifers per treatment (2 heifers/pen) to determine rumen pH, NH_3, volatile fatty acids (VFA), and in vitro cellulose disappearance. Data were analyzed as repeated measures using PROC MIXED of SAS with pen as the experimental unit. Heifers fed 80% had greater PUN and glucose than 60% and 40% during the treatment period ($P < 0.01$); however, PUN and glucose were similar between dietary treatments during the common period ($P > 0.10$). Rumen pH was least for 80% and greatest for 40% on d 56 ($P < 0.01$), but similar during the common period ($P > 0.10$). Rumen NH_3 was similar between treatments during the common period from d 56 to 112 ($P > 0.10$). During the treatment period, total VFA concentrations were greater for 80% and 60% than 40% on d 56, averaging 118.2, 108.1, and 74.2 m*M*, respectively ($P < 0.01$). Molar proportions of acetate and A:P ratio on d 56 of the treatment period were greatest for 40% ($P < 0.01$). Also, 40% had lower molar proportions of propionate and butyrate as compared with 80% during the treatment period on d 56 ($P < 0.01$). After being placed on a common diet, total VFA and molar proportions of VFA were similar between treatments ($P > 0.10$). Cellulose disappearance in vitro was similar between treatments overall ($P > 0.10$). As expected, blood and rumen metabolites were altered when heifers were fed diets with greater grain inclusion rates.

Key Words: dairy heifer, grain inclusion, rumen fermentation

TH138 Effects of energy source (starch or fat) on performance, eating pattern, and carcass quality of Holstein bulls fed high-concentrate rations during the finishing period. M. Devant*[1], B. Quintana[1], and A. Bach[2,1], *[1]Department of Ruminant Production-IRTA, Torre Marimon, Caldes de Montbui, Barcelona, Spain, [2]ICREA, Barcelona, Spain.*

This study evaluated the effects of energy source (starch or fat) on performance, eating pattern, and carcass quality of Holstein bulls fed high-concentrate diets during the finishing period. A total of 79 bulls (291 ± 2.1 kg BW and 216 ± 0.8 d age) were divided into 2 treatments: (1) 51% starch and 5.7% fat (HSLF) and (2) 41% starch and 7.2% fat (LSHF) in a completely randomized design. Concentrates were isonitrogenous and isoenergetic. Palm oil was increased (from 2.7 to 4.0%), while corn (from 25.5 to 18.6%) and barley (from 31.0 to 22.0%) decreased in HSLF and LSHF, respectively. Individual concentrate intake and eating pattern were recorded daily with a computerized concentrate feeder, and BW was recorded every 14 d. Animals were slaughtered after 97 d and HCW, and carcass quality were evaluated. Data were analyzed using a mixed-effects model with repeated measures. During the first 2 wk of study, LSHF showed less ($P < 0.05$) eating rate (105.5 ± 2.28 g/min) than HSLF (113.7 ± 2.28 g/min) bulls. However, total DMI did not differ between treatments (6.5 ± 0.17 kg/d) because meal duration (10.2 ± 0.22 min) and meal size (0.89 ± 0.030 kg) of LSHF were greater ($P < 0.01$) than in HSLF bulls (9.3 ± 0.22 min and 0.81 ± 0.030 kg, respectively). During the 3 to 6 wk differences between treatments in eating rate were maintained ($P < 0.01$); however meal size and meal duration were not affected by treatment. In consequence, DMI was less

($P < 0.05$) in LSHF (6.4 ± 0.17 kg/d) than in HSLF bulls (6.9 ± 0.17 kg/d). Thereafter, eating rate of LSHF increased to levels of HSLF bulls, and no differences among treatments were observed. Carcass weight and dressing percentage were greater ($P < 0.05$) in HSLF than in LSHF bulls (234 and 229 ± 1.6 kg, 53.1 and 52.4 ± 0.23%, for HSLF and LSHF, respectively). During the first weeks of the finishing period, eating pattern of the concentrate may be affected when substituting starch for fat. The increase in fat content of the finishing concentrate maintaining the energy density in bulls may decrease carcass weight and dressing percentage.

Key Words: beef, energy source, eating pattern

TH139 Effects of zinc sources on performance, hematology, and biochemistry of blood serum in finishing lambs. M. Mallaki*, M. A. Norouzian, and A. A. Khadem, *The University of Tehran, Tehran, Iran.*

The purpose of this study was to investigate the effects of organic and inorganic zinc sources on performance, hematological and biochemical parameters of blood serum in finishing lambs. Eighteen male Zandi lambs (21.28 ± 0.85 kg BW and 70 ± 5 d) were randomly allocated to one of 3 dietary treatments in a randomized design. Animals in group 1 were treated as control (no zinc supplementation), whereas animals in groups 2 and 3 were supplemented with 25 mg of zinc/kg DM from either zinc sulfate monohydrate (ZnS) or zinc peptide (ZnP), respectively. There was no difference among groups for numbers of red blood cells (14.95, 14.59 and 13.84; respectively), hemoglobin concentration (11.24, 11.14 and 11.20; respectively), packed cell volume (36.17, 35.52 and 37.20; respectively), and mean corpuscular hemoglobin concentration (7.6, 7.2 and 8.2; respectively). White blood cell count was lower in ZnP group (8.66 vs 11.07 and 11.86; ZnP, control and ZnS respectively) ($P = 0.08$). Activities of aspartat amino transferase and alanin amino transferase were similar between experimental groups. Dry matter intake and ADG in ZnP groups were greater ($P < 0.05$) than ZnS and control groups. There was no difference in feed conversion ratio between groups. These results demonstrated that zinc may be beneficial for the performance and health of finishing lambs.

Key Words: hematology, performance, zinc

TH140 Effects of supplemental bupleurum extract on lactation performance and rumen fermentation in Holstein cows subjected to heat stress. L. Pan[1], D. P. Bu*[1], J. Q. Wang[1], J. B. Cheng[1,2], X. Z. Sun[1,2], W. Liu[1,3], R. X. Hu[1,3], and C. Y. Ren[1,3], *[1]Chinese Academy of Agricultural Sciences, Beijing, China, [2]Anhui Agricultural University, Hefei, Anhui, China, [3]Gansu Agricultural University, Lanzhou, Gansu, China.*

Bupleurum extract (BE) has been shown to alleviate negative effects of high ambient temperature. This experiment was conducted to investigate effects of supplemental BE on lactation performance and rumen fermentation of cows under heat stress. Forty Holstein cows were assigned to one of 4 groups (n = 10) according to milk yield (37.5 ± 1.8 kg/d), day in milk (75 ± 15) and parity (1.7 ± 0.4) in a completely random block design. Four treatment diets consisted of supplemental BE at 0, 0.025, 0.05 or 0.1% of dry matter, which were randomly assigned to one of 4 groups. Cows were housed in a tie-stall barn and were individually fed the treatment diets. The experiment lasted for 10 wk in hot summer. Ambient temperature and humidity were measured 3 times a day. Milk yield, feed intake, respiration rates (RR) and rectal temperatures (RT) were measured twice a week, and milk samples were collected every 10 d. Rumen fluid samples were collected at wk 6 and 10 of the trial. Data were analyzed by repeated measures using Proc Mixed procedure of SAS. During the experiment, average temperature-humidity index were respectively 78.20 ± 2.74, 79.72 ± 3.26 and 78.26 ± 3.37 at 0600 h, 1400 h and 2200 h. Average RR (65.61^a, 60.32^b and 67.42^a vs. 71.40^a breaths/min, $P < 0.01$) and RT (39.10^b, 39.04^b and 39.07^b vs. 39.28^a °C, $P < 0.01$) were decreased for cows fed BE supplementation. Compared with control, cows supplemented with BE increased dry matter intake (22.79^a, 21.59^b and 22.07^b vs. 20.94^c kg/d, $P < 0.01$) and milk production (34.73^a, 33.38^b and 32.37^{bc} vs. 31.50^c kg/d, $P < 0.01$). There was no treatment effect on milk fat concentration or milk protein concentration, while milk fat yield (1.13^a, 1.12^a and 1.09^{ab} vs. 1.02^b kg/d, $P < 0.05$) and milk protein yield (0.97^a, 0.95^a and 0.92^a vs. 0.89^b kg/d, $P < 0.01$) were increased compared with control. Rumen pH, ammonia-N concentration and total volatile fatty acid concentration were not different among groups. Overall, supplemental BE at 0.025% or 0.05% could improve lactation performance without changing rumen fermentation in cows subjected to heat stress.

Key Words: bupleurum extract, cow, heat stress

TH141 Effect of ration on intake, digestibility, and rumen microbial yield in heifers under intensive fattening system. J. Mora, X. Cortes, H. J. Morazan, A. R. Seradj, D. V. Mata, and J. Balcells*, *Dept. Animal Production, University of Lleida, Lleida, Spain.*

Twelve crossbred heifers (BW: 362 ± 25 kg) were randomly distributed in 2 feeding groups and received, concentrate [CON; cereal grain 64 g/100 DM and protein meals 26 g/100 DM; CP: 15.5% CF: 10.8%] plus cereal straw and a total mixed ration [TMR; silages of sunflower 30 g/100 DM, ryegrass 28 g/100 DM and complete immature corn cob 42g/100 DM; CP: 14.0; CF: 15.4) and both rations were supplied ad libitum. Digestibility, intake and duodenal flow were determined using 2 flow marker system [Lignin sulfuric (Li-Sf), and Ytterbium acetate (Yb)]. Ten days before sacrifice (0 to 10d), Yb was supplied orally twice a day (0800 and 1800 h) at a dose (2 mg Yb/kgBW) using a drencher, the first 7 d (0 to 7 d) were for marker changeover and the rest (7 to 10 d) for collecting feces. Microbial nitrogen (MN) yield was quantified using 2 microbial markers, purine bases (BP) and ^{15}N (2 mg ^{15}N/g N ingested) that was supplied along with Yb (d 5 to 10). At harvest (d 10) animals were shipped by feeding group to the harvest plant at 0700, harvested at 1030 and rumen and abomasums digesta were sampled (1100–1130 h). Rumen content was filtered using a surgical gauze and rumen fluid sampled (4 mL) to determine ammonia-N ($N\text{-}NH_3$) and volatile fatty acids (VFA) concentration. The rest of rumen liquid was used to isolate the bacterial reference sample by differential centrifugation. The $N\text{-}NH_3$ levels in the rumen (95.6 and 124.1 for CON and TMR, respectively, $P = 0.23$) suggest an excess of degradable N and might explain the N-losses between intake and rumen out-flow. Type of ration did neither alter ammonia nor VFA concentrations but TMR induced a VFA profile with a greater acetate proportion. Heifers fed TMR in relation to those received concentrate plus straw (CON) showed a greater level ($P < 0.05$) of DM intake (4.5 vs. 5.5 kg; SEM = 0.32), apparent digestibility in the whole tract (0.87 vs. 0.91; SEM = 0.01), MN yield (21.8 vs. 38.4; SEM = 3.5) and efficiency (g of MN/kg DOMR, 19.3 vs. 24.4; SEM = 1.1 for CON and TMR, respectively). High quality TMR in growing heifer improves rumen fermentation condition and microbial-N yield efficiency.

Key Words: digestibility, ^{15}N, purine base

TH142 Effect of endophyte-infected tall fescue seed on ruminal metabolism and physiology in Angus steers. D. H. Kim*[1], J.

L. Klotz[2], and D. L. Harmon[1], *[1]Department of Animal and Food Sciences, University of Kentucky, Lexington, [2]USDA-ARS, Forage-Animal Production Research Unit, Lexington, KY.*

This study was conducted to evaluate the effect of fescue toxicosis on changes in rumen physiology and metabolism. Eight ruminally cannulated Angus steers (BW = 548 ± 33 kg) were blocked in pairs based on BW and randomly allocated to 4 blocks. The steers were fed alfalfa cubes at 1.5 × NE_m and dosed (1 kg/d) with ground endophyte-infected tall fescue seed (E+; 4.45 mg ergovaline/kg DM) or endophyte-free tall fescue seed (E−) via rumen cannula once daily for 21 d. On d 14, rumen fluid was collected before feeding and every 2 h for a subsequent 8 h period. Rumen contents were removed before the morning feeding on d 16 for evaluation of ruminal fill, and then the rumen contents were returned to the rumen with a probe for continuous monitoring of ruminal pH, temperature and pressure. Dry matter intake was not different (P = 0.293) between treatments (82.20 ± 1.05 and 79.80 ± 1.38 g of DM/$BW^{0.75}$ for E− and E+, respectively), whereas rumen content DM was higher (P = 0.060) for E+ than E− (16.26 ± 2.26 and 12.97 ± 1.72 g of DM/kg of BW, respectively). Total VFA, acetate, propionate, and butyrate concentrations, and acetate:propionate ratio were higher for E+ than E− (Table 1). Likewise, ammonia concentration was higher (P = 0.058) for E+ dosing. Ruminal pH and temperature were not affected by treatment (P = 0.657 and 0.499, respectively), whereas ruminal pressure was lower (P < 0.001) for E+ dosing. Serum prolactin concentration was lower (P < 0.001) for E+ (0.40 ± 0.02 and 25.49 ± 2.61 ng/mL for E− and E+, respectively). Data in this study indicate that endophyte-infected tall fescue seed may contribute to depression of ruminal VFA absorptive function related to ruminal motility changes.

Table 1. Comparison of ruminal metabolism and physiology between endophyte-infected tall fescue seed (E+) and endophyte-free tall fescue seed (E−)

Item	Treatment		SEM	*P*-value
	E−	E+		
Total VFA, mM	104.56	131.36	13.03	0.002
A:P ratio	3.93	4.33	0.13	<0.001
Acetate	73.35	93.40	9.62	0.002
Propionate	19.01	21.76	2.10	0.052
Butyrate	8.25	11.01	1.02	<0.001
Ammonia, mM	7.37	9.06	1.34	0.058
pH	6.84	6.83	0.17	0.657
Temperature, °C	38.73	38.80	0.26	0.499
Pressure, mbar	1035.65	1020.83	9.32	<0.001

Key Words: ruminal physiology, steer, tall fescue

TH143 Feeding incremental levels of ground flaxseed linearly reduced milk yield and enteric methane emission in organic Jersey cows. T. L. Resende*[1], A. F. Brito[2], K. J. Soder[3], D. H. Woitschach[4], A. B. D. Pereira[2], and R. B. Reis[1], *[1]Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil, [2]University of New Hampshire, Durham, [3]USDA-ARS, University Park, PA, [4]Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil.*

Twenty (8 primiparous and 12 multiparous) organic Jersey cows averaging 425 kg BW (SD ± 37) and 111 DIM (SD ± 62) in the beginning of the study were blocked by milk yield and parity and randomly assigned to treatments in 5 replicated 4 × 4 Latin squares to investigate the effects of incremental dietary levels of ground flaxseed (0, 5, 10, or 15% diet DM) on intake and yields of milk and milk components. Sixteen cows (4 squares) were used to measure enteric methane emissions using the SF_6 tracer technique; 12 cows (3 squares) were used to collect ruminal samples using an oral lavage tube. All cows were fed TMR containing (% diet DM): 55% alfalfa/grass baleage, 8% grass hay, and 37% concentrate; soybean meal (from 6 to 2% diet DM) and cornmeal (from 27 to 16% diet DM) were replaced with flaxseed (from 0 to 15% diet DM) to keep diets isonitrogenous while roasted soybean (2% diet DM) was maintained constant across treatments. Yields of milk and milk components were reduced linearly when cows were fed incremental levels of flaxseed. The linear reduction in DMI with increasing flaxseed explains the observed decreases in the yields of milk and milk components. Methane emissions expressed in g/d was reduced linearly with increasing flaxseed possibly as a result of decreased DMI and enhanced molar proportion of ruminal propionate. However, no significant differences were found when expressing enteric methane emissions on an efficiency basis, averaging 15.8 g/kg DMI and 10.6 g/kg ECM across treatments. Increasing flaxseed reduced milk yield but appears to be effective at mitigating methane emission.

Table 1. Effect of ground flaxseed on performance and ruminal metabolism

	Flaxseed (% diet DM)					*P*-value	
	0%	5%	10%	15%	SED	Linear	Quadratic
DMI, kg/d	16.9	16.8	15.7	16.1	0.29	<0.001	0.33
Milk, kg/d	21.2	21.0	20.6	19.9	0.35	<0.001	0.25
Milk fat, kg/d	0.98	0.99	0.94	0.93	0.03	0.05	0.69
Milk protein, kg/d	0.73	0.73	0.69	0.66	0.02	<0.001	0.33
Ruminal total VFA, mM	64.9	65.4	66.2	71.3	4.00	0.13	0.42
Ruminal acetate, % total VFA	72.8	72.3	72.2	71.8	0.29	<0.01	0.73
Ruminal propionate, % total VFA	14.4	14.7	15.4	16.4	0.25	<0.001	0.06
Methane, g/d	276	260	250	232	23	0.05	0.95

Key Words: flaxseed, methane, organic dairy cow

TH144 Effect of source of corn silage and level of dry matter intake on rumen nutrient pool sizes and turnover in dairy cows. F. Lopes*, D. E. Cook, R. W. Bender, and D. K. Combs, *Department of Dairy Science, University of Wisconsin, Madison.*

Our objective was to compare how digestibility and passage of fiber differ due to source of corn silage at 2 levels of dry matter intake. Eight rumen-cannulated dairy cows (110 ± 5 d in milk) were assigned to replicate 4 × 4 Latin squares with 21 d period to evaluate rumen nutrient pool sizes and turnover. Treatments were arranged as a 2 × 2 factorial with main effects of intake [restricted (3.1% of body weight) vs. ad libitum] and source of corn silage (conventional (NCS) vs. BMR). Treatments were (1) NCS-restricted (28.22% NDF); (2) NCS-ad libitum (25.40% NDF); (3) BMR-restricted (27.38% NDF); and (4) BMR-ad libitum (25.37% NDF). Intake and milk production were measured during d 14 to 21. Ruminal contents were evacuated manually 4h after and 2 h before feeding on d 20 and 21. Rumen content was analyzed for OM, NDF, iNDF (indigestible neutral detergent fiber) content. Data were analyzed with MIXED procedure of SAS with fixed effect of diet, period and intake, and cow within square was the random effect. Ruminal digesta volume and mass did not differ among treatments. Intake of DM and aNDF were not affected by source of corn silage. Milk yield was

not affected by intake but milk fat (%) was higher for treatments with restricted intake compared with ad libitum intake. Rumen pool size of DM and NDF did not differ among treatments but pool size of iNDF was higher for diets with NCS than BMR diets. Ruminal turnover rates of DM and NDF did not differ, ruminal turnover of iNDF tended ($P < 0.08$) to increase at higher intake.

Table 1.

	NCS		BMR		
Item	restricted	ad lib	restricted	ad lib	SEM
DM intake, kg/d	25.14[bc]	27.99[ab]	22.81[c]	28.18[a]	1.46
NDF intake, kg/d	7.10	7.13	6.21	7.17	0.42
Digesta wet mass, kg	76.26	85.51	77.64	80.88	4.65
Ruminal pool, kg					
DM	9.90	11.33	10.36	10.87	0.74
NDF	5.46	6.12	5.74	5.93	0.31
iNDF	3.18	3.70	2.57	2.56	0.25
Ruminal turnover rate, %/h					
DM	11.33	10.40	9.37	11.14	0.74
NDF	5.77	4.93	4.62	5.25	0.40
iNDF	2.26	2.90	2.55	3.43	0.56

[abc]$P < 0.05$.

Key Words: corn silage, fiber digestibility, turnover

TH146 Performance and intake of finishing Nellore young bulls on pasture in the rainy season supplemented with crude glycerin. E. San Vito*, J. F. Lage, R. A. Silva, P. Castignino, A. F. Ribeiro, L. R. Simonetti, L. M. Delevatti, M. Machado, E. E. Dallantonia, R. A. Reis, and T. T. Berchielli, *São Paulo State University, Jaboticabal, São Paulo, Brazil.*

The aim of this work was to evaluate the effect of crude glycerin (CG; 80% of glycerol) inclusion as a substitute to corn grain in the intake, average daily gain (ADG) and shrunk body weight final of finishing Nellore young bulls on pasture, supplemented in the rainy season. Fifty Nellore young bulls with initial shrunk body weight of 427 ± 15.76 kg were randomly assigned to 5 treatments, with 2 replicates. The animals were distributed in 10 paddocks, with 1.8 ha each (2 paddocks per treatment), of *Brachiaria brizantha* 'Xaraés' with a height of 30 cm. Treatments were constituted by 5 levels of CG inclusion in the supplement: (0, 70, 140, 210 and 280 g/kg dry matter (DM) of CG based on dry matter) as a substitute to the corn grain. The animals were supplemented daily in a proportion of 300g/100kg of body weight. The supplement was constituted of corn grain, soybean meal, urea, gluten meal and mineralized salt, containing 300 g/kg DM of crude protein based on dry matter. The experiment was conducted in 141 d, and the animals were weighed in the beginning and in the end of the experiment, after 14 h of solids and liquids shrunk to evaluate the average daily gain. Thirty animals were used for evaluation of intake and nutrient digestibility, estimated using 3 markers: isolated, purified and enriched lignin (LIPE), titanium dioxide (TiO_2) and indigestible neutral detergent fiber (iNDF), used for estimation of fecal excretion, supplement intake and forage intake, respectively. Data was analyzed using the GLM procedure of SAS program and the effects of treatments were considered significant at $P < 0.05$. There was no statistical significance ($P > 0.05$) among the treatments, for ADG and shrunk body weight final, dry matter intake and dry matter digestibility, with mean values of 0.869, 550.3, 10.8 and 58.2, respectively. The inclusion of crude glycerin until the level of 280 g/kg DM in the supplement did not affect the performance, dry matter intake and dry matter digestibility of finishing Nellore steers on tropical pasture in the rainy season.

Key Words: biodiesel, by-product, forage

TH147 Effects of increasing levels of whole raw soybean in the Nellore steer diets on ruminal fermentation and microbial protein synthesis. N. R. B. Cônsolo*, A. S. C. Pereira, R. Gardinal, J. E.Freitas Junior, J. R. Gandra, C. S. Takiya, F. P. Rennó, and G. D. Calomeni, *Universidade de São Paulo, Pirassununga, São Paulo, Brazil.*

Soybean is a significant and important source of protein for animal feeds and its production has grown over the years. Observing its importance a study was conducted to evaluate the ruminal fermentation and microbial protein synthesis of Nellore steers in feedlot conditions while fed increasing levels of whole raw soybean (WRS). Twelve steers, in individual pens, were assigned in a 4 × 4 Latin square design with 4 diets. The diets were T0 (0% of WRS), T8 (8% WRS), T16 (16% WRS), and T24 (24% WRS), in a dry matter basis. Each period had 14 d for adaptation and 4 d for data collection. On d 18, samples of ruminal liquid were collected through ruminal cannula at 0, 2, 4, 6, 8, 10, and 12 h after feeding for analysis of pH, VFA, and ammonia-N (NH_3-N). In addition, microbial protein synthesis was estimated by purine derivatives in spot urine samples. Statistical analyses were performed by Proc Mixed procedure of SAS software. Increasing levels of WRS increased ruminal pH ($P < 0.05$). In addition, WRS induced a linearly decreasing effect ($P < 0.05$) on the NH_3-N concentration. Regarding VFA, inclusion levels of WRS prompted a quadratic effect ($P < 0.05$) on total VFA concentration, while presented a linear effect ($P < 0.05$) in butyrate percentage and a quadratic effect in acetate molar concentration ($P < 0.05$) with the lower score in T8 (66.81 vs. 62.66 m*M* to control and T8 respectively). No difference ($P > 0.05$) was observed for the percentage of acetate or propionate and acetate to propionate ratio. Microbial protein synthesis was not altered by WRS treatment. Therefore, adding WRS in the diets tested in this trial did not affect microbial protein synthesis and had no negative effects on ruminal fermentation in beef cattle.

Key Words: protein source, volatile fatty acid, ruminant

TH148 Carcass traits of Nellore young bulls finished in pasture supplemented with crude glycerin. E. San Vito*, J. F. Lage, L. M. Delevatti, E. E. Dalantonia, M. Machado, L. R. Simonetti, R. A. Silva, P. Castagnino, R. A. Reis, and T. T. Berchielli, *São Paulo State University, Jaboticabal, São Paulo, Brasil.*

This trial aimed to evaluate the effects of feeding crude glycerin (CG) - 80% of glycerol - included as a substitute to corn grain in supplements of young bulls finished in pasture on rainy season on hot carcass weight (HCW), dressing percentage (DP), carcass shrink loss (CSL), rib fat thickness (RFT) and ribeye area (REA).Fifty Nellore young bulls with initial shrunk body weight of 427 ± 15.76 kg were randomly assigned to 5 treatments, with 2 replicates. The animals were distributed in 10 paddocks, with 1.8 ha each (2 paddocks per treatment), of *Brachiaria brizantha* 'Xaraés' with a height of 30 cm. Treatments were constituted by 5 levels of CG inclusion in the supplement: (0, 70, 140, 210 and 280 g/kg dry matter (DM) of CG based on dry matter) as a substitute to the corn grain. The animals were supplemented daily in a proportion of 300g/100kg of BW. The supplement control was constituted of corn grain, soybean meal, urea, gluten meal and mineralized salt, containing 300 g/kg DM of crude protein. The diets were isonitrogenous and formulated to meet the

requirements for maintenance and gain of the animals according to Brazilian recommendations. After 141 d on feed, the animals were slaughtered with 550.1 ± 32.6 BW. The carcasses were weighed for obtained the HCW and DP. The carcass were refrigerated for 24 h at 0°C and then rib fat thickness (RFT) and ribeye area (REA) were measured in the region between 12 and 13th rib. Data was analyzed using the GLM procedure of SAS program and the effects of treatments (linear and quadratic) were considered significant at $P < 0.05$. Glycerin level did not affect HCW ($P = 0.116$), DP ($P = 0.406$), CSL ($P = 0.169$), RFT ($P = 0.874$) and REA ($P = 0.215$) with mean values of 307.6, 55.6, 1.5, 2.9 and 84.3, respectively. Adding crude glycerin in supplement (28% of DM) does not affect the carcass traits of young bulls finished in pasture on rainy season.

Key Words: beef cattle, glycerol, rib fat thickness

TH149 Meat quality from Nellore young bulls finished on pasture supplemented with crude glycerin. E. San Vito*, J. F. Lage, R. A. Silva, L. M. Delevatti, E. E. Dalantonia, L. R. Simonetti, M. Machado, M. B. Abra, A. F. Ribeiro, and T. T. Berchielli, *São Paulo State University, Jaboticabal, São Paulo, Brazil.*

This trial aimed to evaluate the effect of crude glycerin (CG) inclusion as a substitute to corn grain on Warner-Bratzler shear force (WBSF), cooking losses (CKL), thawing loss (TL), total loss (TL) and intramuscular fat (IMF) of meat from young bulls. The CG used was derived from soybean biodiesel production (80% glycerol). Fifty Nellore young bulls with initial shrunk body weight of 427 ± 15.76 kg were randomly assigned to 5 treatments, with 2 replicates. The animals were distributed in 10 paddocks, with 1.8 ha each (2 paddocks per treatment), of *Brachiaria brizantha* 'Xaraés' with a height of 30 cm. Treatments were constituted by 5 levels of CG inclusion in the supplement: (0, 70, 140, 210 and 280 g/kg dry matter (DM) of CG based on dry matter) as a substitute to the corn grain. The animals were supplemented daily in a proportion of 300g/100kg of BW. The supplement was constituted of corn grain, soybean meal, urea, gluten meal and mineralized salt, containing 300 g/kg DM of crude protein. The diets were isonitrogenous and formulated to meet the requirements for maintenance and gain of the animals according to Brazilian recommendations. After 141 d on feed, the animals were slaughtered with 550.1 ± 32.6 BW. A boneless longissimus muscle (LM) section 10 cm thick was removed from the posterior end of the wholesale rib. LM samples were individually vacuum-packaged and held at −20°C for analysis. Data was analyzed using the GLM procedure of SAS program and the effects of treatments (linear and quadratic) were considered significant at $P < 0.05$. There was no statistical significance ($P > 0.05$) among the treatments, for WBSF ($P = 0.509$), CKL ($P = 0.826$), TL ($P = 0.491$), TL ($P = 0.810$) and ether extract ($P = 0.516$) with mean values of 3.6, 28.2, 2.9, 30.2 and 0.95, respectively. The inclusion of crude glycerin until the level of 280 g/kg DM in the supplement did not affect the meat quality of young bulls finished on tropical pasture in the rainy season.

Key Words: glycerol, intramuscular fat, shear force

TH150 Microbial protein synthesis in dairy cows fed with sources of unsaturated fatty acids. V. P. Bettero*[2,1], J. E. Freitas Junior[1], M. D. S. Oliveira[2], B. C. Venturelli[1], E. F. Jesus[2], R. Gardinal[1], G. D. Calomeni[1], K. A. Koyama[1], V. G. C. Lacuna[1], B. C. Benevento[1], R. V. Barletta[1], and F. P. Rennó[1], *[1]University of Sao Paulo, Pirassununga, Sao Paulo, Brazil, [2]State University Julio de Mesquita, Jaboticabal, Sao Paulo, Brazil.*

The aim of this study was to evaluate the microbial protein synthesis in dairy cows supplemented with sources of unsaturated fatty acids. Eight Holstein cows in the mid lactation (80 ± 20 d in milk; mean SD) cannulated in the rumen and abomasums (580 ± 20 kg of weight; mean ± SD) with milk yield of 25 kg/d were assigned randomly into two 4 × 4 Latin squares, fed the following diets: (1) control (C); (2) refined soybean oil (inclusion of 3% in the total dry matter; OS); (3) whole soybean raw (WS; inclusion of 16% in the total dry matter); and (4) calcium salts of unsaturated fatty acids (CSFA; inclusion of 3% in the total dry matter). Milk yield and the dry matter intake were measured daily throughout the experimental period. Milk samples were collected on d 16 of the experimental period. Urine aliquots (50 mL) were obtained 4 h after feeding, on d 16 of the experimental period. Urine was filtered and diluted in 0.036 *N* sulfuric acid to prevent bacterial destruction of purine derivatives and precipitation of uric acid. A sample of pure urine was collected for determination of total nitrogen, urea and creatinine. The microbial protein synthesis was estimated as a function of the purine derivatives absorption. Data were analyzed using PROC MIXED of SAS 9.1 according with the orthogonal contrasts (C vs. SO + WS + CSFA); (SO vs. WS + CSFA) and (WS vs. CSFA). There was no difference ($P > 0.05$) in daily excretion in mmol/L and mmol/day of allantoin in urine and milk, urine uric acid excretion in urine L/day, total purine, purine derivatives, purines absorbable in mmol/day, microbial nitrogen production, microbial crude protein, g/day and efficiency of microbial protein synthesis between the experimental diets, although on the 2 last parameters OS (1187.13 g/day and 118.73 microbial CP/kg TDN consumed, respectively) was numerically higher than C (1086.19g/day and 108.63 microbial CP/kg TDN consumed, respectively) in 8.5%. The inclusion of unsaturated fatty acids in the diet of dairy cows did not influence the microbial protein synthesis.

Key Words: allantoin, fat feeding, microbial nitrogen

TH151 Protein maintenance requirements of goats. A. K. Almeida*, D. C. Soares, S. P. Silva, M. H. M. R. Fernandes, I. A. M. A. Teixeira, and K. T. Resende, *UNESP Univ Estadual Paulista, Jaboticabal, São Paulo, Brazil.*

We have proposed to investigate the effect of gender in protein maintenance requirements and the extension of the difference for Saanen goats between 30 and 45 kg of body weight (BW). We used 24 intact males, 23 females and 24 castrated males with initial BW of 30.0 ± 1.09 kg and initial age of 258 ± 53 d. At 30.0 ± 1.09 kg of BW, 6 intact males, 6 females and 6 castrates were slaughtered to estimate the initial body composition, we found one equations for each gender ($P \leq 0.0001$) for initial crude protein content. The other animals were randomly allocated into 18 groups (blocks) of 3 animals of the same gender, subjected to 0, 25 or 50% of feed restriction. The restriction level was calculated for each group of 3 animals, based on the ad libitum animals intake, when these animals reached 45 kg of BW, they were slaughtered, dictating the number of days of the other 2 animals in the group. After that the body was grinded, freeze-dried and analyzed nitrogen (N) content. To estimate the retained N, we took the final body composition minus initial body composition. As expected, we did not find difference neither the apparent digestibility of CP ($P = 0.22$) nor gender ($P = 0.42$) for feed restriction level. We used the MIXED procedure SAS (SAS Inst. Inc., Cary, NC) to perform the regression of the retained N in the weight gain on N intake, we used the CONTRAST option to verify difference among genders, the ESTIMATE option gave us the overall intercept and slope. The net requirement of N for maintenance (MRNP) was assumed to be the intercept of the regression of the retained N in the daily gain (g of

N/kg$^{0.75}$ of EBW) on N intake (g of N/kg$^{0.75}$ of EBW), that represents the endogenous and metabolic losses of N multiplied by 6.25. Our study indicated the value of 419 ± 67 mg of N/kg$^{0.75}$ of EBW for minimal N losses, which corresponds to MRNP of 2.62 ± 0.5 g/kg$^{0.75}$ of EBW. The N intake required for maintenance, at retained nitrogen equal to zero, was 1.15 g of N/kg$^{0.75}$ of EBW, which corresponds to the intake of 7.16 g of CP/kg$^{0.75}$ of EBW. According to this study the feeding systems recommendations underestimates the protein requirements for goats. FAPESP process number: 2010/02482–4.

Key Words: gender, kid, nutrition plan

TH152 Encapsulated nitrate product replacing soybean meal on feedlot performance of finishing beef steers. M. L. R. Pereira[1], V. R. M. Couto[1], R. C. Araujo[1], F. A. Lino[1], A. M. Mobiglia[1], J. A. Silva[1], A. C. Carvalho[1], P. H.J. Cunha[1], and J. J. R. Fernandes*[1], *[1]Escola de Veterinaria e Zootecnia da UFG, Goiania, Goias, Brazil, [2]GRASP Ind. e Com. LTDA, Curitiba, Parana, Brazil.*

Nitrate salts can be used as NPN sources. Despite this, nitrate is not currently used due to the risk of methemoglobinemia. The objective of this experiment was to evaluate the effects of an encapsulated calcium nitrate product (16% total N and 65.1% NO_3 in DM basis) as a replacement of soybean meal during an 84-d finishing period of feedlot beef steers. One hundred 20 Nellore beef steers (339.5 kg of initial BW) were used in a randomized complete block design with 4 treatments and 5 replicates. Blocks were defined by initial BW and pens with 6 animals each were considered as replicates. Treatments were defined as follows: CTL = control diet using soybean meal without any further addition of NPN; ENP-1 = inclusion of 1% encapsulated nitrate product (ENP) in the dietary DM; ENP-2 = inclusion of 2% ENP; and ENP-3 = inclusion of 3% ENP. Diets were isonitrogenous and isoenergetic with a 90:10 concentrate:forage (sugarcane bagasse) ratio. Animals were stepwise adapted to treatments by feeding CTL for 4 d, ENP-1 for 4 d, ENP-2 for 5 d, and then ENP-3. During adaptation, blood methemoglobin (MetHb) in all animals were below 2% of total hemoglobin. A quadratic increase ($P < 0.05$) was observed on average MetHb throughout experimental period (0.62, 0.98, 1.54, and 1.45% for CTL, ENP-1, ENP-2, and ENP-3, respectively). The DMI decreased linearly ($P < 0.02$) with nitrate inclusion (9.6; 8.7; 8.8; 8.4 kg/d for CTL, ENP-1; ENP-2; ENP-3, respectively). Final BW and ADG were not affected ($P > 0.10$) by treatments. Feed efficiency, expressed in carcass weight basis, also did not differ ($P > 0.10$) among treatments, showing values of 0.121, 0.130, 0.128, and 0.127 according to the incremental dosages of ENP. No effects ($P > 0.10$) were observed on hot carcass weight, carcass yield, and fat thickness. In conclusion, encapsulated nitrate product is an effective NPN source, being able to replaced soybean meal resulting in similar animal performance. The observed basal levels of MetHb indicated that animals were not at risk for methemoglobinemia development.

Key Words: animal growth, beef cattle, methemoglobin

TH153 Production, composition and oxidative stability of milk enriched in polyunsaturated fatty acids from dairy cows fed alfalfa protein concentrate or supplemental vitamin E. M.-C. Fauteux*, Y. Lebeuf, R. Gervais, and P. Y. Chouinard, *Departement des Sciences Animales, Universite Laval, Quebec, QC, Canada.*

Alfalfa protein concentrate (APC; Extraluz, Desialis) produced by cold pressing of fresh forage followed by drying and pelleting of the extract is a source of protein (>50% CP) and carotenoids (>1000 µg/g of DM), the latter being known for their role as antioxidants. Effects of feeding APC or supplemental vitamin E on production, composition and oxidative stability of milk enriched in polyunsaturated fatty acids (PUFA) were evaluated using 6 lactating Holstein cows (DIM = 224; BW = 672 kg; milk yield = 20.9 kg) used in a replicated 3 × 3 Latin square (21-d periods, 14-d adaptation). Treatment diets were formulated to contain (% DM): CTL = 9% soybean meal (SBM); VitE = 9% SBM + 7000 IU vitamin E; and APC = 9% APC. All cows received continuous abomasal infusion of 450 g/d of linseed oil. As a result, milk fat content of c9c12 18:2 increased from 0.9% to 3.8%, while c9c12c15 18:3 increased from 0.3% to 12.5% during the experimental period compared with the pretrial period. There was no difference ($P > 0.68$) in milk fat (MF) content of these 2 fatty acids among treatments. Milk protein (3.60%), and fat content (4.30%) were similar among treatments ($P > 0.31$). Milk yield tended to be higher for APC (14.8 kg/d; b) compared with VitE (13.1 kg/d; a, $P = 0.08$) but was not different from CTL (13.4 kg/d; ab). Cows fed APC had a higher protein yield (521 g/d; b) compared with VitE (446 g/d; a) whereas CTL had an intermediary value (484 g/d; ab). Redox potential of fresh milk was reduced when cows were fed vitE (144 mV; a) and APC (152 mV; a) compared with CTL (189 mV; b). Dietary treatments had no effect on fresh milk contents of dissolved oxygen (8.1 mg/L; $P = 0.41$) and conjugated diene hydroperoxides (62.8 mmol/kg of MF; $P = 0.76$). Hexanal content of fresh milk was lower for cows fed VitE (0.03 mg/kg of milk; a) compared with CTL (0.07 mg/kg of milk; b) whereas APC had an intermediary value (0.05 mg/kg of milk; ab). In conclusion, feeding APC to dairy cows helped prevent oxidative degradation of milk enriched in PUFA.

Key Words: carotenoid, cow, oxidation

TH154 Effects of canola meal treatment with different levels of tannins extracted from pistachio hulls on the N fractions by the Cornell Net Carbohydrate and Protein System (CNCPS). M. Dehghan-Banadaky*, A. R. Jolazadeh, and N. Vahdani, *Department of Animal Science, University of Tehran, Karaj, Tehran, Iran.*

The objective of this study was to investigate the effects of different levels of extracted tannin from the pistachios hulls on protein fractioning of canola meal (CM) based on the Cornell net carbohydrate and protein system (CNCPS).The sun dried pistachio hulls was grounded through a 0.5 mm screen and soaked with ratio of 1:10 between pistachio and water. Filtered extract was concentrated by heating at 95 ℃. The CM was treated with pistachio concentrated extract (PCE) containing 11% Tannin in DM of extract, in different levels of 0, 5, 10, 15, 20 and 30 gr tannin in100 gr DM of canola meal . Protein fractioning of CM was determined according to procedures by Licitra et al. (1996). According to results, 5% level has shown the lowest soluble fraction (total of A, B1) among treatments. There was no significant difference among treatments in B2 fraction. All treatments were increased B3 fraction compared with control and 20% level has showed the highest B3 fraction. There was a reduction in C fraction when the level of PCE was increased. The lowest soluble fraction of CP followed by the highest escaped protein (B2+B3) elicited to recommend 5% level as the best treatment for CM, in lab scale.

Table 1. Mean and SE of proportion of the soluble and insoluble CP fractions expressed as percentages of total CP for CM based on the CNCPS

	Soluble fraction			Insoluble fraction			
Treatment	A	B1	A+B1	B2	B3	C	B2+B3+C
Control	3.3^{abc}±0.20	13.3^{f}±0.6	16.6^{e}±0.60	73.9^{a}±0.78	8.1^{b}±0.13	1.3^{a}±0.04	83.4^{a}±0.7
5%	3.8^{a}±0.10	16.3^{e}±0.6	20.1^{d}±0.64	69.4^{b}±0.76	9.4^{a}±0.09	1.1^{ab}±0.03	79.9^{b}±0.64
10%	3.7^{ab}±0.52	19.3^{d}±0.6	22.1^{c}±0.95	67.3^{c}±0.81	8.6^{b}±0.07	1.1^{ab}±0.09	77.3^{c}±0.95
15%	2.1^{bc}±0.17	22.3^{c}±0.6	25.2^{b}±0.68	65.3^{c}±0.62	8.3^{b}±0.18	1.1^{ab}±0.08	74.8^{d}±0.68
20%	2.7^{cd}±0.16	25.3^{b}±0.6	27.9^{a}±0.67	61.5^{d}±0.31	9.4^{a}±0.40	1.1^{b}±0.07	72.1^{e}±0.67
30%	2.1^{d}±0.12	27.88^{a}±0.3	29.8^{a}±0.25	60.1^{d}±0.34	9.3^{a}±0.15	0.7^{c}±0.10	70.2^{e}±0.20

Key Words: CNCPS, canola meal, tannin

TH155 Aflatoxin B1 binding by treated lactobacilli as a mycotoxin binder in ruminant gastrointestinal model. R. Motameny[2], M. Dehghan-Banadaky*[1], and S. Totonchi-Mashhour[2], *[1]Department of Animal science, University of Tehran, Karaj, Tehran, Iran, [2]Department of Animal Science, Faculty of Agriculture, Science and Research Branch, Islamic Azad University, Tehran, Iran.*

The present study investigated the ability of *Lactobacillus rhamnosus* PTCC 1637, *Lactobacillus plantarum* PTCC 1058, and *Lactobacillus acidophilus* PTCC 1643 in nonviable forms to bind high dosage of the AFB1 in simulated ruminant gastrointestinal model. Bacteria were grown in MRS broth (37°C, 24 h) and killed with heat or acid. The AFB1 naturally produced with *Aspergillus parasiticus* PTCC 5286 via fermentation of rice and extracted with chloroform. Differential analysis for aflatoxin B1, B2, G1, G2 was done by HPLC method. Result showed that from the total aflatoxins content, 84.64% was aflatoxin B1 and 15.36% was aflatoxin G1. Each sample contained 1×10^9 treated bacteria per 1.5 mL of buffer (18 µg/mL AFB1) that incubated continuously in pH 6.5 (16 h), 1.9 (1 h) and 7.8 (24 h) based on 3-step in vitro procedure that simulating rumen, abomasum and intestine situation of ruminants. At the end of incubation period bacteria were pelleted and the supernatant fluid containing unbound the AFB1 was collected and analyzed by microtiter plate ELISA method. Results shown 26.9, 21.4, 19.8% AFB1 binding percentage with *L. plantarum, L. rhamnosus* and *L. acidophilus*, respectively, with no significant differences among them ($P > 0.05$). Aflatoxin B1 binding percentage by heat and acid treatments were 21.9 and 23.8% respectively, with no significant differences. We concluded that, these strains and treatments had similar ability to reducing high dosage of impure aflatoxin B1 in ruminant model but more in vitro investigation are needed for selecting an appropriate mycotoxin binder based on lactobacilli.

Key Words: aflatoxin B1, ELISA, *Lactobacillus*

TH156 Ruminal fermentability of killed lactobacilli as mycotoxin binder. R. Motameny[2], M. Dehghan-Banadaky*[1], and AA Sadeghi[2], *[1]Department of Animal Science, University of Tehran, Karaj, Tehran, Iran, [2]Department of Animal Science, Faculty of Agriculture, Science and Research Branch, Islamic Azad University, Tehran, Iran.*

Heat and acid killed of *Lactobacillus rhamnosus* PTCC 1637, *Lactobacillus plantarum* PTCC 1058, and *Lactobacillus acidophilus* PTCC 1643 have ability to bind AFB1. Ruminal fermentability of these organic compounds is a key factor for assessing their usefulness as mycotoxin binders in addition to their aflatoxin binding properties. Objective of current study were to assess cumulative gas production of these treated bacteria as an indirect index for ruminal fermentation process. Briefly each strain were grown in MRS broth (37°C, 24 h), pelleted, washed, treated with heat or acid, washed, dried and finally 200 mg of each sample was weighed into a serum bottle (5 samples in total) before the injection of 30 mL rumen fluid based on Theodorou et al. (1994). Results showed that lowest ($P \leq 0.0001$) cumulative gas production (7.5 mL) obtained by *L. rhamnosus*, *L. plantarum*, and *L. acidophilus* with 14.4 and 14.3 mL gas production showed highest cumulative gas production during incubation time ($P \leq 0.0001$). Heat and acid treatments with 10.1 and 14.0 mL of cumulative gas production showed significant differences ($P \leq 0.0001$). Lowest gas production related to 2h of incubation period (3.9 mL), then gas production until 12 h was constant (5.1 to 6.4 mL) and from 24 to end of incubation period increased significantly ($P \leq 0.0001$) from time to another time (7.4 to 30.7 mL). Heat treated *L. rhamnosus* with lowest ruminal fermentability during 96 h of incubation period, showed appropriate property for selecting as mycotoxin binder in ruminant ration.

Key Words: gas production test, *Lactobacillus*, mycotoxin binder

TH157 Steam flaking barley grain decreases rumen pH when compared to grinding. M. Dehghan-Banadaky*, M. Eslamizad, and A. Lakki, *Department of Animal Science, University of Tehran, Karaj, Tehran, Iran.*

Results on the effect of steam flaking (SF) versus grinding (G) of barley grain on rumen pH have been inconsistent. In this study, 5 nonlactating, non-pregnant ruminally cannulated Holstein cow were used to compare the effect of G and SF barley grain on rumen pH. Treatments were applied to cows in a cross over design with five 10-d periods (7 d of adaptation and the last 3 d for sampling). Cows were fed a ration providing maintenance requirements based on NRC 2001. The experimental ration was similar between treatment except for the proportion of either SF or G barley .The total amount of barley fed was 4.2 kg daily with 100:0, 75:25, 50:50, 25:75 and 0:100 ratios of G to SF barley grain. Results indicated that SF barley grain significantly decreased rumen fluid pH when substituted for 75 and 100% of G barley grain in diet suggesting that SF increases rate and extent of starch digestion in the rumen.

Table 1. Rumen fluid pH in cows fed different ratios of ground to steam flaked barley grain

	Treatment						
	SF100: G0	SF75: G25	SF50: G50	SF25: G75	SF0: G100	SEM	*P*-value
Rumen pH	6.60^{a}	6.63^{ab}	6.69^{ab}	6.70^{b}	6.74^{b}	0.036	0.047

Key Words: barley, ground, steam flaking

TH158 Lactation performance and nitrogen balance in cows fed red clover or alfalfa based diets differing in rumen-degraded protein supply. M. Leduc*[1], R. Gervais[1], E. Baumann[1], Y. Lebeuf[1], GF Tremblay[2], and PY Chouinard[1], *[1]Universite Laval, Quebec, Quebec, Canada, [2]Agriculture and Agri-Food Canada, Quebec, Quebec, Canada.*

Polyphenol oxidase in red clover silage (RCS) is known to reduce proteolysis which can modify dietary N utilization in ruminants. Rumen metabolism of N could be further modified by applying heat treatments to dietary protein supplements. The objective of this trial was to compare the effects of RCS and alfalfa silage (AS) fed in diets differing in rumen-degraded protein (RDP) supply on milk yield and composition, and on N balance in dairy cows. Eight multiparous Holstein dairy cows (72 ± 17 DIM) were used in a replicated 4 × 4 Latin square design (21-d periods, 14-d adaptation). Four treatments were compared in a 2 × 2 factorial

arrangement with AS or RCS fed in diets providing 85 (RDP85) or 100% (RDP100) of calculated RDP requirements. Untreated and heat-treated (AminoPlus) soybean meals were used to adjust dietary RDP. Cows fed AS diets had a higher N intake (633 g/d; $P < 0.01$) than those fed RCS diets (540 g/d) as a result of higher dietary CP concentration (15.4 vs. 14.4%; $P < 0.01$) and DM intake (25.8 vs. 23.4 kg/d; $P < 0.01$). Milk yield was higher for cows fed AS (35.7 kg/d; $P < 0.01$) compared with RCS (34.3 kg/d). Cows fed RDP85 had a higher milk yield (35.4 kg/d; $P = 0.04$) compared with RDP100 (34.6 kg/d). Milk protein content and yield were higher for cows fed AS (3.29% and 1172 g/d, respectively; $P < 0.01$) compared with RCS (3.14% and 1075 g/d). Concentration of MUN was higher for cows fed AS (8.1 mg/dL; $P < 0.01$) compared with RCS (6.6 mg/dL). As a percentage of N intake, cows fed AS had a lower fecal N excretion (33.0% vs. 41.2%; $P = 0.01$) and a higher urinary N excretion (28.0% vs. 22.6%; $P < 0.01$) than cows fed RCS. As a result, total N excretion was similar among the 2 silages (62.4% of N intake; $P = 0.31$). Finally, efficiency of milk N secretion was lower when cows were fed AS (29.7%; $P = 0.02$) compared with RCS (32.1%). Varying RDP supply had no effect on N balance ($P > 0.16$). In conclusion, under the conditions of the current trial, feeding AS allowed a higher production of milk and milk protein but the efficiency of milk N secretion was lower as compared with RCS.

Key Words: polyphenol oxidase, red clover, rumen-degraded protein