mycotoxin, however analyses revealed 220 ppb on DON, < 10 ppb ZEA and < 50 ppb T-2. The data suggest that in piglets exposed to weaning stress and a natural infection with HPS, DON levels as low as 220 ppb can decrease performance. From day 15-20, all piglets were treated with Vital TSS (Trimethoprimum, Sufathiazolum and Sulfidimidinum). This treatment effectively controlled the HPS infection. During this trial phase no differences in performance were recorded between treatments, indicating that a reduction in stress level did allow the piglets to cope with 220 ppm of dietary DON. Mycotoxin-contaminated straw did not affect piglet performance or health. However, low levels of dietary DON led to a reduction in performance in piglets exposed to weaning and microbial stress. Mycotoxin adsorbent can help in alleviating the negative effects on performance.

Table 1: Effect of contaminated straw and mycotoxin adsorbent on piglet performance

Parameter	Control	Straw	S + Adsorbent	SE
ADFI, g (d1-14)	346	334	378	15.3
ADFI, g (d15-28)	752	705	705	24.3
ADFI, g (d1-28)	549	520	542	17.6
ADG, g (d1-14)	218a	226a	276b	11.5
ADG, g (d15-28)	520	473	500	21.6
ADG, g (d1-28)	369	350	388	13.6
FCR (d1-14)	1.65c	1.54cd	1.38d	0.06
FCR (d15-28)	1.44	1.48	1.42	0.05
FCR (d1-28)	1.48	1.48	1.41	0.03

a,b P<0.05; c,d P<0.10

Key Words: Straw, Mycotoxin, Piglet

M112 Influence of diet on microbial community structure and activity in the intestinal tract of weanling pigs. A. Piva*[1], L. Magnani[1], G. Casadei[1], P. P. Gatta[1], K. M. Selig[2], and J. A. Patterson[2], [1]*University of Bologna, Italy Via Tolara di Sopra, 50, Ozzano Emilia (BO),* [2]*Department of Animal Sciences, Purdue University, West Lafayette, IN.*

Weaning is the hardest step in the lifespan of a pig, and is often characterized by microbial imbalance, changes in intestinal structure and function, scours, low performance, or even death. Different nutritional strategies were studied relative to their ability to modulate intestinal microflora and performance. Three diets were fed over 5 weeks as follows: 1) standard U.S. diet with plasma protein, carbadox, zinc oxide and copper sulfate (US), 2) standard plant-protein-based European diet (EU) 3) EU diet + TRILAC (US Patent # 6,217,915) as a source of tributyrin and lactitol (TL). Performance was recorded at 7, 21, and 35 days, along with NH_3, VFA and Lactic Acid Bacteria (LAB) count in cecum, colon and jejunum. Despite any effects recorded during the first week, after 21 days US diet fed piglets reported significantly (P<0.05) greater LW (11.36 kg, SE=0.42, n=30) and Feed Efficiency (0.53, SE=0.03, n=5), compared to EU (LW=9.38 kg; FE=0.39), or TL (LW=9.83 kg, FE=0.40) fed piglets. No differences were noticed between EU and TL treatments. A similar pattern was recorded at the end of the study (35 d) when US fed animals showed the highest (P<0.05) LW (18.87 kg, SE=0.62, n=25) whereas Feed Efficiency did not differ among groups. NH_3 was not affected by any treatment throughout the study, whilst colonic VFA concentration after 21 days was higher in EU and TL groups compared to US piglets (+27% and +77%, respectively, P<0.03). Moreover TL diet increased (P<0.01) LAB count in the cecum (9.02 ± 0.36 log 10 cfu/g feces) and colon (9.15 ± 0.28 log 10 cfu/g feces) of piglets than did US diet (7.50 ± 0.44 and 8.03 ± 0.45 log 10 cfu/g feces, respectively). In conclusion a standard US diet added with plasma protein, carbadox, zinc oxide and copper sulfate out-performed a plant-protein-antibiotic-free European diet. Nevertheless the addition of tributyrin and lactitol together beneficially affected microbial balance and fermentation products leading to a LW numerically between those of US and EU formulations.

Key Words: Weanling Pigs, Intestinal Microbiota, AGP Alternatives

Forages and Pastures

M113 Nutritive quality of *Poa pratensis* in model grassland communities exposed to ground-level ozone. D. Dodson*[1], J. Bender[2], J. Lin[1], and R. Muntifering[1], [1]*Auburn University, Auburn, AL,* [2]*Federal Agricultural Research Center, Braunschweig, Germany.*

Tropospheric (i.e., ground-level) ozone (O_3) is the most significant phytotoxic air pollutant in the US and Europe, and its concentration globally is expected to increase by 0.3 to 1.0%/yr for the next 50 yr. Because interspecific plant competition is theorized to amplify O_3 stress, especially early in the growing season, a phytometer-based approach was utilized to investigate effects of exposure to elevated O_3 on nutritive quality of *Poa pratensis* (phytometer) and four competitor species (*Anthoxanthum odoratum, Achillea millefolium, Rumex acetosa and Veronica chamaedrys*) representative of an extensively managed, species-rich grassland community of Central Europe. Model plant communities (mesocosms), in which *P. pratensis* was grown in monoculture and in mixed cultures with each of the competitor species, were placed into open-top chambers and exposed continuously during April and May to carbon-filtered air + 25 ppb O_3 (control) or non-filtered air + 50 ppb O_3 (elevated O_3). *Poa pratensis* was harvested from mesocosms at the end of the exposure period and assessed for relative food value (RFV), which was predicted from concentrations of NDF and ADF. Across all mono- and mixed cultures, concentrations of NDF, ADF and lignin were greater ($P < 0.001$), and RFV was lower ($P < 0.001$) for *P. pratensis* grown under elevated O_3. Increased concentrations of lignin were considerably greater than could be explained on the basis of increased concentrations of NDF and ADF, consistent with the general mechanism of plant response to environmental stress. Concentrations of cell wall constituents and N were not affected by competition, and N concentration was not affected by exposure to elevated O_3. While effects of early-season O_3 stress on RFV of *P. pratensis* were not amplified by interspecific competition, exposure to elevated O_3 decreased RFV of *P. pratensis* by an average of 10%, which is sufficient to have nutritional implications to its utilization by herbivores.

Key Words: Tropospheric Ozone, Forage Quality, *Poa pratensis*

M114 Effect of increased cutting height of corn silage on nutritive value, milk yield and milk composition. D. Dominguez-Diaz*[2] and L. D. Satter[1,2], [1]*Dairy Forage Research Center, USDA-ARS, Madison, WI,* [2]*Dairy Science Department, University of Wisconsin-Madison, Madison.*

The objective of this study was to evaluate the effect of increasing cutting height of a conventional corn hybrid (Golden Harvest H8250) from 20 cm (Normal cut corn silage, **NC**) to 61 cm (High cut corn silage, **HC**) on the nutritive value of corn silage, milk yield and milk composition. Thirty six multiparous and six primiparous Holstein cows averaging 70 days in milk (SD±16) and 45.2 kg milk/d (SD±6.4) were randomly assigned to the NC or HC diets following a 1-wk pretrial period. The experiment was a single reversal design with two 6-wk periods. The silages were chopped at 0.95 cm theoretical length of cut and stored in plastic bag silos. The NC and HC diets contained 65% forage, of which 70% was corn silage and 30% alfalfa silage. Increasing cutting height reduced DM yield by 8.3%, and increased grain content by 11.6% and decreased stalk by 38.5%. The concentration of DM, CP and starch were increased 9.1, 4.8 and 22.3% with the HC silage, and NDF, ADF and ADL concentrations were reduced by 9.9, 14.9 and 23.5%. Corn silage pH was slightly increased with the HC treatment. DMI was similar between the NC and HC diets (24.4 and 24.6 kg/d). The HC treatment increased yield of milk (P≤0.03) and 3.5% FCM (P≤0.19) compared to the NC diet (40.4 vs. 39.3 and 41.6 vs. 40.8 kg/d). Feed efficiency was increased (P≤0.06) with the HC treatment (1.66 vs. 1.62). Milk composition, body weight and body weight change were unaffected by treatment.

Key Words: Cutting Height, Corn Silage

M115 Site and extent of digestion of diets containing brown midrib-3, low-cut, or high-cut corn silage. D. Dominguez-Diaz*[2] and L. D. Satter[1,2], [1]*Dairy Forage Research Center, USDA-ARS, Madison, WI,* [2]*Dairy Science Department, University of Wisconsin-Madison, Madison.*

The objective was to evaluate the effect of feeding brown midrib-3 corn silage (bm3) and conventional corn silage (Golden Harvest H8250) cut at 20 cm (Normal cut corn silage, NC) or 66 cm (High cut corn silage, HC) on ruminal fermentation, digestion kinetics, and site and extent of digestion. Nine multiparous Holstein cows averaging 172 DIM (SD±70) and 40.1 kg milk/d (SD±1.5) were randomly assigned to NC, HC and bm3 diets in a 3 × 3 Latin square design with 21-d periods. Dry matter digesta flow to the omasum was estimated using Ytterbium, CoEDTA and indigestible NDF markers. Omasal digesta samples were obtained by inserting a sampling device through the ruminal cannula. Fecal grab samples were used to estimate total tract digestibility. DMI was similar among NC, HC and bm3 diets (22.8, 22.9 and 23.7 kg/d). Milk yield and 3.5% FCM were similar among treatments (33.4, 31.8, 34.0 and 34.9, 32,8 and 35.9 kg/d). The daily mean of ruminal pH, acetate, propionate and total VFA concentrations were similar among treatments.The A/P ratio and ruminal ammonia concentrations were decreased (P≤0.05) with bm3 compared to the NC and HC diets (3.56 vs. 3.67 and 3.68, and 6.64 vs. 7.70 and 7.62 mM). Ruminal pool sizes of DM, OM, CP, NDF, ADF and starch were unaffected by treatment. Ruminal turnover rates of NDF and ADF were increased (P≤0.003) with feeding of bm3 compared to the NC and HC diets (5.34 vs. 4.52 and 4.56, and 5.0 vs. 4.17 and 4.24%/h). Apparent ruminal, postruminal and total digestibility of DM, OM and NDF were unaffected by treatment. Ruminal digestion of starch was reduced with the bm3 treatment, but resulted in 0.32 kg/d more starch digested in the small intestine. Ruminal and postruminal digestion of ADF were unaffected by treatment, but total tract digestion of ADF was increased (P≤0.03) with the bm3 compared to the NC and HC diets (46.5 vs. 42.6 and 43.6%).

Key Words: bm3, Cutting Height, Corn Silage

M116 Nutritive quality of early-season *Trifolium* forage as influenced by nitrogen and ground-level ozone. K. E. Kittendorf*[1], B. Sanchez-Gimeno[2], J. Sanz[2], J. Lin[1], and R. B. Muntifering[1], [1]*Auburn University, Auburn, AL,* [2]*Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas, Madrid, Spain.*

Tropospheric (i.e., ground level) ozone (O_3) is the most significant phytotoxic air pollutant in the US and Europe, and its concentration globally is expected to increase by 0.3 to 1%/yr over the next 50 yr. Because N enrichment is theorized to increase susceptibility of vegetation to O_3 injury by altering leaf-cell apoplast pH, combined effects of O_3 and N on forage quality were investigated in an experiment in which seedlings of three *Trifolium* species representative of a Mediterranean dehesa community (*T. subterranean, T. cherleri* and *T. striatum*) were grown in open-top chambers (OTC) to which added air had been carbon-filtered (CF), representing approximately half-ambient O_3 concentration; non-filtered (NF), characteristic of ambient air; or enriched to twice-ambient O_3 concentration (2X). Within each air treatment, N fertilizer was applied to simulate a range of N enrichment levels (10, 30 and 60 kg N/ha) suggested from soil-test values and estimates of wet deposition in the vicinity of Madrid, Spain. Plants were exposed to air treatments for 30 d, removed from OTC, and maintained in ambient air until they were harvested 1 mo later. Exposure to elevated O_3 decreased ($P < 0.01$) biomass yield (2X < NF < CF), whereas N enrichment increased ($P < 0.01$) biomass yield (60 > 30 > 10 kg N/ha) in all three species. Exposure to elevated O_3 decreased ($P < 0.01$) relative food value (RFV) of *T. subterraneum* (2X < NF < CF) and *T. cherleri* (2X < NF, CF), but not of *T. striatum* as predicted from increased ($P < 0.01$) concentrations of NDF, ADF and lignin. Nutritive quality of *Trifolium* forage was not affected by N enrichment and, contrary to the original hypothesis, N enrichment did not amplify negative effects of O_3 on biomass yield or RFV. Across all treatments, early-season exposure to 2X O_3 decreased RFV of *T. subterraneum* and *T. cherleri* by an average of 13% compared with CF and NF exposures, which is sufficient to have nutritional implications to its utilization by herbivores.

Key Words: Tropospheric Ozone, Forage Quality, *Trifolium*

M117 Forage production and quality of triticale cultivars in the Tennessee Valley. M. Lema*[1] and E. Cebert[2], [1]*Tennessee State University, Nashville,* [2]*Alabama A & M University, Normal.*

Because of its cold tolerance and double-cropping potential, triticale (X*Triticosecale Wittmack*)can play an important role in bridging the feed shortage gap in late fall and winter in the Tennessee Valley when other cool season grasses become dormant. Field trials were conducted in 2001 and 2002 at Winfred Thomas Agricultural Research Station (WTARS) and Sand Mountain Agricultural Substation (SMAS) in the Tennessee Valley to evaluate the forage yield and quality of six triticale cultivars (TCL105, TCL111, TX98D955, TX96VT5019, Tritical 498 and Tritical 2700). The cultivars were planted in four replicated 6-row plots 6.1 m long with rows 1.22 m apart in a randomized complete block design. At both locations, TX98D955, TX96VT5019 and Tritical 2700 produced higher(P<0.05) forage DM than the other cultivars (2-yr average of 4,134; 3,851 and 4,063 kg/ha for TX98D955, TX96VT5019 and Tritical 2700, respectively versus 2,744; 3,070 and 3,077 kg/ha for TCL105, TCL111 and Tritical 498, respectively at WTARS and 6,326; 5,974 and 5,938 kg/ha for TX98D955, TX96VT5019 and Tritical 2700, respectively versus 4,531; 3,784 and 4,060 kg/ha for TCL105, TCL111 and Tritical 498, respectively at SMAS). Crude protein, ether extract and gross energy contents were lower (P<0.05) for TCL111 and TCL105. Acid-detergent fiber content was higher (P<0.05) and IVDMD lower (P<0.05) for TCL 105. The cultivars TX96VT50190 and TX98D955 had higher (P<0.05) P content and the cultivars TCL105, TCL111, TX96VT5019 and TX98D955 higher (P< 0.05) Ca content than the rest. The cultivars TCL105 and TCL111 were higher (P<0.05) in Mg and lower (P<0.05) in K than the other cultivars. Sulfur was higher (P<0.05) for Tritical 498 and Zn higher (P<0.05) for TCL498, TX96VT5019 and TX98D955. Iron content was lower (P<0.05) for TX96VT5019 and TX98D955 than for the other cultivars.

Key Words: Titicale cultivars, Forage yield, Forage quality

M118 Effects of a bacterial inoculant on fermentation, quality, degradability and aerobic stability of whole head grain sorghum ensiled at two stages of grain maturity. L. O. Abdelhadi*[1] and J. M. Tricarico[2], [1]*Est. El Encuentro, Research and Extension in Ruminant Nutrition. Cnel. Brandsen, Argentina,* [2]*Allech Biotechnology Inc., Nicholasville, KY.*

Pasture based systems around the world are being displaced to marginal areas where sorghum has agronomic advantages with respect to corn. Because high quality forages are needed to feed high producing animals, Argentina's producers need to improve silage quality. A completely randomized design with a 2x2 factorial arrangement of treatments was used to evaluate the effects of a commercial bacterial inoculant (Sil-All, Alltech Inc., Nicholasville, KY) on DM recovery, OM degradability (OMD), fermentation, chemical composition and aerobic stability of whole head grain sorghum ensiled at two stages of maturity. The same hybrid was harvested at both milk (MS) and dough stages (DS) of grain maturity and ensiled for 3 months in triplicate mini silos constructed from PVC pipe with or without bacterial inoculant. Samples were collected before ensiling, after ensiling for 3 months, and after exposing 3 month-old silage to air for 3d. Samples were analyzed for pH, DM, CP, NDF, WSC, NH_3-N, and OMD after incubation with ruminal fluid for 24, 28 or 72h. Incoculation increased silage DM recovery over the control at MS (92.4 vs 97.9%, P=.08) but had no effect at DS of sorghum maturity. Ensiling sorghum at MS resulted in lower (P<.01) DM and WSC content, and greater (P<.01) CP content than ensiling at DS. Inoculation had no effects on DM, CP and NDF content, pH or NH_3-N concentrations, but increased (P=.05) WSC content regardless of sorghum maturity at harvest. The OMD of sorghum harvested at MS was greater (P<.01) than that of sorghum harvested al DS after incubation for 24 or 48h. Inoculation improved aerobic stability of silage regardless of sorghum maturity as indicated by lower (P<.01) temperature in inoculated silage after exposure to air for 3d. We conclude that inoculation of whole head grain sorghum silage may be more advantageous when harvesting at an earlier stage of maturity.

Key Words: Silage, Grain Sorghum, Inoculant

M119 Estimating degradable intake protein on producer farms in northern Arkansas. W. K. Coblentz*, J. E. Turner, R. K. Ogden, K. P. Coffey, F. W. Pohlman, A. H. Brown, M. B. Daniels, J. L. Gunsaulis, M. L. Thomas, and J. B. Humphry, *University of Arkansas, Fayetteville*.

Two case studies were conducted on producer farms in northwest Arkansas during 2000-01 to assess concentrations of degradable intake protein (DIP) and undegradable intake protein (UIP) in forages grown throughout the region. In Case Study 1, DIP was greater ($P < 0.05$) by 11.7 and 0.76 percentage units of N and DM, respectively, for samples from cool-season pastures compared to samples collected from pastures dominated by warm-season grasses. For both photosynthetic types, NDF exhibited a strong negative correlation ($r < -0.605$; $P < 0.006$) with DIP; generally, both N and in-vitro organic matter disappearance (IVOMD) were strongly and positively correlated ($r > 0.665$; $P < 0.002$) with DIP, but N was not correlated with DIP ($P > 0.05$) in warm-season pastures when DIP was expressed as a percentage of total plant N. In Case Study 2, N fertilization at two producer sites increased concentrations of N in primarily linear ($P < 0.0001$) patterns for bermudagrass forages, but there was no carryover effect ($P > 0.05$) on a second harvest that received no additional fertilization. In harvests immediately following fertilization, DIP increased with N fertilization rate; the linear term was significant ($P < 0.004$) in each case, but it was coupled with quadratic or cubic effects in some harvests. Pool size for UIP also increased linearly ($P < 0.002$) with N fertilization in three of four harvests that immediately followed applications of N fertilizer, but the magnitude of these responses was small compared to those observed for DIP. As observed in Case Study 1, there were strong negative correlations ($r < -0.451$; $P < 0.0001$) between concentrations of NDF and DIP at both individual harvest sites, and on a combined basis. Conversely, DIP was correlated in a strong positive manner with concentrations of N ($r > 0.778$; $P < 0.0001$) and IVOMD ($r > 0.408$; $P < 0.0001$) at both sites, and in a combined analysis. Despite the diverse conditions of the two studies, DIP was positively correlated with concentrations of N and IVOMD, but negatively correlated with NDF.

Key Words: DIP, UIP, N fertilization

M120 Comparison of mechanically processed barley silage with regular barley silage on lactational performance of Holstein cows. J.-S. Eun[1], S.-H. Hong*[2], and K. Beauchemin[1], [1]*Agriculture and Agri-Food Canada, Lethbridge, AB, Canada,* [2]*Sahmyook College Cheongnyangni, Seoul, Korea*.

Mechanical processing of whole crop barley prior to ensiling may be useful for improving nutrient utilization by dairy cattle. The objectives of this study were to assess the effects of feeding mechanically processed barley silage as the main forage source on lactational performance. Sixteen primiparous (187 ± 52 DIM) and 8 multiparous (87 ± 69 DIM) Holstein cows were used in a completely randomized design with a 2-wk covariate period and a 6-wk treatment period. The 2 treatments were: 1) RBS = TMR diet containing regular barley silage, and 2) MPBS = TMR diet containing mechanically processed barley silage. Barley silage and alfalfa hay supplied 41% and 5% of the diet DM. Intake, BW, and milk production were measured during the covariate and the treatment periods. In addition, 2 multiparous cows were used for in situ measurements of the ruminal DM and fiber degradation kinetics of the barley silages and diets. Results were analyzed with repeated measurements using a mixed model that included a covariate adjustment. Feeding MPBS had no significant effects on DMI (21.7 kg/d), milk yield (33.9 kg/d), or milk composition with only FCM (31.7 vs. 29.7 kg/d, $P = 0.51$) and milk fat concentration (3.57 vs. 3.30%, $P = 0.32$) showing a numerical improvement. Dairy efficiencies calculated as milk yield/DMI or FCM/DMI were not different between the diets. Body weight and BCS were not affected by treatments. Effective ruminal degradability of DM was similar for both barley silages, indicating that when the silages were ground to remove the effects of mechanical processing, the potential digestion was similar. In summary, mechanical processing did not improve the nutritional merits of barley silage for lactating dairy diets under the conditions of this experiment.

Key Words: Mechanically Processed Barley Silage, Degradability, Milk Production

M121 Effect of forage diversity on intake and productivity of grazing lactating dairy cows over two grazing seasons. K. J. Soder*[1], M. A. Sanderson[1], J. L. Stack[2], and L. D. Muller[2], [1]*USDA-ARS, Pasture Systems and Watershed Management Research Unit,* [2]*The Pennsylvania State University, University Park*.

A study was designed to determine the effects of forage diversity on intake and productivity of grazing lactating dairy cows over two grazing seasons. In a randomized block design, twenty lactating Holstein cows (100 DIM, 634 kg BW) were assigned to one of four treatments for four 21-d periods. The four pasture treatments were: Orchardgrass(OG)/white clover (2SP); 2SP + chicory(CH; 3SP); OG + CH + red clover + tall fescue + perennial ryegrass + birdsfoot trefoil (6SP); and 6SP + white clover + alfalfa + KY bluegrass (9SP). Pasture allowance was 25 kg DM/cow/d. Cows were fed a 13% CP corn-based concentrate (1 kg/4 kg milk) in two equal feedings after milking. Pasture DMI was measured using Cr_2O_3 as a fecal marker. Pasture CP was higher while IVDMD was lower in Year 2. Pasture CP and IVDMD was higher for the more complex mixes. Pasture DMI was higher during Year 1, which was a drought year. Milk yield, milk fat and milk protein were not affected by year or treatment. Level of forage diversity did not have a major impact on DMI or productivity of grazing dairy cows. However, forage production and carrying capacity were greater on the complex mixtures than on the 2SP mix, particularly during drought.

	2SP	3SP	6SP	9SP	SEM	P-value
Pasture CP, %DM						
2002	21.8^{bc}	20.0^{a}	21.2^{ac}	22.5^{bc}	0.46	0.002
2003	23.2^{a}	24.5^{a}	25.7^{b}	24.1^{a}	0.46	0.002
Pasture IVDMD, % DM						
2002	66.6^{a}	70.4^{b}	70.9^{b}	67.2^{a}	1.20	0.02
2003	65.2^{a}	63.9^{a}	60.1^{b}	63.8^{b}	1.20	0.02
Pasture DMI, kg/d						
2002	14.7	13.7	13.6	12.9	0.49	NS
2003	11.1	10.5	10.5	10.0	0.49	NS
Milk Yield, kg/d	34.1	35.3	34.4	34.3	1.10	NS
Milk Fat, %	3.6	3.5	3.6	3.5	0.07	NS
Milk Protein, %	2.8	2.8	2.7	2.8	0.02	NS

Key Words: Pasture, Diversity, Intake

M122 Nitrogen characteristics and nitrogen degradation kincetics of crabgrass harvested in northern Arkansas. R. K. Ogden*, W. K. Coblentz, K. P. Coffey, J. E. Turner, D. A. Scarbrough, J. A. Jennings, and M. D. Richardson, *University of Arkansas, Fayetteville*.

Common crabgrass [*Digitaria ciliaris* (Retz.) Koel.] is undesirable in fields of bermudagrass [*Cynodon dactylon* (L.) Pers.], because it dries slowly, and can cause spontaneous heating and molding in hay. However, the visual observation suggests that livestock prefer crabgrass to many other summer forages. Our objectives were to assess N partitioning within leaf, stem, and whole-plant crabgrass; and to determine the in-situ disappearance of N for whole-plant crabgrass forages. Alfalfa (*Medicago sativa* L.), bermudagrass, and orchardgrass (*Dactylis glomerata* L.) also were evaluated for ruminal in-situ disappearance of N as diverse controls. Crabgrass was harvested at weekly intervals between 11 July and 22 August 2001. Concentrations of N and neutral detergent soluble N (NDSN) in whole-plant crabgrass decreased over sampling dates. These decreases exhibited a linear ($P = 0.001$) relationship with time for N, and linear ($P < 0.0001$) and cubic ($P = 0.006$) effects of time for NDSN. When crabgrass was evaluated for in-situ disappearance of N in five (383 ± 22.7-kg) ruminally cannulated crossbred steers, the mean disappearance rate over seven sampling dates (0.092/h) was more rapid ($P < 0.0001$) than observed for bermudagrass hay (0.046/h), but was slower ($P < 0.0001$) than observed for alfalfa (0.223/h). The effective ruminal degradability of N was greater ($P < 0.0001$) for crabgrass (mean = 85.3%) than alfalfa (83.3%), bermudagrass (72.3%), and orchardgrass (76.0%) hays. Over the seven harvest dates, the effective ruminal degradability of N for crabgrass was 10.8 to 14.8 percentage units greater ($P < 0.0001$) than the bermudagrass hay evaluated simultaneously. These results indicate that crabgrass N exhibits high (≥

83.1%) effective ruminal disappearance on all harvest dates, but exhibited a much slower disappearance rate than alfalfa.

Key Words: Crabgrass, Nitrogen, Degradation

M123 Chemical composition and in vitro digestibility of three cultivars of Guinea grass (Panicum maximum Jacq) at three ages of cut under tropical dry forest conditions. M. A Cuauro, B. Gonzalez, O. Araujo-Febres*, and J. Vergara, *La Universidad del Zulia, Facultad de Agronomía Maracaibo, Venezuela*.

A field experiment was carried out, during the rainy season in order to evaluate crude protein (CP), neutral detergent fiber (NDF), in vitro digestibility of dry matter (IVDDM) and in vitro digestibility neutral detergent fiber (IVDNDF) contents in leaves of guinea grass (Panicum maximum Jacq) var. common, var. Mombasa and var. Tanzania. Plots (4 x 5 m) were established in randomized complete block design with a split plot arrangement of treatments, with harvest at 21, 42 and 63 days of age after an initial cut. Grass variety served as the main plot and cutting ages as subplot. Data were analyzed by least squares ANOVA using the GLM procedures of SAS. Total CP concentration in var. common is higher (P< .05) than var. Tanzania and var. Mombasa (17 vs 12 %) at 21 d, (12 vs 10 %) at 42 d and (11 vs 9%) at 63 d. The var. common had lower NDF concentration than var. Tanzania and var. Mombasa at 21 d, but not at 42 and 63 d. The IVDDM were similar in all grasses at 21 and 42 d. In contrast, the var. common decreased (P< .05) IVDDM at 63 d. No differences (P > 0.05) were detected among cultivars.

Key Words: Panicum maximum, Crude Protein, In Vitro Dry Matter Digestibility

M124 Effects of a bacterial inoculant on fermentation, quality, degradability and aerobic stability of whole-plant grain sorghum and corn silages. L. O. Abdelhadi*[1] and J. M. Tricarico[2], [1]*Est. El Encuentro, Research and Extension in Ruminant Nutrition. Cnel. Brandsen, Argentina,* [2]*Alltech Biotechnology Inc., Nicholasville, KY*.

Ensiling of sorghum and corn in Argentina frequently result in low quality silages that must be fed at low inclusion rates to avoid negative effects on animal performance. A completely randomized design was used in two studies to evaluate the effects of a commercial bacterial inoculant (Sill-All, Alltech Inc. Nicholasville, KY) on DM recovery, OM degradability (OMD), fermentation, chemical composition and aerobic stability of whole-plant grain sorghum (SS) and corn silages (CS). Sorghum and corn were harvested at the milk and dough stages of maturity, respectively, and ensiled for 3 months in triplicate mini silos constructed from PVC pipe with or without bacterial inoculant. Samples were collected before ensiling, after ensiling for 3 months, and after exposing 3 month-old silage to air for 3d. Samples were analyzed for pH, DM, CP, NDF, WSC, NH_3-N, and OMD after incubation in ruminal fluid for 24, 48 or 72h. Inoculation tended to increase DM recovery of SS by 3.0% and increased (P<.05) DM recovery of CS by 5.1%. The DM, CP, NDF and WSC contents, pH and NH_3-N concentrations were similar in control and inoculated SS. On average, inoculation increased (P=.02) the DM content, reduced pH (P=.05) and NDF (P=.09) content in CS. Trends towards increased OMD were observed for both SS and CS, being the numerical increases 3.4 and 3.5% for SS and CS, respectively after *in vitro* incubation for 48 and 72h. Inoculation did not affect the temperature of SS but reduced (P=.01) the temperature of CS after exposure to air for 3d, thus improving its aerobic stability. Although greater benefits were observed when inoculating CS compared to SS, the numerical increases in DM recovery and OMD obtained for SS may be of economic importance. We conclude that bacterial inoculation may be applied successfully to improve the quality of whole-plant sorghum and corn silages.

Key Words: Grain Sorghum Silage, Corn Silage, Inoculant

M125 Biomass yield and nutritive quality of eastern gamagrass (*Tripsacum dactyloides*) exposed to ground-level ozone. J. Lin*, J. Lewis, R. Muntifering, S. Ditchkoff, and A. Chappelka, *Auburn University, Auburn, AL*.

Tropospheric (i.e., ground-level) ozone (O_3) is the most significant phytotoxic air pollutant in the US, and its concentration globally is expected to increase by 0.3 to 1.0%/yr for the next 50 yr. Because very little is known about effects of ground-level O_3 on yield and nutritive quality of native grass species, we conducted an experiment in which eastern gamagrass (*Tripsacum dactyloides*) was grown in open-top chambers (OTC) to which added air had been carbon-filtered (CF), representative of that found at the cleanest air-quality sites in the US; non-filtered (NF), characteristic of ambient air in Auburn, AL; or enriched with O_3 to twice ambient concentration (2X). Primary-growth and regrowth forages were harvested monthly from each of nine OTC (three OTC/air trt). Mean daytime O_3 concentrations over the entire experiment (June 9 to September 4, 2003) were 14, 29, and 61 ppb, respectively, for CF, NF and 2X treatments. Across all three primary-growth harvests, biomass yield and concentrations of NDF and ADF were greater ($P < 0.05$) for 2X than CF, but not NF forage. A harvest period × treatment interaction ($P < 0.05$) was observed such that biomass yield and concentrations of NDF and ADF in the final primary-growth harvest were greater ($P < 0.05$) for 2X than NF and CF forages (23.2 vs. 16.1 and 13.8 g DM/plant; 73.7 vs. 68.2 and 65.2%; and 37.6 vs. 33.5 and 32.8%, respectively). Relative feed value (RFV) calculated from NDF and ADF concentrations in the final primary-growth harvest was lower ($P < 0.05$) for 2X than NF and CF forages (75.3 vs. 85.7 and 90.5, respectively). Concentrations of CP and lignin in primary-growth forages were not different among treatments, and no differences in biomass yield or chemical composition of regrowth forages were observed among treatments. Nutritive quality (RFV) of primary-growth eastern gamagrass forage was decreased by 14% in the 2X compared with NF and CF treatments, which is sufficient to have nutritional implications to its utilization of by herbivores.

Key Words: Tropospheric Ozone, Forage Quality, Eastern Gamagrass

M126 Effect of type of concentrate on grazing behaviour of dairy cows. R. G. Pulido*, E. Felmer, A. Hinostroza, and F. Wittwer, *F. Cs. Veterinarias, Universidad Austral de Chile, Valdivia, Chile*.

Two experiments were carried out to evaluate the effect of two sources of carbohydrate (fibrous and starchy) and two levels of crude protein in concentrate supplements (17.0% in exp 1 and 11.9% in exp 2) on grazing behaviour and herbage intake (HI) of spring calving dairy cows. In exp 1, 12 multiparous Friesian dairy cows (BW 529 kg), yielding 33 l/d and at 53 days of lactation, were assigned to a 3x3 Latin square design with periods of 21 days. In exp 2, 30 multiparous Friesian dairy cows (BW 512 kg), yielding 29.3 l/d and at 65 days of lactation, were assigned to a continuous randomized design for 45 days. For both experiments the treatments included: grazing alone (TGO), grazing plus 6 kg/d of sugar beet pulp-based concentrate (TFC) and grazing plus 6 kg/d of cereal-based concentrate (TSC). The concentrates were balanced by CP and ME. The cows were supplemented twice a day and managed under a strip grazing system on pasture consisting mainly of perennial rye grass. During the last week of each period in exp 1, and at one time point in exp 2, a record of individual grazing behavior was made every 10 minutes for all the cows during 24 hrs grazing activities. Throughout the trial BW was recorded weekly. HI and total dry matter intake (TDI) was estimated using Cr2O3. The results for HI during exp 1 were 15.4, 10.5 and 10.9 kg/d for treatments TGO, TCF and TCS, respectively (P<0.05). TDI was 15.4, 15.8 and 16.2 kg/d, respectively (P>0.05), grazing time (GT) was 562, 510 and 507 min/d, respectively (P>0.05), ruminating time (RT) was 393, 367 and 418 min/d, respectively (P=0.06) and body weight change was 0.18; 0.50 and 0.69, respectively (P<0.05). The results for HI during exp 2 were 16.8, 11.2 and 12.1 kg/d for treatments TGO, TCF and TCS, respectively (P<0.05). TDI was 16.8, 16.5 and 17.4 kg/d, respectively (P>0.05), GT was 510, 456 and 466 min/day, respectively (P>0.05), RT was 451, 491 and 442 min/day, respectively (P=0.06) and body weight change was 0.72; 0.99 and 0.88, respectively (P>0.05). The results suggest that carbohydrate source did not affect the grazing behaviour of dairy cows on this experiment. Key words: Cows grazing, intake, carbohydrates

Key Words: Grazing Cows, Intake, Carbohydrates

M127 The effects of xylanase addition on the fermentation of distillers wet grains in laboratory silos. V. Akay*, *Alltech, Inc., Nicholasville, KY.*

The objective of this study was to investigate the effects of the addition of xylanase on the fermentation of distillers wet grain (DWG). Distillers wet grains (36.36% DM) were obtained from New Energy Corporation (South Bend, IN). Treatments were: 1) control (CONT; water); 2) XYL1 (xylanase; 1.0 million XU/tonne); 3) XYL2 (xylanase; 2.0 million XU/tonne); 4) XYL3 (xylanase; 3.0 million XU/tonne). Three different levels of enzyme were prepared from a concentrate (200, 000 XU/g) by dissolving 0.5, 1.0 and 1.5 g in 100 ml distilled water for XYL1, XYL2 and XYL3, respectively. Seven kilograms of DWG was placed into a mixer and 7 g of distilled water or enzyme solution was sprayed to obtain proper levels of enzyme concentrations for each treatment. Equal portion of treated DWG was packed into three 1 L Weck jars and sealed for each treatment (total 12 jars). Treated samples were incubated at room temperature. Jars were opened after 14 days of incubation and analyzed for pH, DM, ADF, NDF, N and soluble sugars. Data were analyzed as completely randomized design using the GLM procedure of SAS. Significant was declared at P #8804 .05. Crude protein, arabinose and maltotriose did not differ among treatments. The pH content of ensiled samples was lower for XYL2 compared to CONT, XYL1 and XYL3. Neutral detergent fiber was lower in enzyme treated samples compared to CONT, and enzyme supplementation had both a linear and quadratic effect on NDF. Enzyme supplementation decreased lactic acid and had both a linear and quadratic effect on lactic acid. Dextrin was higher in enzyme treated samples compared to CONT, and enzyme supplementation had both a linear and quadratic effect on dextrin. Dextrin content was higher for XYL2 and XYL3 compared to XYL1. Glucose was higher in enzyme treated samples compared to CONT. Enzyme supplementation increased xylose compared to CONT. These changes in the composition of enzyme treated DWG may have some effect on animal performance.

Key Words: Distillers Wet Grains, Xylanase, Silo

M128 Herbage and animal performance responses to management intensity of continuously stocked bahiagrass pastures. R. L. Stewart, Jr.*, L. E. Sollenberger, J. C. B. Dubeux, Jr., and J. M. B. Vendramini, *University of Florida, Gainesville.*

Bahiagrass (*Paspalum notatum*) pasture covers approximately one million hectares in Florida, 90% of which is utilized by beef cattle. Increasing urbanization may force beef producers to achieve economic livelihood on reduced land area. One option is to increase intensity of management of the remaining pasture resource. The objectives of this research were to evaluate the effects of management intensity (MI), defined as a combination of N fertilization and stocking rates (SR), on yearling beef heifer and bahiagrass pasture performance. Treatments included LOW (40 kg N ha^{-1} yr^{-1}, 1.2 animal units [AU, one AU=500 kg live weight] ha^{-1} SR), MODERATE (120 kg N ha^{-1} yr^{-1}, 2.4 AU ha^{-1} SR), and HIGH MI (360 kg N ha^{-1} yr^{-1}, 3.6 AU ha^{-1}), and each was replicated across two pastures. Herbage mass (3.0 MG ha^{-1}) and herbage allowance (4.0 kg forage kg^{-1} animal weight) were greater for LOW and decreased ($P<0.05$) as MI increased to HIGH (2.6 Mg ha^{-1} and 1.1 kg forage kg^{-1} animal weight). This occurred despite herbage accumulation rate being greater ($P<0.02$) for HIGH (33 kg ha^{-1} d^{-1}) than LOW (19 kg ha^{-1} d^{-1}). Nutritive value increased with increasing MI, in part due to greater N rate and also because the higher stocking rates likely increased the frequency at which cattle revisited grazing locations. Average daily gain decreased ($P<0.02$) from LOW to HIGH (0.46 to 0.36 kg d^{-1}) because of the lower herbage allowance for HIGH. Gain per hectare increased ($P<0.02$) with increasing MI due to greater forage utilization. Bahiagrass cover increased ($P<0.03$) with the HIGH MI (7.1%) and decreased with LOW (-6.4%) and MODERATE (-4.7%) due to invasion of bunchgrass weeds. In conclusion, the increase in liveweight gain per hectare did not compensate for the additional cost associated with increased management. Therefore, if the need for increased production per unit land area becomes acute, the use of another more management-responsive grass species likely will be required.

Key Words: *Paspalum notatum*, Nitrogen Fertilization, Stocking Rate

M129 Responses by steers compared under continuous and frontal grazing. H. Lippke, T. D. A. Forbes*, E. Rivera, P. G. Soderstrom, and B. G. Warrington, *Texas Agricultural Experiment Station, Uvalde, TX.*.

Forage intake, digestible DM (DDM), and ADG by steers grazing ryegrass (*Lolium multiflorum* L.) under a frontal grazing system (FGS) were compared with responses under continuous stocking (CGS) at three stocking densities. All pastures were irrigated by a center pivot system. In the FGS, a break wire attached to the towers of the center pivot was advanced at a rate that would leave 30% of the leaf with the ungrazed residue (e.g., 10 cm min^{-1} for 6 h daily). Each pasture was stocked with five Angus steers (testers), balanced for weight and sire effects. Additional steers (grazers) were placed in the FGS and high-density CGS pastures. Initial stocking densities were 1375, 1258, 895, and 717 kg BW ha^{-1} for the FGS and the three CGS pastures, respectively. Dry matter intake (DMI) and DDM were estimated in January (Jan), February (Feb), and April (Apr), using alkane marker techniques. In Jan, mean DDM ranged from 773 to 779 g kg^{-1}, except for the medium CGS pasture with 740 g kg^{-1} ($P<0.05$). In Feb, DDM ranged from 747 to 773 g kg^{-1}, except for the high CGS pasture (650 g kg^{-1}, $P<0.05$). In Apr, the medium CGS had greater DDM (710 g kg^{-1}, $P<0.05$) than the FGS and low CGS pastures (680 g kg^{-1}); mean DDM of the high CGS pasture was 692 g kg^{-1}. In Jan, mean estimates of DMI ranged from 21.8 to 24.6 g kg^{-1} BW among pastures and were not different ($P=0.19$). In Feb, DMI for medium CGS (25.2 g kg^{-1} BW) and low CGS (23.0 g kg^{-1} BW) were greater ($P<0.05$) than for high CGS (19.3 g kg^{-1} BW); mean DMI for FGS (20.4 g kg^{-1} BW) was different ($P<0.05$) from medium CGS. In Apr, means for DMI ranged from 17.3 to 19.4 g kg^{-1} BW and were not different ($P>0.2$). Mean ADG for the medium CGS pasture (1.09 kg) was greater ($P<0.05$) than for high CGS (0.89 kg), with low CGS (1.01 kg) and FGS (0.92 kg) intermediate. These data are consistent with the observed rank growth and earlier maturity of the low-density CGS pasture and the persistently lower herbage mass of the high-density CGS pasture. The FGS provided no performance benefit over CGS.

Key Words: Intake, Digestibility, Alkane

M130 Kura clover spreading ability with grass competition. B. Kim*[1] and K. Albrecht[2], [1]*College of Animal Resources science, Kangwon National University,* [2]*Department of Agronomy, University of Wisconsin-Madison.*

Kura clover (Trifolium ambiguum M. Bieb.) is known to develop an extensive rhizome system when grown in monoculture. However, there is no information about the effects that competition from companion grasses could have on its rhizome development. This study was conducted to determine the difference in rhizome development of Kura clover planted in three different grass treatments of smooth bromegrass (Bromus inermis Leyss) and Kentucky bluegrass (Poa pratensis L.) swards and to evaluate the effect of defoliation height on Kura clover rhizome development. The experimental design was a randomized complete block with split, split-plot arrangement using three replications. The three grass treatments (killed-grass, grass and grass+N fertilizer) were randomly assigned to whole plots with two cutting height treatments (4-cm or 10-cm stubble height) assigned to sub plots. Two plants of each of the ten different entries of Kura clover (populations started from seeds or clones started from rhizomes) were randomly assigned to sub-sub plots. Rhizome development was measured in mid-September two years after transplanting in both swards at the University of Wisconsin Arlington Agricultural Research Station. Individual plants spread up to 1 m in diameter over a 2-year period after transplanting with no grass competition. The mean spread of kura clover by rhizome growth was greatest in killed-grass plots (85-cm diameter), least in the grass+N plot (29-cm diameter), and intermediate (57-cm diameter) in the grass only plots for both swards. The defoliation height of the swards did not significantly affect the spread of Kura clover regardless of grass status (killed or + or N) in either smooth bromegrass or Kentucky bluegrass. Kura clover generally spread more in smooth bromegrass sward compared to Kentucky bluegrass swards. Reducing the competition from grasses is a management tool that can be used to maximize the colonizing ability of Kura clover.

Key Words: Kura Clover, Rhizome

M131 The effects of addition of pectinase on the levels of soluble sugars during ensiling of whole sugar beets in laboratory silos. V. Akay* and P. Karnezos, *Alltech, Inc.*

The objective of this study was to examine the effects of pectinase on the levels of soluble sugars during ensiling of whole sugar beets in sealed Weck jars. Whole sugar beets were obtained from Best Agri Marketing, CA. Treatments were: 1) CONT (control, water); 2) PECT25 (pectinase; 2.5 million AJDU(apple juice depectinizing unit)/tonne); 3) PECT50 (pectinase; 5.0 million AJDU/tonne); and 4) PECT75 (pectinase; 7.5 million AJDU/tonne). Sugar beets were washed with tap water and shredded with a pruning shredder. Three different levels of enzyme were prepared from a concentrate (1 million AJDU/g) by dissolving 0.250, 0.500 and 0.750 g in 100 ml distilled water for PECT25, PECT50 and PECT75, respectively. Seven kilograms of shredded sugar beets was placed into a mixer and 7 g of distilled water or enzyme solution was sprayed to obtain proper levels of enzyme concentrations for each treatment. Equal portions of treated sugar beets were packed into six 1 L Weck jars and sealed for each treatment. Treated samples were incubated at room temperature. Jars were opened after 14 days of incubation and analyzed for pH, dry matter, soluble sugars and liquid content. Data were analyzed as a completely randomized design using the GLM procedure of SAS. Significance was declared at P #8804 .05. Addition of pectinase to sugar beets decreased the pH, arabinose and acetic acid contents, and increased the lactic acid, fructose and galactose contents compared to control. Addition of pectinase to sugar beets also increased the liquid content of ensiled sugar beets compared to control.

Items	CONT	PECT25	PECT50	PECT75	SEM
pH	3.86^{a}	3.84^{a}	3.72^{b}	3.71^{b}	.008
Dry matter, %	16.90^{a}	16.84^{ab}	16.75^{b}	16.83^{ab}	.045
Dextrin, % of DM	25.40^{ab}	20.71^{c}	27.72^{a}	23.37^{bc}	.961
Arabinose, % of DM	20.98^{a}	19.33^{a}	16.30^{b}	15.19^{b}	.617
Maltose, % of DM	0.62^{a}	0.42^{b}	0.63^{a}	0.35^{b}	.034
Maltotriose, % of DM	0.62^{a}	0.62^{a}	0.63^{a}	0.42^{b}	.003
Glucose, % of DM	0.41^{bc}	0.21^{c}	0.63^{ab}	0.83^{a}	.104
Fructose and Galactose, % of DM	4.49^{c}	6.72^{b}	6.83^{b}	9.22^{a}	.550
Lactic acid, % of DM	6.70^{b}	6.92^{b}	9.40^{a}	9.50^{a}	.198
Acetic acid, % of DM	3.17^{a}	3.05^{a}	2.72^{b}	2.43^{c}	.087
Liquid, %w	62.10^{b}	70.65^{a}	73.73^{a}	73.45^{a}	1.100

^{abc}Means in row without common superscripts differ ($P < .05$).

Key Words: Sugar Beet, Pectinase, Silo

M132 Comparison of forage drying methods. T.W. White*, A.J. Phelps, H.G. Bateman, and C.C. Williams, *Louisiana State University Agricultural Center.*

Effects of drying method on forage analysis were compared using fresh-cut samples of immature and mature alfalfa, red clover, crimson clover, white clover, Coastal bermudagrass, Grazer bermudagrass, bahiagrass and ryegrass. Eight samples of each forage were cut at two stages of maturity. Four samples were oven-dried at 50° C and four samples were freeze-dried. After the initial drying, the forages were ground to pass a 2-mm screen and DM determined at 100° C. Ash, CP, NDF and ADF were determined on the oven-dried (50° C) and freeze-dried samples and reported on DM (100 °C) basis. A 2x2x8 factorial arrangement of treatments was analyzed as a completely randomized block design. Immature forage contained more ash ($P < 0.01$) and less ($P < 0.01$) NDF and ADF than mature forage. Legumes were lower ($P < 0.01$) in NDF, generally lower in ADF and higher ($P < 0.01$) in CP than grasses. Ash and NDF were higher ($P < 0.02$) and CP was lower ($P < 0.01$) in oven-dried forages than in freeze-dried forages. These results suggest that drying method may affect apparent forage composition.

Key Words: Forage, Drying methods, Analysis

M133 Effect of winter stocker growth rate and finishing diet on beef longissimus fatty acid composition. C. Realini[1], S. Duckett*[1], J. Neel[2], J. Fontenot[3], and W. Clapham[2], [1]*University of Georgia,* [2]*USDA-ARS,* [3]*Virginia Tech University.*

Seventy-two Angus-cross steers were stockered during the winter months at three growth rates (LOW [0.36 kg/d], MED [0.55 kg/d] or HIGH [0.82 kg/d] prior to finishing on pasture (PAST) or corn silage-concentrate diet (CONC) to determine the effects on longissimus muscle fatty acid composition and cholesterol content. Fatty acid profile and cholesterol content of ribeye steaks (12th rib) were determined by GLC. Data were analyzed as a 3 x 2 factorial design with stocker growth rate (LOW, MED, HIGH), finishing diet (PAST or CONC) and two-way interaction in the model. Total lipid content was two-fold greater ($P < 0.01$) for CONC than PAST, and similar between stocker growth rates. Longissimus muscle from CONC had greater ($P < 0.01$) proportions of myristoleic, palmitic, palmitoleic, oleic, and total monounsaturated fatty acids than PAST. Saturated fatty acid concentration was greater ($P < 0.05$) for PAST-LOW than PAST-MED or CONC-HIGH. Trans-11 octadecenoic acid and the cis-9 trans-11 isomer of CLA were 234% and 90% greater ($P < 0.01$), respectively, for PAST than CONC. Omega-3 fatty acid concentration was 136% greater ($P < 0.05$) for PAST than CONC due to increases in EPA (C20:5), DPA (C22:5), and DHA (C22:6). For omega-6 fatty acids, PAST-MED had greater ($P < 0.05$) levels of omega-6 and linoleic acid than PAST-LOW or CONC-HIGH with CONC-LOW and PAST-HIGH being intermediate. The ratio of omega-6 to omega-3 fatty acids was lower ($P < 0.05$), more desirable from a human health standpoint, for PAST than CONC. Cholesterol content tended ($P = 0.06$) to be greater for PAST than CONC with no differences among stocker growth rates. Increasing growth rate during winter stockering prior to finishing had only minor influences on longissimus fatty acid composition. Finishing cattle on pasture reduced the total fat content of the longissimus and increased the concentrations of omega-3 fatty acids, CLA and trans-11 octadecenoic acid.

Key Words: Beef, Fatty Acids, Forages

M134 Effect of winter stocker growth rate and finishing diet on beef rib composition, quality and palatability. C. Realini[1], S. Duckett*[1], J. Neel[2], J. Fontenot[3], and W. Clapham[2], [1]*University of Georgia,* [2]*USDA-ARS,* [3]*Virginia Tech University.*

Angus-cross steers (68 steers in 2002; 62 steers in 2003) were stockered at three growth rates (LOW, MED or HIGH) during the winter months prior to finishing on pasture (PAST) or corn silage-concentrate diet (CONC) to determine the effects on 9-10-11th rib composition, color, and palatability. Steers were harvested at a commercial meat plant and rib (IMPS107) removed from each carcass. The percentage of lean, fat and bone was determined by physical dissection of the 9-10-11th rib section. Data were analyzed as a 3 x 2 x 2 factorial design with stocker growth rate, finishing treatment, year and all interactions in the model. Percentages of bone and lean in the 9-10-11th rib section were greater ($P < 0.05$) for PAST than CONC finished. Rib sections from steers finished on PAST had a 46% reduction ($P < 0.05$) in fat trim (subcutaneous and intermuscular) compared to CONC finished. Reduced growth rate (LOW) during winter stockering reduced ($P < 0.05$) percentage of bone and tended ($P = 0.08$) to increase the percentage of fat in the rib section. Rib section weight increased ($P < 0.05$) with higher winter growth rates for CONC but did not differ among stocker growth rates for PAST. Overall, rib section weight was 28% heavier for CONC than PAST. Longissimus muscle from PAST was darker ($P < 0.01$), less ($P < 0.01$) red, and less ($P < 0.01$) yellow compared to CONC. Subcutaneous fat color was darker ($P < 0.01$) and more yellow ($P < 0.01$) for PAST than CONC. The interaction between finishing treatment and year was significant ($P = 0.01$) for Warner-Bratzler shear force (WBSF). In 2002, WBSF at 14-d of postmortem aging did not differ between PAST and CONC; however in 2003, WBSF was greater ($P < 0.05$) for PAST than CONC. Increasing growth rate during winter stockering had only minor effects on rib weight and composition. Finishing diet altered rib weight and composition, lean and subcutaneous fat color, and tenderness.

Key Words: Beef, Forages, Tenderness

M135 Effect of winter period rate of gain on finishing growth rate, final weight and carcass parameters from pasture or feedlot finished cattle. J. P. S. Neel*[1], J. P. Fontenot[2], W. M. Clapham[1], and S. K. Duckett[3], [1]*USDA-ARS, AFSRC,* [2]*Virginia Tech,* [3]*The University of Georgia.*

English-type crossbred steer calves (71 head in 2002; 62 head in 2003) were used to compare growth rate, final weight and carcass parameters from cattle finished on pasture (PAST) or corn silage-concentrate (CON) in feedlot, after being wintered at projected low (LOW, ADG =

0.36 kg), medium (MED, ADG = 0.55) or high (HIGH, ADG = 0.82) growth rates. Steers were harvested on the same dates, across treatments, at a commercial meat plant. Data were analyzed as a 3 x 2 x 2 factorial design with winter treatment, finishing treatment, year and all interactions in the model. Winter treatment influenced ($P < 0.05$) finishing ADG (ADG), final weight (FW), carcass weight (CW), dressing percentage (DP) and quality grade QG. Steer ADG during finishing was greater ($P < 0.05$) for LOW than MED and MED than HIGH wintering treatments. Animal FW and QG was greater ($P < 0.01$) for HIGH than LOW winter treatment. Carcass weight and DP was greater ($P < 0.05$) for HIGH. Finishing treatment influenced ($P < 0.001$) yield grade (YG), rib fat (RF), ribeye area (REA), kidney, pelvic and heart fat (KPH) and QG with values being higher for the CON treatment. The interaction between finishing treatment and year was significant ($P < 0.05$) for ADG, FW, CW and DP. Pasture finished cattle had lower ($P < 0.001$) ADG, FW, CW and DP in year two than one, while no differences were seen between years for the CON treatment. Year influenced ($P < 0.05$) RF, KPH and QG. Cattle had higher ($P < 0.05$) RF and QG, and lower KPH in year 1. Lower winter period gain resulted in greater finish period gain. Finishing cattle on CON resulted in greater ADG, FW, CW, DP, YG, QG, RF, REA and KPH. Carcass quality grades were lower in year 2 than year 1.

Key Words: Finishing, Pasture, Winter

M136 Effects of γ-terpinene, terpinolene, α-copaene, and α-terpinene on consumption of alfalfa pellets by sheep.

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Secondary chemistry influences shrub consumption by free-ranging ruminants. However, effects of many specific terpenes on herbivory have not been examined. Four experiments were conducted to examine effects of individual terpenes on alfalfa pellet intake by lambs. Forty-five lambs (9 lambs/treatment) were individually fed alfalfa pellets sprayed with either γ-terpinene, terpinolene, α-copaene, or α-terpinene at one of five concentrations in an ethanol carrier. Treatments (0, .5, 1, 2, and 10X) were multiples of the concentration (X) of a specific terpene on the leaf surface of *Flourensia cernua*. Terpenes were applied to alfalfa pellets (0.64 kg·lamb^{-1}·d^{-1}, DM basis), and consumption was measured during a 20-min interval for 5 d. Lambs were adapted to handling and individual pen feeding for 10 d and were maintained and fed alfalfa pellets in one group (except during 20-min tests) at a mean total daily intake of 3.9% of BW (DM basis). A day effect ($P < 0.02$) was detected for intake with γ-terpinene ($P < 0.0001$ for both linear and quadratic contrasts). A treatment effect ($P < 0.02$) was observed for α-copaene, with intake on the 2X treatment lower than other treatments. No effect of terpinolene or α-terpinene on intake was observed during the 20-min interval. None of the chemicals tested were strongly related to intake of alfalfa pellets by lambs under the conditions of this study.

Key Words: Intake, Sheep, Terpenes

M137 Forage quality differences between grass hay stored as dry large round bales or wet wrapped round bales.

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High humidity associated with the Appalachian region of the US, requires hay producers to wait 2 to 3 days between mowing and baling. Most hay is stored at 80 to 85% dry matter (DM) as large round bales (DRB). Hay harvested as wrapped, large round bales (WRB) usually range from 40 to 60 % DM. The ability to store WRB at high moisture reduces field drying time to 1 to 2 days. Reduced drying time and increased forage moisture increases leaf retention and decreases field losses. In an on-farm research study 7 forage producers representing 7 WV counties harvested hay as either DRB or WRB that was cut from the same field on the same day. Samples (n = 16) were analyzed for DM, crude protein (CP), available protein (AP), degradable protein (DP), soluble protein (SP), acid detergent fiber, neutral detergent fiber (NDF), crude fat (CF), total digestible nutrients (TDN), net energy lactation (NEl), net energy maintenance (NEm), net energy gain (NEg), calcium, phosphorus, magnesium, potassium, sulfur, relative feed value, ash, lignin, NDF insoluble CP (NDICP), starch, nonfiber carbohydrate, and sugar. WRB hay contained higher levels of CP (12.1 vs 10.7% DM; P<.05), CF (3.6 vs 2.2% DM; P<.01), NEm (.51 vs .42Mcal/lb; P<.05), SP (6.0 vs 2.2% DM; P<.001), and SP (50.6 vs 21.4% CP; P<.001) and lower levels of NDICP (2.7 vs 4.5% DM; P<.01) compared to DRB. WRB hay tended to contain higher levels of AP (11.1 vs 9.7% DM; P=.07), TDN (56.8 vs 52.2% DM; P=.07), NEl (.53 vs .43 Mcal/lb; P=.43), NEg (.26 vs .17Mcal/lb; P=.05), DP (68.8 vs 55.4% CP; P=.05) and lower levels of lignin (8.5 vs 7.2% DM; P=.1) compared to DRB. The economic impact of the improved quality only covered the cost of the plastic. To maximize the value of wrapping hay it is necessary to harvest at earlier stages of growth so that forage quality improvements will pay for the additional machinery, labor and material cost. For WV cattle producers, WRB could be a cost effective way to improve nutrition of hay-fed animals if the productive state of those animals require additional nutrients.

Key Words: Forage, Hay, Large Round Bales

M138 Assumption testing of the optimal sampling schedule of diet components.

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The accounting of forage inventory can be conceptualized as a quality control issue that can be monitored using a Shewhart X-bar chart. This procedure requires three inputs: number of samples n, sampling frequency h, and control limits L. All three affect the performance of the chart and, thus, the total quality cost (TCQ). A TCQ function consists of cost/cycle while the process is in-control (IC) A, cost/cycle while the process is out of control (OC) B, cost/cycle for sampling and analyses F, and expected duration of a cycle D. A=C_0/J, where C_0 is quality cost/d while producing is IC, and J=1/mean time process is IC. B=C_1(E-τ-A_2h+T_1+T_2)+sY/A_1+W, where C_1 is quality cost/d while producing is OC, E=time to sample and analyze one item, τ=[1-(1+Jh)e^{-Jh}]/[J-Je^{-Jh}] is the expected time for assignable cause to occur given that it occurs between the i^{th} and the $(i+1)^{th}$ sample, A_2=1/(1-β) is the average run length while OC, T_1 is the expected time to discover the assignable cause, T_2 is the expected time to fix the diet, β is the probability(IC_signalprocess_is_OC), s=(e^{-Jh})/(1-e^{-Jh}) is the expected number of samples taken while IC, A_1=1/α is the average run length while IC, α is the probability(OC_signal-process_is_IC), and W=cost to fix the diet. D=1/J-τ+E+A_2h+T_1+T_2. F=(a+bn)/hD where a is the fixed cost per sample, and b is the cost/(unit sampled). The daily TCQ=(A+B+F)/D. The model assumes the normal distribution, but the true distribution remains unknown. We have performed extensive simulation varying J parameter from 5 to 90 d using: Standard Normal (SN); SN with +/- 3.5 SD outliers inserted with a frequency of 1, 5 and 10%; LogNormal with σ taking values 0.3, 0.6, 1.0, 2.0, 4.0, SN with graduate change of mean from 0 to 1.5 SD over 7, 14 and 28 d. The simulation showed that the optimal solution is not sensitive to outliers (the average TCQ cost change was less than 1%) or to long tails (LogNormal test showed the average TCQ cost change in range 6.12 to +1.74%). Finally, the gradual mean change test yielded the most significant cost increase (27.8 to 42.9%).

Key Words: Sampling & Simulation, Quality Control, Assumption Testing

M139 Effects of source and level of two legumes or cotton seed meal on intake and digestibility of Coastal Bermudagrass (*Cynodon dactylon*) hay diets by goats.

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The objective of this study was to determine effects of two levels of *Strophostyles helvula* (Hel; 1.57% N, 47.57% NDF), *Strophostyles leiosperma* (Leo; 1.88% N, 49.0% NDF), or cotton seed meal (CSM; 8.10% N, 35.26% NDF) upon intake of coastal bermudagrass (CBG; 2.03% N, 68.12% NDF) hay and apparent digestibility of dietary OM (OMD), NDF (NDFD), and N (ND). Six Boer-Spanish goats (average weight 46.22 ± 3.99 Kg) were fed CBG plus fixed levels of Hel, Leo, or CSM at 0.34 or 0.68% of BW / d in a 6 by 6 Latin square design with 3 by 2 factorial arrangements of treatments. The CBG was fed ad libitum, and legumes / CSM fed in two equal daily feedings during a 7 d adjustment period and 7 d collection period in metabolism crates. Feces were collected every 24 h, weighed, sub-sampled, and frozen until dried at 100°C. Diet, legumes / CSM, and fecal samples were ground to pass a 1 mm screen in a Wiley mill and analyzed for OM, NDF and N. Nutrient intake and digestibilities were calculated and data analyzed

by GLM procedures of SAS. Interactions between source and amount were insignificant (P = 0.16). Intake of N was greater (P < 0.01) by goats fed CSM (111.3 ± 6.0 mg/kg BW) than by those fed Hel or Leo (each 74 ± 6.0 mg/kg BW). Otherwise N intake did not differ. Lack of differences due to inclusion of legumes was probably due to similarity in N content of legume and CBG (P = 0.29). Other than a trend for CSM to increase N intake, source and level of legume or CSM had no effect on intake of hay or digestibility of dietary NDF (P > 0.05). There was a tendency for improved digestibility of OM with the 0.68% supplementation level of all sources (P = 0.06; 56.5 vs. 63.3 ± 2.4, 0.34 and 0.68% levels respectively). There was no benefit from feeding these legumes or CSM with CGB for these goats. Feeding these sources and levels of the two legumes or CSM did not impair intake or digestibility of CBG in this trial. Similarities in nutrient intake among treatments indicate that legumes and CSM replaced dietary CBG instead of increasing total intake.

Key Words: Goat, Legume, Supplement

M140 Effect of corn silage chop length on lactation performance of dairy cows on a commercial farm – a case study. T. D. Nennich*[1], J. H. Harrison[1], D. L. Davidson[1], J. Werkhoven[2], and A. Werkhoven[2], [1]*Washington State University, Puyallup,* [2]*Werkhoven Dairy, Monroe, WA.*

The theoretical length of cut (TLC) of corn silage can affect the lactation performance of dairy cows. An on-farm case study was conducted to compare the differences in the lactation performance between cows fed corn silage that was chopped at 1.6 cm (SHORT) or 2.5 cm (LONG) TLC. Two pens of mid-lactation Holstein dairy cows (115 cows per pen) were assigned to one of two treatments in a 2 x 2 Latin square design. Diets were fed for two periods of 24 days each. The corn silages were stored in a bunker (SHORT TLC) or AgBag (LONG TLC) silo. Diets were formulated to contain 22.7% corn silage (DM basis) and were similar except for the corn silage. Cows were milked an equal number of times and averaged 3.2 milkings per day. Pen milk weights were recorded at each milking. Milk was sampled for composition analysis four times each period using the California DHIA in-line sampling kit. As expected, LONG diets resulted in a greater percentage of material on the top screen of the particle separator than SHORT diets. Milk production was numerically greater (0.4 kg/milking or 1.2 kg/d on a 3x milking schedule) for cows consuming SHORT diets. Dry matter intake and milk composition were similar for the two diets. Feeding SHORT corn silage diets resulted in numerically greater milk production (0.4 kg/milking) when corn silage was fed at a rate of approximately 23% of the dietary DM on this commercial dairy.

Treatment	Milk, kg/milking	DMI, kg/d	Milk fat, %	Milk protein, %
LONG	12.9	26.6	3.47	3.11
SHORT	13.3	26.5	3.50	3.09
SD	1.6	1.5	0.24	0.09

Key Words: Corn Silage, Dairy, Chop Length

M141 Peanut stover and bermudagrass hay for wethers on summer hardwood range in north central Texas. C. E. Packard*[1,2], J. P. Muir[1], R. Wittie[2], and R. Harp[2], [1]*Texas Agriculture Experiment Station, Stephenville, TX,* [2]*Tarleton State University, Central Texas.*

Goats in the south-central United States raised on range often face a mid-summer forage quantity and quality deficit that may be mitigated by feeding inexpensive hay or stover. Peanut stover (10 % CP, 40% ADF) and Bermudagrass hay (12% CP, 33% ADF) were tested in north-central Texas as a 0.5% and 2.0% BW supplement/substitution on 20 kg Spanish X Boer goat wethers that browsed native hardwoods (8 head ha-1) and in a traditional feedlot, using a complete feed ration as a control. For 10 weeks from July to September in 2002 (216 mm rainfall) and in 2003 (354 mm rainfall) average daily gains (ADG) were measured and ADF and CP concentration of the primary browse species were determined. Goats receiving 0.5% BW bermudagrass in 2002 had greater ADG than those in the control and 0.5% BW peanut paddocks (P < 0.1). There were no differences (P > 0.1) in ADG among goats fed 2.0% BW of bermudagrass, and peanut stover or control animals in 2002. There were no differences (P > 0.1) among treatments in 2003. Goats fed concentrates in the drylot had greater (P < 0.1) ADG than goats eating either hay or stover ad libitum both years. There were no differences (P > 0.1) in carcass percent among animals in the range treatments. Control goats in the drylot had greater (P < 0.05) carcass percentages than animals fed either stover or hay (45, 37 and 31%, respectively). Supplementing goats on hardwood range with bermudagrass hay at 0.5% BW improved ADG only when low rainfall resulted in diminished browse (450-750 kg ha-1 at an average 11% CP and 29% ADF). Goats on woodland range at excessive stocking rates or on degraded range may also benefit from bermudagrass supplementation even during high rainfall years.

Key Words: Goat, Stover, Hay

M142 Forage intake, digestibility and gain by five beef breedtypes grazing rye-ryegrass-bermudagrass pasture and subsequent feedlot performance. T. D. A. Forbes*[1], F. M. Rouquette[2], R. D. Randel[2], and J. J. Cleere[3], [1]*Texas Agricultural Experiment Station, Uvalde, TS,* [2]*Texas Agricultural Experiment Station, Overton, TX,* [3]*Texas Cooperative Extension, Overton, TX.*

An experiment was conducted using Angus (ANG), Bonsmara (BON), Brahman (BRM), Bonsmara x Angus (BA) and Braunvieh (BRV) steers grazing bermudagrass pastures overseeded with rye and ryegrass to determine forage intake and digestibility (DMD) using alkane markers, and to relate performance on pasture to subsequent feedlot performance. Ten animals of each breed were allotted to 5 pastures on Dec. 12. Animals were weighed at the start of the trial and at 28-d intervals for 121-d. On April 19, 5 animals of each breed were dosed with a controlled-release alkane capsule for the determination of intake and digestibility. From April 29, fecal samples were collected from each dosed animal on 5 consecutive days. Forage samples were collected daily for alkane determination, and forage mass was measured at the start and end of the intake trial. Forage and fecal samples were frozen and lyophilized prior to extraction of alkanes and determination by GC. Initial BW (kg) was 255 ± 7.3, 183 ± 6.9, 197 ± 6.9, 256 ± 7.7, and 213 ± 6.9, respectively for ANG, BON, BRM, BA and BRV. The BON and BRM steers were 4 mo younger than the other breeds. Consequently, ADG and intakes are reported on a BW basis. Average daily gain on forage was highest (P = 0.006) in the BON steers (3.47 ± 0.275 g.kg $LW^{-1}.d^{-1}$) followed by BRV, ANG, BRM and BA (3.6 ± 0.26, 3.5 ± 0.27, 3.3 ± 0.26 and 2.8 ± 0.29, respectively). Breed did not differ (P = 0.50) in DMI (5.2 ± 0.19 kg DM/d). Diet DMD tended (P = 0.07) to be higher in BRM and BRV and lowest in BA (0.69, 0.69, 0.68, 0.67, and 0.65 ± 1.07 for BRM, BRV, ANG, BON, and BA respectively). Feedlot ADG tended to be higher (P = 0.09) in the BON steers followed by ANG, BA, BVH, and BRM (5.5 ± 0.25, 5.1 ± 0.26, 5.1 ± 0.26, 4.9 ± 0.23 and 4.5 ± 0.23 g.kg $LW^{-1}.d^{-1}$ respectively). Steers had higher ADG in the feedlot than on forage, but there was no correlation (r = 0.117, P = 0.445) between ADG on forage and ADG in the feedlot. These data suggest that BON steers, though smaller at the onset of the study, were able to grow efficiently, and that steers that perform well on forage can also perform satisfactorily in the feedlot.

Key Words: Alkanes, Steers, Grazing

M143 Soybean by-products for feeding grazing dairy cows. 1. Milk production and composition. R. F. Gregoret*[1], M. C. Gaggiotti[1], M. R. Gallardo[1], S. E. Valtorta[2], G. A. Conti[1], and C. Arakaki[3], [1]*Experimental Station Rafaela INTA, Ruta 34 km 227 Rafaela 2300 Santa Fe Argentina,* [2]*National Research Council (CONICET) CC 22 Rafaela 2300 Santa Fe Argentina,* [3]*CICV INTA CC 77 Castelar 1712 Buenos Aires Argentina.*

The objective of this trial was to evaluate the effects of three soybean by-products on milk production and composition. Nine Holstein lactating cows, rumen fistulated (133 DIM) were used in a 3x3 Latin squares design replicated 3 times (28 days periods). The treatments were: SH = Soybean hulls, SM = Soybean meal (Solv-extd, 44) and SSr = Soybean seeds raw. The diets were iso-energy (1.6 Mcal NEL/kg DM), iso-protein (CP = 16%) and iso-fiber (NDF = 42%), and were formulated on a DM basis with alfalfa grazing (28%), a silage based partial mixed ration (PMR = 71%) and a mineral mix (1%). In SH soybean hulls represented 26% of total offered DM; in SM the soybean meal was 16%, while soybean seed represented 17% in SSr. Corn silage, on the

other hand, represented 13, 40 and 42 % in SH, SM and SSr, respectively. The PMR was fed to each cow in individual pens between the am and the pm milking. The rest of the day cows were sent to an alfalfa pasture, on daily strips. No differences were detected in DM intake. However, NDF consumption was higher in SH. There were no significant treatment effects on milk production and composition. The milk fat content was lower in SH (P = 0.06). Soybean hulls may be included in a high proportion (26 %) to feed grazing dairy cows in winter, to partially replace corn silage.

	Treatments[1]				Effects[2] P<		
	SH	SM	SSr	SEM	T	P	T*P
DMI, kg/d	18.7	18.4	19.0	0.75	0.2731	0.0063	0.5486
NDF intake, kg/d	8.6[a]	6.8[b]	6.6[b]	0.32	0.0007	0.0022	0.5542
Milk, kg/d	25.7	25.6	24.6	2.23	0.4438	0.8530	0.3719
3.5% FCM, kg/d	23.7	23.4	23.3	1.69	0.9889	0.4263	0.1403
Milk fat, %	3.09[b]	3.37[ab]	3.51[b]	0.12	0.0594	0.0227	0.4212
Milk protein, %	3.49	3.49	3.40	0.12	0.2539	0.4539	0.9974
Fat yield, kg/d	0.83	0.82	0.82	0.06	0.9900	0.4300	0.1403
Protein yield, kg/d	0.93	0.86	0.79	0.05	0.2300	0.9600	0.1263

[1]SH = Soybean hulls, SM = Soybean meal (Solv-extd, 44) and SSr = Soybean seeds raw [2] T = treatment; P = period; T*P = interaction

Key Words: Soybean By-Products, Alfalfa Grazing Dairy Cows, Milk Production and Composition

M144 Soybean by-products for feeding grazing dairy cows. 2. Rumen fermentation. M. C. Gaggiotti*[1], C. Arakaki[2], M. R. Gallardo[1], R. F. Gregoret[1], S. E. Valtorta[3], G. A. Conti[1], and O. Quaino[1], [1]*Experimental Station Rafaela INTA Ruta 34 km 227 Rafaela 2300 Santa Fe Argentina,* [2]*CICV INTA CC 77 Castelar 1712 Buenos Aires Argentina,* [3]*National Research Council (CONICET) CC 22 Rafaela 2300 Santa Fe Argentina.*

Nine ruminal fistulated Holstein cows in mid lactation, were used to evaluate soybean by-products on rumen fermentation, in a 3x3 Latin squares design replicated 3 times (28 days periods). The treatments were: SH= Soybean hulls, SM= Soybean meal (Solv-extd, 44%) and SSr= Soybean seeds raw. The diets were isoenergy, isoprotein and isofiber, and were formulated with alfalfa grazing, a silage based partial mixed ration (PMR) and a mineral mix. Soybean by-products represented 26, 16 and 17% of the DM diet, in SH, SM and SSr. Corn silage was 13, 40 and 42 %, respectively. The PMR was fed individually between am and pm milking, after which all cows were sent to an alfalfa pasture, on daily strips. Ruminal fluid samples were taken on days 23 and 25 during each period, at 0, 3, 6, 9, 12, 15, 18, 21 and 24 hours post-am PRM feeding to analyze pH, NH_3, total VFA, acetate (Ac), propionate (Pr) and butyrate concentrations. There were significant treatment effects on pH, total VFA and Ac:Pr ratio. In SH, pH and Ac:Pr ratio were lower, while total VFA were higher. Values for pH were never below 6.0 and the lowest Ac:Pr (1.75) was recorded 9 hours after the PRM feeding. There was a trend in all treatments for Ac:Pr to grow higher 6 hours after the beginning of grazing. Except for treatment by sampling time in Ac and Pr, no other significant interactions were detected. Soybean hulls can partially replace some winter diet ingredients, such as corn silage, with no evident negative effects.

	Treatments[1]				Effects[2] P<			
	SH	SM	SSr	SEM	T	P	H	T*H
pH	6.19[b]	6.46[a]	6.53[a]	0.04	<.001	<.001	<.001	0.597
NH_3, mg%	16.35	20.21	17.87	1.29	0.131	0.040	<.001	0.568
Total VFA, mM	150.47[a]	139.04[ab]	135.73[b]	3.29	0.012	0.013	<.001	0.143
Acetate, mM	85.37	82.46	81.32	1.92	0.326	0.324	<.001	0.047
Propionate, mM	41.90	32.13	30.00	1.15	<.001	0.022	<.001	0.024
Butyrate, mM	15.45	15.21	15.29	0.40	0.912	<.001	<.001	0.449
Ac:Pr	2.09	2.66	2.79	0.07	<.001	0.187	<.001	0.006

[1]SH = Soybean hulls, SM = Soybean meal (Solv-extd, 44) and SSr = Soybean seeds raw[2] T = treatment; P = period; H = sampling time; T*H = interaction

Key Words: Soybean By-Products, Alfalfa Grazing Dairy Cows, Rumen Fermentation

M145 Evaluating the use of indigestible neutral detergent fiber to predict dry matter intake of cattle fed high forage diets. R. Driskill*, J. R. Russell, K. Bormann, and W. J. Powers, *Iowa State University, Ames.*

The efficacy of NDF and indigestible NDF (iNDF) to predict voluntary feed consumption of steers fed a grass hay diet was determined in a digestion trial. Six Angus-Hereford growing steers (mean BW, 304 kg) were used in two 3 x 3 Latin square trials with a 7 d adjustment and 3 d collection periods. Three maturities of smooth bromegrass hay (pre-bloom, mid-bloom, mature) were fed at ad libitum levels individually in metabolism crates. Neutral detergent fiber was determined in an Ankom Fiber Analyzer (Ankom Technology Corp., Fairport, NY) with sodium sulfite and a heat-stable alpha-amylase on forage and fecal samples and the remaining residues after a 96 h fermentation of forage and fecal samples in ruminal fluid and a phosphate buffer in a Daisy^{II} Incubator (Ankom Technology Corp., Fairport, NY). Concentrations of NDF and iNDF for the pre-bloom, mid-bloom, and mature hays were 56.1, 18.4; 67.6, 27.5; 70.1, 29.1% DM. Intakes and excretions of NDF and iNDF were 2.07±0.33, 0.92±0.21; 0.80±0.16, and 0.80±0.19 %BW and did not differ between steers. Regressions predicting NDF and iNDF excretion (%BW) from NDF and iNDF intakes (%BW) were NDF_{fecal} = -0.11 + 0.50 NDF_{intake}, r^2 = 0.61; $iNDF_{fecal}$ = -0.02 + 1.03 $iNDF_{intake}$, r^2 = 0.74. Regressions predicting NDF and iNDF intake (%BW) from DMI (%BW) were NDF_{intake} = 0.48 + 1.08 DMI, r^2 = 0.70; and $INDF_{intake}$ = 0.38 + 0.23 DMI, r^2 = 0.19. Although iNDF excreted as %BW did not differ from iNDF consumed, large variations in iNDF intake as %BW suggests that iNDF is less accurate than NDF in predicting DMI of steers fed a single forage species.

Key Words: Indigestible Neutral Detergent Fiber, Forage Intake, Beef Cattle

M146 Visual assessment versus compressed sward heights as predictors of forage biomass in cool-season pastures. R. E. Vibart*[1], S. L. White-Bennett[2], J. T. Green[2], and S. P. Washburn[1], [1]*Department of Animal Science, North Carolina State University, Raleigh,* [2]*Department of Crop Science, North Carolina State University, Raleigh.*

Two methods to predict pasture biomass for fescue-ladino clover and orchardgrass-ladino clover swards were studied. Visual assessment by an experienced observer was compared to compressed heights using a 0.2-m^2 acrylic plate meter that exerted 6.0 kg/m^2 pressure on the sward. Regression analyses were conducted for each method using clipped and dried plant material to ground level from 0.25-m^2 quadrats used as the referral method. Sampling included 150 observations for fescue on 38 d and 119 observations for orchardgrass on 30 d from 1995 to 1998. Estimates of biomass were sequential from least to most invasive: visual assessment; compressed sward height; and clipped biomass. Higher coefficients of determination (R^2) and lower errors of prediction (S_{xy}) for regressions indicated improved prediction of forage biomass. Regressed across sampling days and all observations, visual assessments (R^2 = 0.69 and 0.65, S_{xy} = 685 and 624 kg DM/ha for fescue, and orchardgrass, respectively) were more accurate in predicting forage biomass than were compressed sward heights (R^2 = 0.37 and 0.47, S_{xy} = 998 and 775 kg DM/ha for tall fescue and orchardgrass, respectively). Regression equations within sampling days were also more precise for visual assessment than for compressed sward heights for fescue (R^2 = 0.94 vs. 0.83 ± 0.03; $P < 0.01$; S_{xy} = 297 vs. 442 ± 48; $P < 0.05$; n = 38) and tended to differ for orchardgrass (R^2 = 0.94 vs. 0.89 ± 0.02; $P = 0.07$; S_{xy} = 247 vs. 321 ± 42; $P = 0.16$; n = 30). Compared to compressed sward heights, visual assessment had a higher percentage of predictions with $R^2 \geq 0.8$ (92 vs. 68% of 38, $P < 0.05$) for fescue and a numerically higher percentage (93 vs. 83% of 30) for orchardgrass. Reasons for lower accuracy using compressed sward heights were not clear. Indentations in soil surface, differences in composition, maturity, or ground cover could contribute to less precision using the plate meter. Visual assessment proved to be a simple and accurate method of predicting forage biomass in cool season pastures.

Key Words: Pasture Biomass

M147 Effect of swine manure application on winter wheat tissue growth and nitrogen, phosphorus, and potassium content. D. M. Sholly*, M. C. Walsh, B. C. Joern, A. L. Sutton, and B. T. Richert, *Purdue University, West Lafayette.*

Two studies were conducted to determine the effect of swine manure application on winter wheat growth and nutrient uptake. Manure was added to soil on an N basis at 224 and 325 kg plant available nitrogen (PAN)/hectare for Exp. 1 and 2, respectively. Soil was mixed with manure from pigs fed diets 1-4: 1) Standard (STD), 17.7% CP; 2) STD + 10% wheat bran (WB); 3) Low Nutrient Excretion diet (LNE) containing 13.9% CP, HAP corn, synthetic amino acids, and phytase; 4) LNE + 10% WB; 5) Negative Control (NC), 0 added PAN; and 6) Positive Control (PC), 325 kg PAN from $(NH_4)_2SO_4$ (Exp. 2 only). In Exp. 1 and 2, 20 and 30 winter wheat (CV. Patterson) seeds were sown/pot, respectively; 4 pots/trt. Exp. 1 wheat was defoliated at d 35, 63, and 91 for harvest 1 (H1), 2 (H2), and 3 (H3), respectively, and in Exp. 2 at d 28 and 56 for H1 and H2, respectively. Exp. 1, all manure trts increased H1, H3, root, total vegetative tissue (TVT), and total plant tissue (TPT) wt and N, P, and K tissue content compared to the NC ($P<.05$). STD manures increased H1 tissue wt by 12% (1.78 vs. 1.56 g; $P<.03$) and N and P content ($P<.001$), but decreased H2 tissue wt by 49% (0.31 vs. 0.61 g; $P<.0002$) and N, P, and K content ($P<.001$) compared to LNE manures. WB manures had no effect on plant growth or nutrient content ($P>.10$). Exp. 2, the PC increased H1, root, TVT, and TPT tissue wt ($P<.05$) and N content of H1, H2, TVT, and TPT and root K content ($P<.04$) compared to the NC. STD manures increased ($P<.03$) H2 tissue wt and N content by 19% and TVT tissue wt and N content by 10% compared to LNE manures. Manure trts increased H1 and TVT tissue wt ($P<.10$) and N ($P<.05$) content over the PC. Total P content of H1, H2, TVT, and TPT was increased ($P<.01$) by all manure trts over PC and STD manures were higher than LNE manures ($P<.01$). WB manures increased H1 P content by 11.5% compared to manures without WB (4.14 vs. 4.68 mg; $P<.01$). Manure trts yielded greater wheat growth than the NC and PC while also increasing plant tissue N and P content. Manure from pigs fed WB had minimal effects on wheat growth.

Key Words: Swine Manure, Wheat, Growth

M148 Effect of grass nonstructural carbohydrates on milk yield and composition and dry matter intake of dairy cattle. A. Buyserie*, P. French, and T. Downing, *Oregon State University, Corvallis.*

Previous research indicates increasing NSC content of grass forages increases utilization of degradable protein, microbial protein synthesis, and milk production. Dry matter intake also increases and N excretion decreases. Objectives were to identify differences in milk yield and composition, dry matter intake, and rumen fermentation between a high NSC and a lower NSC grass ingested as greenchop. Cool-season, perennial ryegrasses, one with a relatively high NSC content (HNSC) and one commonly grown in Oregon (CNSC) were selected. Grasses were planted fall, 2002 and fed spring, 2003. Twelve Holsteins and 2 Jerseys were blocked by milk yield and assigned at random to treatment. Individual intake and milk yield were collected twice daily for 21 days. Milk samples were collected for four consecutive milkings days 0, 7, and 21. Days 9 and 21, rumen samples were collected at 0, 1, 2, 3, 4, 6, 8, 10, and 12 hours relative to TMR feeding and analyzed for pH and ammonia. Grasses were cut, sampled, and offered *ad-lib* twice daily. TMR was offered for one hour twice daily. Data were analyzed with the MIXED procedure of SAS. For grass DMI, treatment by day interaction was significant ($P<0.01$), with grass DMI being greater for HNSC during week 2. TMR DMI was greater for HNSC treatment ($P<0.05$). Milk yield and yield of milk fat and milk protein were greater for HNSC treatment ($P<0.05$). MUN and rumen ammonia did not differ between treatments ($P>0.05$). Grass nutrient composition was different than expected. Grass NDF and ADF were similar ($P>0.05$), HNSC was higher in CP ($P<0.01$) and lower in NSC ($P<0.05$). In this study, milk and component yields for HNSC were greater than CNSC treatment, however effects appear to be caused by factor(s) other than grass NSC.

Key Words: Grass Forages, Nonstructural Carbohydrates, Protein Utilization

M149 Number of experimental units required to detect differences in grazing time. D. H. Seman*[1], J. A. Stuedemann[1], and L. W. Douglass[2], [1]*USDA-ARS, Watkinsville, GA,* [2]*University of Maryland, College Park.*

The objective of this study was to determine the number of cattle necessary to detect differences in time spent grazing by steers on E+ tall fescue. In each of two years, 12 yearling Angus steers grazed tall fescue pastures, three pastures were highly infested (64%)(*Neotyphodium coenophialum*) KY-31 fescue, while three had low infestation rates (32%). One steer on each pasture received an experimental drug to overcome effects of endophyte infection and one received a placebo on Monday, Wednesday, and Friday during the three-week (1988) and four-week (1989) study. All 12 steers were fitted with vibracorders to record continuous grazing behavior during the studies. Statistical analyses of time spent grazing/h was conducted by the Mixed Procedure of SAS with day as a repeated measure and pasture considered a random effect. The Mixed Procedure calculated eight standard errors, one for each endophyte, drug and year combination and resulted in a range of values when estimating the number of experimental units. It would take from 14 to 115 steers/treatment to detect a 5% difference in minutes spent grazing/h $\alpha=.05$. Up to 30 steers/treatment would be needed to detect a 10% difference, 7 to 15 to detect a 15% difference, 4 to 9 to detect a 20% difference, 4 to 6 for a 25% difference, and 2 to 5 to detect a 30% difference. These analyses point out the importance of calculating an accurate standard error with which to estimate experimental units. Box-Jenkins ARIMA time series analysis showed that minutes spent grazing/h differed ($P<.05$) between days when steers were gathered and given drug and days when steers were left alone in 1988 and during week 1 in 1989. Grazing behavior at any given time of the day was correlated with the previous one or two hours. A significant 24-h seasonal component showed that grazing behavior repeated ($P<.01$) at the same time on subsequent days. Results suggest that it may not be necessary to monitor grazing behavior continuously day after day to obtain a representative sample. Data on days when normal grazing behavior is disrupted, e.g., by gathering steers, may not be representative of time spent grazing throughout a given collection period.

Key Words: Cattle, Grazing Behavior

M150 Relationship of rate of appearance of vaccenic acid and pH during in vitro biohydrogenation of linolenic acid from alfalfa hay. C. V. D. M. Ribeiro* and M. L. Eastridge, *The Ohio State University, Columbus.*

Using an in vitro system, approximately 0.5 g of DM from alfalfa hay (92%) and sucrose (8%) was incubated with rumen fluid using two different buffers: one at average pH at 6.3 (HpH buffer, 100:0 $NaHCO_3$/NaCl, wt/wt) and the other at 5.8 (LpH buffer, 50:50 $NaHCO_3$/NaCl, wt/wt). Samples were incubated for 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 h. At each time point, the pH was measured and the tubes were immediately put in ice and stored at -20 °C until freeze-drying. Fatty acids (FA) were methylated with sodium methoxide (10 min at 50 °C) followed by HCl in methanol (10 min at 80 °C). Rates (mg/ml/h) for individual FA were determined using PROC NLIN of SAS (2002). The pattern of linolenic acid disappearance was similar for both pH. The amount of linolenic acid remaining was high for the LpH buffer until 7 h. After 7 h, the amounts were the same for both buffers. A similar pattern for the amounts of vaccenic acid (VA) was observed from 0 to 6 hours. The amount of VA formed from 0 to 6 h was the same, peaked at 2 h and decreased until 6 h for both buffers. After 6 h, the rates of VA appearance were 0.00502 and -0.000783 for the HpH and LpH buffers, respectively. The amount of VA from 6 to 12 h of incubation changed very little for the LpH buffer. The amount of stearic acid was always higher for the HpH buffer. The rates of stearic acid appearance from 0 to 6 h were 0.00214 and 0.00103 for HpH and LpH buffers, respectively. Disappearance of linolenic acid from alfalfa hay was slightly affected by a low pH, with no difference after 7 h. Based on linolenic acid disappearance, the final reduction step of biohydrogenation appears to be more susceptible to the low pH than the steps prior to the formation of VA.

Key Words: Vaccenic Acid, Alfalfa, Biohydrogenation

M151 Comparison of biohydrogenation of fatty acids in lyophilized forage and air dried forage with sucrose additions. C. V. D. M. Ribeiro* and M. L. Eastridge, *The Ohio State University, Columbus*.

Grazing animals produce a higher percentage of conjugated linoleic acid (CLA) in milk fat compared to animals fed TMR, and most of the CLA is synthesized in the animal from vaccenic acid (VA). It has been proposed that this higher amount of CLA in milk fat is due to higher concentrations of soluble sugars in fresh plants. To observe the effect of sucrose on biohydrogentaion (BH) and formation of trans-18:1 fatty acids (FA), four continuous culture fermenters were used in a 4 X 4 Latin square. Each period consisted of 7 d of adaptation and 3 d of sample collection. Fresh alfalfa samples (prebloom to early bloom) were obtained from a greenhouse at the Ohio Agricultural Research and Development Center (Wooster, OH). Samples were harvested randomly and immersed immediately in liquid nitrogen using a metal grid. Samples were freeze-dried, ground at 1mm, and stored at -20 °C. Alfalfa hay was purchase and contained 38% NDF and 21% CP. The treatments were: 1) fresh alfalfa, 2) alfalfa hay, 3) 96% alfalfa hay and 4% sucrose, and 4) 92% alfalfa hay and 8 % sucrose. The FA analyses were performed on the effluent samples. The FA were methylated with sodium methoxide (10 min at 50 °C) followed by HCl in methanol (10 min at 80 °C). Data were analyzed by the PROC MIXED procedure of SAS (2002). Total BH and BH of linolenic acid were higher ($P < 0.05$) for fresh alfalfa compared to alfalfa hay with no sucrose. The BH of linoleic and linolenic acid decreased linearly with higher sucrose supplementation. Total BH decreased linearly ($P < 0.05$) for alfalfa hay with higher sucrose supplementation. It seems that sucrose impaired total BH. Fresh alfalfa had a more complete BH with lower levels of trans-18:1 FA in the effluent. Although not different statistically, percentage of VA in the effluent was numerically lower ($P = 0.13$) for fresh alfalfa. Percentage of trans-10 18:1 also tended to be lower ($P < 0.10$) for fresh alfalfa. We concluded that sucrose itself may not be responsible for the higher VA observed in milk of grazing cows. We speculate that other factors, such as pH and soluble proteins, may also be involved.

Key Words: Biohydrogenation, Alfalfa, Continuous Culture

M152 Effects of level of protein supplementation on performance of crossbred calves grazing Tifton 85 bermudagrass. S. A. Woods*[1], F. M. Rouquette, Jr.[2], G. E. Carstens[1], T. D. A. Forbes[3], and W. C. Ellis[1], [1] *Texas Agricultural Experiment Station, College Station, TX,* [2] *Texas Agricultural Experiment Station, Overton, TX,* [3] *Texas Agricultural Experiment Station, Uvalde, TX*.

The high protein requirement of growing crossbred calves fuels the search for grazing management programs that effectively meet their nutritional needs. The objective of this study was to determine the effects of level of protein supplementation (PS) on performance of crossbred calves grazing Tifton 85 bermudagrass (TIF85). Weaned Simmental-sired, 25% Angus, 25% Brahman steers and heifers (n = 59; mean BW = 345.4 ± 4.1 kg) were blocked by BW within sex, and randomly assigned to one of four treatment groups (three pasture replicates/trt): (1) pasture (PAS), (2) PAS + 0.2% BW of a 2:1 SBM:corn PS containing salt, dicalcium phosphate, magnesium oxide, and Rumensin 80, fed daily (.2BW), (3) PAS + 0.4% BW PS (.4BW), or (4) PAS + 0.8% BW PS (.8BW). The PAS calves were provided free choice access to a mineral premix without Rumensin 80. TIF85 pasture plots (0.68 ha) were stocked at 8.6 hd/ha and grazed for 90 d during the summer of 2003. Calves were weighed at the start of the study and 28 d thereafter. ADG during the first 56 d of the study increased ($P < 0.001$) in a linear manner as the level of PS increased (0.93, 1.03, 1.16 and 1.27 ± 0.05 kg/hd/d for PAS, .2BW, .4BW and .8BW, respectively). Overall ADG during the 90 d study also increased ($P < 0.001$) in a linear manner (0.70, 0.81, 0.92 and 1.11 ± 0.04 kg/hd/d for PAS, .2BW, .4BW and .8BW, respectively). Overall, calves receiving .8BW treatment gained 37 kg more than those grazing PAS. Using pasture plot as experimental unit, BW gain per ha increased ($P < 0.001$) in a linear manner as level of PS increased (546, 634, 716 and 864 ± 32.5 kg/ha for PAS, .2BW, .4BW and .8BW, respectively). Additional calf gain was 0.11, 0.21 and 0.40 kg/d for .2BW, .4BW and .8BW, respectively. Efficiency of supplementation, expressed as PS:extra gain ratio, was 6.83, 6.85 and 7.24 for .2BW, .4BW and .8BW treatments, respectively. In this study, level of PS up to 0.8% of BW was effectively used to increase the performance of calves grazing Tifton 85 bermudagrass.

Key Words: Tifton 85 bermudagrass, Protein Supplementation, Stocker

M153 Forage quality of perennial grass as influenced by stubble height. J. H. Cherney* and D. J. R. Cherney*, *Cornell University, Ithaca, NY*.

Timing of spring grass harvest is critical to obtaining optimum forage quality, and the harvest window is narrow. We studied the feasibility of harvesting grass at a higher stubble height to improve forage quality.Rival reed canarygrass, Okay orchardgrass, and Select tall fescue were fertilized with 0, 112 and 224 kg N fertilizer/ha at spring greenup and sampled in late May or early June in 2001, 2002 and 2003. Four replicates at each of two sites were sampled, a fertile site in Ithaca, NY and a more marginal high elevation site in Dryden, NY. Samples were cut at a 10-cm stubble height and sectioned into 5-cm increments using a paper cutter. Samples were dried, ground and analyzed for forage quality parameters. The study was analyzed as a randomized complete block with a split plot arrangement of treatments. Main plots were grass species; subplots were nitrogen fertilizer treatments. Dry matter yield per cm of stubble height above a 10-cm cut was highly positively correlated with total stand yield ($r^2 = 0.88$; $P < 0.01$), ranging from 36 to 108 kg DM per cm of vertical growth. Percent of total yield per cm of lower canopy varied with the height of the stand. For grass fertilized with 112 kg of N, CP increased by 0.25 percentage units ($r^2 = 0.74$; $P < 0.01$) and NDF decreased by 0.30 percentage units ($r^2 = -0.85$; $P < 0.01$) per cm of vertical height above a 10-cm stubble. In vitro digestibility increased by 0.29 percentage units ($r^2 = 0.74$; $P < 0.01$) and fiber digestibility increased by 0.30 percentage units ($r^2 = 0.59$; $P < 0.01$) per cm of vertical height above a 10-cm stubble. Forage quality of the total stand increased in CP by 0.15 percentage units and decreased in NDF by 0.13 percentage units per cm of additional stubble left in the field, which is inconsequential.

Key Words: Forage Quality, Stubble Height, Grass

M154 Evaluation of tall fescue, soybean hulls and ionophores *in vitro*. L. A. Briggs*, J. C. Waller, H. M. Blalock, and C. J. Richards, *The University of Tennessee, Knoxville*.

Combinations of endophyte (*Neotyphodium ceonophialum*) infected (E+) Kentucky-31 tall fescue (*Festuca arundinacea* Schreb.) and soybean hull (SH) were incubated *in vitro* with ionophores to determine VFA and gas production, DM disappearance, and NH_3-N release. Substrates consisted of tall fescue:SH ratios of 100:0, 85:15, 70:30, 55:45, and 0:100. Substrates were incubated with no ionophore, Rumensin®, or Bovatec® in a 5 x 3 factorial design with three replicate runs. Both ionophores were mixed at a rate to provide 33 mg of active ingredient per kg of substrate. Substrates (0.5 g; DM) were sealed in F57 bags (Ankom, Inc., Macedon, NY) and incubated in 100 mL of McDougalls buffer:rumen fluid inoculum (4:1). Gas pressure sensors were used to continuously monitor changes in pressure over a 72 h period. At the end of the incubation, the F57 bags were removed, washed with hot water, and dried for determination of DM disappearance. A sample of the remaining inoculum was retained for VFA and NH_3-N analysis. Ionophore addition did not affect DM disappearance, gas production, or VFA and NH_3-N concentrations. DM disappearance increased linearly ($P < 0.05$) with SH concentrations from 0 to 45%. There was a tendency ($P < 0.08$) for the rate of gas production to respond in a quadratic manner as SH increased from 0 to 45%. Gas production per unit of substrate disappearance did not differ ($P > 0.48$). Acetate and total VFA concentrations increased linearly ($P < 0.05$) while propionate concentrations tended ($P < 0.08$) to increase with SH concentrations from 0 to 45%. Incubation of 100% SH resulted in the greatest valerate and isovalerate concentrations. Concentrations of NH_3-N decreased as SH concentrations increased from 0 to 45%. Substitution of up to 45% soybean hulls in fescue-based diets resulted in greater substrate digestion with increased energy release and decreased NH_3-N release.

Key Words: Fescue, In Vitro, Digestion

M155 Effects of stocking method and rate on seasonal cow-calf performance and forage quality. W. E. Wyatt*[1], B. C. Venuto[2], J. M. Gillespie[3], and D. C. Blouin[3], [1]*Louisiana State University Agricultural Center, Jenerette,* [2]*Grazing Lands Research Laboratory, USDA, ARS, El Reno, OK,* [3]*Louisiana State University Agricultural Center, Baton Rouge.*

Effects of stocking method and rate on cow-calf performance and forage quality were evaluated by the following treatments: continuous-stocked pastures at a low (1.2; CL), medium (2.0; CM), and high rate (2.7 cows per ha; CH) and rotational-stocked pasture (8 paddocks) at a high rate (2.7 cows per ha; RH). Brangus cows and calves were stocked on replicated treatment pastures on a year-around basis for three years. Cows were weighed prior to calving (January), prior to breeding (April), at weaning (October), and again the following January. Spring-born calves were weighed at birth, in April, and at weaning. Seasons corresponding to weigh periods were February-April (ES), May-June (LS), and July-October (S). The LS period represented a transition from annual ryegrass (principal forage in ES) to common bermudagrass-dallisgrass (principal forages in S) forage bases. Statistical analyses were conducted using a generalized linear mixed-model procedure. Cow weight gains and calf ADG were similar (P>.2) among treatments in ES. In LS, CL cows lost less weight than CM (P<.01; -33 vs -48 kg), and CH cows lost less weight than RH (P<.01; -39 vs -54 kg). Calf ADG in LS was greater for CL than for CM (P<.01; .93 vs .8 kg) and was greater for CM than for CH (.72 kg; P<.01), but similar (P=.54) between CH and RH calves. In LS, forage CP (12.7 vs 11.1 %) and IVTD (60.9 vs 57.3 %) were greater for CH than for RH (P<.05). In S, CM cows gained more weight than CL cows (P<.05; 34 vs 28 kg) and than CH cows (P<.01; 34 vs 18 kg) and CH cows gained more weight than RH cows (P<.01; 18 vs 11 kg). In S, CL and CM calves had similar ADG (P=.76; .98 and .96 kg), but CM was greater than CH (.78 kg; P<.01) and CH was greater than RH (.7 kg; P<.05). In S, forage CP was greater for CH than for RH (P<.01; 13.3 vs 11.7 %). Selected forage IVTD tended (P<.1) to be higher for CM than for CH. Stocking rate and method affected cow-calf performance and forage quality in late-spring and summer (warm-season, perennial grasses), but had less impact during the early-spring (cool-season, perennial grasses).

Key Words: Stocking Rate, Stocking Method, Cow-Calf

M156 Evaluation of ensiled sorghums with and without condensed tannins as feeds for ruminants. H. Carneiro*[1], P. B. Arcuri[1], J. A. Rodrigues[2], F. S. Sobrinho[1], S. S. Brum[1], and M. Villaquiran[3], [1]*Embrapa Gado de Leite Juiz de Fora, MG, Brazil,* [2]*Embrapa Milho e Sorgo Sete Lagoas, MG, Brazil,* [3]*E (Kika) de la Garza American Institute for Goat Research, Langston University, Langston, OK.*

Historically, there is a believe that condensed tannins (CT) are responsible for low digestibility of plant material and are recognized as anti-nutritional factors in diets of monogastric animals. High CT concentrations can reduce the absorption of protein from the small intestine of monogastric. However, in ruminant diets low concentrations (1-3% DM) can be beneficial by reducing ruminal degradation of forage protein, which outweigh any detrimental effects of reduced protein availability in the small intestine. A total of 10 Sorghum cultivars (lines CMSXS114 Tannin (T) and CMSXS165 Without Tannin (WT), Hybrids 9953101(T), 9953130(T), BR601 (WT), BR701 (T), BR700 (T), and AG2005 (WT), and Varieties BR 501(WT), and BR506 (WT)) with 8 replications were ensiled in PVC silos of 3 kg per silo for 60 d and then analyzed for CT, (colorimetric analysis by the butanol-HCl method) CP, NDF, ADF, and in situ and in vitro (4, 24, and 48 h) digestibilities. Condensed tannins from quebracho were purified using affinity chromatography with sephadex LH-20 and used as a standard. Low concentration of CT have been defined as 10 g/kg DM or less and medium as 10 to 50 g/kg DM or more. Hybrid BR701 had the highest concentration of CT among the sorghums (P<0.05) with 7 g/kg DM. Differences among sorghums were not detected for NDF (P=0.10), ADF (P=0.10), or in vitro digestibility (P=0.09). The highest CP content was noted for line CMSXS165 (9.74 g/kg; P<0.05). Concentrations of CP in CMSXS114 (8.32 g/kg), BR 700 (7.44 g/kg), and BR701 (8.05 g/kg) were above the overall mean (7.4 g/kg). The Hybrid BR700 showed the fastest rate of ruminal degradation of these 3 in the 4 h (P<0.05), followed by CMSXS114 and CMSXS165. The two latter were sorghums isogenic lines that differ only in CT concentration. It was concluded that digestibility was not affected by CT level; however, relative CT concentrations were low. Therefore, we would do not anticipate significant effects of CT content on DM intake, digestibilities, or performance in cattle fed these sorghum silages.

Key Words: Silage, Tannin, Ruminant Nutrition

Ruminant Nutrition I

M157 Effect of increasing sodium bicarbonate proportion in high concentrate diets on ruminal fermentation in finishing beef heifers. L. González*, A. Ferret, S. Calsamiglia, and X. Manteca, *Universitat Autònoma de Barcelona Edifici V, Campus UAB, Bellaterra, Barcelona, Spain.*

Four rumen fistulated Holstein heifers (264 ± 12 kg initial BW) were used in a 4 x 4 Latin square design to determine the effect of increasing levels of sodium bicarbonate (0, 1, 2 and 4 %, on DM basis) on ruminal fermentation. The main ingredients of the concentrate were: 33% barley grain, 32% corn grain, 16% tapioca and 10% soybean meal. Heifers were allowed to consume concentrate and barley straw on an ad libitum basis, which resulted in a mean of 12 to 88 forage to concentrate ratio. Linear, quadratic and cubic effects were analyzed with the Type 1 analysis of variance of the PROC MIXED procedure of SAS with animal and period considered random effects. Mean ruminal pH and total area under the pH curve tended to increase linearly (P < 0.15) with increasing buffer proportion. The lowest pH (5.65 ± 0.09) was similar across treatments. Hours in which pH was below 5.8 tended (P = 0.10) to a quadratic effect, the values being 12.6, 3.6, 3.2 and 4.7 h, for 0, 1, 2 and 4 % of sodium bicarbonate, respectively. Average ammonia nitrogen concentration was not affected by treatment (2.44 ± 0.87 mgN/100mL). Total VFA concentration was not affected by treatment (143 ± 12 mM). Molar proportion of propionate decreased linearly (P < 0.05) and acetate tended to increase linearly (P < 0.10) with increasing buffer proportion in the diet. Acetate to propionate ratio, molar percentage of butyrate and branch-chained VFA increased linearly (P < 0.05) as sodium bicarbonate proportion increased in the diet. Valerate was not affected by treatment. Data suggests that increasing sodium bicarbonate beyond 1% does not bring any further benefits to overall pH and ruminal fermentation conditions. Factors other than sodium bicarbonate proportion used as a buffer must play a role in the control of the effects of high concentrate diets on ruminal fermentation.

Key Words: Beef Heifers, Rumen Fermentation, Sodium Bicarbonate

M158 Effects of sodium bicarbonate on ruminal pH and feed intake in feedlot cattle. L. Paton*[1], M.A.G. von Keyserlingk[1], K. A. Beauchemin[2], and D. M. Veira[3], [1]*University of British Columbia Animal Welfare Program, University of British Columbia, Vancouver, British Columbia, Canada,* [2]*Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada,* [3]*Agriculture and Agri-Food Canada, Kamloops, British Columbia, Canada.*

The objective of this study was to determine whether sodium bicarbonate ($NaHCO_3$) could reduce the risk of acidosis in cattle receiving high concentrate diets. Ruminally cannulated Jersey steers (n=3) and Holstein cows (n=3), previously adapted to a high concentrate diet, were used in a repeated 3x3 Latin square to study the effects of $NaHCO_3$ on daily feed intake and ruminal pH. Cattle were provided ad libitum access to a control diet of steam-rolled barley, barley silage, and a protein-mineral supplement at 80, 12 and 8% (DM basis), respectively. Treatments were control, control plus free choice $NaHCO_3$ mixture and control supplemented with 0.7% $NaHCO_3$ (% DM basis). The free choice $NaHCO_3$ mixture was offered as 30% dried molasses and 70% $NaHCO_3$ based on a previous palatability trial. Periods consisted of 11 d adaptation and 3 d of continuous ruminal pH measurements using indwelling electrodes. Daily DMI (mean ± SE) did not differ between the control (7.95 ± 1.34 kg/d) and free choice $NaHCO_3$ (8.27 ± 0.86 kg/d) (P = 0.67) or the $NaHCO_3$ supplemented diet (7.94 ± 0.48 kg/d) (P = 0.99). Mean lowest feed intake for the control diet, free choice $NaHCO_3$ diet and 0.7% $NaHCO_3$ supplemented diet were 2.98 kg/d, 5.51 kg/d and 6.89 kg/d, respectively. Considerable variation in daily free choice