

Forages and Pastures - Livestock and Poultry: Pastures and Grazing

W101 Effect of morphological traits on intake characteristics of four grass species found in temperate biodiverse pasture systems.

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Meadow fescue (MF, *Festuca elatior*), orchard grass (ORG, *Dactylis glomerata*, L.), quack grass (QG, *Elytrigia repens*), and reed canarygrass (RCG, *Phalaris arundinacea*) were sown in micro-sward boxes (79 cm × 47 cm × 11.5 cm) to investigate intake characteristics of four grass species. Once established, micro-swards were defoliated at 21-d intervals before being offered to non-pregnant, non-lactating Holstein cows in short-term tests. Boxes were weighed (± 0.1 g) before and after each test during which cows were allowed to take approximately 50 bites. Bite mass, DM content, sward surface height, tiller length and density, and leaf width, length and area data were collected. Mean DM bite mass was greatest for QG and RCG. Sward surface height was greatest for RCG and lowest for MF. Tiller length was greatest for ORG. Tiller density was greatest for MF and QG. Leaf width was greatest for ORG and RCG. Leaf length was greatest for ORG and lowest for QG and RCG. Leaf area was greatest for ORG and RCG. Sward surface height was the best predictor of DM bite mass, which may lead to greater apparancy of that species, thus the grazing animal may consume more material from that species, potentially subjecting that species to greater grazing selection than others in the same sward. However, implications on long-term survival of that species would be dependent on residual and sward re-growth characteristics after repeated defoliation.

Table 1.

	MF	ORG	QG	RCG	SE
Forage DM, %	21.9	21.4	28.0	26.5	3.05
Bite mass					
....g fresh/bite	3.89 ^{ac}	4.29 ^b	3.48 ^a	4.02 ^{bc}	0.15
.... g DM/bite	0.85 ^a	0.90 ^{ab}	0.97 ^{bc}	1.07 ^c	0.05
Sward surface height, cm	20.84 ^a	26.33 ^b	24.09 ^{ab}	31.74 ^c	1.16
Tiller length, cm	27.67 ^a	36.20 ^b	24.02 ^a	27.38 ^a	1.12
Tiller density, cm ²	97.31 ^a	72.45 ^b	107.83 ^a	75.40 ^b	3.83
Leaf width, cm	2.78 ^a	2.97 ^b	2.76 ^a	2.98 ^b	0.05
Leaf length, cm	14.52 ^a	17.63 ^b	10.70 ^c	10.57 ^c	0.86
Leaf area, cm ²	43.83 ^a	136.76 ^b	55.02 ^a	101.66 ^b	9.81

^{abc} Means within the same row with different superscripts differ ($P < 0.05$).

Key Words: Biodiverse Pasture Systems, Grazing Behavior, Intake Characteristics

W102 Estimation of forage intake and the presence of alkaloids in ruminal fluid and forage in steers grazing three different fescue types.

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During two consecutive grazing seasons, DMI of steers grazing 'Kentucky-31' endophyte infected (E+), endophyte free (E-), and Q4508-AR542 non-ergot alkaloid-producing endophyte infected (Q)

tall fescues (*Festuca arundinacea*) was estimated. Also, ergovaline (EV) and lysergic acid amide (LSA) were quantified in forage and ruminal fluid of steers grazing E+. Estimates of DMI did not differ ($P = 0.88$) when based on samples collected at 0800, 1700, or a composite of the two sampling times. Estimation of DMI using handplucked samples tended to be higher ($P = 0.06$) than from whole plant clipped samples. In 2004, estimated DMI of steers grazing E- was higher ($P < 0.001$) than Q and E+. In 2005, DMI of steers grazing E- was higher than Q and E+ in June ($P < 0.05$), and higher ($P < 0.05$) for steers grazing E- than Q in September. Lysergic acid amide, an analog of lysergic acid, and EV were present in E+ forage throughout the grazing season but were not detectable in E- and Q. Similarly, LSA appeared in ruminal fluid of steers grazing E+, but not in steers grazing E- and Q. Ergovaline was not detectable in ruminal fluid of steers grazing any of the three fescue types. The appearance of LSA in ruminal fluid through the season was similar to patterns of forage alkaloids (LSA and EV). Lower DMI may affect performance of steers grazing of E+. Low DMI of steers grazing Q suggests that the fescue variety Q4508 may not be the optimal variety for the incorporation of non-ergot alkaloid-producing endophyte strains. Additionally, the appearance of LSA in ruminal fluid of steers grazing E+ suggests that this ergot alkaloid may contribute to fescue toxicosis.

Key Words: Dry Matter Intake, Ergot Alkaloids, *Festuca arundinacea*

W103 Efficacy of EndoFighter™ for stocker cattle grazing endophyte-infected tall fescue pastures during late summer and fall.

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An 84 d grazing trial was conducted (Aug 24–Nov 17) near Spring Hill, TN was to determine the efficacy of EndoFighter™, an ADM Alliance Nutrition, Inc. product designed to be fed to cattle grazing or fed endophyte-infected fescue. Jesup tall fescue pastures grazed in this trial were > 90% infested with *Neotyphodium coenophialum* (E+). Sixty weaned crossbred heifers (325 kg) were used in a randomized block design, blocked by weight, breed and previous treatment and randomly allotted to pastures with four animals per 1.2-ha paddocks and five replications per treatment. Treatments were ADM Alliance Nutrition, Inc mineral products: 1) Mastergain® mineral = Control; 2) EndoFighter™ mineral; 3) Prototype mineral. Heifers had free choice access to E+ grass, water and shade. Heifers were weighed on d 0, 1, 28, 56, 83, and 84. Initial and final weights were an average of the two beginning and ending weights, respectively. Data collected were initial, d 28, d 56, and final weights, and ADG (period 1 = d 1 to 28; period 2 = d 29 to 56; period 3 = d 57 to 84; total = d 1 to 84). Blood serum was collected at d 0, 28, 56, and 84 for prolactin analysis. Mineral consumption and animal grazing behavior were determined at 14-d intervals. Data were analyzed using the MIXED procedure of SAS. For all variables, contrasts were performed to compare Control to mineral supplements containing EndoFighter™ or Prototype. Total ADG (kg) and average daily mineral consumption (g) were: 0.61, 170*; 0.56, 122*; 0.50, 146; for Control, EndoFighter™ and Prototype, respectively (* $P < .09$). Serum prolactin was not different ($P > .05$) among treatments. According to National Weather Service data for

Franklin, TN, the maximum temperature reached at least 32.2° C on four days of the trial. Animal performance and prolactin levels were not significantly affected by the feeding of EndoFighter™ or Prototype in this trial. Mild weather conditions may have contributed to the lack of responses observed because heifers were not stressed by a combination of E+ and elevated ambient temperature.

Key Words: Beef Heifers, Tall Fescue, EndoFighter™

W104 Effect of cultivar and defoliation frequency on forage yield of *Chloris gayana* kunth in a moderate saline soil of the semiarid chaco of Argentina. M. V. Cornacchione*¹, H. E. Pérez², and A. E. Fumagalli^{1,3}, ¹Instituto Nacional de Tecnología Agropecuaria, Santiago del Estero, Argentina, ²Instituto Nacional de Tecnología Agropecuaria, Leales, Tucumán, Argentina, ³Universidad Nacional de Santiago del Estero, Santiago del Estero, Argentina.

The aim of the trial was to evaluate the effect of four cultivars and clipping frequency on forage production, leaf:stem ratio, dead leaf proportion and leaf protein content of *Chloris gayana* in a moderate saline soil (from 0 to 60 cm depth, the avg. E_{Ce}=9.6 dS/m and avg. pH=7.95). The experimental design was a completely randomized block in a split-plot arrangement with four replicates. The main plot had three tetraploid and one diploid cultivar; Callide, Boma, INTA-PEMAN (Experimental line; EL), and Topcut respectively. The grasses were sown in February of 2005. The split-plot consisted of two defoliation treatments (beginning November 2005 to May 2006): every seven weeks clipping (SWD) and the other at the end of the growing season (mature forage defoliation, MFD). Cultivar × defoliation interaction was not statistically significant for all variables, except for the % of dead leaf (P<0.01). Cultivars did not differ in forage yield, but forage production was greater in MFD (9850±1580 kg DM/ha; P<0.01) than SWD (6380±1048 kg DM/ha). Leaf:stem ratio was similar among cultivars, but did differ (P<0.01) in response to defoliation treatment (3.67±0.80 vs. 0.63±0.10 for SWD and MFD respectively). Under SWD Topcut and Callide had less % of dead leaf (P<0.01; 4.29±0.76 and 4.45±0.83 respectively) than Boma and EL (6.95±1.36 and 7.86±1.6), but in MFD % of dead leaf was significantly different among cultivars (P<0.01). Thus Callide, EL, and Boma had approximately 34, 64, and 75% more dead leaf than Topcut (on average 70.19±1.35, 86.05±1.12, 91.72±1.74 and 52.32±9.69). Leaf CP was significantly greater in SWD vs. MFD (P<0.01; 7.51±0.50 vs. 3.74±0.86 for SWD vs. MFD). EL, Boma and Topcut were similar in leaf CP (6.1±1.74, 6.05±2.18 and 5.50±2.64, respectively) and Callide was lower (4.83±2.24; P<0.01). In conclusion the seven weeks defoliation frequency decreased forage yield, however this frequency consistently improved forage quality and reduced the proportion of dead leaf. Among cultivars Topcut was superior due to less proportion of dead leaf.

Key Words: *Chloris gayana*, Forage Production, Saline Soil

W105 Effect of herbage depletion on cattle grazing dynamics in wheat pastures. P. Gregorini*¹, M. Bowman³, W. Coblenz⁴, P. A. Beck², and S. A. Gunter², ¹USDA-ARS, University Park, PA, ²University of Arkansas SWREC, Hope, ³University of Arkansas, Fayetteville, ⁴USDA-ARS, Madison, WI.

Two complementary experiments were conducted to assess grazing dynamics, intake rate, quality and ruminal degradation kinetics of herbage consumed under three herbage depletion levels. In the first experiment (behavioral), three rumen cannulated steers faced (15 min. grazing session) grazing scenarios simulating the levels of pasture depletion at three sward surface heights (ungrazed, 21 cm, CNTL; medium, 14 cm, MD; and high depletion level, 7 cm, HD). Grazing scenarios were sampled for green leaf and stem mass. Intake rate was determined by rumen evacuations. Grazing dynamic was determined by bite/min, bite depth, eating step/min, eating distance, potential area harvested while grazing, and bites and intake/feeding station. Also, quality of potential herbage eaten was estimated by herbage hand-plucking. In the second experiment (ruminal degradation kinetics) samples of herbage eaten by steers during the grazing sessions of the first experiment were incubated in situ in five rumen fistulated steers. The soluble, degradable and undegradable consumed herbage DM fractions were determined, as well as the DM disappearance rate, lag time and DM effective degradability. Green leaf and stem mass quadratically concave decreased (P = 0.01) from CNTL to HD. Treatment did not affect herbage DMI (675 g, SE = 45; P = 0.14) during the grazing sessions; but tended (P = 0.06) to decrease herbage DMI/ feeding station with increasing depletion level. Depletion led steers to a quadratically convex increase in eating steps/ min, eating distance and potential area harvested while grazing (P < 0.05). Depletion did not affect bite rate (33 bites/min SE = 6; P = 0.10); but led to shallower bites (P < 0.01). None of the herbage potentially consumed and ruminal degradation kinetics parameters were affected by treatment (P > 0.05). Under these experimental conditions, steers adapted grazing dynamics to sustain a constant nutrient intake. Behavioral adaptations would make nutrient intake rate less sensitive to certain herbage depletion levels.

Key Words: Grazing Behavior, Herbage and Nutrient Intake, Ruminal Degradation Kinetics

W106 Evaluation of ryegrass-based pastures grazed under the leaf stage concept in commercial dairy farms in the highlands of Costa Rica. J. M. Sánchez*^{1,2}, L. Villalobos^{1,3}, and A. Martínez^{1,2}, ¹Universidad de Costa Rica, San José, ²Centro de Investigación en Nutrición Animal, San José, Costa Rica, ³Escuela de Zootecnia, San José, Costa Rica.

Perennial ryegrass (*Lolium perenne*) grows year round in the highlands of Costa Rica (2700 to 3200 m in altitude) and does not require annual reseeds as it often does in temperate climates, due to the lack of frost in this tropical region. These characteristics as well as its high DM yield and good nutritional value makes this pasture a good alternative for dairy farmers in the area. Because of the irregular topography and the diversity of microclimates in the highlands of Costa Rica, dairy farmers have had to apply plant phenological concepts such as leaf stage, to determine when to graze this pasture. The aim of this study was to analyze the yield, utilization of the pasture on offer and botanical composition of ryegrass-based pastures, and nutritional value according to NRC (2001) proposed methodologies, in four farms located between 2700 and 3200 m in altitude in the Central Mountains of Costa Rica. Farms were selected at random and pastures were grazed at 32 to 45 d intervals. Measurements and samples were taken every two months during a year period. Results show cows in the four farms grazed ryegrass at a proper vegetative stage, since the average number of leaves found before defoliation was 2.85, and this grass is

considered a 3 leaf plant. Likewise, botanical composition analysis shows that 75.9% of the biomass was ryegrass, 13.9 other grasses, 6.1 clover, 1.3 weeds and 2.8 senescent material. Average DM yield was 18 t/ha/year, which is similar to those obtained in temperate climates under ideal conditions of environment and management. Pastures in the four evaluated farms were established more than 15 years ago. On average, pasture contained 25.2% CP, 49.8% NDF, 25.6% ADF, 15.4% NFC, 3.3% Lignin and 1.53 Mcal/ kg NEL (3X), all on DM basis. Agronomic and nutritional data shows the grazing system based on the leaf stage concept is a good tool for managing ryegrass-based pastures in areas where topographic and climate conditions are diverse.

Table 1.

Farm N°	N° of leaves at grazing	Regrowth period, d	DM yield, kg/ha/cut	% of grass on offer utilized	CP DM%	NL _L (3X) Mcal/kg DM
1 ¹	2.87 ^a	45	3787	45.2	24.7 ^b	1.55 ^{a,b}
2	2.88 ^a	35	4510	48.4	22.9 ^c	1.48 ^b
3	2.81 ^{a,b}	35	4187	43.2	26.5 ^a	1.47 ^b
4	2.78 ^b	32	3839	41.3	26.8 ^a	1.62 ^a

^{a,b,c}Means in a column with different superscripts are different ($P \leq 0.05$)

¹Average of 12 samples or measurements

Key Words: Ryegrass, Plant Phenology, Nutritional Value

W107 Supplementation of digestible fiber and glucomannan to tall fescue pastures: Dry matter intake and fecal alkaloid concentration. R. L. Mills^{*1,2}, C. J. Richards², and J. C. Waller¹, ¹The University of Tennessee, Knoxville, ²Oklahoma State University, Stillwater.

An 84 d randomized block design utilizing 96 weaned beef calves (238.8 ± 20.1 kg) in each of two consecutive years was used to assess the efficacy of digestible fiber and glucomannan (MTB-100[®], Alltech, Nicholasville, KY) supplementation. Groups of four test calves were randomly assigned to 24 endophyte-infected tall fescue (*Lolium arundinaceum* Schreb. S.J. Darbyshire) spring pastures (1.23 ± 0.06 ha) with additional grazer calves used in a put-and-take system. Pastures, blocked by previous productivity, were randomly assigned to one of five treatments: 1) no supplementation (CON); 2) supplemented with soybean hulls (SH) at 0.33% BW (DM basis; LO); 3) supplemented with SH at 0.66% BW (DM basis; HI); 4) LO plus 20 g/d MTB-100[®]; and 5) HI plus 20 g/d MTB-100[®]. Calves had free-choice access to water and a loose vitamin/mineral mix. Chromic oxide was dosed and fecal grab samples obtained (d 54 to d 59) to estimate fecal output and fecal alkaloid concentration determination. Total DMI was calculated using IVDMD and fecal output. Data were analyzed using the MIXED procedure in SAS with contrasts of main effects of SH level (LO vs. HI), MTB, SH level x MTB, and CON vs. supplemented (SUPP). No interaction between SH level and MTB was observed ($P > 0.10$). Supplementation increased forage DMI and total DMI ($P < 0.01$) by 3.0 and 4.3 kg/d above the control with HI SH tending to increase total DMI by 8.9% over the LO SH level ($P = 0.06$). Fecal ergot alkaloid concentration decreased ($P < 0.01$) 31.3% with supplementation and was not affected by MTB ($P > 0.05$). Increasing from LO to HI SH

tended to decrease fecal alkaloid concentration 11.2% ($P = 0.08$). These results indicate that digestible fiber supplementation can increase total intake and reduce fecal alkaloid concentration of calves grazing endophyte infected tall fescue pastures, but addition of glucomannan had no influence.

Key Words: Tall Fescue, Soybean Hulls, Glucomannan

W108 Evaluation of endomycorrhizal colonization in three species of crassulacean acid metabolism in northern part of Mexico. J. R. Martinez^{*1}, M. A. Peña², R. E. Vazquez¹, E. Gutierrez¹, E. Olivares¹, J. A. Vidales¹, and R. D. Valdez³, ¹Facultad de Agronomía, UANL, Monterrey, Mexico, ²INIFAP, General Teran, Mexico, ³CRUCeN, Universidad de Chapingo, Zacatecas, Mexico.

An experiment was conducted (from April to October of 2006) to evaluate the mycorrhizal colonization in the radical volume of agave (*Agave americana*), spineless prickly pear (*Opuntia* sp.), and native prickly pear (*Opuntia lindheimeri*). This project was carry out because these plants have been less studied than C3 species as enhancers of degraded areas, as well as their forage value in semidesert zones. Mycorrhizal colonization can help to survive this species when they are transplanted into eroded soil by improving water and nutrient transport. This work was analyzed using a 3 × 2 factorial arrangement of treatments including three species: agave, spineless prickly pear and native prickly pear, inoculated with 100 spores and not inoculated, using three pots by treatment. Fungus used for the inoculation was *Glomus intraradices*. Mycorrhizal colonization and count of spores were evaluated, and mycorrhizal colonization was transformed to Arcsen. Both variables were greater ($P < 0.05$) for native prickly pear and agave than spineless prickly pear. Mycorrhizal colonization was 73.8, 71.9 and 60.6% for agave, native prickly pear and spineless prickly pear, respectively. Spore count was greater ($P < 0.05$) for agave and native prickly pear than spineless prickly pear. Spore count were 10,000, 9,150 and 4,400 spores per 100 g of dry ground for agave, native prickly and spineless respectively. It was possible to colonize roots of agave and prickly pear by inoculating with spores of *Glomus intraradices*.

Key Words: Mycorrhiza, Prickly Pear, Agave

W109 Evaluation of EndoFighter™ in a tall fescue grazing system for beef cattle. A. E. Fisher^{*1}, S. S. Block², K. J. Daniels², M. A. Franklin², N. A. Pyatt², and J. C. Waller¹, ¹University of Tennessee, Knoxville, ²ADM Animal Nutrition Research, Decatur, IL.

The objective of this project was to evaluate EndoFighter™ mineral fed to stocker cattle grazing endophyte-infected tall fescue (*Festuca arundinacea*) pasture during summer grazing conditions. EndoFighter™ mineral was supplied by ADM Alliance Nutrition, Inc. and is recommended for use when beef cattle are grazing endophyte-infected tall fescue. The study was conducted near Dandridge, TN from April through September 2006, using 125 beef steers (avg initial wt = 274 kg) in a 126-d grazing period. Three groups were placed at Location 1 and two groups at Location 2, which were less than one mile apart. At both locations, steers were allotted to one of two treatments: Control (n=53, ADM Alliance Nutrition, Inc. MasterGain[®] mineral CTC/IGR) and Treatment (n=67, MasterGain[®] with EndoFighter™ CTC/IGR).

Mineral mixtures were formulated for consumption of 0.11 kg/h/d. Cattle grazed tall fescue-dominated pasture and were supplemented with corn gluten feed pellets at 1.36 kg/h/d. Forage samples were collected for Ergovaline analysis. Individual animal weights were recorded on d 1, 63 and 126 and behaviors were recorded twice per week at 1300 for the duration of the trial. Recorded behaviors were grazing (shade or no shade), lying (shade or no shade) and at water. The maximum temperature reached at least 29.4° C on 72 days of the trial. Five steers were removed from experiment due to morbidity. All data were analyzed using the MIXED procedure of SAS with individual as the experimental unit for growth, hair coat and body condition. Differences were determined at $P < 0.05$. Treatment cattle had a higher average daily gain than Control cattle (0.80 vs. 0.69 kg/h/d, respectively, $P < 0.01$). Cattle behavior was affected by treatment with more Treatment cattle observed grazing than control (761 vs. 200 occurrences, respectively, $P < 0.01$) and more Control cattle located in shade than Treatment (1394 vs. 1413 occurrences, respectively, $P < 0.01$). Offering a mineral product containing EndoFighter™ resulted in better gains and more grazing behavior by cattle grazing tall fescue pasture during the summer.

Key Words: Beef Cattle, Tall Fescue, EndoFighter™

W110 Changes in chemical composition and vertical distribution of kura clover-reed canarygrass swards relative to days of regrowth. K. L. Kammes*, D. K. Combs, and K. A. Albrecht, *University of Wisconsin, Madison.*

Knowledge of the plant-animal interface is essential to better understand intake, ingestive behavior, and diet selection of grazing dairy cows. Four 0.75 ha pastures with a mixture of 45% kura clover (*Trifolium ambiguum* Bieb.) and 55% reed canarygrass (*Phalaris arundinacea* L.) were used in a randomized complete block design to evaluate changes in chemical composition and vertical distribution of swards in relation to days of regrowth across periods, cuts, species, and layers. Samples were taken from four separate plots at nine time points throughout the trial which consisted of three periods (June 5-19, July 5-19, and July 24-August 7) with three regrowth ages in each period. Days of regrowth at the start of each period were 17, 26, and 31, respectively, followed by two subsequent samplings with 7 days between each sampling within a period. Pastures were mechanically harvested once before period 1 and twice before periods 2 and 3. Herbage samples were cut at ground level and bundled together to maintain the vertical structure of the sward. Each sample was divided into either reed canarygrass (RCG) or kura clover (KC) and then cut into 10-cm layers starting from the base of the plant. The layers were analyzed for neutral detergent fiber (NDF) and crude protein (CP). The NDF concentration ranged from 23 to 35% and 56 to 67% of DM for KC and RCG, respectively, with the highest concentration in the lower layers that contain mainly petioles and stems. Concentration of CP ranged from 17 to 31% and 11 to 24% of DM for KC and RCG, respectively, being highest in the upper strata that primarily consist of leaves and leaf blades. When the sward was analyzed as a whole; there was a single linear relationship between NDF (slope = 0.44) and CP (slope = -0.25) and days of regrowth, regardless of period or cut. By knowing the chemical composition of the vertical distribution and the depth of grazing, it is possible to predict the chemical composition of herbage selected by ruminants.

Key Words: Pasture, Intake, Dairy

W111 Growth performance and immune function of fall-born beef calves weaned from endophyte infected tall fescue pastures on different dates in the dpring. J. D. Caldwell*¹, K. P. Coffey¹, W. K. Coblenz¹, R. K. Ogden¹, M. L. Looper², D. L. Kreider¹, J. A. Jennings², D. S. Hubbell, III¹, T. W. Hess¹, and C. F. Rosenkrans, Jr.¹, ¹University of Arkansas, Fayetteville, ²USDA-ARS, Marshfield, WI.

Fall-born calves grazing *Neotyphodium coenophialum*-infected tall fescue [*Lolium arundinaceum* (Schreb.) Darbysh.] (E+) should benefit from early weaning because of reduced exposure to E+ toxins, but our previous research has not supported this hypothesis. Gelbvieh × Angus calves (n=238) were used in a 3-yr study to determine the optimal time to wean fall-born calves grazing E+ pastures. Cow-calf pairs were allocated randomly by weight and age to one of four weaning dates: 1) March 13 (177 d of age; MrW), 2) April 13 (204 d of age; ApW), 3) May 11 (236 d of age; MyW), and 4) June 8 (264 d of age; JuW). At weaning, calves were weighed, vaccinated, blood collected, and calves were moved to a 3.2-ha pasture adjacent to their dams. After 14 d, blood samples were collected a second time, and calves were weighed and moved directly to wheat (MrW and ApW) or bermudagrass (MyW and JuW) pastures. Calf BW did not differ ($P > 0.21$) among treatments on the earlier weaning dates, but BW on the June weaning date, actual and 205-d adjusted weaning BW, ending BW (14 d following the June weaning date), and BW change between the March and June weaning dates increased linearly ($P < 0.05$) across treatments. Response to bovine virus diarrhea and infectious bovine rhinotracheitis vaccination measured 14-d post-weaning increased ($P < 0.05$) linearly, and that of bovine respiratory syncytial virus increased ($P < 0.05$) linearly and quadratically across treatments. Total antioxidant potential at weaning and change during weaning increased ($P < 0.05$) linearly across treatments. Predominantly linear trends were observed ($P < 0.05$) across treatments for various serum minerals and red and white blood cell counts. Delaying the weaning of fall-born calves grazing E+ pastures until early June may be beneficial for calf growth and immune function.

Key Words: Calves, Fescue, Weaning Date

W112 Intensive short duration grazing of fescue pastures to extend the grazing season of winter wheat. W. A. Phillips*, B. K. Northup, and B. C. Venuto, *USDA-ARS Grazinglands Research Laboratory, El Reno, OK.*

Over 10 million ha of winter wheat (*Triticum aestivum* L.) are planted in the southern Great Plains (SGP) each year, and serves as the major forage resource for millions of stocker calves before they enter the feedlot for finishing. If more BW gain is produced during the stocker phase, then the amount of feed grains used during the finishing phase will be less. This experiment examined the feasibility of using a perennial cool-season grass to extend the period of grazing for winter wheat and produce more kg of BW/calf. Three, 1.7-ha 2-yr old tall fescue (*Festuca arundinacea* Var. Jessup "Max-Q™") pastures were used for short periods of intensive grazing in the spring (S) and fall (F). The pastures were fertilized each year with 56 kg of N/ha (F and S) and 22 kg of P/ha (F only). Calves (n= 215; 280 ± 32 kg BW) used were predominately British breeds, less than 12 months of age. A different set of calves were used in each grazing period (3 S and 3 F periods). Standing crop available for grazing at the start of the grazing period was used to determine the stocking rate. Data were analyzed using a mixed model to determine the impact of grazing period on

stocker performance with pasture serving as the experimental unit and year (n=3) was random. Pastures produced more ($P < 0.01$) forage in the S than in the F (4490 vs. 2230 kg DM/ha) and the stocking rate was greater ($P < 0.01$) in the S than in the F (2290 vs. 1450 kg BW/ha). Length of the grazing period and the number of grazing d/ha were not different ($P > 0.10$) between S (35 d and 259 d/ha) and F (39 d and 245 d/ha), but ADG was greater ($P < 0.01$) during the S as compared to the F (1.02 vs. 0.57 kg). As a result, BW gain/ha were greater ($P < 0.01$) during the S than in the F (264 vs. 140 kg/ha). Under intensive short-duration grazing management, fescue pastures can be used to extend the traditional SGP winter wheat grazing season and would result in greater BW gain/calf. Shifting land resources from wheat to fescue production did not decrease gross returns to the enterprise but did change the month of the year calves would be purchased and sold.

Key Words: Stocker Cattle, Wheat Pasture, Fescue

W113 Growth and reproductive performance of heifers grazing Jesup tall fescue varying in endophyte status. M. E. Drewnoski*, E. J. Oliphant, J. T. Green, jr, M. E. Hockett, and M. H. Poore, *North Carolina State University, Raleigh.*

The objective of this study was to investigate the effects of endophyte free (E-), endophyte-infected (E+) and novel endophyte-infected (EN) Jesup tall fescue on the ADG and reproductive performance of heifers. The trial was conducted over three consecutive years. In early December of each year, 48 Angus cross heifers (initial body wt 266 kg) were randomly assigned to treatment (trt) and strip-grazed on stockpiled E+, E- or EN fescue. In late February, heifers were removed from pastures and fed trt hay. In late March, heifers were synchronized using a controlled intravaginal drug-releasing device, (CIDR®) for 7d followed by injection with PGF2 α . Heatmount detectors (Kmar®) and observation for behavioral estrus were used to detect estrus for three estrous cycles. Heifers were artificially inseminated 8 to 12 hrs after the onset of standing estrus. In mid-April heifers moved back on to trt pasture and rotationally grazed until late June. At the end of the trial, heifers had been maintained on E+, E- or EN (pasture or hay) for a total of 152, 188 and 191 days in years 1, 2, and 3, respectively. Conception was determined by transrectal ultrasonography at approximately 30, 60 and 90 days after synchronization. When grazing stockpiled fescue, pasture ADG of heifers did not differ among the trt ($P = 0.13$). Winter gains were 0.50, 0.57 and 0.51 kg/d (SE \pm 0.04) for E+, E- and EN, respectively. However, during the late spring, heifers on EN and E- had higher pasture ADG than the heifers on E+ ($P < 0.01$). Spring gains were 0.24, 0.75, and 0.71 kg/d (SE \pm 0.03) for E+, E- and EN, respectively. Response to synchronization and conception to synchronization did not differ among trt ($P = 0.21$; $P = 0.34$). The number of services to conception did not differ among trt ($P = 0.39$) and was 2.24, 2.34 and 1.99 for E+, E- and EN, respectively. Pregnancy rate did not differ among trt ($P = 0.63$) and was 54, 65, and 65 % for E+, E- and EN, respectively.

Key Words: Reproduction, Endophyte, Heifer

W114 Comparison of bloat potential between hard red and soft red winter wheat. M. S. Akins*, E. B. Kegley¹, K. P. Coffey¹, K. S. Lusby¹, W. K. Coblenz², R. K. Bacon¹, J. C. Moore¹, J. D.

Caldwell¹, and J. V. Skinner Jr.¹, ¹*University of Arkansas, Fayetteville,* ²*USDA-ARS, Marshfield, WI.*

Some aspects of wheat pasture bloat have been researched extensively, but little research has evaluated the effect of wheat type on bloat. Forty-eight Angus heifers (238 \pm 12 kg BW) and 8 Gelbvieh by Angus ruminally cannulated heifers (515 \pm 49 kg BW) grazed 1-ha pastures of either hard red (HR) or soft red (SR) winter wheat (*Triticum aestivum* L.) to evaluate the effect of wheat type on bloat potential. Cattle grazed from November 11 to 22 and from November 26 to December 7, 2006 in a crossover design. Bloat was scored at 1000 and 1600 daily. Rumen samples were taken the last 2 d of each period at 0600, 1200, and 1800, and then evaluated for pH, foam production/strength, and consistency. Forage availability was not different ($P > 0.05$) between HR and SR. Respective initial and final forage availabilities were 1385 and 1071 kg/ha for HR, and 1504 and 901 kg/ha for SR. Overall, the stocker calves bloated 2.1% of the observations with no difference between HR and SR ($P = 0.52$). Rumen fluid pH did not differ between HR and SR ($P = 0.89$) at any point in the day (overall mean = 5.95). Consistency of the rumen fluid differed ($P < 0.0001$) across wheat types. Fluid from heifers on SR flowed 7.4 cm and HR flowed 9.5 cm in a consistometer. There was also a type by time interaction ($P = 0.03$) with SR at 1200 and 1800 being more viscous than SR at 0600 and HR at all times. Foam production as determined by bubbling CO₂ gas through rumen fluid was greater ($P = 0.01$) for SR (9.1 cm) compared to HR (5.7 cm). Foam strength measured as a percentage of initial foam height was greater ($P = 0.01$) for SR (45%) than for HR (28.5%). Differences ($P = 0.001$) between sampling times occurred, with foam strength at 0600 (18%) being less than at 1200 (43%) and 1800 (48%). Therefore, SR had a higher bloat potential than HR based on rumen fluid measurements, but no differences were observed in the frequency of bloat in stocker cattle.

Key Words: Wheat Pasture Bloat, Hard Red, Soft Red

W115 The effect of initial spring grazing date and stocking rate on sward profile during the main grazing season. E. Kennedy*^{1,2}, M. O'Donovan¹, F. O'Mara², and L. Delaby³, ¹*Teagasc, Dairy Production Research Centre, Moorepark, Fermoy, Co. Cork, Ireland,* ²*School of Agriculture, Food Science and Veterinary Medicine, UCD, Belfield, Dublin, Ireland,* ³*INRA, UMR Production du Lait St. Gilles, France.*

The objective of this study was to establish the effect of initial spring grazing date and stocking rate on sward profile of *Lolium perenne* during the main grazing season. Sixty-four spring calving dairy cows were randomly assigned to 4 grazing treatments. The treatments were comprised of 2 swards, early (E) and late (L) grazed. Two stocking rates (SR), high (H) and medium (M), were applied across each sward. The early grazed sward was created by grazing half the area once between 16 February and 4 April. The remaining area was ungrazed from the previous October (late grazed sward). The SR imposed were 5.5 cows/ha (EH), 4.5 cows/ha (EM), 6.4 cows/ha (LH) and 5.5 cows/ha (LM). The study was completed over 4 \times 21-day rotations from 16 April to 3 July 2004. Measurements reported were taken during the 2 (R2) and 4 (R4) grazing rotations. Pre-grazing herbage mass $>$ and $<$ 4cm was measured. Pre and post-grazing extended tiller heights (ETH) and extended sheath heights (ESH) were measured on 100 tillers in each treatment paddock. The morphological composition of herbage for each treatment was ascertained weekly by cutting a sample from ground level with a scissors. Tiller density was also calculated.

Data were analyzed using analysis of variance. Pre-grazing sward height, ETH, ESH, DM yield > and < 4cm were significantly higher for the LH and LM swards during R2. However, the leaf:stem ratio was higher for the early grazed swards. Post-grazing measurements were higher ($P < 0.001$) for the late grazed sward during R2. The leaf % was higher on the early grazed swards ($P < 0.05$) however leaf yield ($P < 0.05$) was higher on the late grazed swards. Dead % and yield were lower on the early grazed sward during R2. There were no differences in morphological composition or pre and post grazing measurements during R4. These results suggest that swards should be grazed early in spring and stocked at a medium SR from April to July.

Key Words: Grazing Date, Stocking Rate, Sward Profile

W116 Comparing finishing beef cattle performance and forage characteristic of ryegrass (*Lolium perenne*), rye (*Secale cereale*) and oats (*Avena sativa*). A. C. Pereira*, E. J. Bungenstab, J. C. Lin, B. Gamble, S. P. Schmidt, C. Kerth, and R. B. Muntifering, *Auburn University, Auburn, AL*.

Ryegrass (*Lolium perenne*), rye (*Secale cereale*) and oats (*Avena sativa*) were compared as pasture sources for forage-finished beef. Replicate 1.42-ha paddocks (2 per forage) were established and stocked with three Angus \times Continental crossbred steers (374 kg \pm 5.54 initial BW) per paddock for an 84-day finishing phase. All steers had access to salt and minerals free choice. Grazing was initiated on Jan. 19, 2006, when average forage mass reached at least 1000 kg/ha. Forage mass and nutrient composition were determined by clipping 0.25-m² quadrats (n=8 per paddock) prior to the beginning of grazing and continued every two weeks during the trial. Stocking rates were adjusted following quadrat clipping by using put-and-take steers to maintain forages in the vegetative stage. Comparisons of animal performance ended when steers reached 530 kg. Statistical analyses were performed using the PROC GLM procedure in SAS. Daily gain per animal (1.81 kg/d) did not differ ($P > 0.10$) among treatments. rye compared with oats and ryegrass had more CP (18.9%, 17.5% and 17.6% respectively; $P < 0.05$), but ryegrass had less ADF (19.3%, 25.4% and 23.3%; $P < 0.05$) and NDF (37.7%, 46.7% and 44.5%; $P < 0.05$) compared with rye and oats. Total gain per ha was less for ryegrass compared with rye and oats (322 kg/ha, 394 kg/ha and 399 kg/ha; $P < 0.05$). Pasture with oats and rye increase beef production per hectare compared to ryegrass by increasing stocking rate without decreasing daily gain or diet quality.

Key Words: Small Grain, Finishing, Pasture

W117 Performance of stocker cattle grazing two sorghum \times sudangrass hybrids under various stocking rates. K. C. McCuiston*¹, F. T. McCollum², L. W. Greene³, B. W. Bean^{2,3}, and R. VanMeter³, ¹Texas A&M University, Kingsville, ²Texas Cooperative Extension, Amarillo, ³Texas Agricultural Experiment Station, Amarillo.

Summer annual forages are a practical roughage source for stocker cattle operations on the Texas High Plains because of their high yielding potential and energy content. The objective of this study was to describe the relationship between weight gain, stocking rate (SR),

and forage quantity and quality for two types of sorghum \times sudangrass (SS) hybrids (*Sorghum bicolor* (L.) Moench) using regression analysis. Steer calves (231 \pm 4 kg) were grazed for 84 d during the summers of 2004 and 2005. Twelve experimental pastures (6 per SS type) were planted to a brown midrib (BMR) or photoperiod sensitive (PS) SS. Each pasture was assigned a different SR ranging from 2.33 to 4.10 AU \times ha⁻¹ \times 84 d⁻¹. Initial, final and 28 d incremental weights were taken and used to calculate ADG and gain/ha. Forage was sampled on weigh days to determine forage availability, in vitro true digestibility (IVTD), and crude protein (CP) levels over the grazing season. Forage availability was reduced as SR increased after 56 and 84 d of grazing ($P < 0.01$). Stocking rate did not affect IVTD ($P = 0.20$) or CP ($P = 0.43$). Average daily gains were not affected by SR during the first 28 and 56 d of grazing ($P > 0.31$); this implies that gains are less sensitive to SR because forage quantity and quality are uniformly higher earlier in the grazing season. Gain/ha increased linearly in response to SR during the first 28 ($R^2 = 0.60$) and 56 d ($R^2 = 0.80$) of grazing. After 84 d of grazing and a more complete utilization of forage resources, the response of ADG and gain/ha was curvilinear in nature. At light to moderate SR, ADG and gain/ha were higher for the BMR; whereas the PS maintained ADG and gain/ha at higher SR. Our results indicate that cattle grazing these forages were capable of gaining over 1 kg \times head⁻¹ \times d⁻¹ and up to 420 kg/ha over an 84 d grazing season but response was dependent on SR.

Key Words: Brown Midrib, Sorghum \times Sudangrass, Stocking Rate

W118 Nutritive value of marafalfa grass under tropical dry forest conditions. T. Clavero* and R. Razz, *Facultad de Agronomia, Universidad del Zulia, Maracaibo, Zulia, Venezuela*.

Marafalfa grass (*Pennisetum purpureum* \times *Pennisetum glaucum*) is a high quality tropical grass which has potential as forage for ruminants but questions remain about quality response to defoliation management. A plot study undertaken on the tropical north coast of Venezuela, assessed the effect of defoliation interval on herbage quality of marafalfa grass. The study included three defoliation frequencies (3, 6 and 9 weeks). Treatments were replicated three times in a randomized block design. Measurements included total nitrogen (TN), in vitro dry matter digestibility (IVDMD), acid detergent fibre (ADF), neutral detergent fibre (NDF), lignin (L) and total non-structural carbohydrates (TNC). Data were subjected to analysis of variance, using general linear models procedures of SAS statistical package. Treatments means were contrasted using Tukey test. Nutritive quality of marafalfa grass declined from three to nine weeks of growth. At each interval TN content declined significantly ($P \leq 0.05$). ADF and L only increased significantly ($P \leq 0.05$) between six and nine weeks. The highest value of IVDMD (62.45%) was obtained on three weeks of growth and declined on 10.35 digestible units from 3 to 9 weeks. TNC concentrations increased linearly as defoliation interval increased. Values for TNC concentrations ranged from 13.5 to 20.1 %, for 3 and 9 weeks, respectively. This study showed that the quality of marafalfa grass becomes less favorable with advanced maturity, this could be due to the rapidly increase and accumulation of dead leaf tissue and the lignification of the cell walls. It is suggested that marafalfa grass be harvested at about six weeks of growth to optimize nutritive value.

Key Words: Marafalfa Grass, Nutritive Value, Defoliation

W119 Comparing wether kids on summer cultivated pasture and mesquite rangeland with and without maize grain supplement. S. Pagan-Riestra*^{1,2}, J. P. Muir¹, K. A. Littlefield^{1,4}, and S. M. Weiss³, ¹Texas Agricultural Experiment Station, Stephenville, ²Texas A&M University, College Station, ³University of the U.S. Virgin Islands Experiment Station, Kingshill, St. Croix, ⁴Tarleton State University, Stephenville, TX.

Cultivated pastures and supplements are needed to complement rangeland-based goat production in warmer regions of North America during the hot and dry months of June through September. To address this need, growing Spanish X Boer wether kids (average 25 kg) grazing cultivated pasture (primarily annual legumes and *Amaranthus retroflexus*) were compared to kids on honey mesquite native rangeland (NR; *Prosopis glandulosa* var. *glandulosa*) with an understory dominated by little bluestem (*Schizachyrium scoparium*) during the summers of 2002 and 2003 in north-central Texas. Wethers within both pasture and rangeland were supplemented with maize meal at 0, 0.5, or 1.0% BW. Herbage biomass in the cultivated pasture peaked in July whereas biomass in the NR tended to peak in August. Kids supplemented with 0.5% BW maize on the rangeland had 61% greater average daily gains (ADG) than unsupplemented animals whereas those on cultivated pasture had to be supplemented at 1.0% BW maize before showing an increase in ADG (31%) compared to unsupplemented animals. Unsupplemented wether kids on rangeland gained only 30.5% the ADG of kids fed a balanced feedlot diet (159 g ADG) while kids on cultivated pasture gained 53.3% of those fed a balanced feedlot diet, indicating that neither forage-based system was able to provide the nutrition needed to achieve maximum gain potential. Improved pasture and maize meal supplement both have potential for increasing wether kid ADG compared to rangeland during dry hot summer months.

Key Words: Wether Kids, Improved Pastures, Corn Supplement

W120 Cactus pear cladodes as a source of forage for growing-finishing lambs in Central Mexico. G. Aranda-Osorio*, C. A. Flores-Valdez, and M. Cruz-Miranda, *Universidad Autonoma Chapingo, Chapingo, Mexico.*

The objective of this study was to evaluate the effect of cactus pear (nopal) cladodes in diets for growing-finishing lambs on dry matter intake (DMI), total and average daily gain (TLWG and ADG), feed conversion (FC) and profitability (P). Fifty four male lambs (Corriedale × Criollo) with an average initial liveweight of 20.2 kg (\pm 3.2 kg) were used. Triads of lambs were formed with similar liveweight and housed in a pen (experimental unit), which were randomly allotted to the following treatments: 1) T0% inclusion of Nopal (Control); 2) T15% Nopal, cactus pear at 15 % (DM basis) of the ration, and 3) T30% nopal, cactus pear at 30 % (DM basis) of the ration. The diets were formulated in order to fulfill the nutritional requirements for a growing-finishing lambs according to NRC (1985). The experiment was a completely randomized design with three treatments and six replicates. The cladodes were chopped (approximately 2.5 cm² and mixed by hand with the diet in the feedbunk at each feeding. Lambs were fed twice a day, at 08:00 h and 16:00 h. The experiment lasted 71 days (adaptation: 14 days, experimental period: 56 days). The inclusion of 15 or 30 % cactus pear in dry matter basis represented

55 and 75 % as fed basis for T15% and T30%, respectively. Results showed that initial liveweight was similar ($P>0.01$) among treatments, as well as the ADG between T0% (34.54 kg) and T15% (33.95 kg), but T30% (30.71 kg) was lower ($P<0.01$). DMI was consistently similar ($P>0.01$) between T0% (0.928 kg) and T15% (0.993 kg) and higher ($P<0.01$) than T30% (0.615 kg). Average feed conversion was similar ($P>0.01$) between T0% (5.14) and T15% (5.09) but higher ($P<0.01$) than T30% (3.44). Lambs fed with high ratio of cactus pear (T30%) were more efficient in converting feed to live weight. The inclusion of cactus pear reduced feed cost by approximately 48 and 65 % for T15% and T30%, in relation to T0%. Thus, live weight gain cost was reduced by about 29.1 and 64.3 % in T15% and T30% in relation to T0%. The inclusion of cactus pear between 15 and 30% may represent an important alternative to feed growing-finishing lambs without affecting animal performance and, on the other hand, may reduce production costs.

Key Words: Cactus Pear, Forage, Lamb Performance

W121 Supplementation effects of Calliandra (*Calliandra calothyrsus*) on weight gains and efficacy of control of gastrointestinal nematodes in weanling goats. A. Acero*, E. Valencia, and A. A. Rodríguez, *University of Puerto Rico, Mayaguez Campus, Mayaguez, Puerto Rico.*

Information on shrub and tree legumes for supplemental feeding and their effects on weanling goat weight gains or efficacy of control of gastrointestinal nematodes (GIN; *Haemonchus contortus*) are limited. Calliandra (*Calliandra calothyrsus*) is a tree legume with high protein concentration (CP; 22%) and condensed tannin (CT; 19 to 30%). Its high CP makes it an alternative for supplementing low quality grass diets of small ruminants and its high CT may reduce GIN infestation. An experiment was conducted to determine the effects of Calliandra on average daily gain (ADG) and efficacy against GIN on weanling Boer goats. Eight weanling goats (12.4 kg) were randomly assigned to two treatments; a base diet of guineagrass hay (GH; Panicum maximum Jacq.) and leaves and twigs of freshly cut Calliandra (FC) supplemented at 20% of expected dry matter (DM) intake based on 3% LW. After morning supplementation, goats grazed native pastures ad libitum. Goats were weighed bi-weekly, and throughout the trial, feces and blood (every 21 d) were taken from individual animals to determine fecal egg counts (FEC) and blood pack cell volume (PCV). Crude protein for grazed pastures, GH and FC were 5.4, 5.0, and 14%, respectively. Neutral detergent fiber averaged 77, 72, and 65% for grazed pastures, GH and FC, respectively. FAMACHA[®] score were also taken on individual animals every 14 d. Data were analyzed using repeated measures analysis. Supplementation with FC did not have any effect on ADG, FAMACHA scores (3.4) and PCV (26%). Fecal egg counts (FEC), however, were significantly lower ($p<0.05$) in goats supplemented with FC than for GH. Adjusted means were 638.2 eggs/g and 982.1 eggs/g for FC and GH, respectively. This reduction in FEC with FC can reduce the frequent use of antihelmintic. Further studies will compare antihelmintic treatment with varying inclusion rates of FC on weanling goats.

Key Words: Calliandra, Gastrointestinal Nematodes, Boer Goats