

Forages and Pastures III

TH35 Grazing management effects on physical and nutritional characteristics of pastures. M. Haan, J. Russell*, and D. Morrical, *Iowa State University, Ames.*

Cattle grazing in riparian areas may contribute to sediment and nutrient loading of surface waters. A study was conducted to evaluate the effects of cattle grazing on physical characteristics and the nutrient composition of cool-season grass pastures. Six 12-ha cool-season grass pastures, each bisected by a 195-m stream segment, were assigned to one of three treatments: continuous stocking with unrestricted stream access (CSU), continuous stocking with stream access restricted to a stabilized crossing (CSR), and rotational stocking with stream access in a riparian paddock (RS). In 2005, 2006, and 2007 each pasture was stocked from mid-May through mid-October with 15 Angus cows, initial BW (mean±SE) 614±72, 577±53, and 621±56 kg, respectively. Forage sward height and mass, and the proportions of bare and manure-covered ground were measured monthly from open and congregation sites on the stream banks and at distances of 0 to 34 m, 34 to 68 m, and greater than 68 m from the stream bank. Forage samples were analyzed for IVDMD, CP, and phosphorus (P). Occurrence of bare and fecal-covered ground were greater ($P<0.05$) in congregation than open areas of pastures across all grazing treatments during most months. Forage mass on stream banks did not differ between grazing treatments, but was lesser ($P<0.05$) within the 34 m zone of CSU pastures than in CSR pastures. Sward height was inversely related to forage mass. Proportion of bare ground on stream banks did not differ between grazing treatments. Proportions of bare ground within 34 m of the stream in CSU pastures were greater ($P<0.05$) than the CSR or RS pastures in late summer of 2005 and 2006. Fecal cover was greater ($P<0.05$) on the banks and within 34 m of the stream in CSU pastures than CSR pastures in most months. Crude protein and P concentration and IVDMD of forage did not differ between treatments. Forage characteristics and ground cover in the riparian area of a rotationally stocked pasture were similar to an ungrazed riparian buffer indicating that improved grazing management practices may be able to reduce negative impacts of cattle on surface water quality while still allowing use of riparian areas for cattle production.

Key Words: Water Quality, Forage Quality

TH36 Grazing management effects on selected stream bank characteristics and erosion. M. Haan¹, J. Russell*¹, and J. Kovar², ¹*Iowa State University, Ames*, ²*USDA-ARS, Ames, IA.*

Cattle grazing in riparian areas may contribute to sediment and nutrient loading of surface waters. A study was conducted to establish the effects of cattle grazing on stream bank erosion. Six 12-ha cool-season grass pastures, each bisected by a 195-m stream segment, were assigned to one of three treatments: continuous stocking with unrestricted stream access (CSU), continuous stocking with stream access restricted to a stabilized crossing (CSR), and rotational stocking with stream access in a riparian paddock (RS). In 2005, 2006, and 2007 each pasture was stocked from mid-May through mid-October with 15 Angus cows, initial BW (mean±SE) 614±72, 577±53, and 621±56 kg, respectively. Stream bank erosion susceptibility score (0 = low susceptibility, 60 = high susceptibility) and stream channel morphology (based on image analysis at 10 transects per pasture) were determined pre-, mid-, and post-grazing in all years. Stream bank erosion was measured at ten transects per pasture using erosion pins. Exposed pin length was measured monthly

during the grazing season, and one month post-grazing in all years. At one location per pasture, bank erosion was also measured with ground-based LiDAR (Light Detection and Ranging) pre- and post-grazing in 2006 and 2007. Stream banks in CSU pastures had a greater ($P<0.05$) erosion susceptibility score than did CSR or RS pastures. Stream cross-sectional area decreased at a rate of 13.0 cm² per day, with no difference ($P>0.05$) between grazing treatments. Annual net erosion, as determined by erosion pins, averaged -5.3 (erosion), 0.1 (deposition), and -6.6 (erosion) cm in 2005, 2006, and 2007, respectively, and did not differ ($P>0.05$) between treatments in any year. Over the entire study period (May, 2005 through December, 2007) the rate of net soil erosion from stream banks averaged -0.01 cm of soil per day and did not differ ($P>0.05$) between treatments. Similar to erosion pins, no differences ($P>0.05$) in soil erosion between treatments when measured by LiDAR. Grazing management had little effect on stream bank erosion during three years of the study.

Key Words: Water Quality

TH37 Ingestive behavior of dairy cattle during the different grazing down process of palisadegrass subjected to rotational stocking. A. C. Ruggieri*¹, E. R. Januskiewicz¹, D. R. Casagrande^{1,2}, A. G. Pascoa¹, R. A. Reis^{1,3}, and M. J. R. Paranhos da Costa^{1,3}, ¹*São Paulo State University, Jaboticabal, São Paulo, Brazil*, ²*Fundação de Amparo a Pesquisa do Estado de São Paulo, São Paulo, Brazil*, ³*Conselho Nacional de Desenvolvimento Científico Tecnológico, Brasília, Distrito Federal, Brazil.*

This study aimed evaluate the effect of different herbage allowance (HA) in a rotational stocking on animal behavior and the relationship between time of grazing and sward height and patterns of herbage ingestion of dairy cattle on palisadegrass (*Brachiaria brizantha* cv. Marandu). The experiment was carried out at UNESP in São Paulo State, Brazil, from November 2005 to April 2006. Treatments were four HA (4, 7, 10 and 13% of LW) allocated in a complete randomized block design with three replications. Measurements were performed in five grazing cycles and the stocking density was calculated aiming at a paddocks occupation of the eight hours in one day, and 21 days of resting period. The response variables analyzed were: vertical height of the plants in each feeding station, animal behavior and patterns of animal movement and search for herbage. The method of analysis was the focal behavior. The bite rates were different due to differences on HA. The bite rate was highest at the third grazing cycle due to the increase in the sward height. On the second grazing cycle the animals concentrated the grazing in the stratum above 15 cm in the 4 and 10% HA. In the 13% HA the animals grazed a highest layer of plants, due to great available herbage mass. In the forth grazing cycle the grazing stratum increased with the increment of the sward height. In highest heights, the animals reduced the grazing time. In all the HA the animals grazed stratum superior to 15 cm above the soil. In the fifth cycle, with 4% of HA the animals concentrated the grazing in the stratum height above 20 cm and above 10 cm in the 7% and 13% HA. When the herbage mass is abundant, the competition among the animals is smaller providing a selective grazing. In superior sward heights the animals dedicate less time in the grazing activities as a consequence of the highest herbage mass.

Key Words: Animal Behavior, Herbage Allowance, Sward Structure

TH38 Behavior of steers grazing novel endophyte tall fescues in southern Arkansas. B. Stewart*¹, P. Beck¹, D. Singh², and S. Gunter¹, ¹University of Arkansas, Hope, AR, ²Barenbrug USA, Tangent, OR.

Calves grazing Kentucky-31 (KY-31) tall fescue often exhibit signs of fescue toxicosis caused by ergot alkaloids produced by fungal endophytes. These fungal ergot alkaloids enable the tall fescue to be highly persistent in harsh conditions. Performance of calves grazing Endophyte-free (EF) tall fescue is improved but plant persistence is reduced. Novel endophyte (NE) tall fescues combine the advantages of plant persistence with the increased animal performance of fescues not containing the endophytes. Eleven 0.81-ha pastures (Una silty clay loam) were sprayed with 4.7 L glyphosate/ha and no-till seeded with EF (Barcel, Barenbrug USA, Tangent, OR), NE (Jessup AR542, Pennington Seed, Madison, GA; and BAR FA BE 9301A, Barenbrug USA), and KY-31 tall fescues in the fall of 2005. Calves (n=33, BW= 227 ± 6.7 kg, n=3/ pasture) were used to evaluate animal grazing behavior once/hour from daylight to dark on one day per month. Due to a treatment x time x month interaction ($P < 0.01$), data were separated by month and reanalyzed. In January and March grazing was affected ($P < 0.01$) by time of day across treatments. Calves were observed grazing for 94.5% of the observations prior to 11:30 and 84.9% of the observations thereafter in January. In March calves were observed grazing for 87.2% of the observations prior to 11:30 and for 77.8% of the observations between 11:30 and 16:30. Calves grazed for 96% of the observations after 16:30 with the exception of 17:30 where there was a tendency ($P = 0.09$) for KY-31 calves to graze less than the others (72 vs. 97%). In 2007 calves were removed from EF (lack of forage) and KY-31 (heat stress). In May 2006, there was a treatment x time interaction ($P = 0.08$). At 6:30, KY-31 tended ($P = 0.09$) to graze less (75 vs. 100%) than the EF and NE calves. Calves in EF pastures grazed more ($P < 0.01$) than the others (100 vs. 89%) at 8:30. At 9:30, 100% of all calves were cooling. At 11:30, NE grazed less ($P < 0.01$) than the others (54 vs. 100%). At 16:30, EF grazed more ($P < 0.01$) than the others (100 vs. 52%). The results of this experiment indicate that calves on NE pastures grazed more frequently during the heat of the day and stayed on pasture longer into the summer when compared to KY-31 and EF fescue.

Key Words: Tall Fescue, Grazing, Behavior

TH39 Giving beef calves a choice of pasture-type influences behavior and weight gain. H. T. Boland*¹, G. Scaglia², and W. S. Swecker, Jr.³, ¹Virginia Polytechnic Institute and State University, Blacksburg, ²Iberia Research Station, LSU Agricultural Center, Jeanerette, LA, ³Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA.

A 38-d backgrounding study was conducted to determine the response of spring born Angus cross-bred steer calves (n=54, initial BW=228±1 kg) when grazing endophyte-free tall fescue (*Festuca arundinacea* Shreb.) or alfalfa (*Medicago sativa* L.) as single monocultures or paddocks of 50% fescue and 50% alfalfa (by area) as adjacent monocultures (F: A). Fescue and alfalfa paddocks were rotationally stocked at a rate of 3.1 steers/ha while F: A stocking rate was 4.5 steers/ha. Calves were fitted with pedometers that recorded percentage of time spent standing, lying, or active (walking), and the number of steps taken per day. The experiment was a randomized complete block design and the MIXED procedure was used to analyze the data with block as a random effect, paddock as the experimental unit, and day as the repeated measure.

Alfalfa paddocks were of higher CP ($P < 0.0001$) than tall fescue paddocks (24 vs 12 %, respectively). Alfalfa paddocks also had lower ($P < 0.0001$) NDF (36%) and ADF (24%) than tall fescue paddocks (62 and 33%, respectively). Calves grazing alfalfa were more ($P = 0.03$) active (5.0%) than F: A calves (4.1%) while those grazing tall fescue did not differ in activity level from other treatments (4.8%). Similarly, calves grazing alfalfa took more ($P = 0.02$) steps/d (3072) than F: A calves (2411), with calves grazing tall fescue taking an intermediate number of steps/d (2927). Calves grazing tall fescue spent less ($P = 0.003$) time standing and more ($P = 0.003$) time lying (48.0 and 47.3%, respectively) than calves grazing alfalfa (49.2 and 45.8%, respectively) or the F: A calves (50.7 and 45.2%, respectively). Calves grazing alfalfa had lower ($P < 0.02$) ADG (0.57 kg) than calves grazing tall fescue (0.79 kg) or F: A (0.83 kg). Providing calves with a choice of forages improved their performance over grazing alfalfa alone. Calves could be maintained at a higher stocking rate with numerically greater ADG when given a choice of forages compared to tall fescue alone.

Key Words: Grazing Behavior, Adjacent Monocultures, Pedometers

TH40 Tall fescue based forage systems supplemented with winter annuals for stocker cattle. B. T. Campbell*¹, A. E. Fisher¹, G. E. Bates¹, J. C. Riggins², F. N. Schrick¹, and J. C. Waller¹, ¹University of Tennessee, Knoxville, ²University of Tennessee, Springfield.

A four year study (2004-2007) was conducted at Highland Rim Research and Education Center near Springfield, TN to compare tall fescue (*Lolium arundinaceum* Schreb.) forage systems in which rye (*Secale cereale* L.)/ryegrass (*Lolium multiflorum* Lam.) was used to supply additional high quality forage to stocker cattle. Twelve 1.2-ha pastures were assigned to two cool-season forages and two forage systems with three replicate pastures each. Cool-season forage treatments were: (1) endophyte-infected (*Neotyphodium coenophialum*) Ky-31 tall fescue and (2) Jessup MaxQ™ tall fescue. The two forage systems were: (1) stockpiled tall fescue, supplemental feed (a blend of byproduct feeds formulated to provide energy and protein equivalent to tall fescue hay) during winter, spring growth tall fescue and (2) stockpiled tall fescue, rye/ryegrass during winter when available, spring growth tall fescue and rye/ryegrass. Forage systems containing rye/ryegrass were established by drilling 38 kg of rye and 6.8 kg ryegrass in a prepared seedbed in 0.4 ha of the allotted 1.2 ha pasture area. All pastures were clipped in late spring to assure vegetative growth. In late-November, four weaned beef steers were randomly allotted to each pasture based on age, weight, and breed and remained on pastures until mid to late June. Steers grazed rye/ryegrass when it reached average height of 20 cm and were removed at an average height of 8 to 10 cm. Forage heights before and after grazing of rye/ryegrass and the number of days grazing were recorded. When forage was unavailable or insufficient, cattle were fed a byproduct-based supplement. Animal weights were collected on two consecutive days at the beginning and end of the trial. Data collected at 14-d intervals included: steer weight, forage availability by clipping strips (2 per 0.4-ha pasture), and blood serum for prolactin. Data were analyzed using the MIXED procedure of SAS and differences determined at $P < 0.05$. Steers grazing Jessup MaxQ™ pastures gained more ($P < 0.05$) weight and had higher ($P < 0.05$) serum prolactin levels than those grazing Ky-31 regardless of presence of rye/ryegrass.

Key Words: Tall Fescue, Beef Cattle, Stockers

TH41 Efficacy of EndoFighter™ for steers grazing endophyte-infected tall fescue pastures during summer. R. Norman^{*1}, C. D. Lane, Jr.¹, S. S. Block², A. E. Fisher¹, B. T. Campbell¹, F. N. Schrick¹, and J. C. Waller¹, ¹University of Tennessee, Knoxville, ²ADM Animal Nutrition Research, Decatur, IL.

An 84-d grazing trial was conducted (Jun 14-Sep 7) near Spring Hill, TN 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 steers (267 kg) were used in a completely randomized design 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; and 3) Prototype mineral. Steers had free choice access to E+ grass, water and shade. Steers were weighed on d 0, 1, 21, 42, 63, 83, and 84. Initial and final weights were an average of the two beginning and ending weights, respectively. Data collected were initial, d 21, d 42, d 63, and final weights, and ADG (period 1 = d 1 to 21; period 2 = d 22 to 42; period 3 = d 43 to 63; period 4 = d 64 to 84; total = d 1 to 84). Blood serum was collected at d 0, 21, 42, 63, 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 and differences determined at $P < 0.05$. For all variables except behavior, contrasts were performed to compare Control to mineral supplements containing EndoFighter™ or Prototype. This trial was conducted during extreme heat (d 1-42 had $30 \text{ d} \geq 32^\circ \text{C}$; d 43-84 had $31 \text{ d} \geq 35^\circ \text{C}$ with $19 \text{ d} \geq 39^\circ \text{C}$) and drought conditions, thus forage was limited during the last 42 d of the trial and E+ hay was provided. Total ADG (kg) and average daily mineral consumption (g) were: 0.50, 134; 0.54, 147; 0.44, 116; for Control, EndoFighter™ and Prototype, respectively. Serum prolactin was not different ($P > .05$) among treatments for the entire trial. However, serum prolactin levels for EndoFighter™ were higher ($P < 0.05$) than Control at d 21 (26.0 vs. 10.1 ppb, respectively) and d 42 (58.9 vs. 30.8 ppb, respectively).

Key Words: Beef Heifers, Tall Fescue, EndoFighter™

TH42 Two year study on finishing beef cattle performance and forage characteristics 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. R. Kerth, and R. B. Muntifering, Auburn University, Auburn, AL.

A 2-yr grazing trial was conducted with ryegrass (RG; *Lolium perenne*), rye (R; *Secale cereale*) and oats (O; *Avena sativa*) as winter pasture for forage-finished beef. Replicate 1.42-ha paddocks (2 per forage) were established and stocked initially with 3 Angus × Continental crossbred steers per paddock (374 ± 5.5 kg initial BW in year 1 and 410 ± 7.0 kg in year 2). All steers had free-choice access to salt-mineral mix and water. Grazing was initiated on Jan 19 (84 d grazing season in year 1) and on Nov 27 (145 d grazing season in year 2) when average forage DM availability reached 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 every 2 wk during the trial. Stocking rates were adjusted using put-and-take steers to maintain forage in the vegetative stage. Evaluation of animal performance was discontinued when steers reached 530 kg. Average daily gain differed ($P < 0.05$) between years, but there was no animal × year interaction. In year 1, seasonal-

mean ADG (1.81 ± 0.03 kg/d) did not differ among treatments. In year 2, RG produced higher ($P < 0.05$) ADG (1.18 ± 0.06 kg/d) than did R (0.94 ± 0.06 kg/d), but ADG did not differ between RG and O (1.03 ± 0.06 kg/d). There was no year effect or year × treatment interaction for forage concentrations of CP and NDF. Rye contained more CP ($19.8 \pm 0.8\%$) than did RG ($17.4 \pm 0.8\%$), but %CP did not differ between R and O ($17.9 \pm 0.8\%$). Ryegrass had lower ($P < 0.05$) concentration of NDF ($40.0 \pm 1.4\%$) than did O ($46.3 \pm 1.4\%$) and R ($45.1 \pm 1.4\%$). Total gain/ha differed ($P < 0.05$) between years, but there was no year × treatment interaction. Year 1 had lower ($P < 0.05$) gain/ha (371 ± 17.0 kg) than did year 2 (556 ± 17.0 kg/ha). There were no differences in total gain/ha among forage sources in either year, however RG was superior than R but did not differ from O in year 2 in supporting ADG.

Key Words: Grazing, Finishing, Pasture

TH43 Effect of forage species during finishing on growth rate, final weight and carcass parameters from pasture finished cattle. J. P. S. Neel^{*1}, J. P. Fontenot², W. M. Clapham¹, S. K. Duckett³, E. E. D. Felton⁴, and W. S. Swecker, Jr.², ¹USDA-ARS-AFSRC, Beaver, WV, ²Virginia Polytechnic Institute and State University, Blacksburg, ³Clemson University, Clemson, SC, ⁴West Virginia University, Morgantown.

In 2005 and 2006, Angus-crossbred steers (n = 72; 431 ± 40 kg initial BW) were used to compare growth rate, final weight and carcass parameters from pasture-finished cattle grazing cool-season mixed (MP), alfalfa (AL), or pearl millet (PM) pastures during the final 44 d of finishing. Mixed pasture consisted primarily of bluegrass (*Poa pratensis* L.), orchardgrass (*Dactylis glomerata* L.), fescue (*Festuca* L.) and white clover (*Trifolium repens* L.). Steers were harvested on the same dates, across treatments, at a commercial meat plant. Forage species did not influence final weight (FW), marbling score (MS), quality grade (QG), rib fat (RF), kidney, pelvic and heart fat (KPH) or yield grade (YG). Forage species influenced ($P < 0.05$) ribeye area (REA) with PM being greater ($P < 0.05$) than MP and AL. There was a trend ($P = 0.06$) for forage species to impact carcass weight (CW) with PM tending ($P < 0.06$) to be greater than MP and AL. Year influenced REA and KPH with REA being greater ($P < 0.05$) in 2006 and KPH being greater ($P < 0.05$) in 2005. The interaction between finishing treatment and year was significant ($P < 0.05$) for finishing period ADG (ADG) and dressing percentage (DP). Year did not influence ADG for MP or PM while ADG was greater ($P < 0.001$) in 2005 than 2006 for AL. Pearl millet produced greater ($P < 0.05$) ADG than MP. In 2005, AL had equivalent ADG to PM but lower ($P < 0.05$) ADG than PM and MP in 2006. Year influenced ($P < 0.05$) DP in AL and PM, being greater in 2006 than 2005. Dressing percentage was greater ($P < 0.05$) for AL and PM than MP in 2006. Pearl millet and MP produced consistent ADG across years. Animal performance was improved with PM versus MP during both years and was greater than AL in 2006.

Key Words: Finishing, Pasture, Forage

TH44 Performance and carcass characteristics of the supplemented or not beef heifers grazing palisade grass (*Brachiaria brizantha*) on the rainy season. D. R. Casagrande^{1,2}, R. A. Reis^{*1,3}, A. C. Ruggieri¹, T. T. Berchielli^{1,3}, M. H. Moretti^{1,2}, J. F. de Mattos^{1,2}, and M. A. A. Balsalobre⁴, ¹São Paulo State University, Jaboticabal, São

Paulo, Brazil, ²Fundação de Amparo Pesquisa do Estado de São Paulo, São Paulo, São Paulo, Brazil, ³Conselho Nacional de Desenvolvimento Científico e Tecnológico, Brasília, Distrito Federal, Brazil, ⁴Bellman Nutrição Animal, Mirassol, São Paulo, Brazil.

This research evaluated performance (kg/d and kg/ha) and carcass characteristics of beef heifers (initial BW = 200 kg; 1/4 Saint Gertrudis × 1/4 Nelore × 1/2 Braunvieh) grazing palisade grass pastures from December 2006 to April 2007. Treatments were the factorial arrangement of three forage allowances (FA; 2.0, 2.5, 3.0 kg DM/kg BW) and two levels of supplementation (none, C; 0.3%BW/d, PS), distributed in a randomized complete block design with two replications. The PS ingredients were: cotton seed meal, citrus pulp, urea, Megalac[®], and mineral (26.0% CP, 81.0%TDN). Six tester heifers were stocked continuously in each experimental unit (1.0 ha). Desired FA was maintained using put-and-take heifers (BW = 230 kg). Average daily gain was 0.49 and 0.66 kg/d for C and PS (P<0.05), respectively; response to PS was greater (P<0.05) at the end of experimental period. Supplementation increased (P<0.05) gain per unit of land from 523 to 627 kg/ha. Forage allowance did not affect (P>0.05) ADG (0.48, 0.53, 0.60 kg/d for 2.0, 2.5, and 3.0 kg DM/kg LW, respectively). Gain per unit of land increased (P<0.05) from 502 to 647 kg/ha as FA increased from 2.0 to 3.0 kg DM/kg LW. Heifers supplemented with PS had larger (P<0.05) *longissimus dorsi* muscle area but fat thickness over the loin and rump were not affected. We conclude that supplementation increased ADG, gain per unit of land, and *longissimus dorsi* muscle area of beef heifers grazing palisade grass pastures in different forage allowances.

Key Words: Forage Allowance, Supplementation, Tropical Grass

TH45 Productivity, utilization and nutritive quality of dallisgrass (*Paspalum dilatatum*) as influenced by stocking density under continuous or rotational grazing. E. J. Bungenstab*, A. C. Pereira, J. C. Lin, J. L. Holliman, and R. B. Muntifering, Auburn University, Auburn, AL.

Information on dallisgrass (*Paspalum dilatatum*) under intensive grazing is limited. Therefore, we conducted a trial in which replicate 0.40-ha paddocks in a dallisgrass pasture were continuously grazed (CG), or replicate 0.40-ha paddocks were subdivided into either two 0.20-ha, three 0.13-ha or four 0.10-ha cells and rotationally grazed (RG). Within RG treatments, 0.20-, 0.13- and 0.10-ha cells were grazed for 7 d followed by 7, 14 or 21 d rest, respectively. Three Angus × Continental crossbred steers (initial BW, 354 ± 6 kg) were assigned randomly to each paddock initially, and cattle were weighed at 28-d intervals. Post-grazing residual forage DM and pre-grazing forage DM availability and quality were measured weekly in RG cells, concurrently with measurement of forage DM availability and quality in CG paddocks. One steer was removed from each paddock after 28 d because of persistent drought. Data were analyzed by the GLM/Least Squares Means procedure of SAS. Over the 84-d trial, total liveweight gain from the 0.10-ha cells (143 kg/ha) was greater (P = 0.08) than from 0.13-ha cells (63 kg/ha), but was not different from 0.20-ha cells (111 kg/ha) or CG paddocks (108 kg/ha). Similarly, ADG was greater (P = 0.08) for RG steers from 0.10-ha (1.03 kg/d) than 0.13-ha (0.45 kg/d) cells, but was not different between steers from 0.20-ha cells (0.80 kg/d) or CG paddocks (0.78 kg/d). Mean forage concentration of CP was greater (P = 0.09) for 0.10-ha and 0.13-ha than 0.20-ha cells and CG paddocks. Forage concentration of NDF was lower (P = 0.03) for 0.13-ha cells than CG paddocks, and ADF concentration was lower (P = 0.07) for CG paddocks, 0.10-ha and 0.13-ha cells than

0.20-ha cells. Mean forage DM availability was greater (P = 0.03) for the 0.20-ha, 0.13-ha and 0.10-ha cells (2819, 2587 and 2462 kg/ha, respectively) than CG paddocks (1793 kg/ha), and mean residual forage DM following grazing in the RG cells (2,172 kg DM/ha) was not different from the CG paddocks. Results indicate that intensive RG management of dallisgrass has potential for increasing forage productivity while maintaining nutritive quality compared with CG.

Key Words: Dallisgrass, Rotational Grazing, Stocking Density

TH46 Supplementation with different levels and sources of energy for steers on *Panicum maximum* Jacq cv Tanzânia pasture: forage availability, morphological composition and nutritive value. M. C. Ar. Santana*¹, V. P. B. Euclides², and A. B. Mancio³, ¹Universidade Estadual Paulista, Jaboticabal, São Paulo, Brazil, ²Empresa Brasileira de Pesquisa Agropecuária - Embrapa, Campo Grande, Mato Grosso do Sul, Brazil, ³Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil.

Tropical forages are the primary base of the bovine production system and supplementation strategies contribute to improved utilization. This experiment was carried out to evaluate the forage mass, morphological composition, and nutritional value of *Panicum maximum* Jacq. cv Tanzânia, and the influence of supplementation with different levels and energy sources on animal performance. The experiment was conducted from July 22 to October 21, 2005, on guineagrass pasture fertilized with two levels of N (150 and 300 kg of N/ha/yr). Forty-eight crossbred steers, average age = 12 mo, were used in a completely randomized design of a 2×3 factorial treatment arrangement (2 N levels and 3 supplements), with four replications. The supplements were: a) mineral salt, and supplementation at 1% of LW with the following supplements, b) 41.1% corn, 49.5% soybean meal, 2.5% calcium carbonate, 0.6% mineral salt, 6% NaCl and 0.06% of rumensin; c) 24.3% soybean meal, 24.3% soybean hulls, 48% soybean seed, 2.5% calcium carbonate, 0.6% of mineral salt, 6% NaCl and 0.06% of rumensin. There were no treatment interactions (P>.63) for forage variables of that were evaluated. The supplements did not influence the morphological composition (P>.43), mass (P>.45) or nutritional value (P>.06) of the forage. The steers supplemented with 1% LW performed better (P<.01) than those supplemented with mineral salt. However there was no effect (P>.14) of energy source, being on average, 500, 960 and 1,000 g/steer/d for supplement a, b and c, respectively. The fertilizer N level influenced the CP (P<.05), in vitro organic matter digestibility (P<.05) and mass (P<.02) of forage which were higher for the highest level of fertilization. In spite of variation in its composition and available forage, the guineagrass pasture was able to maintain, throughout the dry season, a reasonable nutritional value.

Table 1. Least square means for forage mass (FM), crude protein (CP), in vitro organic matter digestibility (IOMD) of guineagrass fertilized with 150 (N150) and 300 (N300) kg/ha.

	N150	N300	Pr>F
FM (kg/ha of DM)	2320 (190)	3017 (222)	0.02
CP (%)	7.1 b (0.27)	9.0 a (0.32)	0.05
IOMD (%)	51.0 b (1.13)	57.4 a (1.35)	0.05

Means followed by different letters in the same row are different by Tukey's Test (P<0.05). Values between parentheses represent the standard means error.

Key Words: Levels of Nitrogen, Feed Supplementation, Forage Mass

TH47 Monensin and *Saccharomyces cerevisiae* as additive for beef heifers grazing *Brachiaria brizantha* cv. Marandu. L. M. Abaker Bertipaglia^{1,3}, G. M. Peruca de Melo¹, A. Prates e Oliveira^{1,3}, R. Andrade Reis^{*1,2}, T. T. Berchielli^{1,2}, A. S. Ferraudo^{1,2}, E. Braga Malheiros^{1,2}, and L. Abaker Bertipaglia¹, ¹São Paulo State University, Jaboticabal, São Paulo, Brazil, ²Conselho Nacional de Desenvolvimento e Tecnológico, Brasília, Distrito Federal, Brazil, ³Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, Brasília, Distrito Federal, Brazil, ⁴Fundação de Amparo à Pesquisa do Estado de São Paulo, São Paulo, São Paulo, Brazil.

This trial was conducted to evaluate protein supplementation with additives on performance of heifers (Santa Gertrudez, Brahman, Nelore) maintained in palisade grass pasture. The experiment was performed during the transition from rainy to dry season (P1-March to June) and in the dry period (P2-July to September). The supplements were: mineral (M); protein supplement (PS); PS plus monensin (PSM, 137mg/kgDM); PS plus yeast (PSY, 43×10⁶CF/kgDM); and PS plus monensin and yeast (PSMY). Supplementation levels were 0.4% BW in P1, and 0.5% BW in P2. Forage quantity and quality were evaluated in addition to total DM, intake and total animal weight gain (TWG). The data were analyzed as a randomized block design with repeated measures. Pasture total herbage mass, green dry matter mass, and leaf proportion decreased after June (beginning of P2). Forage quality (cell wall, N and in vitro organic matter digestibility) in extrusa samples changed little during the periods. During P1, SPM heifers had the lowest forage intake (1.8%BW); the other treatments averaged 2.0%BW. However, in P2 all supplement groups had lower forage intake (average 1.5%BW) than M (2.0%BW). The additives PSM, PSY and PSMY increased supplement intake (0.5%BW) compared to PS (0.4%BW). Protein supplementation increased TWG (37.1 and 47.0kg/period, P1 and P2), compared to the animals of the M supplementation (24.0 vs 22.7 kg/period, P1 and P2). The PSM group gained more TWG (40.7kg) than PSY (30.9kg) in P1; however in P2 the additives did not affect the TWG. Animal performance was associated with forage green DM mass, green and died proportions. Extrusa sampling methodology was not a good approach to evaluate the supplementation effects in this trial.

Key Words: Intake, Supplementation, Tropical Grass

TH48 Effects of rumen degradable protein supplementation on forage intake and digestibility of early weaned beef calves consuming stargrass hay and receiving soybean hull supplementation. T. Saraiva¹, J. M. B. Vendramini^{*1}, L. E. Sollenberger², U. Inyang¹, R. Farias¹, and J. D. Arthington¹, ¹University of Florida, Ona, ²University of Florida, Gainesville.

The objective of this study was to evaluate the effects of different levels of rumen degradable protein supplementation, on forage intake and digestibility of early weaned calves consuming stargrass (*Cynodon nlemfuensis*) hay and receiving 0.85% BW soybean hulls supplementation. The experiment was conducted at the Range Cattle Research and Education Center, Ona, FL from 4 June 2007 to 7 July 2007. Calves were weaned on 6 Jan 2007 at an average age of 84 d. They grazed annual ryegrass (*Lolium multiflorum*) pastures and were moved to a stargrass pasture on 5 May 2007. The treatments were three levels of rumen degradable protein supplementation, soybean meal (SBM, 35% RUP 65% RDP), a 50:50 mixture of SBM-soyplus[®] (modified expeller soybean meal, 60% RUP 40% RDP), or soyplus[®], supplemented at

0.15% BW. Three early weaned steers (160±18 kg BW) were used. The statistical design was a latin square 3 x 3, 3 treatments and 3 periods (10 d adaptation, and 7 d data collection). Ground stargrass hay (11% CP, 51% IVOMD) was offered daily and adjusted to allow 10% refusals. Daily offered forage and refusals were weighed, and subsampled for DM determination. Total feces production was collected, placed in aluminum pans, and dried at 60°C for diet apparent digestibility determination. There was no difference (P>0.10) in forage DM and total DM intake among treatments. Forage DM and total DM intake were 2.2±0.1 and 2.9±0.1 % BW respectively. In addition, there was no effect of different levels on rumen degradable protein supplementation on diet apparent digestibility, 57.5±2.5 %. In conclusion, it is unlikely that rumen degradable protein supplementation at the levels tested in this study will improve performance of early weaned calves that are being fed soybean hulls while grazing warm-season grasses pastures during the summer in Florida.

Key Words: Early Weaned Calves, Forage Intake, Stargrass

TH49 Effect of urea inclusion and cooking time on intake of blocks containing greasy cottonseed meal by beef cows. T. A. Wickersham^{*1}, F. M. Rouquette², J. E. Sawyer¹, and R. O. Dittmar, III¹, ¹Texas A&M University, College Station, ²Texas AgriLife Research, Overton, TX.

One hundred pregnant, spring-calving beef cows (body condition score (BCS) = 5.2 and BW = 574 kg) were used to evaluate intake of cooked molasses protein supplements. Cows were stratified by BCS and BW, and randomly assigned to 1 of 12 dormant Tifton 85 bermudagrass pastures from October 1 through November 2. Pastures were randomly assigned to receive a block type (3 pastures per block type). All blocks contained 25% greasy cottonseed meal (a byproduct of the biodiesel industry, 30% CP), but differed in urea content and length of cooking. Blocks contained 0 (N) or 20 equivalents of CP from urea (U) and were cooked for a standard time to achieve regular hardness (R) or for an extended time to increase hardness (H) in a 2 × 2 factorial arrangement to yield NR, NH, UR, and UH. Blocks were weighed and hardness measured with a penetrometer 3 times weekly to determine intake and block hardness. Cow BW and BCS were recorded on d 0 and d 33. Cow data were analyzed as a completely random design with pasture as the experimental unit. Block hardness and disappearance were evaluated as repeated measures with pasture as the subject. Block hardness was influenced by the interaction between urea inclusion and cook time (P = 0.01). Blocks without urea were hardest regardless of cook time (NR = 8.3, NH = 8.1 kg/cm²); including urea softened blocks, but increasing cook time increased hardness (UR = 4.57, UH = 5.34 kg/cm², SE = 0.16). A cook × urea × day interaction existed (P = 0.03) for block intake, driven by greater intake (P < 0.03) of UR than all other block types from d 7 to 19. Block intake was influenced by the interaction between urea inclusion and cook time (P = 0.01). Urea inclusion increased intake, but longer cook time reduced intake of urea containing blocks by 44% (P < 0.01) while longer cook time resulted in only numerical reductions in intake of N blocks (1.06, 0.59, 0.46, 0.35 ± 0.05 kg/d; UR, UH, NR, NH, respectively). Block type did not result in significant BCS changes; however, including urea tended (P = 0.07) to increase BCS change (U = 0.22, N = -0.28). Similarly, BW change was not affected by treatment (P > 0.21), but increased for all treatments during the study.

Key Words: Protein, Supplement, Self-Fed

TH50 Effects of three levels of rumen degradable protein supplementation on performance of early weaned calves grazing stargrass and receiving soybean hulls. T. Saraiva¹, J. M. B. Vendramini^{1*}, L. E. Sollenberger², U. Inyang¹, R. Farias¹, and J. D. Arthington¹, ¹University of Florida, Ona, ²University of Florida, Gainesville.

Warm-season grasses have reduced concentrations of CP fraction A, rapidly degradable in the rumen, and rumen degradable protein may be a limiting factor on performance of early weaned beef calves grazing warm season grasses. The objective of this study was to evaluate the effects of different levels of rumen degradable protein supplementation on performance of early weaned calves grazing stargrass (*Cynodon nlemfuensis*) pastures and receiving 0.85% BW of soybean hulls. Calves were weaned on 6 Jan. 2007 at an average age of 84 d. They grazed annual ryegrass (*Lolium multiflorum*) pastures until 5 May 2007, when they were moved to experimental pastures where they remained until 22 Aug. 2007. The treatments were three levels of rumen degradable protein supplementation, soybean meal (SBM, 35% RUP 65% RDP), a 50:50 mixture of SBM-soyplus[®] (modified expeller soybean meal, 60% RUP 40% RDP), or soyplus[®], supplemented at 0.15% BW, and distributed in a randomized incomplete block design. Treatments SBMSP and SP were replicated three times and SBM two times. The experimental units were 0.51-ha pastures, each divided into two paddocks for rotational stocking (14-d grazing and 14-d rest period). Four calves were assigned to each pasture. Every 28 d, calves were weighed and average daily gain calculated. Herbage mass was measured every 14 d using the disk plate meter methodology. Hand plucked samples were collected every 14 days and were analyzed for CP and IVOMD. There was no difference ($P \geq 0.10$) in forage CP (11%), IVOMD (56%), herbage mass (1880 kg/ha), and herbage accumulation (99 kg/ha/d) among treatments. Calves average daily gain did not differ among treatments (0.56 kg/d). The levels of rumen degradable protein treatments tested in this study did not improve performance of early weaned calves grazing stargrass and receiving soybean hulls. It is likely that soybean hulls supplementation supplied the RDP required by early weaned calves grazing stargrass and affected the response of the rumen degradable protein treatments.

Key Words: Early Weaned Calves, Stargrass, Rumen Degradable Protein

TH51 Comparing mathematical models to estimate *in vitro* gas production kinetic parameters of the forage consumed by grazing cattle. M. Murillo-Ortiz, M. A. Cerrillo-Soto*, E. Herrera-Torres, O. Reyes-Estrada, A. Juárez-Reyes, G. Nevárez-Carrasco, and E. Ávila-Rodríguez, *Universidad Juárez del Estado de Durango, Durango, Dgo. México.*

The goodness-of-fit test of three mathematical models: Mitscherlich (M1), McDonald (M2) and Orskov and McDonald (M3) to describe the kinetic parameters of *in vitro* gas production from forage selected by grazing cattle was evaluated. Extrusa samples from four steers were incubated in 100 ml calibrated glass syringes. Gas production measures overtime were fitted to the models. The residual mean square (RMS) and the mean square of predicted error (SMPE) were used as selection criteria. The NLIN procedure NLIN (SAS, 2003) was utilized to estimate the kinetic parameters and to evaluate the goodness-of-fit of the models. The parameters and the statistical criteria were then analyzed in a completely randomized design. Means were compared using Tukey's test. The gas produced from the soluble fraction **a** (ml/500 mgDM) was different among models ($P < 0.05$). Values ranged from

-12.2 with M3 to 0.709 with M1. The highest value ($P < 0.01$) for the gas produced from the insoluble but slowly degradable **b** (ml/500mgDM), was recorded with M1 (97.4 ml/500mgDM) and the lowest with M3 (60.5 ml/500mgDM). The potential gas production **a+b** was similar in M2 (100.5ML/500mgDM) and ($P > 0.05$) M1 (98.1ml/500mgDM); however, both values were higher ($P < 0.05$) than those obtained with M3 (48.3ml/500mgDM). The constant rate of gas production **kd** was highest ($P < 0.05$) with M1 (7.2 % h^{-1}) and the lowest with M3 (3.4 % h^{-1}). Regarding to the statistical criteria to evaluate the goodness-of-fit test of the models, both the RMS and the SMPE were different ($P < 0.05$) among models. M1 had the best goodness-of-fit with values of 7.5 for RMS and 20.3 for SMPE which were lower to those registered with M2 (RMS=15.0; SMPE=58.1) and with M3 (RMS=40.3; SMPE= 112.5). It is concluded that M1 had the best statistical performance to describe the kinetic parameters of *in vitro* gas production.

Table 1. Statistical criteria for fitting of the models to evaluate *in vitro* gas production kinetics

Models	Parameters					
	a	b	a+b	kd	I	lag
M1	0.70 ^c	97.4 ^a	98.1 ^a	7 ^a	2.74	
M2	4.75 ^b	95.3 ^a	100.5 ^a	4 ^b		4.3
M3	-12.2 ^a	60.5 ^b	48.3 ^b	3 ^c		
Means	5.8	84.4	82.3	4.6		
SD	1.8	2.6	3.3	0.01		
			Selection criteria			
Models	RMS	SMPE				
M1	7.6 ^c	20.3 ^c				
M2	15.0 ^b	58.1 ^b				
M3	40.3 ^a	112.5 ^a				
SD	0.27	0.91				

Means within columns with different superscript differ ($P < 0.05$); RMS=residual mean square; SMPE=square mean of predicted error; I and lag=lag phase (h); a, b (ml/500mgDM); kd (% h^{-1})

Key Words: *In Vitro* Gas, Models, Grazing

TH52 Comparison of techniques for estimation of forage dry matter intake by cattle grazing grass pastures. M. Undi*, K. H. Ominski, C. Wilson, and K. M. Wittenberg, *University of Manitoba, Winnipeg, Manitoba, Canada.*

Four techniques were compared for their ability to estimate forage DMI of grazing animals. In the Cage technique, the difference between forage clipped from 0.25m² quadrats inside and outside grazing cages after 12 to 20 days of grazing represented forage consumed by grazing animals. The second technique used n-alkane controlled release capsules to measure DMI of individual animals (n-alkane marker technique). The other two techniques were prediction equations; one utilized BW and ADG to estimate DMI (Minson equation) and the other related dietary net energy concentration and BW to DMI (Net Energy equation). The four methodologies were applied to a three-year study evaluating liquid hog manure on the productivity of grass pastures. The study utilized steers of a relatively uniform body size on six continuously-grazed grass pastures. When individual animal intakes were compared, the Net Energy equation estimated lower ($P < 0.05$) DMI than the Minson equation, with the n-alkane marker technique being intermediate. Dry matter intake (mean±SD, kg d⁻¹) was 5.3±0.76, 7.3±0.53, and 6.5±2.58 for the Net Energy equation, Minson equation, and n-alkane marker

technique, respectively. Dry matter intake estimated by the Cage technique averaged $17.5 \pm 11.61 \text{ kg d}^{-1}$ and was higher ($P < 0.05$) than estimates from the other techniques. Dry matter intake estimates from different techniques were ranked ($P < 0.05$): Cage technique > Minson equation > n-alkane marker technique > Net Energy equation. The DMI estimates generated by the Cage technique had the largest coefficient of variation, with extreme values representing a DMI range from 0.3 to 15.2% BW. The strongest correlation ($r = 0.48$; $P = 0.0001$) in DMI estimates was between the Net Energy and Minson equations due to the inclusion of BW as a component in both equations. The n-alkane marker technique and prediction equations produced repeatable DMI estimates. These results suggest that prediction equations can be useful for rapid DMI estimation and that the n-alkane marker technique may be more suitable when a wide range of pasture conditions are expected over the course of the evaluation period.

Key Words: Grazing Cages, N-Alkanes, DMI

TH53 An alternative method to assess 24h ruminal in vitro neutral detergent fiber digestibility. J. P. Goesser*, P. C. Hoffman, and D. K. Combs, *University of Wisconsin, Madison*.

Run to run variance due to the inconsistent nature of rumen fluid inoculum confounds comparisons of forage *in vitro* NDF digestibility (NDFD) analyzed in different repetitions or laboratories. Our objective was to determine if priming rumen fluid and allowing it to produce a standard amount of gas before inoculating samples improved assay repeatability. In two experiments, we compared run to run variance of NDFD estimates between two modified Goering and Van Soest (1970) *in vitro* assays. In both assays, dried, ground (1mm) alfalfa samples (0.5 g) sealed in Ankom F57 bags were placed in 125 ml Erlenmeyer flasks and incubated with Van Soest *in vitro* media and 10 ml of rumen fluid. In experiment 1, rumen fluid was collected from a cannulated cow fed a high forage diet and prepared one of two ways; rumen fluid was either used immediately after it was collected and strained through cheese cloth (GVA), or strained fluid was combined with buffer, reducing solution and 12.5mg cellulose/ml rumen fluid and allowed to produce 0.3ml gas/ml rumen fluid prior to inoculation (RPA). The assay was repeated 5 times, with 13 samples per method. In experiment 2, inoculum was prepared one of three ways; RPA, GVA except rumen fluid was collected and pooled from two cows (GVP), or RPA with fluid pooled from 2 cows. The *in vitro* assays were repeated 5 times with 8 samples per method. NDF was analyzed using Ankom²⁰⁰ forage fiber analyzer and 24h NDFD was determined as: $\text{NDFD (\% of NDF)} = 100 \times [(\text{NDF}_{0\text{h}} - \text{NDF}_{\text{residue}}) / (\text{NDF}_{0\text{h}})]$. Data for each experiment were analyzed using a mixed model procedure and repetition sum of squares for each technique were determined and compared with an F-test to assess technique repeatability. In both experiments rumen fluid priming significantly reduced rep sums of squares, 51.2 v. 503 and 23.3 v. 164, compared to the respective GVA or GVB. However priming significantly decreased NDFD values, 22.5 v. 24.8 and 23.9 v. 26.6%, compared to GVA and GVB, respectively. Priming rumen fluid with cellulose improved ivNDFD assay precision, but depressed ivNDFD.

Key Words: In Vitro, NDF Digestion, Methods

TH54 Improvement of the rumen fluid priming method for measuring in vitro NDF digestibility. J. P. Goesser*, P. C. Hoffman, and D. K. Combs, *University of Wisconsin, Madison*.

Recently we developed an alternate method to assess 24h *in vitro* NDF digestibility (ivNDFD) based on priming rumen fluid inoculum. Priming rumen fluid inoculum with cellulose improved ivNDFD assay repeatability but depressed ivNDFD means. Our objective in this study was to determine if priming with a mixture of carbohydrate and urea would affect ivNDFD mean and variance. Three modified Goering and Van Soest (1970) ivNDFD assays were evaluated over 24, 28, 48, 54, and 72h using dried, ground (1mm) alfalfa or wheat straw (0.5g) sealed in Ankom F57 forage fiber bags. Bags were placed in 125ml Erlenmeyer flasks and incubated with Van Soest media and 10 ml of rumen fluid. Rumen fluid was collected prior to feeding from two cannulated cows fed a high forage diet and was prepared in one of three ways; pooled rumen fluid was strained and used immediately to inoculate flasks (GV); strained, pooled fluid was combined with buffer, reducing solution and 0.125mg primer/ml rumen fluid and allowed to produce 0.3ml gas/ml rumen fluid prior to sample inoculation (CG); CG method without the primer mixture (UN). The assay was repeated 5 times, with 5 time points and 2 subsamples/time point/method. Neutral detergent fiber was analyzed using an Ankom²⁰⁰ forage fiber analyzer and NDFD was determined as: $\text{NDFD (\% of NDF)} = 100 \times [(\text{NDF}_{0\text{h}} - \text{NDF}_{\text{residue}}) / (\text{NDF}_{0\text{h}})]$. Results were analyzed using a mixed model procedure, and data were subset by method to obtain repetition sum of squares, which were compared with an F-test to assess method repeatability. The ivNDFD rate (%/h), extent (% NDF), and lag time (h) did not differ between the methods (6.47, 47.4, 10.6 and 4.67, 45.2, 12.3) for alfalfa and straw respectively. Rep sums of squares was reduced with CG compared to GV (19 v. 228, $P < 0.018$), however mean NDFD estimates were similar (35.51 v. 35.94). These results suggest the modified ivNDFD method using rumen fluid primed with a mixture of carbohydrate and urea reduced run to run error and resulted in similar estimates of NDFD as the modified Goering and Van Soest method.

Key Words: In Vitro, NDF Digestion, Methods

TH55 Comparison of means and run to run variation of in vitro NDFD between two labs using different in vitro NDFD methods. J. P. Goesser*, L. M. Bauman, P. C. Hoffman, and D. K. Combs, *University of Wisconsin, Madison*.

This study compared the results and precision of a modified *in vitro* NDFD assay (CG), run in our research lab, to a modified Goering and Van Soest (1970) ivNDFD assay (COM) run at the UW-Marshfield Soils & Forage Laboratory (Marshfield, WI). Nine dried, ground (1mm) forage samples were evaluated in duplicate in three repetitions for 24, 30, and 48h ivNDFD by both laboratories, using a coded design where neither laboratory technician could identify the samples. The method in our research lab was: forage samples (0.5g) sealed in Ankom F57 forage fiber bags, were placed in 125ml Erlenmeyer flasks and incubated with Van Soest media and 10ml of rumen fluid. Rumen fluid inoculum was collected prior to feeding from two cannulated cows fed a high forage diet and was combined with buffer, reducing solution and 0.125mg priming mixture/ml rumen fluid and allowed to produce

0.3ml gas/ml rumen fluid prior to inoculation. The primer consisted of a mixture of carbohydrate and NPN substrates. NDF was analyzed using an Ankom²⁰⁰ forage fiber analyzer. The procedure at Marshfield was: forage samples (0.5g) were weighed into 125ml Erlenmeyer flasks and incubated with Van Soest media and 10ml of rumen fluid. Rumen fluid was from a cannulated cow fed a high forage diet. Samples were inoculated immediately after collecting rumen fluid. Feed and residual NDF was analyzed using the Van Soest method (<http://uwlab.dyndns.org/marshfield/>). In both labs, NDFD was determined as: $\text{NDFD (\% of NDF)} = 100 \times [(\text{NDF}_{0\text{h}} - \text{NDF}_{\text{residue}}) / (\text{NDF}_{0\text{h}})]$. Results were analyzed using a linear mixed model procedure, and repetition sum of squares were compared with an F-test to assess method repeatability. The rep sums of squares did not differ, but ivNDFD standard errors for CG and COM were 0.823 and 1.41, respectively. A rep by time interaction ($P < 0.001$) was evident for COM, which was not significant for CG. These data suggest the CG method, run in our lab, was more precise than the COM procedure run in a commercial setting across 24, 30 and 48h time points.

Key Words: In Vitro, NDF Digestion, Methods

TH56 Amount of sample NDF affects estimates of in vitro NDF digestibility. J. P. Goeser*, P. C. Hoffman, and D. K. Combs, *University of Wisconsin, Madison*.

The amount of forage sample dry matter is known to affect estimates of *in vitro* NDF digestibility (ivNDFD). The objective of this study was to determine if the amount of sample NDF also affects estimates of ivNDFD. *In vitro* NDFD of six forages (bm3 whole-plant corn and stover, normal whole-plant corn and stover, alfalfa silage, and wheat straw) were compared. Each forage was dried, ground (1mm), and weighed into Ankom F57 forage fiber bags to achieve 0.125, 0.25, or 0.5 g of NDF per sample bag. Sample dry matter weights ranged from approximately 0.15 to 1.5 g per bag. Samples were digested in duplicate using a modified ivNDFD assay for 0, 24, 30, or 48 h. Rumen fluid inoculum was collected and pooled from two cannulated donor cows. Inoculum was mixed with buffer, reducing solution and primed with a mixture of carbohydrates and nitrogen, and allowed to produce 0.3 ml gas/ml of rumen fluid mix prior to inoculating feed samples. NDF digestibility was calculated as: $\text{NDFD (\% of NDF)} = 100 \times [(\text{NDF}_{0\text{h}} - \text{NDF}_{\text{residue}}) / (\text{NDF}_{0\text{h}})]$ and data were modeled using SAS Proc Mixed. The model included fixed effects of NDF level, forage, time, and all interactions. Forage, time and NDF level all significantly ($P < 0.0001$) affected ivNDFD. As amount of sample NDF increased from 0.125 g to 0.5 g, ivNDFD decreased from an average of 39.78 to 28.03% of NDF across the three time points. Interactions were significant for NDF level and feed, feed and time, NDF level and feed and time, and tended to interact ($P < 0.059$) for NDF level and time. In conclusion, as the amount

of sample NDF increased, estimates of ivNDFD decreased for each forage. *In vitro* NDFD estimates were also affected by forage and time. These results suggest that differences in NDF digestibility due to factors such as forage maturity could be partially confounded by differences in the amount of sample NDF if forages are weighed into the *in vitro* systems by dry matter weight, rather than amount of sample NDF.

Key Words: NDF, In Vitro, NDF Digestion

TH57 Measures of acid detergent lignin recovery and evaluations of the 2.4 time lignin factor for estimating indigestible NDF. E. Raffrenato*, M. E. Van Amburgh, and P. J. Van Soest, *Cornell University, Ithaca, NY*.

The Cornell Net Carbohydrate and Protein System uses 2.4 times acid detergent lignin (ADL) in a ration with NDF to estimate indigestible NDF (iNDF) in forages (Chandler et al. 1980). Previous tests for nutritional uniformity indicated an average recovery of 86%. However, sintered glass filters with a 40 μm aperture might not achieve complete recovery of fine particles (Uden, 2006). The objectives of our study were to evaluate ADL recovery and to assess the ratio between ADL and iNDF after improved recovery of ADL in order to estimate iNDF. Thirty forage samples of various species and ADL content were analyzed for ADL content in Gooch crucibles of porosity of 40 μm , with or without glass microfiber filters (1.5 μm ; Whatman[®], 934-AH). The same samples were also fermented *in situ* for 16 d using bags of PPT monofilament fabric with porosity of 15 μm and an open area of 8.5% (Ankom Technology). The bags were inserted into a PVC tube and in the rumen of two fistulated dry cows. The same samples were also fermented for 16 d in the same bags in a Daisy Ankom System. Medium and rumen fluid were renewed every 4 d. All bags were analyzed for NDF after 16 d. Ratios between ADL and NDF, for estimation of iNDF, were back calculated with the iNDF obtained after the fermentations. Recovery of ADL varied among samples, but was generally higher using the filter paper. ADL recoveries were between 1 and 75% higher using the filter paper with higher recoveries for the lower ADL forages (corn silages and vegetative grasses). Long fermentations were consistent within specie for both *in-situ* and *in-vitro* procedures. The 2.4 factor was not constant and was impacted by the increased ADL recoveries. The observed ratio was higher in forages higher in ADL and NDF (2.4 to 4.2). Further, the observed ratio was lower in most corn silages and grasses and ranged from 1.4 to 2.5. The data suggest re-evaluation of the lignin procedure to improve recovery of lignin particles and the development of forage family and specie-specific equations for the estimation of the iNDF value.

Key Words: Lignin, NDF