

lot using the same meter under different concentrations of lactose (50 – 400 mg/dL) in model solution. After incubation with lactase, the sample was applied onto the test strip and the glucose concentration was determined. We found that meters and replications were not significantly different ( $P < 0.05$ ). However, the test strip lots were significantly different from each other. A standard curve using all the data was linear and had a slope of 0.855 and intercept of -18.77 ( $R^2 = 0.99$ ). In order to verify the predictive ability of the method, different concentrations of lactose (1.9 – 6.5%) were prepared independently and analyzed using the proposed method as well as by HPLC. Since, the glucose meter reading was significantly influenced by test strip lot, six different lots were utilized in this experiment. Simultaneously, standard curves were also developed for each of the six test strip lots. Lactose concentration was then calculated from the combined and individual standard curves. The average absolute bias, calculated for 25 samples, was found to be between 0.08–0.17 for individual standard curve and 0.1 – 0.36 for the combined standard curve. The proposed method shows potential in rapid measurement of lactose in dairy products.

**Key Words:** lactose, glucose meter, rapid measurement

**754 Persistency of conjugated linoleic acid and vaccenic acid on Sardo cow cheese.** G. A. Gagliostro<sup>\*1</sup>, M. Martínez<sup>2</sup>, V. I. Cejas<sup>3</sup>, M. A. Rodríguez<sup>3</sup>, and M. Balán<sup>4</sup>, <sup>1</sup>*Instituto Nacional de Tecnología Agropecuaria, Balcarce, Buenos Aires, Argentina*, <sup>2</sup>*Instituto Nacional de Tecnología Agropecuaria, Salta, Argentina*, <sup>3</sup>*Instituto Nacional de Tecnología Industrial, PTM MIGuelete, Buenos Aires, Argentina*, <sup>4</sup>*PRODEO S.R.L., Chivilcoy, Buenos Aires, Argentina*.

Persistency of 9-cis 11-trans C18:2 (CLA), trans-11 C18:1 (VA) and other fatty acids (FA) was tested on Sardo cheese elaborated from milk with high CLA and VA contents. The same feeding trial and cows were also used when transfer of FA to Tybo cheese was tested. Milk was obtained from eight Holstein cows (570 kg, 109 days in milk) producing 24.8 kg milk/d and consuming (DM basis) 7.3 kg/cow of concentrate, 1.94 kg/cow/d of a TMR (corn silage, 70%, soybean oil, 22%, fish oil 5.4% and urea, 2.6%) and 8 kg of pasture. After 25 days of adaptation, milk was collected and transformed into Sardo cheese reproducing industrial conditions. Milk and chesse FA composition was analyzed by GLC and differences in FA content between milk and cheese were stated using the T-test for paired observations. Milk fat, protein and lactose contents were 23, 35.1 and 47.1 g/kg respectively, with a fat/protein ratio of 0.65. Intake of 427 g/d of soybean oil (229 g of C18:2) and 105 g of fish oil contained in the TMR reduced the atherogenicity index ( $AI = [(C12 + 4C14 + C16)/total\ unsaturated]$ ) of milk from a pre supplementation basal value of 2.06 to 1.16. Basal concentration

(g/100g) of the atherogenic FA C12:0 (4.04) C14:0 (12.52) and C16:0 (29,16) were decreased by intake of oils (C12:0 = -1.66, 41%, C14:0 = -3.48, 28% and C16:0 = -4.89, 11%). After oil supplementation milk CLA content increased from a basal value of 1.42 to 3.58 g/100g and VA from 2.56 to 3.58 g/100g FA. Elaborated Sardo cheese contained 26.73% fat and 31.23% protein (w/w) with an atherogenicity index of 1.22. Significant differences between milk FA and cheese FA content were not detected. Transfer of 9-cis 11-trans CLA to Tybo cheese averaged 98%. Assuming that the cheese fat contain 95% FA, intake of 90 g/d of Sardo cheese rich in CLA may allow to obtain the suggested anticancer dose (800 mg) of CLA. These results were obtained using a feeding strategy that may be easy carried out by the farmer and the grazed forage represented about 46.4% of total dry matter intake.

**Key Words:** Sardo cheese, conjugated linoleic acid, vaccenic acid

**755 Dairy food intake among historically African American college campus students.** A. M. Patterson\* and S. A. Ibrahim, *North Carolina A & T State University, Greensboro*.

Dairy foods, such as milk, cheese, and yogurt are one of the greatest sources of essential nutrients such as potassium and calcium. Dairy foods are also mostly known for their importance in bone health and overall diet health. Previous studies have shown a low consumption of dairy foods among African American, but no recent studies have been conducted with African American college campus students. The purpose of this study was to survey a sample of students about the consumption of dairy foods from a historically African American college campus. Fifty four male and female students provided information on their intake of dairy products by completing the Food Frequency Questionnaire (FFQ). The section of the FFQ of interest to this study related to what type of dairy products (cheese, yogurt, ice cream, liquid milk) and other food items that include dairy products (pizza, hamburgers, etc.) are eaten and how often consumed. The survey also inquired about their intake amounts, and their feelings and attitudes about those foods that are consumed and the ones that are not consumed. Our results indicated that there was a low dairy products intake among the students that participated. Ninety percent of the respondents reported consuming less than the recommended daily amount; males tended to consume more than females. Both males and females received most of their dairy from cheeses that were included on foods such as pasta, pizza, cheeseburgers, but the most popular dairy product that was consumed was ice cream. The results suggest that African American college campus students need to increase their dairy food consumption, but do so by choosing healthy dairy foods such as yogurt, low-fat cheeses and milk.

**Key Words:** historically African American, dairy products

## Forages and Pastures: Grazing and Pasture Utilization

**756 Effect of fall grazing system on annual ryegrass quality and beef cattle performance.** J. M. Kelzer<sup>\*1</sup>, S. Bird<sup>2</sup>, R. D. Mathison<sup>2</sup>, P. R. Peterson<sup>1</sup>, and R. S. Walker<sup>3</sup>, <sup>1</sup>*University of Minnesota, St. Paul*, <sup>2</sup>*University of Minnesota, Grand Rapids*, <sup>3</sup>*University of Minnesota, Andover*.

Windrowed and stockpiled annual ryegrass as fall grazing systems were evaluated for forage quality and beef cow performance over two separate years. In 2007 and 2008, two 6-acre paddocks were seeded in early spring with annual ryegrass, rotationally grazed during summer, fertilized, and stockpiled in August. In mid-October, forage from one-

half of each replicated 6-acre paddock was cut while the other half was left standing. Two windrows in each cut section were raked together 1 d following swathing to represent the windrow treatment. Dry, pregnant Angus beef cows ( $n = 32$  each year) averaging  $651 \pm 75$  kg BW,  $5 \pm 2$  yr of age,  $125 \pm 22$  d pregnant, and BCS of  $5.5 \pm 0.5$  for 2007 and  $582 \pm 80$  kg BW,  $4 \pm 3$  yr of age, 131 d pregnant, and BCS of  $5 \pm 0.4$  were assigned randomly to one of four 3-acre paddocks representing one of two grazing treatments: 1) windrowed annual ryegrass (WIN), and 2) stockpiled annual ryegrass (STO). Data for forage quality and animal performance were collected and analyzed by year. Forage CP, ADF,

and NDF were greater ( $P < 0.05$ ) over time, whereas percent TDN and relative feed value were lower ( $P < 0.05$ ) over time for WIN vs. STO paddocks for both years. Compared to WIN, cattle on STO paddocks grazed 8 and 10 d longer ( $P < 0.05$ ) in 2007 and 2008. Animal BW gain and ADG were similar for cows grazing STO and WIN paddocks in 2007 and averaged  $-1.4 \pm 26.4$  kg BW and  $0.02 \pm 0.8$  kg/d; however, animal BW gain ( $39.9$  vs.  $20.0 \pm 11.9$  kg BW) and ADG ( $1.0$  vs.  $0.7 \pm 0.4$  kg/d) were greater ( $P < 0.05$ ) for STO than WIN in 2008. Results of this study indicate forage CP, TDN, ADF, NDF, and relative feed value are affected by fall grazing system over time. Thus, stockpiling forage may be a viable system to retain forage quality and maintain beef cow performance later in the grazing season.

**Key Words:** annual ryegrass, grazing system, beef cattle

**757 Economic potential of stocker cattle grazing legume-interseeded bermudagrass.** J. Guretzky\*, R. Reuter, J. Biermacher, J. Springer, T. Butler, H. Aljoe, J. Rogers, and B. Cook, *The Noble Foundation, Ardmore, OK.*

Planting legumes is a forage management strategy that may offset N fertilization costs and improve stocker cattle gains on pasture. Our objectives were to document herbage availability, average daily gain, and net returns to land, labor, and management from stocker cattle grazing N-fertilized and legume-interseeded bermudagrass pastures. Research was conducted in nine, 1.4-ha paddocks, continuously stocked with 204-kg steers at 2.8 steers/ha, near Ardmore, OK, in 2008. Treatments arranged in a completely randomized design included: bermudagrass fertilized with urea at 112 kg N/ha; bermudagrass interseeded with a grazing-type alfalfa at 6.9 kg PLS/ha; and bermudagrass interseeded with a mixture of winter annual legumes (hairy vetch, crimson clover, and arrowleaf clover at 12.3, 9.4, and 5.8 kg PLS/ha, respectively). Legumes were no-till drilled into dormant bermudagrass on 11 Oct. 2007. The N-fertilized system supported 84 grazing days (23 May to 15 August) and gains of  $1.12 \pm 0.22$  kg/d. The alfalfa system supported 56 grazing days (23 May to 18 July) and gains of  $1.21 \pm 0.23$  kg/d. The annual legume system allowed 66 grazing days (24 April to 28 June) and gains of  $1.43 \pm 0.33$  kg/d. Average daily gain and gain/ha were similar among systems ( $P = 0.65$  and  $0.13$ , respectively). Planting annual legumes improved average herbage availability in April and May ( $2709 \pm 223$  kg/ha) compared to N-fertilized ( $1638 \pm 134$  kg/ha) and alfalfa ( $1378 \pm 184$  kg/ha) systems. Average herbage availability in June and July, however, peaked within the N-fertilized system ( $3683 \pm 344$  kg/ha) compared to the alfalfa ( $1339 \pm 204$  kg/ha) and annual legume systems ( $1276 \pm 180$  kg/ha). Net returns were \$292, \$109, and \$227/ha for N-fertilized, alfalfa, and annual legume systems, respectively. Net returns between the N-fertilized and the annual legume system were sensitive to price of N, gain/ha, value of gain, and grazing days. Poor establishment limited herbage availability, grazing days, and net returns within the alfalfa system. The annual legume system has economic potential based on the first year data.

**Key Words:** forage systems, forage ecology, grazing systems

**758 Economic feasibility of stocker cattle grazing tall fescue infected with a novel endophyte in the Southern Great Plains of the USA.** J. T. Biermacher\*<sup>1</sup>, R. Reuter<sup>1</sup>, B. J. Cook<sup>1</sup>, M. A. Islam<sup>2</sup>, A. Hopkins<sup>1</sup>, J. H. Bouton<sup>1</sup>, and T. J. Butler<sup>1</sup>, <sup>1</sup>Samuel Roberts Noble Foundation, Ardmore, OK, <sup>2</sup>University of Wyoming, Laramie.

The objective of this study was to compare the net return of stocker cattle grazing either novel endophyte-infected tall fescue or annual rye/ryegrass pastures. In a randomized complete block design, four paddocks of cereal rye and ryegrass were planted in early September 2005, 2006 and 2007. Additionally, four paddocks of an experimental tall fescue were planted in late September 2005. Each fall, beef steers (245 kg BW) were randomly assigned to paddocks. Animals were weighed every 28 days of each grazing season, and forage availability and nutritive value samples were collected. Stocking rates were adjusted periodically throughout the grazing season to attempt to maintain equal forage availability among paddocks. Total costs for the perennial system includes the 5-yr amortized cost of establishing the tall fescue and the annual expenses for fertilizer and weed control. Average daily gain between treatments was similar (1.1 kg/d, Table 1.); however the annual system produced 43% more grazing days. Average total cost of the perennial system was 101 USD / ha less than the rye/ryegrass system. The annual system realized a total economic advantage of 92 USD / ha over the perennial system. Although the perennial tall fescue system cost less, the additional grazing days available in the annual system compensated for this relative cost advantage. The economic results are sensitive to the number of grazing days, stand life expectancy and prices of rye and ryegrass seed.

**Table 1. Average daily gain, grazing days, total gain, total cost and net return to land, labor and management for annual and perennial forage systems for stocker cattle**

Performance measure	Rye/ryegrass		Tall Fescue	
	Avg.	St. Dev.	Avg.	St. Dev.
Average daily gain (kg / ha)	1.1 <sup>a</sup>	0.1	1.1 <sup>a</sup>	0.1
Grazing days	225 <sup>a</sup>	73	157 <sup>b</sup>	64
Total gain (kg / ha)	520 <sup>a</sup>	258	362 <sup>b</sup>	116
Total cost (USD / ha)	367 <sup>a</sup>	99	266 <sup>b</sup>	96
Net return (USD / ha)	264 <sup>a</sup>	410	172 <sup>b</sup>	55

Letters that differ were statistically different at the 95% level of confidence.

**Key Words:** economics, stocker grazing systems, novel endophyte-infected tall fescue

**759 Utilization of switchgrass in a dual purpose stocker cattle and bioenergy system.** J. A. Guretzky, J. T. Biermacher, R. R. Reuter, J. R. Blanton Jr.\*<sup>1</sup>, J. Mosali, M. Kering, and B. J. Cook, *The Samuel Roberts Noble Foundation, Ardmore, OK.*

The objective of this study was to determine if switchgrass (*Panicum virgatum*) produced for bioenergy production could serve as a dual crop for stocker cattle management programs. Switchgrass is a native grass that produces sufficient biomass on marginal lands to serve as a bio-refinery feedstock. Stocker cattle production generally involves lightweight calves developed on forage-based diets for feedlot production or cow replacements. In May 2007, 9.7 ha of Alamo switchgrass was established in southern Oklahoma on sandy soil and divided into twelve, 0.8 ha paddocks to evaluate stocker cattle performance and switchgrass utilization at 4 stocking densities. In April 2008, steers ( $n = 36$ ) weighing 348 kg, were randomly assigned to control (0 steers/ha), low (2.5 steers/ha), medium, (5 steers/ha) and high (7.5 steers/ha) stocking density paddocks. Herbage mass and nutrient composition was measured bi-weekly during the grazing period and at completion of switchgrass growing season (September). Animal weights were collected

on d 0 and at completion of grazing. Grazing was terminated when forage height was less than 10 cm. Overall, ADG and total gain per ha was not significantly affected ( $P = .34$ ) by treatment but a numerical trend was observed with the higher stocking density (1.5 kg/d) outperforming both the low (0.8 kg/d) and medium (1.2 kg/d) stocking densities. Stocking density significantly affected ( $P < .001$ ) total grazing days with the high density (21d) resulting in fewer days than either low (98d) or medium (30d) stocking densities. Stocking density did not affect ( $P > .05$ ) biomass availability at conclusion of growing season, however grazing significantly ( $P < .01$ ) reduced overall biomass. Control paddocks contained 14,100 kg/ha at conclusion of growing season, whereas grazed paddocks averaged 7,615 kg/ha. Nutrient composition was not significantly affected by grazing ( $P < .05$ ). While grazing reduced biomass availability of switchgrass, the significant animal performance gained could impact producer profitability.

**Key Words:** switchgrass, stocker cattle, grazing

**760 Effects of supplemental cottonseed meal versus part-time annual ryegrass grazing on performance of beef heifers grazing stockpiled limpograss pastures.** J. M. B. Vendramini\* and J. D. Arthington, *University of Florida, Ona.*

Limpograss [*Hermathria altissima* (Poir.) Stapf & C.E. Hubb.] is an important perennial forage in Florida because of its adaptation to poorly drained soils and better cool-season growth than other available warm-season grass varieties. The objective of this study was to evaluate the performance of heifers grazing stockpiled limpograss pastures supplemented with cottonseed meal or grazing part-time annual ryegrass (*Lolium multiflorum* Lam.). The experiment was conducted over 2 consecutive years from Feb. to April. Twelve 0.5 ha limpograss pastures were staged at a 10 cm stubble height and fertilized with 60 kg N / ha in Oct., and stockpiled from Oct. to Feb. of the subsequent year. Three Angus crossbred yearling heifers ( $338 \pm 30$  kg LW) were assigned to each pasture. Treatments consisted of 3 supplementation rates, 0 (control), 1.1, and 2.2 kg/heifer daily of cottonseed meal, or part-time grazing ryegrass on a completely randomized design with three replicates. Ryegrass pastures were planted in Nov. and fertilized with 30 kg N/ha. Heifers were allowed to graze ryegrass three 24-h periods each week (Mon, Wed, and Fri.). Ryegrass pastures were 0.4 ha. Limpograss herbage mass was greater in pastures where the heifers part-time grazed ryegrass than in other treatments ( $2100$  vs.  $1800 \pm 50$  kg/ha). Herbage mass accumulation ( $24 \pm 3$  kg/heifer daily), CP ( $12 \pm 1\%$ ), and IVDOM ( $50 \pm 1\%$ ) were similar among treatments. There was a linear increase in ADG of heifers receiving crescent levels of cottonseed meal from 0.14 and 0.67 kg/d, but there was no difference in ADG of heifers grazing part-time ryegrass and supplemented with 2.2 kg CSM/d (0.64 kg/d). There was no difference in BUN concentrations between heifers receiving the control treatment ( $19 \pm 1$  mg/dL) and part-time grazing ryegrass ( $21 \pm 1$  mg/dL); however, heifers receiving 1.1 and 2.2 kg of cottonseed meal/d had greater BUN concentration compared with control ( $23$  and  $27 \pm 1$  mg/dL, respectively). Part-time grazing ryegrass may be an economically viable option for the supplementation of beef cattle in the southeast US.

**Key Words:** limpograss, annual ryegrass, supplementation

**761 Prediction of rumen function measures from plant constituents in lactating cows fed pasture-based diets.** R. E. Vibart\*, B. A.

Barrett, and D. Pacheco, *AgResearch Limited, Palmerston North, New Zealand.*

A greater concentration of water-soluble carbohydrates (WSC) in grasses has shown promise in improving the asynchronous supply of nitrogen (N) and carbohydrates for microbial protein synthesis in the rumen, enhancing N capture in the grazing ruminant. Data from experiments with lactating cows (17 publications, 42 treatment means) where freshly-cut or grazed pasture comprised more than 70% of the total dry matter consumed, were used to evaluate the effects of plant constituent concentrations and nutrient ratios [organic matter (OM), WSC, crude protein (CP), neutral detergent fiber (NDF), non-fibre carbohydrate (NFC), WSC/CP, NFC/CP] on rumen function indicators. Regression was performed using the stepwise selection method restricted to  $P = 0.05$  for variables to enter and remain in the model. Response equations were also examined by combining results from all studies using meta-analysis methods. Response variables included ruminal pH (mean  $6.2 \pm$  SD 0.24), total volatile fatty acids concentration (tVFA;  $121.6 \pm 17.0$  mmol/L), ammonia N concentration ( $11.8 \pm 6.1$  mmol/L), microbial N flow ( $236.1 \pm 57.6$  g/d), and efficiency of microbial protein synthesis (EMPS;  $24.0 \pm 5.1$  g microbial N/kg OM apparently digested in the rumen). No plant constituent variable met the significance level of entry for ruminal pH, whereas OM (microbial N flow: adj.  $R^2 = 0.21$ ; RMSE = 51.2;  $P = 0.004$ ), OM and CP (EMPS: adj.  $R^2 = 0.23$ ; RMSE = 4.5;  $P = 0.007$ ), and OM, CP, WSC, and NDF (tVFA: adj.  $R^2 = 0.61$ ; RMSE = 10.6;  $P < 0.001$ ; ammonia N: adj.  $R^2 = 0.84$ ; RMSE = 2.4;  $P < 0.001$ ) were selected predictors. No additional variation was explained by nonlinear analysis. Out of the variables studied, forage components were better at explaining the variability of tVFA and ammonia N concentration (adj.  $R^2$  values  $> 0.6$ ) compared with microbial N flow and the EMPS (adj.  $R^2$  values  $< 0.3$ ). These last results highlight the challenge of enhancing N capture in pasture-based systems through breeding programmes aimed at modifying the chemical composition of temperate forages.

**Key Words:** rumen function, ryegrass, nitrogen capture

**762 Prediction of nitrogen utilization efficiency from plant constituents in lactating cows fed pasture-based diets.** R. E. Vibart\*, B. A. Barrett, and D. Pacheco, *AgResearch Limited, Palmerston North, New Zealand.*

Identifying suitable dietary predictors of the efficiency of nitrogen (N) utilization (ENU, g N per kg of N intake) is critical to develop management strategies to optimize N capture in grazing ruminants. Data from experiments with lactating cows consuming ryegrass-based diets were used to evaluate the effects of plant constituent concentrations and nutrient ratios on the ENU in milk (ENU<sub>m</sub>) and manure (ENU<sub>ma</sub>). The data set used (36 publications, 153 treatment means) was derived from studies where freshly-cut or grazed pasture comprised more than 70% of the total dry matter consumed. Regression and mixed models were performed using the stepwise selection method constrained to  $P = 0.05$  for variables to enter and remain in the model, and meta-analysis methods, respectively. Total N intake (mean  $516 \pm$  SD 105 g/d) was partitioned into milk N ( $115 \pm 22$  g/d) and manure N ( $398 \pm 103$  g/d). Crude protein (CP) concentration was the best single predictor of both ENU<sub>m</sub> and ENU<sub>ma</sub> ( $P < 0.001$ ; adjusted  $R^2 = 0.59$  and  $0.39$ ; RMSE = 31.6 and 49.0 g N/kg N intake, respectively). Stronger relationships (increased adj.  $R^2$  and reduced RMSE values) were obtained by adding water soluble carbohydrates (WSC) alone (ENU<sub>m</sub>: adj.  $R^2 = 0.64$ ; RMSE = 29.6 g milk N/kg N intake) or with neutral detergent fiber (NDF) to the models (ENU<sub>ma</sub>: adj.  $R^2 = 0.51$ ; RMSE = 43.9 g milk N/kg N intake). Within studies, the ratio of WSC to CP and the concentrations of CP,

WSC, and NDF, as well as N intake, were suitable predictors of both  $ENU_m$  and  $ENU_{ma}$  ( $P < 0.05$ ; adj.  $R^2$  ranged from 0.64 to 0.93), indicating the consistency of these relationships within numerous studies. Results herein suggest that the partitioning of carbon between soluble and structural carbohydrates within the plant affects N utilization in grazing ruminants. Although WSC provide the most readily available source of energy for grazing ruminants, the highly-digestible nature of NDF from these diets provide for additional energy in the rumen that also contributes in reducing N in manure.

**Key Words:** efficiency of nitrogen utilization, ryegrass, dairy

**763 Effects of stocking rate and supplementation on lactation and reproduction in pasture-based dairy systems in Eastern North Carolina.** R. E. Vibart<sup>\*1</sup>, S. P. Washburn<sup>2</sup>, G. A. Benson<sup>2</sup>, and J. T. Green<sup>2</sup>, <sup>1</sup>AgResearch Limited, Palmerston North, New Zealand, <sup>2</sup>North Carolina State University, Raleigh.

A balance between stocking rate and per cow performance is required to optimize grazing strategies and profitability in pastoral dairying. Beginning September 2003, a seasonal, fall-calving, pasture-based system was established on a research station dairy herd to address the effects of stocking rate (supplementation rate adjusted accordingly) on lactation and reproduction performance for three years. Eighty lactating cows including Holstein (H); Jersey (J); and crosses of H and J were assigned to one of two stocking rate (SR) groups and balanced for breed group. Cows were assigned to either a low stocking, low supplementation group (LSR; 2.2 cows per ha) or a high stocking, high supplementation group (HSR; 3.3 cows per ha). Proportional amounts (1.0x and 1.5x; mean 4.6 and 7.6 kg DM/cow for LSR and HSR, respectively) of a corn-based concentrate mix were offered daily in amounts that varied according to pasture quality and availability. Estimates of grazed herbage DM intake, obtained from weighed pasture removal within a 24-h period and grazing area allocated per cow, were 35% greater for cows on LSR (14.3 vs. 10.6 kg DM/d). Lactation performance, however, was greater ( $P < 0.05$ ) for cows on HSR: mature-equivalent milk yield (6,010 vs. 6,733 kg); milk fat yield (205.8 vs. 229.3 kg); protein yields (179.5 vs. 208.7 kg) for cows on LSR vs. HSR, respectively. Reproduction efficiency (conception rate at first and all services, pregnancy rate) was not affected by stocking rate. Although concentrate prices also affect farm profitability, with similar reproduction efficiency, a greater per cow milk yield along with increased productivity per unit of land favored the greater stocking rate.

**Key Words:** stocking rate, lactation, reproduction

**764 Sequence grazing of perennial and annual cool-season grasses to extend the grazing season for stocker calves.** B. K. Northup<sup>1</sup>, W. A. Phillips<sup>\*1</sup>, and A. A. Hopkins<sup>2</sup>, <sup>1</sup>USDA-ARS Grazinglands Research Laboratory, El Reno, OK, <sup>2</sup>Noble Foundation Inc., Ardmore, OK.

Grazing of cool-season grasses by beef calves before entry into the feedlot for finishing is an important component of the US beef production system. The length of time in the feedlot and the quantity of feed grain required to reach market BW would be reduced if more BW was gained during the grazing season. The objective of these experiments were to evaluate the feasibility of using perennial cool-season grass in early fall and late spring to extend the winter wheat stocker calf grazing season. In Experiment 1, six 1.8-ha pastures of non-toxic endophyte infected fescue (*Festuca arundinacea* Schreb.) were established at the

Grazinglands Research Laboratory and allowed one year of deferment for establishment. A different set of calves were used each fall (BW = 250 ± 44 kg) and spring (BW = 326 ± 34 kg). Calves were randomly assigned to pastures and stocking rate was based on the amount of forage available for grazing. Pasture was the experimental unit and data were analyzed using PROC MIXED procedures with year (n=3) being random. Pastures were grazed for 38 ± 7.4 d in the fall (mean start date = Oct. 22) and for 33 ± 6.2 d in the spring (mean start date = Apr. 23). Average daily gain (0.56 vs. 0.99 kg) and stocking rate (1460 vs. 2200 kg BW/ha) was lower ( $P = 0.03$ ) in the fall than in the spring. In Experiment 2, 144 Angus steers were divided into 6 groups, and grazed on 2.1-ha fescue pastures (n=6) for 29 d in the fall, a common wheat pasture for 134 d in the winter and spring and returned to fescue pastures for 29 d in late spring. Initial BW (Nov. 14) in the fall was 248 kg. Steers gained 19.7 ± 1.5 kg in the fall on fescue, 118.0 ± 2.6 kg in the winter and spring on wheat pasture and 32.1 ± 1.7 kg in the late spring on fescue. We conclude that fescue pasture can be used in a sequence grazing system under short intensively grazing management during the fall and spring to extend the winter wheat grazing season by approximately 60 d and can add as much as 52 kg of BW.

**Key Words:** wheat pasture, fescue, stockers

**765 Comparison of fescues versus orchardgrass—Forage characteristics and stocker performance.** M. H. Ramos<sup>\*1</sup>, J. W. Lehmkuhler<sup>2</sup>, and K. A. Albrecht<sup>3</sup>, <sup>1</sup>University of Missouri, Columbia, <sup>2</sup>University of Kentucky, Lexington, <sup>3</sup>University of Wisconsin, Madison.

Since both tall fescue and orchardgrass are well accepted by beef producers, and comparison of reported grazing results being inconsistent, a grazing study was designed to compare non-endophyte infected tall fescue, a novel soft-leaf tall fescue variety (soft leaf) and orchardgrass in a rotational grazing system using stocker cattle. Crossbred beef steers, crossbred beef heifers and Holsteins steers were allowed to graze during 2005, 2006 and 2007. Dry matter availability was not different between treatments at any of the three years ( $P > 0.05$ ). During the year of 2006 only the dry matter production of fescue grasses were higher ( $P < 0.05$ ) than the orchardgrass grass. No significant differences ( $P > 0.1$ ) could be observed between treatments for NDF. During the three years no differences ( $P > 0.10$ ) could be seen between treatments for IVDMD. Orchardgrass pastures had lower ( $P < 0.05$ ) ADG than SL (soft leaf) pastures during the 2005 grazing season. While in 2006 gains for cattle grazing orchardgrass and tall fescue were not different ( $P > 0.05$ ). Tall fescue pastures supported daily gains less than orchardgrass ( $P < 0.05$ ) only in 2007 with 2005 and 2006 showing no differences in ADG between orchardgrass and tall fescue. Soft-leaf tall fescue pastures supported ADG greater than both tall fescue and orchardgrass ( $P < 0.05$ ) in 2005 and gains for cattle consuming soft-leaf tall fescue were also higher in 2007 ( $P < 0.05$ ) compared to tall fescue. Orchardgrass pastures supported fewer animals (lower Stocking density, SD) for most of the grazing season all three years. It can be concluded that DM production for fescues were higher than orchardgrass pastures and that forage quality did not differ due to forage. Quality indicators for forage showed the expected pattern of higher quality during the spring and fall and lower quality during the summer months. Fescues and orchardgrass pastures allow for similar ADG when using stocker animals. Fescue pastures support higher carrying capacity than the orchardgrass which will translate into more animal output per ha.

**Key Words:** fescue, pasture, nitrogen

**766 Use of N fertilization versus interseeded legume—Forage characteristics and stockers performance.** M. H. Ramos\*<sup>1</sup>, J. W. Lehmkuhler<sup>2</sup>, and K. A. Albrecht<sup>3</sup>, <sup>1</sup>University of Missouri, Columbia, <sup>2</sup>University of Kentucky, Lexington, <sup>3</sup>University of Wisconsin, Madison.

Due to increasing prices of N an experiment was conducted to compare the response of stocker beef animals grazed on an interseeded legume to a pasture with N application. The legumes interseeded were Kura Clover with Soft Leaf Fescue, White Clover with Soft leaf fescue and Soft leaf tall fescue only. During all three years of the experiment no differences in dry matter availability ( $P > 0.05$ ) were observed between treatments, with DM production of legumes being lower ( $P < 0.05$ ) than grass during 2006 but not ( $P > 0.05$ ) during 2007. Both NDF and ADF of grass was higher ( $P < 0.05$ ) than legumes during 2006 but no differences were measured the other two years. The IVDMD was higher ( $P < 0.05$ ) for legumes than grass during 2006 with a tendency to follow the same pattern in 2005 but not ( $P > 0.05$ ) during 2007. Lignin, CP, and ASH were not different ( $P > 0.05$ ) among treatments. No significant differences ( $P > 0.05$ ) were observed between treatments for ADG and gain/ha during the 2005 grazing season. End weights and ADG were higher ( $P < 0.05$ ) for the legume treatments than the fescue treatment during 2006 although no significant difference ( $P > 0.05$ ) was measured between treatments for gain/ha in 2006. End weights were not significantly ( $P < 0.05$ ) different between treatments for the 2007 grazing season. It can be concluded that pastures containing a mixture of grass and legume, with the legume representing at least 40% of the mixture, will have better forage quality (lower NDF and higher IVDMD) while still providing the same amount of dry matter compared with pastures that contain only grass and nitrogen fertilizer. Pastures that contain a mixture of legume will allow for higher ADG when compared with pastures that contain grasses only and that can or cannot be translate in higher gains/ha.

**Key Words:** grass, legume, nitrogen

**767 Performance of Holstein steers, beef steers and beef heifers under rotational grazing.** M. H. Ramos\*<sup>1</sup>, J. W. Lehmkuhler<sup>2</sup>, and K. A. Albrecht<sup>3</sup>, <sup>1</sup>University of Missouri, Columbia, <sup>2</sup>University of Kentucky, Lexington, <sup>3</sup>University of Wisconsin, Madison.

A grazing experiment was conducted where Holstein steers, beef steers and beef heifers (both Angus crossed) were intensively grazed during the grazing season of 2005, 2006 and 2007. Animals had access to pasture of tall fescue, soft leaf tall fescue, orchardgrass (all received nitrogen) and soft leaf tall fescue with Kura clover and white clover. All three types of animals were implanted with growth promoting implants during the first two years but not 2007. The initial weight of animals were not different ( $P > 0.05$ ) for 2006, for 2005 heifers started heavier than steers which were heavier than Holsteins, and for 2007 Holstein started the experiment heavier than heifers which were heavier than steers. Since beginning weight was different it was used as covariate in the Statistical model. For two out of three years Holstein steers gained as well ( $P < 0.05$ ) as beef steers and heifers, which were similar. In one year beef steers had higher ADG than Holsteins and heifers. End weight was not different ( $P > 0.05$ ) during 2005, Holstein steers finished as heavy ( $P > 0.05$ ) as beef steers and both were heavier than heifers in 2006. In 2007 Holstein steers finished as heavy as beef heifers but lighter than beef steers. It can be concluded that Holsteins steers have the potential to perform as well as beef steers under managed intensive grazing.

**Key Words:** grazing, Holstein, beef

## Horse Species

**768 The welfare of horses during transport.** J. Woods\*, *J. Woods Livestock Services.*

In the past three years, we have seen an increasing focus on the welfare of horses during transport. This trend is due to a combination of several factors. First, the closing of the three remaining horse slaughter plants in the United States has forced horses to be transported further distances to Canada and Mexico. Second, these closures and current economic restraints have increased the number of unwanted and abandoned horses throughout North America. And finally, several animal rights groups have launched campaigns focusing on the transport of all livestock. With the increase of horses being transported north, Canada has come under even more of a microscope regarding the welfare of the horses not only within our borders, but also those crossing into our country. This increasing scrutiny has brought the horse industry together and to the table to work with enforcement agencies, animal welfare groups, processors and transporters to help ensure our horses are being transported humanely and safely, no matter their destination. Out of this collaboration has also come a campaign to take responsibility for the welfare of horses during transport clear back to the farm through education and awareness to stop the transportation of unfit animals.

**Key Words:** transportation, horse, welfare

**769 Expression of intestinal monosaccharide transporters and the sweet taste receptor in equine small intestine.** D. Arora\*, M. Al-Rammahi, K. Salmon, C. Proudman, and S. Shirazi-Beechey, *University of Liverpool, Liverpool, UK.*

Glucose and sodium are co-transported by the Na<sup>+</sup>-glucose cotransporter, SGLT1, across the luminal membrane of intestinal absorptive cells (enterocytes). Na<sup>+</sup> and glucose exit the cell across the basolateral membrane of enterocytes by Na<sup>+</sup>/K<sup>+</sup>-ATPase and the monosaccharide transporter, GLUT2, respectively. Co-transport of water along with Na<sup>+</sup> and glucose accounts for 50% of the total water absorption across the intestinal luminal membrane. It has been shown that expression of SGLT1 is upregulated in response to increased luminal monosaccharide concentration. This upregulation is achieved through a signalling pathway initiated by the gut sweet taste receptor. Aim: To determine if the gut sweet taste receptor and the signalling elements involved in SGLT1 upregulation are expressed in equine intestine. Intestinal tissue samples from 8 horses, maintained on either a forage pasture or grain based diet, and euthanased for conditions other than intestinal disease were used. Histological examination confirmed the integrity of the tissue. Using immunohistochemistry with antibodies to equine SGLT1 and GLUT2, it was shown that, in all dietary conditions, SGLT1 is expressed on the brush border and GLUT2 on the basolateral membranes of entire villus enterocytes indicating that the transcellular route for absorption of glucose in equine intestine is accomplished by lumenally located SGLT1 and basally residing GLUT2. Furthermore, utilising