

Forages and Pastures: Silages and forages in beef and sheep production systems

T176 Tiller population stability index from the spring in palisadegrass previously used in deferred grazing. Simone Pedro da Silva*¹, Manoel Eduardo Rozalino Santos², Bruno Humberto Rezende Carvalho², Ludiêmilem Keith Parreira da Costa², Denis Douglas Pessoa², Heron Alves de Oliveira², Róger Carvalho Cardoso², Miriã Gonçalves Simplício², and Dilermando Miranda da Fonseca³, ¹Instituto Federal Goiano, Hidrolândia, Goiás, Brazil, ²Universidade Federal de Uberlândia, Uberlândia, Minas Gerais, Brazil, ³Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil.

We evaluated the effect of pasture condition previously deferred and on late winter on regrowth of *Brachiaria brizantha* 'Marandu' (palisadegrass). From October 2013 to January 2014, the palisadegrass pastures were evaluated at the Federal University of Uberlândia, located in the State of Minas Gerais, Brazil. The experimental site was located at 776 m altitude, 18°30' S and 47°50' W. Annual precipitation was around 1.584 mm. Medium temperature was 22.3°C. The tiller dynamics was evaluated in deferred pastures with 4 conditions to late winter. The pastures conditions were low (15.1 cm), medium (23.2 cm), high (31.4 cm) and high/cutting (31.3 cm and cutting to 8.0 cm). The experiment was carried out using a randomized completely design with 3 repetitions and subdivided plots. In each experimental unit (paddocks), all tillers inside the 3 frames with 0.0625 m² were counted and marked with colored plastic. Every 30 d, all tillers were recounted and new tillers were marked with a different wire color. The collected data were used to calculate the tiller population stability index (SI). During spring and early summer, all pastures were kept with 30 cm in continuous stocking, with sheep. There were interactions ($P < 0.05$) of months with pasture conditions for SI. In October, the low (2.3) and high/cutting (2.2) pastures showed ($P < 0.05$) higher SI, followed by medium (1.7) and high (1.4) pasture, respectively. For other months, there was no effect of pasture conditions on SI. The SI was higher in low and high/cutting pastures, due to high tillering these pastures. The SI was less than or equal to one unit only in November (0.9) and December (1.0). The high development of shoots in tillers in October may have generated higher shading at plant base in November and December, causing decrease in SI. The lower and deferred palisadegrass pastures in late winter have a higher SI from early spring, compared with higher pastures. We conclude that cutting of high palisadegrass pasture in late winter improves the tiller population stability index from the spring.

Key Words: grazing, seasons of the year, sward height

T177 Performance of crossbred cows on Tanzania grass pastures subjected to two pasture-management strategies. Alberto Magno Fernandes*¹, Ricardo Augusto Mendonça Vieira¹, Tadeu Silva de Oliveira¹, and Fermino Deresz², ¹Universidade Estadual do Norte Fluminense, Campos dos Goytacazes, Rio de Janeiro, Brazil, ²EMBRAPA-Gado de Leite, Juiz de Fora, Minas Gerais, Brazil.

The objective of this study was to evaluate nutrient intake and yield and components of milk from Holstein × Zebu cows on Tanzania grass using a fixed resting period (FR) or according to 95% light interception (LI, by accuparLP-80) for managing Tanzania-grass pastures. As the LI of the herbage mass reached 95%, the animals were allowed to graze each paddock for 3 d; and (2) 30 d defoliation interval with a 3-d grazing period (FR). Experimental unit consisted of 11 paddocks grazed by 5

Holstein-Gir cows allowing for 2 replicates per defoliation treatment in the first year with the same areas assigned to the same treatment the following year grazed by 4 Holstein-Gir cows per experimental unit. Intake and digestibility were estimated using the external marker chromic oxide (Cr₂O₃). Each grazing animal received 5 g of Cr₂O₃ administered orally in paper cartridges twice daily at 12-h intervals for 12 d. The cows were milked twice daily, at 06.00 and 15.00 h. Milk samples were analyzed every 14 d to determine protein, fat, lactose, energy, and total solids (TS) contents. The management strategies imposed on the Tanzania-grass pasture did not affect ($P > 0.05$) the intake or digestibility of nutrients. Milk yield and milk components were not affected ($P > 0.05$) by the management strategies, but treatment LI95 yielded 2,067 ± 288 kg milk/ha while FR was less at 1,861 ± 288 kg milk/ha ($P < 0.05$). In conclusion, adopting forage management utilizing a 95% light interception defoliation interval improves milk production per land unit and efficiency of land resources.

Key Words: grass, intake, milk

T178 Performance of cows and calves grazing limpograss pastures as affected by creep-feeding protein supplements. J. M. D. Sanchez*¹, J. M. B. Vendramini¹, P. A. Lancaster¹, J. K. Yarbrough¹, F. A. Kuwahara², and V. C. Gomes³, ¹Range Cattle Research and Education Center, University of Florida, Ona, FL, ²Faculdade de Medicina Veterinária e Zootecnia, Universidade Estadual Paulista, Botucatu, Sao Paulo, Brazil, ³Instituto de Zootecnia, Nova Odessa, Sao Paulo, Brazil.

Creep-feeding soybean meal (SBM) to suckling calves grazing limpograss (*Hemarthria altissima*) pastures has been an effective management practice to improve calf average daily gain (ADG); however, it is not clear if the positive effect is result of a greater CP and energy intake or specifically the additional rumen degradable protein (RDP) supplied by the SBM. The objective of this study was to investigate the effects of creep-feeding different amounts of RDP to cow-calf pairs grazing limpograss pastures. The experiment was conducted at the Range Cattle Research and Education Center, Ona, FL from May to August 2014. Treatments were 400 g/d of SBM (65% RDP) or SoyPlus (40% RDP) distributed in a randomized complete block design with 4 replicates. Brangus crossbred cow-calf pairs (n = 16; calf initial BW = 160 ± 5 kg) were randomly assigned to 8 limpograss pastures (1.0 ha/pasture; 2 pairs/pasture). Average daily gain of cows and calves was recorded every 28 d. Body condition scores (BCS) of cows was measured at the beginning and ending of the experiment. Herbage mass (HM) and CP concentration were measured every 14 d. Data were analyzed using the Proc Mixed of SAS with treatment and month as fixed effects and block as random effect. There were no differences in HM ($P = 0.48$, 6800 ± 1200 kg DM/ha) and CP ($P = 0.20$, 12.2 ± 3.2% CP) between treatments. The CP concentration decreased ($P < 0.01$) from May to July and was similar in July and August (from 15 to 10% CP). There was no difference in ADG of cows ($P = 0.71$, 0.12 ± 0.14 kg/d) and calves ($P = 0.24$, 0.74 ± 0.03 kg/d) between treatments. Calf ADG decreased from May to August ($P < 0.01$, from 1.03 to 0.30 kg/d). There were no differences in the final cow BCS ($P = 0.90$, 5.34 ± 0.30) and change in BCS ($P = 0.73$, 0.51 ± 0.31) during the experimental period. In conclusion, the increase in performance of calves creep-fed with SBM observed in

previous studies may be due to increase in CP and energy intake rather than the additional RDP provided by the SBM.

Key Words: soybean meal, SoyPlus, limpgrass

T179 Decreased reproductive rates in sheep fed a high

selenium diet. Thomas Z. Davis*¹, Bryan L. Stegelmeier¹, Kip E. Panter¹, and Jeffery O. Hall², ¹United States Department of Agriculture-Agricultural Research Service, Poisonous Plant Research Laboratory, Logan, UT, ²Utah State University Veterinary Diagnostic Laboratory, Logan, UT.

High Se-containing forages grow on seleniferous soils in many parts of the United States and throughout the world. Selenium is an essential trace element that is required for many physiological processes but can also be either acutely or chronically toxic to livestock. Anecdotal reports of decreased reproductive rates in livestock grazing seleniferous forages have been reported and it has been speculated that reproductive failure is one of the initial changes of Se poisoning. The objective of this study was to determine the effect of high Se forages on reproductive rates in sheep. The study was conducted in 2 phases. Phase 1, the ewes (n = 3–5) were fed a Se-containing alfalfa pellet (made by adding western aster containing approximately 2000 ppm Se) that contained <0.3 (control), 10, 20, 30, 45, or 60 ppm Se for 12 weeks. Feeding of the pellets began 6 weeks before exposing the ewes to rams. Each ewe was exposed to 2 rams twice each day for 2 complete reproductive cycles. At 35 to 45 d post-exposure the pregnancy status of the ewes was determined by ultrasound imaging. Each group fed Se-containing pellets had fewer pregnant ewes than the control group (pregnant ewes/ewes exposed): control (3/3), 10 ppm Se (3/5), 30 ppm Se (0/5), 45 ppm Se (1/5), 60 ppm Se (1/5). Throughout the study hair samples, blood samples, liver biopsies, and muscle biopsies were collected to monitor the Se status of the ewes. In phase 2, ewes were divided into 3 groups (n = 10) and were fed Se-containing pellets containing <0.3 (control), 10, and 30 ppm Se in the same manner and for the same period. However liver and muscle biopsies were not performed. After the first cycle, significantly ($P < 0.05$) more ewes were pregnant in the control group (10/10) than in the 10 ppm Se (6/10) and 30 ppm Se (6/10) groups. After a second cycle 9/10 and 6/10 were pregnant in the 10 and 30 ppm Se groups, respectively. None of the ewes in either phase of the study demonstrated any clinical signs of chronic Se poisoning during the study. In summary, high selenium forages containing 10 ppm Se or greater decreased reproduction rates in ewes when fed for 6 weeks before exposure to rams.

Key Words: selenium, sheep, reproduction

T180 Total nitrogen in Marandu-grass pastures under different grazing intensities in southeast Brazil.

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Pasture productivity relies heavily on exchange of several different compounds between roots and shoots. The study aimed to evaluate nitrogen content on Marandu-grass pasture managed under 3 grazing management heights. The heights of 15, 25 and 35 cm were managed by beef steers grazing under continuous stocking and occurred from January to November, 2011. Data were analyzed by repeated measurements with grazing intensity, period and interactions. Roots and shoots samples were collected monthly. The collected samples were washed, dried and

ground for further analysis. Total nitrogen concentration in the shoots was higher during the summer (14.77 g kg⁻¹ DM) and lower during the drier seasons (7.47 g kg⁻¹ DM) ($P < 0.05$). This decrease in concentration was more marked for the 35 cm pasture height ($P < 0.05$). Total nitrogen concentration in the roots followed the opposite pattern, increasing in drier seasons (7.29 g kg⁻¹ DM), and had no consistent correlation with pasture height. Root nitrogen content was also negatively correlated with precipitation and temperature, while shoot nitrogen was positively correlated ($P < 0.05$). During the summer, fertilizer application along with temperature, precipitation and insolation favor plant growth. With a higher quantity of new leaves in this season there was an increase in shoot nitrogen content. During the winter, limited growth favors nitrogen storage in roots. Our results indicate that roots provide a storage site for nitrogen during drier, less favorable seasons. These reserves were directed to shoot regrowth during the summer. We found a negative linear association between pasture heights and shoot nitrogen content in autumn and winter ($P < 0.05$). In more intensely managed pastures, greater tissue renewal occurs as tillers develop in an environment with reduced competition for light. Indeed, intensely managed palisadegrass pastures have higher rates of tiller appearance and death, and higher defoliation frequency of individual tillers. In addition, taller pastures carry a higher proportion of stem and dead material in relation to shorter pastures, contributing to lower nitrogen concentrations. Root nitrogen did not show a consistent response pattern in relation to pasture height.

Key Words: pasture management, roots, shoots

T181 Effects of conservation method on condensed tannin content, ruminal and intestinal digestion characteristics of purple prairie clover.

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Purple prairie clover (PPC, *Dalea purpurea* Vent.) is a forage that contains high levels of phenolics including condensed tannins (CT) and exhibits anti-*Escherichia coli* O157: H7 activity. The objectives of this study were to evaluate the effects of forage conservation method on the CT content, ruminal and intestinal digestion characteristics of PPC. Whole PPC was harvested at the full flower stage and either immediately freeze-dried to represent green chop (FG), ensiled in mini-silos for 45 d (Silage), or sun cured in the field to DM >85%, baled and stored under shed for 45 d (Hay). In situ DM, NDF and CP degradabilities were determined by incubating the conserved forage in 3 rumen cannulated heifers for 0, 1, 2, 4, 8, 12, 24, 48 and 72 h, and analyzing data for Degradability = $a + b(1 - e^{-c(t-L)})$ and effective degradability (ED) = $a + [bc/(c+k)]e^{-(c+k)L}$. Intestinal DM and CP digestion were estimated by incubating 12-h ruminal in situ residues in a modified 3-step in vitro procedure. Silage exhibited decreased ($P < 0.001$) extractable CT, but increased ($P < 0.001$) protein and fiber-bound CT, whereas Hay only increased ($P < 0.01$) protein-bound CT. The ED of FG was greater ($P < 0.01$) than Silage or Hay, with ED of Hay being lower ($P < 0.01$) than Silage. However, the ED of NDF and CP as influenced by conservation method ranked as Silage > FG > Hay ($P < 0.01$). Conservation method did not affect intestinal DM digestion of 12-h in situ residues, but the CP intestinal digestion of Silage was higher ($P < 0.01$) than FG and Hay. Ensiling increased proportions of protein- and fiber-bound CT, but also increased ED of both CP and NDF as well as in vitro intestinal digestibility of CP. These findings indicate that the biological activity

of CT and the formation of CT-protein complexes were altered by the ensiling process. Silage is a better conservation method than sun cured hay for PPC in terms of ruminal and intestinal digestion of DM, NDF, and CP while the biological activity of CT is higher in Hay than in Silage.

Key Words: purple prairie clover, forage conservation, condensed tannins

T182 Nutrient content of *Atriplex canescens* (Pursh Nutt) as a function of soil electrical conductivity. Aracely Zúñiga*¹, Luz M. Tejada¹, Juan C. Martínez-Alfaro², and Miguel Mellado¹, ¹Autonomous Agrarian University Antonio Narro, Saltillo, México, ²Regional Academic Center UAAAN, Chiapas, México.

Arid and semi-arid areas of northern Mexico are characterized for having little availability of fodder. Another limitation in some desert areas is the presence of soils with high amounts of salts, which limits the development of crops. Four-wing saltbush (*Atriplex canescens*) is a shrub of arid and semi-arid areas adapted to soils with high salinity, it remains green throughout the year, and has a high nutritional content, which represents a good forage for herbivores in these areas. For this study, *A. canescens* samples (leaves) from 20 plots (3 × 3 m) were collected during November in northern Mexico (24°N) and the nutrient content was analyzed. Soil samples near stems of these shrubs were also collected, at depths of 0–30 cm. Crude protein of this fodder shrub was 9.87%. Soil testing showed slight levels of salinity, with an electrical conductivity of 2 to 4 mMhos/cm. The association between nutrient content of *Atriplex canescens* and electrical conductivity of soil were analyzed by nonlinear regression with the CurveExpert program. It was found that the crude protein of *A. canescens* was positively affected by ascending levels of electrical conductivity ($y = 10.9 \times 0.092^{1/x}$; $r^2 = 0.17$). Calcium levels increased with electrical conductivity ($y = 4.85 + 0.34x - 0.32/x^2$; $r^2 = 0.31$). The association between electrical conductivity and phosphorous was weak ($y = 7.29 - 0.94x - 0.5/x^2$; $r^2 = 22$). The variable with the highest association with electrical conductivity was potassium ($r^2 = 0.44$). It was concluded that neither dry matter digestibility nor structural carbohydrates are associated with electrical conductivity of soil and that the increase in electrical conductivity of soil mainly affect the mineral content of this fodder shrub.

Key Words: *Atriplex canescens*, electrical conductivity, crude protein

T183 Nutritional composition of a *Musa* sp. fodder bank located in the central part of Costa Rica. Pablo Chacon Hernandez*, Carlos Boschini Figueroa, and Ricardo Russo Andrade, *Universidad de Costa Rica, San Pedro, San José, Costa Rica.*

Bananas are widely grown in tropical areas and a large proportion of the production is related to the pseudo-stem which is not normally utilized. We hypothesized that this material could be used depending on its nutritional quality. Using a completely randomized block design with 3 replicates, the nutritional composition was evaluated on a *Musa* sp. fodder bank located at the University of Costa Rica's Alfredo Volio Mata Experimental Station during the rainy season of 2012. Five adult plants were harvested on each block at 20–25 cm above ground and divided into 5 sections for sampling (base, center and tip of the pseudo-stem and blades and petioles of the leaves). For the whole plant mean values of 9.22% of DM, 8.57% of CP, 58.02% of NDF, 37.59% of ADF, 9.25% of LIG, 28.34% of CEL, 20.42% of HEMI, 2.35% of EE, 14.17% of ASH, 6.91% of NDICP and 6.91% of NFC were obtained; also, statistical differences among plant parts were found ($P < 0.05$). Despite the low dry

matter content, banana plant portions may be utilized as ingredient in ruminant diets, especially in areas where the crop is commonly grown.

Table 1 (Abstr. T183). Nutritional composition of the *Musa* sp. plant

Bromatological composition (%)	Pseudo-stem			Leaves	
	Base	Center	Tip	Petiole	Lamina
DM	3.93 ^e	4.97 ^d	6.13 ^c	10.38 ^b	20.68 ^a
CP	5.61 ^b	5.87 ^b	5.99 ^b	5.56 ^b	19.82 ^a
NDF	50.63 ^d	55.71 ^c	54.29 ^c	61.34 ^b	68.11 ^a
ADF	33.82 ^c	37.50 ^b	36.15 ^{bc}	44.24 ^a	36.24 ^{bc}
LIG	6.84 ^c	7.57 ^c	7.15 ^c	9.90 ^b	14.79 ^a
CEL	26.98 ^c	29.94 ^b	29.01 ^{bc}	34.34 ^a	21.46 ^d
HEMI	16.81 ^c	18.21 ^b	18.14 ^b	17.10 ^{bc}	31.86 ^a
EE	1.62 ^b	1.96 ^b	2.07 ^b	1.85 ^b	4.27 ^a
ASH	19.30 ^a	16.73 ^b	13.99 ^c	11.74 ^d	9.12 ^e
NDICP	3.83 ^b	3.72 ^b	3.83 ^b	3.89 ^b	19.26 ^a
NFC	26.68 ^a	23.45 ^a	27.49 ^a	23.41 ^a	17.96 ^b

^{a-e}Statistical differences in the same row ($P < 0.05$).

Key Words: fodder bank, *Musa*, bromatology

T184 Litter lignin and phosphorus content in different grazing intensities of Marandu-grass pasture in Southeast Brazil. Mariana Vieira Azenha¹, Elisamara Raposo², Andre Alves Oliveira², Liziane Figueiredo Brito², Estella Rosseto Januszkiewicz², Ricardo Andrade Reis², and Ana Claudia Ruggieri*², ¹EMBRAPA Pecuaria Sudeste, São Carlos, Sao Paulo, Brazil, ²UNESP/FCAV, Jaboticabal, Sao Paulo, Brazil.

The objective of this study was to evaluate lignin and phosphorus content in a Marandu-grass pasture managed under 3 heights of pasture. The pastures were managed by beef steers grazing under continuous stocking. Evaluations of litter decomposition occurred in 2011, at Jaboticabal, SP, Brazil. The litter bag technique was used to evaluate the decomposition of senescent plant material. Incubation times were 4, 8, 16, 32, 64, 128 and 256 d. Nylon bags were used. At the end of each incubation period, the bags were analyzed. The lignin and phosphorus content was analyzed and compared using Proc Mixed from SAS. Polynomial models were used to fit the curves for each pasture stubble height according to incubation times. A significant linear increase in litter lignin with increasing pasture stubble height was observed in the litter incubated ($P < 0.01$), with means of 16.32, 18.50, and 19.84%, respectively, for pasture stubble heights 15, 25, and 35 cm. A relative increase in litter lignin (67%) with decomposition time was observed. Since increasing pasture stubble height is associated with stem elongation, hence higher cell-wall and lignin content than leaves, this could explain the positive association observed between litter lignin and pasture stubble height. The magnitude of differences in lignin content according to pasture stubble height is, however, expected to decrease over the course of the incubation period as the relative content of other components becomes progressively lower while lignin remains undecomposed, since it is chemically very insoluble. Since more soluble components, such as cellulose and hemicelluloses, are primarily used by microorganisms as energy source, a relative increase in litter lignin with incubation time is expected. Phosphorus in the incubated litter was 0.02% on average, and did not differ among pasture stubble heights ($P > 0.05$). The relative increase in litter phosphorus content with incubation time ($P < 0.01$) was expected. As phosphorus immobilization occurs when C/P ratio is

higher than 200, this process prevailed throughout the incubation period, when C/P ratios ranged from 1600 to 825.

Key Words: litter decomposition, height, pasture management.

T185 Adding medium quality hay to the diet of stocker calves grazing annual ryegrass did not improve beef production.

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Strategic use of hay may allow increasing the stocking rate of small areas of high nutritive value pastures, benefiting producers by keeping a greater number of calves for stocker programs. The objective was to compare performance and blood metabolite concentrations of beef steers continuously stocked on annual ryegrass (*Lolium multiflorum* Lam. 'Marshall') or grazing and strategically receiving bermudagrass (*Cynodon dactylon* 'Jiggs') hay (CP = 9.6%; TDN = 50%; NDF = 67%). For 3 consecutive years, 54 steers (BW = 229 ± 2.9 kg) were used. Treatments (3 replicates; n = 6 steers) evaluated were: 1) steers (CON) continuously stocked on ryegrass (1.33 ha; 4.5 steers/ha; 1040 kg BW/ha); 2) steers grazed 50% of the area assigned to CON (0.67 ha; 9 steers/ha; 2081 kg BW/ha) on alternate days (HAY24) and fed hay in a barn; 3) steers grazed 50% of the area assigned to CON (0.67 ha; 9 steers/ha; 2079 kg BW/ha) for 96 h, then were hay-fed in the barn for 72 h (HAY72). Steers were individually fed hay using Calan gates. Blood samples were obtained on 4 consecutive days (d1 after 24 h on ryegrass). Data were analyzed using Proc mixed. Pastures grazed by HAY24 and HAY72 steers had greater ($P < 0.05$) forage mass than CON from d 28 until the end of the grazing season. Concentrations of ADF (27 and 23%) and NDF (41 and 37%) were greater and IVDMD (74 and 78%) was lower ($P < 0.05$) in ryegrass grazed by HAY72 vs. CON, respectively. Production (kg/ha) and ADG (kg) were greater ($P < 0.05$) for CON (498 and 1.2, respectively), intermediate for HAY24 (418 and 0.8, respectively), and lowest for HAY72 (352 and 0.6). Plasma urea nitrogen (PUN) concentration was greatest ($P < 0.001$) for CON (28 mg/dL), intermediate for HAY24 (24 mg/dL), and lowest for HAY72 (21 mg/dL). NEFA were similar for CON and HAY24 (0.32 mEq/L) but lower ($P < 0.001$) than HAY72 (0.47 mEq/L). Concentration of PUN decreased (26 to 23mg/dL) and NEFA increased (0.31 to 0.45 mEq/L) linearly ($P = 0.003$; $P < 0.001$, respectively) from d1 to d4 of sampling. Steers in HAY72 consumed 13% less hay ($P < 0.05$) than those on HAY24. In the present experiment, hay feeding strategies negatively affected animal performance.

Key Words: hay, ryegrass, stocking rate

T186 Cow-calf performance and gain per ha from bermudagrasses overseeded with 'Apache' arrowleaf clover or 'TAM-90' annual ryegrass and stocked at three intensities.

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From 2002 through 2013, both Coastal (COS) and common (COM) Bermudagrass (*Cynodon dactylon*) (BER) pastures were overseeded in Oct each year with either 'Apache' arrowleaf clover (*Trifolium vesiculosum*) (CLV) without N-fertilization or 'TAM-90' annual ryegrass (*Lolium multiflorum*) (RYG) plus N for the 7-mo stocking period. F-1 (Hereford × Brahman) cows with fall-born Simmental-sired (SIM) calves were stocked on all pastures from late Feb. to early June (SPG), and with winter-born SIM calves from mid-June to late Sept. (SUM). All pastures were stocked continuously at 3 intensities (STK) to achieve different forage mass. Proc Mixed was used to determine treatment dif-

ferences. Calf (steers and heifers) ADG was greater ($P < 0.01$) during growth of CLV and RYG in SPG compared with SUM. During SPG, calf ADG was greater ($P < 0.01$) from RYG (1.24 kg d⁻¹) compared with CLV (1.05 kg d⁻¹); and ADG was different ($P < 0.01$) at all 3 STK for low (LO) 1.40 kg d⁻¹, medium (ME) 1.20 kg d⁻¹, or high (HI) 0.83 kg d⁻¹; and no difference for BER. During SUM, calf ADG ($P < 0.01$) was different at all STK at LO (1.05 kg d⁻¹), ME (0.81 kg d⁻¹), and HI (0.58 kg d⁻¹). Cow ADG during SPG was greater ($P < 0.01$) for RYG (0.40 kg d⁻¹) vs CLV (0.20 kg d⁻¹), and all 3 STK were different ($P < 0.01$) for LO (0.74 kg d⁻¹), ME (0.30 kg d⁻¹), and HI (-0.15 kg d⁻¹). In SUM, cow ADG was affected by STK ($P < 0.01$), BER ($P < 0.04$), and STK × BER ($P < 0.04$). Cows lost weight on COM at all 3 STK (-0.19, -0.53, and -0.87 kg d⁻¹); whereas cow ADG on COS was different at each STK of LO, ME, and HI, respectively, at 0.15, -0.47, and -0.89 kg d⁻¹. Calf gain ha⁻¹ for combined SPG and SUM was greater ($P < 0.01$) from COS (720 kg ha⁻¹) than COM (638 kg ha⁻¹); and from either HI or ME STK (758, 724 kg ha⁻¹) compared with LO STK (557 kg ha⁻¹). The RYG + N resulted in total calf gains of 804 kg ha⁻¹ compared ($P < 0.01$) to CLV + no N at 556 kg ha⁻¹. This 11 yr study showed calf gains per ha of more than 550 kg ha⁻¹ on BER with CLV and no-N. Apache CLV proved to be a reliable, productive legume for overseeding BER in the southeastern US without use of N.

Key Words: cow-calf, clover, ryegrass

T187 Performance of steers raised on pastures of elephant and mombasa grasses.

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The performance of steers raised on elephant and mombasa grass pastures was evaluated from October to December 2006. A rotational grazing system with a regulated forage offer was adopted. The experimental area consisted of 2 block containing 18 paddocks of 0.25 ha divided into 9 paddocks with elephant grass and 9 with mombasa grass. Forage species, area block, the interaction among these effects, paddocks within the interaction, and the experimental error were the effects of the treatments. This model was used to analyze pasture attributes. For analyses of intake, digestibility and gain, 24 steers were randomly assigned to the respective interactions among forage vs. block vs. grazing system, totaling 3 animals per triple interaction. The grazing systems consisted of ad libitum (AL) and restricted (PR) grazing. Elephant-grass showed the highest ($P < 0.05$) total dry matter biomass (TB) and green leaf dry matter biomass (GLDM). There were no differences ($P > 0.05$) among forage plants for production of biomass of green leaf dry matter; however, leaf proportion was the greatest ($P < 0.05$) in mombasa grass. Extrusas showed similar ($P > 0.05$) bromatological composition. Only crude protein intake, which was the highest for mombasa pasture, differed ($P < 0.05$) among forage plants. Ad libitum feeding enabled a higher ($P < 0.05$) intake of all nutrients from both pastures. Digestibility of nutrients was higher for elephant-grass but it did not differ ($P > 0.05$) among feeding levels:restricted grazing allowed for greater plant crude protein concentration while ad libitum grazing resulted in greater gross energy consumption. In conclusion, despite qualitative and quantitative differences among forage plants, differences of weight gain per animal and per area were not found. For animal with ad libitum feeding, average body mass gain was 850 g/day and gain per area was 246 kg/ha during the experimental period. Funded by CAPES, CNPq, FAPEMIG, and FAPERJ.

Key Words: digestibility, growth, intake

T188 Diurnal time to move animals to a new paddock: Forage nonstructural carbohydrates concentration, grazing patterns, and performance of beef cattle. F. C. Leite de Oliveira^{*1}, C. O. Rocha¹, J. M. D. Sanchez², R. S. Ferigato³, L. E. T. Pereira¹, C. G. Lima¹, P. H. C. Luz¹, and V. R. Herling¹, ¹University of São Paulo, Faculty of Animal Science and Food Engineering, Department of Animal Science, Pirassununga, Sao Paulo, Brazil, ²Range Cattle Research and Education Center, University of Florida, Ona, FL, ³Anhanguera Faculties, Department of Veterinary, Leme, Sao Paulo, Brazil.

Although the physiology of substances produced in photosynthesis is known, few studies with tropical forage species have been done to provide information about animal grazing patterns and performance. The objective of this study was to investigate the effects of diurnal time of allocating animals to a new paddock on ingestive behavior, forage nonstructural carbohydrates concentration (NSC: sugar and starch) and performance of beef heifers grazing *Brachiaria brizantha* 'Marandu'. The experiment was conducted in southeastern Brazil (21° 59' N; 47° 26' W). Treatments were daily time of allocating animals to new paddocks at 0600 h (AM) and 1500 h (PM) in a randomized complete block design with 3 replicates. Heifers (n = 60, initial BW = 230 kg) were managed by 78 d in rotational stocking, with 1 d grazing period and 25 d resting period during the summer of 2012/2013. All variables were measured every 26 d. Treatments had similar forage allowances ($P > 0.05$, 3.7 ± 0.1 kg DM/kg BW). Times spent grazing, ruminating and other activities were acoustically recorded during a 24 h period. Animals were weighed after a 14–16 h fasting. NSC was determined in forage samples hand-plucked at 0600 and 1500 h, in both treatments. Data were analyzed with Proc Mixed of SAS, with treatment and month as fixed effects and block as a random effect. Total daily grazing time was greater for AM ($P < 0.05$, 490 vs. 450 \pm 5.4 min), however, PM concentrated diurnal grazing time in the afternoon ($P < 0.05$, ~66%), whereas AM did not concentrate grazing activities in the morning when compared with the afternoon ($P > 0.05$, ~50% in each period). There was no difference of NSC between treatments for a given time of the day ($P > 0.05$, 36 and 79 \pm 2.7 g/kg DM at 0600 and 1500 h, respectively), although PM had 50 g NSC/kg DM more than AM at 1500 h ($P < 0.05$). Thus, compensating between grazing time and forage NSC throughout the day resulted in similar ADG (0.75 \pm 0.04 kg/d). The schedule for allocating beef cattle in new paddocks may be done according to the convenience of each farm, as it does not affect performance.

Key Words: daytime, ingestive behavior, sugar

T189 Sequential and mixed grazing of stockpiled toxic tall fescue by fall-calving Angus cows and Katahdin ewes. Taylor N. Drane*, Richard E. Daugherty, James D. Caldwell, Bruce C. Shanks, Chris L. Boeckmann, Cindy A. Deornellis, Amy L. Bax, Abbey J. Kempker, and Jason D. Walker, Lincoln University, Jefferson City, MO.

There are many potential benefits with multi-species grazing including possible performance improvements for one or both species involved. For this reason, there is renewed interest in evaluating mixed versus sequential grazing schemes; however, little research has been done in hair sheep and cattle especially grazing stockpiled toxic tall fescue [*Lolium arundinaceum* (Schreb.) Darbysh; E+]. Therefore, the objective of this study was to determine performance and reproductive measurements by fall-calving Angus cows and Katahdin ewes grazing stockpiled E+ under a mixed or sequential grazing scheme. Over 3 consecutive yr, fall-calving Angus cows (n = 60; 499.8 \pm 56.4 kg initial BW; 5.7 \pm 0.7 initial BCS) and Katahdin ewes (n = 121; 26.1 \pm 6.9 kg initial BW; 2.9

\pm 0.4 initial BCS) were stratified by BW and age within species and allocated randomly to 1 of 4 groups representing 2 treatments: 1) sequential grazing (SG; 6 replications) or 2) mixed grazing (MG; 6 replications). Each year, a total of 8.16 ha (0.68-ha per group) were grazed 40 d for yr 1 and 2 and 42 d for yr 3. In SG, cows always followed ewes and all groups were rotated based on available forage. Initial weight, initial BCS, end weight, end BCS, total gain, and ADG did not differ ($P \geq 0.15$) between treatments. Cow and ewe pregnancy rates did not differ ($P \geq 0.96$) between treatments. Calf birth date and calf birth weight did not differ ($P \geq 0.33$) between treatments. Calf start weight was heavier ($P = 0.03$) for MG vs. SG, but calf end weight, total gain, and ADG were similar ($P \geq 0.13$) between treatments. Lamb birth date, birth weight, and number of lambs born did not differ ($P \geq 0.12$) between treatments. Therefore, sequential grazing compared with mixed grazing may not improve performance and reproductive measurements in fall-calving Angus cows and Katahdin ewes. Thus, the extra labor associated with a multi-species, sequential grazing scheme may not be justified.

Key Words: fescue, mixed grazing, sequential grazing

T190 Performance and reproductive measurements by spring-born Katahdin ewes grazing stockpiled toxic tall fescue, non-toxic tall fescue, or Persist orchardgrass. H. L. Bartimus^{*1,2}, B. C. Shanks¹, J. D. Caldwell¹, A. L. Bax¹, L. S. Wilbers¹, A. J. Kempker¹, J. D. Walker¹, C. A. Clifford-Rathert¹, and A. K. Busalacki¹, ¹Lincoln University, Jefferson City, MO, ²University of Arkansas, Fayetteville, AR.

Stockpiled forages are an alternative to expensive feedstuffs and may extend the grazing season through the winter months for small ruminant producers. Our objective was to evaluate the effects of stockpiled endophyte-infected tall fescue [*Lolium arundinaceum* (Schreb.) Darbysh; E+], novel endophyte-infected tall fescue (NE+), and Persist orchardgrass (*Dactylis glomerata* L.; OG) on performance and reproductive measurements by spring-born Katahdin ewes. Over 2 consecutive years, Katahdin ewes (n = 116; 27.7 \pm 0.57 kg initial BW, 2.8 \pm 0.05 initial BCS) were stratified by weight and BCS and allocated randomly to 1 of 3 treatments consisting of: 1) E+ (5 replications), 2) NE+ (5 replications), 3) OG (5 replications). Each year, excess forage was grazed in early August, 54 kg N/ha was applied in mid-September, and beginning in early November grazing was initiated. Data were analyzed using PROC MIXED of SAS with 2 preplanned orthogonal contrast statements to evaluate ewe performance and reproductive measurements: 1) the mean of E+ vs. the mean of NE+ and OG and 2) the mean of NE+ vs. the mean of OG. Pregnancy rates and percentage of multiple births were analyzed by the Chi-squared procedure of SAS. Ewe BW, BCS, total gain, and ADG did not differ ($P \geq 0.12$) across treatments at the initiation of the study, at breeding, end of breeding, or end of the study. Pregnancy rates did not differ ($P \geq 0.19$) across treatments. Percentage of multiple births tended ($P = 0.07$) to be greater from NE+ and OG compared with E+ (19 vs. 0%, respectively) and tended ($P = 0.07$) to be greater from NE+ compared with OG (19 vs. 0%, respectively). Therefore, grazing spring-born Katahdin ewes on stockpiled endophyte-infected tall fescue, novel endophyte-infected tall fescue, or Persist orchardgrass during the winter months may result in similar performance and pregnancy rates. However, grazing ewes on stockpiled novel endophyte-infected tall fescue may result in more multiple births.

Key Words: Katahdin, grazing, performance