256 Using simulations models to identify voids in knowledge of beef cattle/bermudagrass grazing systems in the South. D. H. Seman*, J. A. Stuedemann, S. R. Wilkinson, A. D. Lovell, A. J. Franzluebbers, and A. L. Dillard, *USDA-ARS, Watkinsville, GA.*

An experiment was conducted to associate grazing cattle productivity and performance with agroecosystem sustainability in the South. The study used 18 0.7-ha paddocks of Coastal bermudagrass on severely eroded soil. Nitrogen (N) was supplied to paddocks by either NH_4NO_3, poultry manure, or crimson clover. Two grazing pressures, high (H) and low (L), were based on the amount of above-ground forage, i.e., H pressure was 1000 to 1500 kg/ha and L was ≥2000 kg/ha with a differential of about 1000 kg/ha between grazing pressures. Grazing pressure was adjusted at 28-d intervals by put-and-take to equalize grazing pressure within treatments. Three Angus yearling steers were randomly assigned as tester steers to each paddock. Forage was measured to ground level at 28-d intervals. Steers were weighed at 28-d intervals. Soil measurements included bulk density, aggregate stability, carbon, N, phosphorus, and potassium at various depths. The GRAZE simulation model was used to simulate one year of the NH_4NO_3 treatment to determine grazing response at intermediate grazing pressures. GRAZE assumed that initial forage amounts and steer weights were identical for all stocking rates. Three intermediate rates were included between L and H. GRAZE calculated 896, 966, 1018, 998, and 818 kg gain/ha from L to H grazing pressure while actual gain/ha for L and H was 412 and 683 kg/ha. Estimated intake was 6515 and 8735 kg/ha as compared to GRAZE calculated intake 6835, 7229, 7585, 7807, and 7681 kg/ha from L to H. GRAZE overestimated gain while intakes were close to observed. GRAZE predicted that the optimum grazing pressure was between grazing pressures used in the study and raises questions of how to interpret soil response measurements between the grazing pressures used.

Key Words: Beef cattle, Model, Grazing

257 Soybean hulls plus undegradable intake protein as supplements to tall fescue hay for cattle exposed to cold. B. W. Hess*, E. J. Schollejegerdes, S. A. Coleman, A. Mowery, D. L. Lalman, and J. E. Williams, *University of Missouri, Columbia.*

Six multi-cannulated Holstein steers (average BW of 601 kg) were used in a split-plot designed experiment to evaluate the effects of dietary treatment on site and extent of digestion and serum insulin at thermoneutrality (20°C; 70% relative humidity) and during exposure to cold conditions (0°C; 55% relative humidity). Cattle consumed tall fescue hay without supplementation (CON), or with daily supplements (DM basis) of .2% of BW supplemental soybean hulls (SOH), or .2% of BW supplemental soybean hulls plus a combination of fish and corn gluten meal (50:50 mixture; 15% of the total supplement; UIP). Forage intake was held constant intentionally, but total intake increased ($P = .007$) due to addition of supplement to the forage diet. Supplemented steers had lower ($P < .10$) particulate passage rates (PPR) in the thermoneutral environment, but PPR increased ($P < .02$) in steers exposed to the cold environment. Likewise, ruminal fluid passage rates increased ($P = .01$) in the cold environment. Microbial OM and N flows to the duodenum were not affected ($P > .10$) by treatment or environment. Organic matter and N truly digested in the rumen were higher ($P < .08$) for supplemented steers than CON. Ruminal NDF digestion was greater ($P = .03$) for supplemented steers, but did not differ ($P > .10$) between SOH and UIP. Digestibility of OM in the lower tract decreased ($P < .10$) in the cold environment for SOH steers. Digestibility of N shifted from the small intestine to the large intestine in response to the cold, which allowed for greater ($P < .10$) OM and NDF digestibilities in the lower and total tract of steers fed UIP. Serum insulin decreased ($P < .01$) only at 12, 15, and 21 h for UIP in response to the cold conditions. Cattle consuming tall fescue hay and supplemental undegradable intake protein maintained nutrient digestion and metabolic status when exposed to cold conditions.

Key Words: Digestion, Insulin, Cold environment

258 Bermudagrass cultivar maturity effects on hay digestibility in steers. G. M. Hill[1]*, R. N. Gates[2], J. W. West[1], and P. R. Utley[1], *[1]Univ. of Georgia, Tifton and [2]USDA-ARS, Coastal Plain Exp. Sta., Tifton.*

Coastal (C), Tifton 78 (T78) and Tifton 85 (T85) meadows were staged to produce 4-wk- and 6-wk-old hays. In a 2 × 3 factorial trial, 30 beef steers (age = 9 mo; BW = 279 kg) were assigned to hay treatments [C, 4-wk (C-4) and 6-wk (C-6); T78, 4-wk (T78-4) and 6-wk (T78-6); T85, 4-wk (T85-4) and 6-wk (T85-6)]. Steers were individually-fed T85 hay free-choice for 14 d, and treatment hays for 14 d. Digestibility of OM (OM-DIG), CP (CP-DIG), ADF (ADF-DIG) and NDF (NDF-DIG) was determined (Cr_2O_3 bolused in capsules, 10 g/steer, d 4 to d 13; fecal samples d 10 to d 14). Hay DM, CP and NDF (%), respectively, were: C-4 = 90.2, 10.6, 78.6; C-6 = 89.9, 7.2, 80.1; T78-4 = 89.7, 9.2, 79.8; T78-6 = 89.8, 7.0, 80.6; T85-4 = 89.9, 9.2, 82.8; T85-6 = 90.1, 7.1, 83.8. The DMI was unaffected ($P > .10$) by treatments. The OM-DIG tended to be higher ($P < .14$) for T85, but OM-DIG and CP-DIG were reduced by maturity. Both ADF-DIG and NDF-DIG were higher ($P < .01$) for T85 than C, and both were affected by maturity. No cultivar × maturity interactions ($P > .30$) occurred. Hay cultivar and maturity affected digestion by steers.

	Cultivar				Maturity		
Item	C	T78	T85	SE	4-wk	6-wk	SE
DMI, kg/d	5.3	5.3	5.2	.2	5.3	5.3	.1
OM-DIG, %	47.8	51.0	54.3	2.2	53.8	48.3	1.8[b]
CP-DIG, %	36.0	34.4	33.2	3.2	41.7	27.4	2.6[a]
ADF-DIG, %	44.9	54.5	59.5	2.6[a]	56.8	49.1	2.1[b]
NDF-DIG, %	51.3	55.4	61.3	2.0[a]	59.7	52.3	1.6[a]

[a]Main effect difference ($P < .01$).
[b]Main effect difference ($P < .05$).

Key Words: Hay, Cynodon, Digestion

259 Variation in preference for morning or afternoon harvested hay in sheep, goats, and cattle. D. S. Fisher[1]*, J. C. Burns[1], and H. F. Mayland[2], *[1]USDA-ARS and North Carolina State University, Raleigh and [2]USDA-ARS, Kimberly, ID.*

Plants vary diurnally in concentrations of nonstructural carbohydrates (TNC) with highest levels observed in the afternoon. If ruminants prefer forages with higher TNC the preference for hays harvested within the same 24 h period may vary. Tall fescue was harvested six times in the vegetative stage. Harvests were paired with one hay cut at sundown (PM) and another the next morning at dawn (AM). This process was repeated 3 times resulting in 6 hays (Hay 1, August 20 PM; Hay 2, August 21 AM; Hay 3, August 21 PM; Hay 4, August 22 AM; Hay 5, September 20 PM; Hay 6, September 21 AM). The hays were field dried, baled, and chopped prior to feeding. Three experiments were conducted (Exp. 1, sheep; Exp. 2, goats; and Exp. 3,cattle) utilizing six animals in each case. Meals of each hay were first offered during an adaptation phase. In the experimental phase, each possible pair of hays (15 pairs) was presented for approximately 2.5 h. The order of presentation of the pairs was randomized. This design allowed statistical analysis by multidimensional scaling as well as by traditional analyses. Multidimensional scaling indicated that the animals were basing selection on a single criteria. In all three experiments, preference for PM hays was greater than for AM hays ($p<.01$) and that the preference for Hay 5 and 6 was greater than Hays 1, 2, 3, or 4 ($p<.01$). The effect of PM and AM cutting varied among experiments for Hays 5 and 6. In Exp. 1, no interactions were present ($p=.61$) and PM hays were preferred by sheep over AM hays in all cases. Goats (Exp. 2) did not distinguish between Hays 5 and 6 but the PM harvest was preferred in Hays 1, 2, 3, and 4 ($p<.01$). Steers (Exp. 3) did not prefer the PM harvest as strongly in the Hay 5 and 6 comparison as in Hays 1 and 2 or Hays 3 and 4 ($p=.02$). Shifting hay mowing from early to late in the day was effective in increasing forage preference.

Key Words: Feeding Preferences, Voluntary Intake

260 Grazing millet during late fall-early winter that was harvested and stored in windrows: An alternative to feeding baled millet in Eastern Colorado. C. L. Munson*, J. C. Whittier, and D. Schutz, *Colorado State University, Ft. Collins*

Forty-four pregnant cows (567 kg, 5.4 BCS) were randomly allotted to windrow grazing or bale feeding to determine if cow performance would differ between the treatments. Treatments were conducted from November 1 to December 20, 1996. Millet was planted in two fields in early June and harvested at the early milk stage. Alternate windrows were baled into small square bales at the time of harvest and bales were weighed to estimate forage amounts in the windrows. Bales and windrows were analyzed October 1 for nutrient composition to determine the amount of forage needed to meet the cows requirements. Field one (1.17 ha) had 10 grazed and 11 baled windrows and field two (4.62 ha) had 21 of each. Windrows were approximately 1 m wide and 20 cm high. Field two was divided into 3 sections (1.54 ha each) in order to support 6 cows/section. Field one was assigned 4 cows. Treatments were: 1) windrow grazing with forage allocation controlled to 13.6 kg·cow^{-1}·d^{-1} by moving a temporary fence every 3 days (TRT1) and 2) daily bale feeding of 13.6 kg·cow^{-1}·d^{-1} with three groups of six cows and one group of four cows confined in dry lots (TRT2). Cow weight and BCS were measured at the beginning of the study, at d 27, and at the end of the study. Change in weight and BCS were calculated from start to d 27 (PR1), d 27 to end weight (PR2) and start to end weight. Forage samples were collected every two weeks for later analysis. Weight loss was less during PR1 for TRT1 cows than for TRT2 cows (–.19 kg/d vs –.46 kg/d; P=.07, respectively) and BCS changes were not different (P=.77). During PR2, TRT1 cows lost weight, whereas TRT2 cows gained weight (–.27 kg/d vs .23 kg/d; P=.01, respectively) and BCS changes were not different (P=.19). Throughout the total study, there was no difference in weight change (P=.39) or BCS change (P=.22). By grazing windrows, similar cow performance was attained and the costs of baling and re-feeding were eliminated.

Key Words: Cows, Bales, Windrows

261 Rotational stocking of cool-season grass and legume pastures by beef cows with yearlings and/or hay harvest to remove excess forage. M. J. Hersom* and J. R. Russell, *Iowa State University, Ames.*

An experiment was conducted to compare cow-calf, stocker, hay and stockpiled forage production from cool-season grass and legume pastures managed by two systems. On May 1, 1996, 16 crossbred cow-calf pairs (507 kg, bcs 4.2) were allotted to four 4.05-ha smooth bromegrass-orchardgrass-birdsfoot trefoil (SB-OG-BT) pastures to graze 2.49-ha by rotational stocking (Hay system). First growth forage was harvested as hay from the remaining 1.56-ha on June 29. After 21 d, cows were allowed to graze the entire 4.05-ha of pastures until October 31. Simultaneous to the initiation of grazing in the hay system, 20 crossbred cow-calf pairs (514 kg, bcs 4.8) and 20 crossbred yearling steers and heifers (289 kg) were allotted to four 4.05-ha SB-OG-BT pastures to graze by rotational stocking for 41 d (Yearling system). Cows from this system strip-grazed replicated 6.08-ha tall fescue-red clover (TF-RC) or smooth bromegrass-red clover (SB-RC) pastures for 57 d. First growth forage was also harvested as hay from 4.56-ha in these fields on June 29. On August 9, yearlings were removed from SB-OG-BT pastures and cow-calf pairs were returned to SB-OG-BT pastures to graze until October 31. Yearlings were placed on a high grain diet in a feedlot and their performance was compared to that of nine similar yearlings placed in the feedlot on May 1. Dry matter yield and the concentrations of IVDDM, NDF, and ADF of forage available in either SB-OG-BT pastures or for cows grazing did not differ between management systems. Seasonal cow and daily calf weight changes did not differ between management systems. Post breeding body condition score increases were greater (P<.05), and calving intervals longer (P<.1) for cows on the hay system than the yearling system. Seasonal calf (P<.05) and growing animal (P<.05) weight gains from the hay and yearling systems were 187.8, 187.8 and 90.6, 132.74 kg/ha. Gross hay, net hay, and net total winter forage (P<.05) yields of the hay and yearling systems were 1216.5, 980.6, 980.6 and 1143.2, 1143.2, 3173.8 kg/ha. Total gains (kg/d) and stored feed intake (kg/d) of yearlings that had grazed or had been put in the feedlot to finish at low choice grade were 1.34, 7.21 and 1.84, 11.7.

Key Words: Beef cattle, Rotational stocking, Grass–legume forages

262 Beef cow/calf nutrition and performance responses to stocking rate on high elevation irrigated pastures. D. G. Eddington*, K. C. Olson, J. A. Walker, B. R. Bowman, B. Kent, H. Q. Winger, M. T. O'Riordan, and R. C. Rollim, *Utah State University, Logan.*

Our objective was to evaluate the influence of stocking rate (SR) on performance and nutrition of beef cattle grazing irrigated pastures. A grazing study was conducted during the summers of 1995 and 1996 at the Utah Agricultural Experiment Station at Panguitch. Vegetation on these pastures was primarily cool-season grasses, with the major species being quackgrass (*Agropyron repens*), Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and orchardgrass (*Dactylis glomerata*). Four SR ranging from to 6.2 to 16.8 and 4.2 to 10.6 AUM/ha in years one and two, respectively, were evaluated in an unreplicated design. Cattle were stratified by age, weight, and body condition score (BCS) to four groups that were randomly assigned to treatments. Performance variables measured at the beginning, middle, and end of each grazing season included body weight of cows and calves, BCS of cows, and milk production using the weigh-suckle-weigh technique. Diet quality was estimated using samples collected in the evacuated rumen of rumen-fistulated cows. Samples were collected during a two-week period following the beginning and middle performance measurement dates. Samples were analyzed for NDF, ADF, and crude protein content. As SR increased, cows gained less BCS (P=.03), calf weight was reduced (P=.04), but milk production increased (P=.01) Cow weight, cow BCS, cow ADG, and calf ADG did not respond (P=.47, .17, .46, .20, respectively) to SR. The period effect did not interact with stocking rate (P>.05) for any variable, but period was significant for BCS change (P=.0001), indicating that intercepts were different for the regression on stocking rate in each period. The intercept for BCS change in period one was .82 (P=.0001) but was not different from 0 in period 2 (P=.78). Crude protein decreased (P=.04) while NDF and ADF increased (P= .03, .04, respectively) as SR increased. Forage allocation, based on stocking rate, influenced the ability of cows to increase BCS and increased calf weight. This appeared to be mediated by the quality of the diet that the cattle could select.

Key Words: Grazing, Beef cattle, Diet quality

263 Patterns of gain and carcass quality of crossbred steers as affected by wintering on wheat or dormant native grass. S. W. Coleman* and W. A. Phillips, *USDA-ARS, Grazinglands Research Laboratory, El Reno, OK.*

The objective was to determine how forage quality during the winter influenced subsequent growth and carcass quality. Forty eight steers were randomly assigned within four sire breeds to two winter treatments and three slaughter groups for a serial slaughter experiment. The treatments were winter wheat or dormant native range pastures from December 12 to March 10 after which all steers grazed wheat pasture until May 27. Steers on native range received 1 kg/d 20% protein cubes. Following wheat pasture, 1/3 of the steers were slaughtered and the remainder finished for 45 or 90 days on a typical feedlot diet. Steers which were wintered on native range gained only –.03 kg/d whereas those which grazed wheat gained .71 kg/d (P < .01). During grazeout those wintered on native range made compensatory gains as compared to those wintered on wheat (1.02 vs .94 kg/d, respectively, P < .05), but did not fully recover the weight differential. Gains during finishing were not statistically different, but steers wintered on native pastures continued to gain 10% faster than those on wheat (1.49 vs 1.34 kg/d, respectively). Wheat pasture steers were heavier (P < .05) at slaughter and had higher marbling and carcass quality scores (P < .05) than those wintered on native. Angus were lighter (P < .05) than Charolais, Gelbvieh, or Red Poll at the end of wheat, but were similar (P > .05) to Gelbvieh at slaughter. Though not statistically significant, Angus steers gained less on forage but more in the feedlot than the continental breeds.

Key Words: Beef cattle, Compensatory gain, Wheat pasture

264 Protein source changes nutrient metabolism of two-year old range cows. L. A. Appeddu*, I. Tovar-Luna, J. E. Sawyer, J. S. Serrato-Corona, J. B. Richards, and M. K. Petersen, *New Mexico State University, Las Cruces.*

Three treatments [feeding high vs low vs no undegradable intake protein (UIP)] were imposed to evaluate metabolic changes in young postpartum cows under drought conditions. Fourteen, 2 yr-old crossbred cows grazing winter range were fed: (1) High Protein cube (HP; n=6), (2) Low Protein cube (LP; n=5), or (3) No Supplement (NS; n=4). Supplemented cows were individually fed 2 d/wk at a rate of 750 g/hd/d starting on April 1,1996 (11±3.4 d postpartum). Supplements were isocaloric and provided equal amounts of ruminally degradable protein (182 g/hd/d), with 256 vs 52 g additional protein as UIP in HP vs LP, respectively. On d 53±3.4 postpartum, an acetate tolerance test was conducted under field conditions. Serum samples were collected from indwelling jugular catheters at -1, 0, 5, 15, 30, 60, and 90 minutes postinfusion. Acetate half life was lower ($P=.07$) for cows fed high versus low UIP levels (38.4, 50.1, and 47.2±4.9 min for HP, LP, and NS, respectively). Serum urea nitrogen levels were higher in supplemented cows ($P<.01$) and in HP- over LP-fed cows ($P<.01$) (12.5, 10.6, and 5.1±.54 mg/dl for HP, LP, and NS). A time effect ($P=.06$) was detected; serum urea nitrogen decreased at 0, 5, and 15 min postinfusion and was elevated by 60 and 90 min. Serum glucose was numerically increased ($P=.15$) by supplementation, and did change overtime ($P=.05$) with lowest glucose levels detected at 0 and 5 minutes postinfusion. Supplementation minimized body weight loss ($P=.02$) and condition loss ($P=.09$) from d 11 to 54 postpartum, while numerically improving ($P=.23$) milk yield on d 50 postpartum (945, 809, and 705±111.8 g milk/4 h for HP, LP, and NS). Increased milk production combined with sparing of body reserves may result from improved acetate utilization and an increased supply of glucogenic amino acids via feeding extra protein in the form of UIP to young, postpartum cows.

Key Words: Protein, Supplementation, Lactation

265 Influence of lasalocid supplementation during late gestation and early lactation on body weight, condition score, and milk production in beef cows fed brome hay based diets. G. T. Wallace[1]*, J. S. Caton[1], and D. V. Dhuvetter[2], *[1]North Dakota State University, Fargo and [2]Farmland Industries, Inc, Kansas City.*

Thirty six pregnant crossbred (Angus × Hereford) beef cows were used to determine the influence of lasalocid on intake, BW change, condition score, and milk production during late gestation (experimental d 0 to 56) and early lactation (experimental d 84 to 127). Cows were fed using electronic head gates in an enclosed barn for a total of 127 d. There were for treatments with nine cows/treatment. Cows were offered a brome hay based diet (9.1 kg/hd daily; 8.3%CP). Diets were adjusted to provide either 85 or 100% of energy requirement with ground corn (1.4 or 2.5 kg and 1.9 or 3.0 kg for late gestation and early lactation at 85 and 100% of requirement, respectively). No differences (P>.10) were noted in cow BW between control and lasalocid fed cows on d 21, 28, 84, 112, and 127. Cow BW was lower (P<.03) in lasalocid fed cows at 42 and 56 d compared with controls. Cows fed 85% of requirement had lower (P<.10) BW at 42, 56, 98, and 127 when compared with cows fed 100% of requirement. Body condition scores were lower (P<.06) in 85 compared with 100% fed cows. Lasalocid had no influence on final body condition score. No differences (P>.10) were noted due to lasalocid in total milk production measured at experimental d 117 or 127. However, lasalocid fed cows at 100% of requirement had greater (P<.10) milk production at day 127 that those fed at 85%. These data suggest that lasalocid fed at 130 mg/hd daily has minimal influences cow performance and milk production.

Key Words: Cows, Lasalocid, Production

266 Shrink by stocker heifers fed different ionophores. K. P. Coffey*, E. B. Kegley, and D. S. Hubbell, *University of Arkansas, Fayetteville.*

Shrink represents an economic loss for both buyers and sellers of stocker cattle. Previous work has shown that lasalocid may reduce shrink in stocker cattle. This experiment was conducted to compare weight loss of stocker heifers fed either lasalocid or monensin with those fed no supplemental ionophore. Forty-eight weaned, crossbred heifer calves (212 ± .4 kg) were weighed without prior removal from feed and water on two consecutive d and allotted in a random stratified manner to 12 groups of four head each. The groups were then allocated randomly to receive .9 kg/d of corn-based supplements either without an ionophore (C), or containing lasalocid (L) or monensin (M) to provide 200 mg/d. Following allotment, heifers were placed on pastures containing predominantly tall fescue and fed their respective supplement for 12 d. On d 13, heifers were removed from pasture, placed in small pens without feed and water for a 24-h period, and weighed every 2 h through 12 h and again at 24 h. On d 24 of the study, heifers were weighed prior to and following a transport of approximately 7 h. On d 13, weights tended (P < .10) to be greater for heifers fed L and M than for those fed C at the time of removal from pasture (T0), and 6 and 12 h following T0. Weight change and % shrink of heifers fed L was greater (P < .05) at 6 h and tended (P = .05) to be greater at 12 h following T0 than that of heifers fed C and M. The greatest total shrink (kg, %, or %/h) occurred during the first 2 h following T0. Heifers fed L tended (P < .10) to have greater shrink (kg, %, and %/h) during this time than those fed C and M. Transit shrink was not affected by dietary treatment, but was numerically greater than the shrink that occurred during a 24-h holding period in pens without feed and water. Therefore, in this study, lasalocid had a negative impact on cattle shrink when heifers were held in pens without feed and water, but not when transportation was involved.

Key Words: Beef cattle, Shrink, Ionophore

267 Effect of volatile compounds on intake of alfalfa pellets by sheep. R. E. Estell*, E. L. Fredrickson, M. R. Tellez, K. M. Havstad, D. M. Anderson, and M. D. Remmenga, *USDA/ARS Jornada Experimental Range, Las Cruces, NM.*

Six experiments were conducted to examine influences of volatile plant compounds on intake. Compounds were selected based on apparent relationships of tarbush leaf surface chemistry and livestock herbivory in previous studies. Average concentration of selected compounds (C) was 100, 100, 5, 300, 25, and 100 μg/g of tarbush DM for camphor, limonene, *cis*–jasmone, β–caryophyllene, borneol, and α–pinene, respectively. During each experiment, 45 individually penned lambs were fed one of five treatments (multiples of C: 0X, .5X, 1X, 2X, or 10X) for five consecutive days. Treatments were applied to alfalfa pellets (.64 kg, DM basis), and intake was monitored during a 20 min interval each morning. Lambs were preadapted to handling procedures and pelleted diet (without treatments) for 10 d before experiments began. Lambs were maintained and fed (approximately 5% of BW) as one group except during 20 min tests. Borneol treatment resulted in intake differences ($P < .04$), with intake for the 2X treatment greater than 0X, 1X, and 10X treatments ($P < .10$). A treatment effect was also observed for α pinene ($P < .05$), with lower intake for the 10X treatment than 0X, .5X, or 1X treatments. Camphor tended to affect intake ($P < .08$), with lower intake for the 10X treatment than 0X or 1X treatments ($P < .10$). Although volatile compounds generally had little influence on intake patterns, reduced intake with increased α pinene (and a similar pattern for camphor) concentration suggests these monoterpenes may partially explain differential herbivory of individual tarbush plants by livestock.

Key Words: Intake, Sheep, Terpenes

268 The effect of dietary inclusion of halophyte *Salicornia bigelovii* Torr. on feedlot performance and carcass characteristics of lambs. M. S. Kraidees*, M. A. Abouheif, M. Y. Al-Saiady, A. Tag-Eldin, and H. Metwally, *King Saud University, Riyadh, Saudi Arabia.*

Sixty-three Najdi ram lambs (22.8 kg) were used to evaluate the effect of dietary inclusion of *Salicornia bigelovii* Torr by-products on feedlot performance, carcass characteristics and mineral and water intake. Either the dry stems or spikes of this seawater-irrigated halophyte were incorporated into complete diets at the rates of 10, 20 or 30% levels, replacing equal amounts of rhodesgrass hay (*Chloris gayana*). The lambs were randomly allocated to 7 dietary groups of 9 lambs each, and fed individually for 100 days *ad libitum*. Feeding salicornia stems up to 30% ,or spikes at 10%, did not affect DMI, compared to control (0% salicornia); however, the inclusion of spikes at levels above 10% decreased DMI. Feeding stems at 10 and 20% improved ADG (P<.05) by 10.6 and 4.8%, respectively, whereas feeding spikes at 20 and 30% decreased (P<.05) ADG by 20.2 and 23.9%, respectively, compared to control. Graded levels of either salicornia stems or spikes had no effect (P>.05) on empty body weight and dressing percentage, but linearly increased (P<.01) the percentages of kidneys and heart weights. Hot carcass weight decreased linearly (P<.05) with increasing levels of spikes. Carcass chemical composition was not influenced (P>.05) by salicornia inclusion, apart from a linear decrease for ether extract and increase for moisture% (P<.05) in lambs fed increasing levels of spikes. Daily sodium intake increased (P<.01) with increasing levels of salicornia in the diet. This, in turn, linearly increased (P<.01) daily water consumption (L. water/kg OM intake) by 9.5, 25.8 and 35.4% in lambs fed salicornia stems at 10, 20 or 30% levels, respectively. Corresponding increases in spike-fed lambs were 31.1, 50.5 and 71.1%, respectively, compared to control. This study indicates that up to 30% inclusion of stems, or 10% of spikes, of *S. biglovii* in the diet is beneficial in feeding growing lambs.

Key Words: Lambs, Salicornia by-products, Feedlot performance

269 Feed intake and digestion in steers consuming broiler litter harvested after one, three, or six broiler growing periods. Z. S. Wang[1]*, A. L. Goetsch[2], J. E. Rossi[1], and D. L. Galloway, Sr.[1], *[1]University of Arkansas, Fayetteville and [2]Dale Bumpers Small Farms Research Center, USDA, ARS, Booneville, AR.*

Eight Holstein steers (171 ± 13.8 kg initial BW) were used in two simultaneous 4 × 4 Latin squares (2 × 4 factorial treatment arrangement) to determine effects on intake and digestibility of the number of 6-wk broiler growing periods (one, 1P; three, 3P; six, 6P) before harvest of litter consumed ad libitum with .5% BW of bermudagrass hay and .5 or 1.0% BW (DM) of ground corn (LC and HC, respectively). Control steers ingested hay ad libitum. Broiler litter was 63, 43, and 35% NDF, 2.2, 3.5, and 4.1% N, and 18, 30, and 27% ash for 1P, 3P, and 6P, respectively. Dry matter intake was greater ($P < .05$) for diets with than without broiler litter (4.32, 5.43, 6.21, and 5.68 kg/d; SE .393), although OM intake was similar among treatments (4.14, 4.83, 5.05, and 4.76 kg/d for Control, 1P, 3P, and 6P, respectively; SE .298). Organic matter digestibility differed more among broiler litter sources with LC vs HC (57.8, 38.0, 50.7, 59.5, 59.5, 53.9, 57.0, and 61.1% for LC-Control, LC-1P, LC-3P, LC-6P, HC-Control, HC-1P, HC-3P, and HC-6P, respectively; SE 2.41); whereas, digestible OM intake was not altered ($P > .05$) by treatments (2.35, 2.25, 2.72, and 2.81 kg/d for Control, 1P, 3P, and 6P, respectively; SE .171). In conclusion, these results suggest that effects of the number of broiler growing periods before litter harvest on OM digestibility decrease with increasing number of periods and are less with high vs low dietary cereal grain levels.

Key Words: Cattle, Broiler Litter, Digestion

270 Changes in ruminal measures and serum urea nitrogen in range cows fed supplements differing in protein and fat. L. A. Appeddu*, J. S. Serrato-Corona, J. M. Sosa, I. Tovar-Luna, L. F. Gulino, T. May, and M. K. Petersen, *New Mexico State University, Las Cruces.*

Four, 3 yr-old cannulated cows grazing dormant winter-spring range were used to evaluate ruminal and serum changes from postpartum supplementation. Treatments included: 1) Cottonseed meal (C); 2) C+Bypass protein (CB); 3) C+10% Fat (CF) (Alifet®); 4) C+Bypass protein+Fat (CBF); and (5) Low Protein (LP) cube. Cows were individually fed 2648 g/feeding on 3 d/wk. Four treatments were arranged in a 2 × 2 factorial of supplemental nutrients to provide similar amounts of TDN and 309 g/d of ruminally degradable protein. An additional 148 g of ruminally undegradable intake protein were supplied in C and CF while 332 g UIP were supplied by CB and CBF cubes. Supplements with fat (CF and CBF) provided 90 g fat. Cows fed LP consumed 187 g protein/d. An incomplete Latin Square was conducted. The first 4 cubes were fed in 3 periods (n=3), and LP was compared to CB (n=2). Ruminal and serum samples were collected over 96 h. Fat-fed cows had a higher (*P=.03*) acetate:propionate ratio (4.6:1 vs 4.0:1). Ruminal ammonia levels were influenced by an interaction (*P=.08*), since concenrations were highest when CB was fed (8.5, 11.4, 8.9, and 9.0±.83 mg/l for C, CB, CF, and CBF, respectively). The CB- vs LP-fed cows also had increased (*P<.01*) ammonia levels. Serum urea nitrogen was also affected by an interaction (*P=.05*) when CB with fat had lower concentrations than when CB was fed alone (13.5, 19.0, 14.6, and 15.0±1.02 mg/dl for C, CB, CF, and CBF). Supplying CB also increased urea nitrogen over LP-fed cows (19.5 vs 14.1±.88 mg/dl; *P<.01*). Ruminal pH was similar across treatments. While replacing carbohydrate with fat in postpartum supplements decreased percentage of ruminal propionate, combining fat with high UIP decreased ruminal and serum nitrogen when extra protein was supplied. Incorporating fat appears to spare both ruminal and metabolizable protein, which could promote.

Key Words: Protein, Fat, Supplementation

271 Grazing annual forages in the northern Great Plains. W. Poland*, P. Carr, and L. Manske, *Dickinson Research Extension Center, ND.*

A study was designed to evaluate the potential of grazing annual forages to support beef cattle production. Crossbred cows (BW=563.8 kg; body condition score [BCS]=6.3) and calves (BW=94.6 kg) were grazed on a sequence of annual forages in each of two yr. Annual forages included winter rye (*Secale cereale*; WR), an oat (*Avena sativa*)/field pea (*Pisum sativum arvense*)/ WR intercrop (OP), barley (*Hordeum vulgare*; BR) and Siberian millet (*Setaria italica*; SM). Replicated pastures (3.36 ha; n=2) of each forage were grazed at a stocking rate of 3 cow/calf pair per ha. A 107-d (15 May to 31 August) grazing period was desired, where WR would be grazed in late May, OP in June, BR in July and SM in August. Total herbage (kg/ha) available for grazing did not differ between yr (1754 and 1548 for yr 1 and 2, respectively; P=.2) and was generally lower for WR than OP, BR and SM (1021, 1790, 1889 and 1904, respectively; P<.01). The sequence of annual pastures provided 77 and 68 d of grazing in yr 1 and 2, respectively. While grazing annual forages, cows gained less BW (16.5 vs 28.0 kg; P=.06) and lost more body condition (–.58 vs .20 BCS; P=.06) in yr 1. Despite differences in cow performance, seasonal calf performance was not different between years. Calf ADG (P=.15) was 1.2 kg/d, while production per head (P=.79) and per ha (P=.78) was 86.8 kg and 64.6 kg, respectively. Calf production (kg/ha; P<.1), while grazing specific annual forages, differed between years. In general, calf production was greatest while grazing BR (77.9 and 90.1 for yr 1 and 2, respectively) during late July and early August, least while grazing WR (45.1 and 38.8) during late May and early June and intermediate for OP (73.5 and 58.1) during late June and July and SM (63.6 and 69.4) in August. Cow and calf pairs can be grazed effectively on annual forages during the summer in the northern Great Plains. Further work is needed to establish potential forage sequences and optimal seeding dates, initial grazing dates, stocking rate and grazing management for annual forage pastures.

Key Words: Cattle, Annual forage, Grazing

272 Effect of nitrogen level and grazing management in grazing systems for spring-calving beef cows. D. G. Morrison*, C. C. Willis, D. L. Castle, and G. J. Cuomo, *Louisiana State University Agricultural Center, Rosepine.*

Four bermudagrass-bahiagrass pasture areas (8 ha each) were overseeded in the fall in each of 3 yr with annual ryegrass and clover. Two areas received no nitrogen (N) fertilizer and two received 168 kg N/ha annually applied in three equal applications. Within N level (2 × 2 factorial), one area was divided into 4 paddocks of 2 ha each and the other into 16 paddocks of .5 ha each for rotational grazing. Spring-calving crossbred cows were stocked (2.5 cows/ha) year-round on each area. Calves were born in February-March and weaned in October. Annual dry matter forage production was greater where N was applied (18.2 vs 14.2 Mg/ha, $P<.05$) but was not affected by grazing management (GM). Applying N increased forage availability estimates (rising plate meter) by 11%; increasing the number of paddocks from 4 to 16 increased forage availability by 6% ($P<.05$). Annual days of grazing by a cow herd was increased 9 d either by applying N or by 16-paddock rotation, but there was no interaction. N fertilization decreased pasture composition of clover ($P<.05$), and tended to increase ryegrass composition. N level × GM interaction affected forage quality ($P<.07$). Where no N was applied forage quality was similar in 4- and 16-paddock rotations, however, where N was applied, forage quality in the 16-paddock rotation was depressed compared with the 4-paddock rotation. Calf weaning weight was similar regardless of GM where no N was applied ($\bar{x}$=262 kg), but at 168 kg N/ha, weaning weight was greater (N level × GM, $P<.01$) for 4-paddock rotation (287 kg) compared with 16-paddock rotation (256 kg). Net returns were lowest for the 168 kg N-16-paddock system while being similar for the other three systems (N level × GM, $P<.01$). In this study, there was little benefit of increasing paddock number from 4 to 16 regardless of N level, however, increased stocking rate potential was indicated for the 168 kg N-16-paddock system.

Key Words: Beef cow, Nitrogen fertilizer, Rotational grazing

273 Effects of grazing management on cow and calf performance in the tallgrass-prairie region. K. C. Olson*, R. C. Cochran, D. E. Johnson, D. C. Hartnett, C. E. Owensby, and D. M. Grieger, *Kansas State University, Manhattan.*

Effects of grazing system (GS) and stocking rate (SR) on cow and calf performance were evaluated using data from the first 5 yr of a long-term study. Late season rest-rotation (LSRR) was compared with continuous (CONT) grazing at low, moderate and high SR (.35, .51, and .75 AU/ha, respectively; AU = 454 kg total cow + calf BW). Cow-calf pairs (n=145) were assigned randomly to pastures each year. LSRR systems consisted of three similar sized paddocks. Cattle were allowed access to all paddocks from early May to 7-15 and then restricted to two of the paddocks from 7-16 to 10-1 each year. The paddock rested from 7-16 to 10-1 was rotated yearly. Cows and calves were weighed and cows were body condition scored (BCS) early May, 7-15, and 10-1 each year. Cows were bred by natural service and pregnancy rate (PR) was ascertained by palpation. Interaction between SR and GS was absent; therefore, regression equations characterizing the effects of SR on GS were examined. The effect of SR on total cow ADG, calf ADG, cow BCS change, and PR was linear ($P<.01$) and slopes were similar ($P>.12$) for both LSRR and CONT. Thus, GS models with common slopes were appropriate. Total cow ADG (kg/d) was described by $y = -.025[SR] + .603$ and $y = -.025[SR] + .654$ for LSRR and CONT, respectively. Total calf ADG was described by $y = -.021[SR] + 1.12$ and $y = -.021[SR] + 1.17$ for LSRR and CONT, respectively. Total cow and calf ADG declined approximately .05 kg/d for each increment in SR. Total cow BCS change and PR were not affected by SR. However, cows managed under LSRR tended to have lower PR than cows managed under CONT (93 vs. 97%, respectively; P=.08). We interpret these data to suggest that ADG of cows and calves decreased with increasing stocking rate. Moreover, CONT allowed greater ADG and PR than LSRR.

Key Words: Grazing systems, Stocking rate, Cows

274 Herbage allowance and the perfomance of heifers on *Panicum coloratum cv Klein* in wintertime. G. Luna Pinto[1,2]*, A. Perotti[1], M. Corada[1], and A. Cabanillas[1], [1]*University of Cordoba and* [2]*EEA Manfredi, INTA.*

This test on continuous grazing with *Panicum coloratum cv Klein* (PCK) was done during winter in 1996 with the intention of generating information that permits to maximize animal production during the period in which pastures offer low quality (winter). The test was done on 22 eight months old Aberdeen Angus heifers. The weighed 180 kg each and the test lasted 120 days. The treatments were three allowance of forage with two repetitions: 13 kgDM/100 kgBW (T1), 10 kgDM/100 kgBW (T2) and 7 kgDM/100 kgBW (T3). The hallowance of forage was determinated at the beginning of grazing and they kept constant all through the test because during winter PCK did not grow at all. The tested variables were: daily gain of live weight (DGW) and gain weight per hectare (GWH). The data were analysed through ANOVA and the averages were compared through Duncan test. The DGW for the different treatments was: 267 grs per day (T1), 241 grs per day (T2) ans 137 grs per day (T3). T3 differed significantly ($p\alpha 0,05$) from the other treatments. As regards the variables GWH the results were: 83,3 kg/ha; 104,1 kg/ha and 77,3 kg/ha for T1, T2 and T3 respectively. There were no significant differents ($p\alpha 0,05$) for this variable. The results obtained suggest that as the availability of forage per animal increased, the DGW increased too. The GWH was not affected directly by the individual gain because the animal burden acted as a compensation factor of the production of meat. PCK is an excellent alternative for the farmers in the north of Cordoba province (Argentina) to develop the growth of heifers assigned to reproduction during the spring-summer period.

Key Words: *Panicum coloratum cv Klein*, Herbage allowance, Low quality pastures

275 Regaining of degraded pastures in the north of Cordoba province (Argentina). G. Luna Pinto[1,2]*, P. Minuzzi[1], A. Cabanillas[1], M. Corada[1], and A. Perotti[1], [1]*University of Cordoba and* [2]*EEA Manfredi, INTA.*

Panicum coloratum cv Klein (PCK) and *Chloris gayana* (CG) are grasses of wide spreading in the north of Cordoba that decrease the dry matter production (DMP) starting from the fourth or fifth year of the implantation. The aim of this study is to determine the effect of different strategies of recovery of two subtropical pastures. These pastures were sown during the summer of 1990. The treatment were: control (T0), mechanical removal (T1), 100 kg/ha of urea (T2), 200 kg/ha of urea (T3), mechanical removal + 100 kg/ha of urea (T4) and mechanical removal + 200 kg/ha of urea (T5). Mechanical removal was done with sharp points at 70 cm one from another and to a depth of 22 cm. The fertilizer, urea (46-0-0), was used at the same time of the mechanical removal, during springtime. At the end of the period of growth of the pastures, the following parameters were determined: DMP, crude protein (CP), ruminal dry matter disappearance (RD) and neutral detergent fibre (NDF). The experimental design employed was in blocks fully aleatorized with three replications and the statistic treatment consisted in the making of ANOVA. Duncan ($p\alpha 0,05$) was used to compare averages. Results are detailed in the following chart:

	T0	T1	T2	T3	T4	T5
DMP (kg DM/ha)	2573^{d}	4087^{c}	5400^{b}	7800^{a}	4934^{bc}	5820^{b}
RD (%)	58,3^{b}	60,1^{b}	63,5^{ab}	67^{a}	64,1^{ab}	66,9^{a}
CP (%)	6,1^{a}	8,1^{a}	8^{a}	8,2^{a}	8,1^{a}	8^{a}
NDF (%)	70^{a}	67^{a}	63^{b}	61^{b}	65^{ab}	64^{b}

*Different letters mean significant differences.

There were meaningful difference ($p\alpha 0,05$) for all the tested variables except for CP. The low DMP in T1, T4 and T5 is due, mainly, to the fact that the number of plant per unit of surface decrease as a consequence of the mechanical treatment. The RD increased for all those treatments with nitrogen fertilization. The decrease of NDF is the main cause for the increase of RD.

Key Words: *Panicum coloratum cv Klein*, *Chloris gayana*, Degraded pastures

276 Regrowth of *Acacia mangium* Will under defoliation. A. Rodríguez-Petit, T. Clavero*, R. Razz, *University of Zulia, Maracaibo, Venezuela.*

A field experiment was carried out in Venezuela to evaluated the total dry matter yield (TDM) and its components (fine fraction, FDM and gross fraction, GDM); and its respectively dry matter accumulation rates (total, TAR; fine fraction, FAR and gross fraction, GAR) of Acacia mangium Will under three intervals of cutting (42, 63 and 84 days) and three cutting heights (50, 75 and 100 cm). A randomized block design with treatments in split plot arrange was used. The results showed that dry matter yields and accumulation rates was affected by harvesting interval. The maximum value were: 735.03, 588.31 and 146.75 g/plant for TDM, FDM and GDM, respectively, when the plants was harvested at 84 days. The same tendency was observed for dry matter accumulation rates (2.92, 2.33 and 0.58 g/plant/day for TAR, FAR and GAR, respectively). TDM and GDM was affected by the interaction of harvesting interval and cutting height. Maximum values was obtained with 84 days interval and 100 cm of height. Acacia mangium Will showed the highest yields with the least frequent and least severe defoliation.

Key Words: *Acacia mangium* Will, Yield, Defoliation

277 Root growth of dwarf elephant grass (*Pennisetum purpureum* cv Mott). T. Clavero*, *University of Zulia, Maracaibo, Venezuela.*

Because of difficulty in studying plant root system of grasses in their natural environment, quantitative generalization about their growth and function are difficult to make. The objective of this research is to describe root system morphology, development and function on dwarf elephant grass during planting phase. Variables measured in this study were shoot/root ratio, total number and root length and horizontally and vertically growth. Dwarf elephant grass showed a significant positive relationship (P<0.001) between root system and leaf number (r=0.48**), root mass and yield (r=0.92), height of plants and maximum root depth (r=0.98**). The grass showed a functional balance of root and shoots. Root length decreased exponentially with depth and 75% of total root length was concentrated in the upper 30 cm.

Key Words: Root growth, Dwarf elephant grass

278 Optimizing ammonia pressurization/depressurization processing conditions to alter carbohydrate fractions and digestibility of dwarf elephant grass. A. Ferrer*, F. M. Byers, and B. E. Dale, *Dept. of Chemistry, Science Faculty, University of Zulia, Maracaibo, Venezuela, Dept. of Animal Science, Texas A&M University. College Station, Tx., and Dept. of Chem. Eng., Mich. State Univ.*

An ammonia process further developed to decrystallize cellulose and solubilize structural carbohydrate components under real-time process conditions was investigated to evaluate the potential of converting dwarf elephant grass into a high energy feedstuff. Temperatures of (75 and 90°), moisture contents of 30 and 60%, and ammonia loadings of 0.5, 1.0 and 1.5 g NH_3 /g DM, as processing conditions were evaluated by determining solubles, hemicellulose and cellulose content; 24 and 48 h ruminal *in situ* Dry Matter Digestibility (DMD) , and reducing sugar production through cellulase hydrolysis. Best results ($P < .05$) were attained at 90°, 60% moisture and l g NH_3 /g DM. Ammonia processing reduced ($P<.05$) hemicellulose from 33 to 20%. Cellulose content remained approximately constant (32%). The 24 and 48h (DMD) increased ($P < .01$) with processing from 60 to 71% and from 73 to 88%, respectively and the reducing sugar yield (% of theoretical yield) doubled ($P < .05$) from 47 to 90%. With these processing conditions, dwarf elephant grass becomes a highly valuable feedstuff, in which the fraction of cell solubles is increased by 40% and the ruminal DMD is increased by over 20%.

Key Words: Ammonia, Elephant Grass, Carbohydrate

279 Forage carbohydrate fraction conversion with ammonia and ozone processing. G. Stone[1]*, T. D. Rogers[2], G. C. Carstens[1], F. M. Byers[1], and A. J. Denvir[2], *[1]Texas A&M University, College Station and [2]Lynntech Inc., College Station.*

Abundant but low quality forages, due to type (ie. elephant grass), seasonal stress (heat units) or maturity, are often available to the livestock industry. Value-added processing is required to increase the utilization of these forages to achieve economical production of meat and milk throughout the world. Processes including ozone or ammonia have shown promise in the conversion of cellulosic biomass where lignification is a limiting factor. Three substrates were evaluated, Dwarf Elephant grass (EG) ground to 5-10mm, EG with an ammonia process (AP) or *in situ* digested (RD) in a canulated steer for 96 h. Untreated (U), rumen degraded (RD) and AP materials, at 50% moisture, were treated with ozone (O) at 0, .2, 2 and 20% ozone concentrations by weight. All treatments were analyzed for neutral detergent fiber (NDF), acid detergent fiber (ADF), and lignin via standard methodologies. Ozone at lower concentrations (0, .2 and 2%) did not alter NDF, ADF or lignin. Ozone at 20% reduced, NDF values in EG, RD and AP by 32, 37 and 31% ($P < .01$), reduced ADF values by 12, 28 and 27% ($P < .01$), and reduced lignin values by 56, 51 and 56% respectively ($P <. 01$). Rumen degraded material showed a significant reduction ($P < .05$) in NDF, ADF, hemicellulose and lignin indicating possible use in the treatment of animal waste. Carbohydrate fractions were:

Substrate/ process	% NDF	% ADF	% Hemi	% Cell	% Lignin
EG 0%	70.8	41.4	29.4	31.3	5.4
EG 20%	48.1	36.5	11.6	33.1	2.4
RD 0%	78.1	43.1	19.2	27.8	9.6
RD 20%	49.0	30.9	11.4	28.2	4.7
EGAP 0%	61.4	42.2	19.2	33.3	4.5
EGAP 20%	42.2	30.9	11.4	28.1	2.0

AP reduced hemicellulose by 10 units (35%) and O further reduced this to 39% of EG, similar to O alone. Ozone at 20% altered CHO fractions to a greater extent than AP.

Key Words: Ozone, Ammonia, Carbohydrate

280 Control of gastrointestinal parasite larvae using nitrogen fertilizer solutions and bleach. J. M. Howell*, J-M. Luginbuhl, M. J. Grice, K. L. Anderson, P. Arasu, and J. R. Flowers, *North Carolina State University, Raleigh.*

Gastrointestinal parasites(GP) are considered to be one of the most prominent health problems facing small ruminant producers. Additional concerns are associated with parasite resistance to traditional anthelmintics and drug withdrawal times. Solutions of commercial fertilizers and bleach were used to examine their effect on the motility of Haemonchus contortus larvae in vitro. Fecal cultures collected from one Suffolk ram lamb infected with 5,000 infective larvae (L3) were incubated in moist vermiculite for 10 d at 28 C and L3's retrieved using a modified Baerman technique. Larvae (500 L3/100μL) were pipetted into individual petri dishes with 400 μL of a known concentration of either urea (U), ammonium nitrate (AN), liquid nitrogen fertilizer (LNF), ammonium nitrate + urea (AMU) or bleach (B).Concentrations were 0, 6, 12, 18 g N/100 mL for N-containing compounds (NCP) and 0, 2.5, 5.0, 7.5, 10 mL/100 mL for B. A randomized complete block design (RCBD) with four blocks was used for each compound. Following a four-hour treatment period, total and non-motile (NM) L3's were counted. Increasing concentration levels resulted in cubic increases ($P < .01$) of percent NM for each compound (U: .4, 22.5, 68.6, 75.2; AN: .3, 39.4, 93.3, 97.2; LNF: .52, 4.3, 77.3,96.6; AMU:.4, 18.4, 40.4, 92.7; B: .2, 2.3, 26.8, 87.6, 99.1). Another trial (RCBD with 4 blocks) compared the highest concentrations of NCP and B. Treatment means (% NM) and orthogonal contrasts were respectively: U, 81.3; AN, 96.8; NLF, 93.3; ANU, 89.2, B, 99.8; B vs all other compounds ($P < .01$), LNF vs other NCP, ($P < .01$), U vs AN ($P < .01$) and U + AN vs ANU ($P < .79$). Larvicidal properties of these compounds could decrease GP loads if used strategically with fertilization and other agricultural practices.

Key Words: Gastrointestinal parasites, Bleach, Nitrogen compounds

281 Ergot alkaloid excretion in cattle grazing endophyte-infested tall fescue. J. A. Stuedemann*, N. S. Hill, F. N. Thompson, D. L. Dawe, N. Filipov, D. H. Seman, R. A. Fayrer-Hosken, and W. P. Hay, *USDA-ARS, Watkinsville, GA and University of Georgia, Athens.*

Ergopeptine alkaloids are the major ergot alkaloids present in endophyte-infested (E+) fescue. Ergopeptine alkaloids are excreted via the biliary system; however, ruminants may convert ergopeptines to lysergic acid amides which are excreted via the urine. The objective was to determine excretion sites of ergot alkaloids and to determine urinary clearance or appearance rates in steers exchanged from endophyte-free (E–) to E+ fescue and vice versa. Sixteen Angus steers grazing two E– (0 ergot alkaliods) and two E+ (358-696 ppb ergot alkaloids) fescue paddocks (four/paddock) were studied over a 65-day period. Bile was obtained from all steers via ultrasonography of the gall bladder followed by percutaneous tap using a needle and syringe. Urine samples were collected prior to obtaining bile. Animal weight was used to compute daily biliary alkaloid excretion. Urinary ergot alkaloid and creatinine concentrations were used to calculate urinary alkaloid excretion adjusted for animal weight. The major route of alkaloid excretion was the urine. To estimate rates of appearance or clearance of urinary alkaloids, two steers from each E+ paddock were exchanged with two steers from E– paddocks and vice versa. Within 48 h of exchange from E+ to E–, daily urinary alkaloid output of steers decreased from 0.72 to 0.04 mg, respectively. In contrast, E– to E+ increased from 0.02 to 0.73 mg, respectively. In summary, urine is the major route of alkaloid excretion, and approximately 95 % of the urinary alkaloids were cleared from animals within 48 h.

Key Words: Fescue toxicosis, Endophyte, Tall fescue

282 Fractionation of crude protein in fresh forages during the spring growth. J. C. Elizalde, N. R. Merchen*, and D. B. Faulkner, *University of Illinois, Urbana.*

The composition of the CP of alfalfa, bromegrass, and tall fescue endophyte free and infected forages (FOR) was compared during the spring growth from vegetative to reproductive stages. Forage were cut from April 27 to June 6 in 1994, and from April 27 to June 11 in 1995 with 11 and 12 dates of harvest, respectively. The CP of the forages was fractionated into non protein N (NPN), soluble CP (B1), insoluble CP that was soluble in neutral detergent (B2), CP insoluble in neutral detergent but soluble in acid detergent (B3), and CP insoluble in acid detergent (C). Effects of year, forages, and dates of harvest (day as a covariable) were included in the model. Alfalfa (A) had higher (P<.01) CP (20.6 % of DM) than grasses (GR, 15.3 %). The NPN (% of CP) was not different (P>.05) among FOR (22.5 %) but B1 (% of CP) was higher (P<.05) in A (17.1 %) than in GR (13.2 %). The B2 fraction (% of CP) was higher (P<.01) in A compared to GR (51.6 % vs 45.9 %, respectively). Alfalfa had lower (P<.01) B3 (3.0 % of CP) than bromegrass (18.6 %) and tall fescue (13.2%). The fraction C was not different (P>.05) among FOR (3.8 %). The decrease in CP (% of DM) across days was higher (P<.05) for bromegrass (–.4 %/d) than for the other FOR (–.29 %/d). The NPN (% of CP) did not change (P>.05) across days in A but decreased (P<.05) in GR (–.09 %/d), and B1 (% of CP) was unchanged (P>.05) across days for all FOR. Fraction B2 (% of CP) decreased in A (–.21 %/d) but was unchanged in GR across days. The fraction B3 (% of CP) increased (P<.05) in A (.10 %/d), decreased in tall fescue infected (–.20 %/d), and did not change (P>.05) in the other FOR. Fraction C (% of CP) was unchanged (P>.05) across days for all FOR. Although FOR growth stage caused some changes in the CP composition, these changes did not override the differences due to species from vegetative to reproductive stages.

Key Words: Forages, Crude Protein, Composition

283 Nutritional quality of tall fescue under elevated carbon dioxide. R. G. Dado*, J. A. Newman, D. J. Gibson, M. L. Abner, W. Coleman, and J. L. Sherwin, *Southern Illinois University, Carbondale.*

Elevated atmospheric CO_2 is a projected environmental change shown to increase growth of many C_3 grasses. Our objectives were to examine changes in forage quality and interactions between CO_2 and mutualistic fungi. One-year old tall fescue either infected (E) or not infected (NE) with an endophytic fungus (*Acremonium coenophialum*) was grown for 12 wk after clipping in open-topped chambers in the field during the summer of 1996. Chambers (20) were maintained at ambient (L) or double ambient (H) CO_2 concentrations. Tillers were also sampled at 4 and 8 wk. After 4 wk, NDF content was lower under elevated CO_2 (52.6 vs 48.2%; P < .01); however, after 8 and 12 wk, NDF content was not different. No interactions between CO_2 and endophyte status were detected for NDF content. After 12 wk, dry yield was higher for E (P < .01) and tended to be higher for H (P < .10). Crude protein content was lower for NE and H (P < .05). Forage quality may be reduced under elevated CO_2. Data for wk-12 are presented:

						P > F	
Item	L-NE	L-E	H-NE	H-E	C[a]	E[b]	C * E
DM, g	58.4	64.0	67.5	76.9	.10	.01	NS
CP, %	15.7	15.4	12.7	11.8	.01	.05	NS
CP, g	9.0	9.7	8.5	9.0	NS	.10	NS
NDF, %	57.5	56.8	58.4	57.2	NS	NS	NS
Lignin, %	10.0	6.8	6.5	8.1	NS	NS	.01
IVTD[c], %	73.4	76.0	73.0	73.4	NS	.05	NS

[a]Main effect of CO2.
[b]Main effect of endophyte status.
[c]IVTD = in vitro true DM digestibility.

Key Words: Forage Quality, Fescue, Carbon Dioxide

284 In Situ fiber digestion characteristics of four grasses of average to low quality. C. P. Mathis*, I.E.O. Abdelgadir, R. C. Cochran, J. S. Heldt, K. C. Olson, B. C. Woods, E. C. Titgemeyer, and E. S. Vanzant, *Kansas State University, Manhattan.*

Four ruminally and duodenally fistulated beef steers (518 kg) were used in a Latin Square design to evaluate rate and extent of in situ NDF digestion for bermuda (BE; 92.7% DM, 7.8% CP, 72.2% NDF), brome (BR; 94.5% DM, 5.3% CP, 70.6% NDF), forage sorghum (FS; 88.9% DM, 4.5% CP, 62.2% NDF), and tallgrass prairie (PR; 93.0% DM, 4.8% CP, 67.5% NDF) hay. All forages were of relatively low quality although the BE hay had the highest CP. Steers were fed hay at 1.5% of BW daily at 0700 and 1900. Forage samples were weighed into dacron bags and incubated for 0, 2, 4, 8, 16, 24, 36, 48, 72, and 96 h in the rumens of steers consuming the same forage. The NDF that was removed by rinsing (fraction A) was considered to be very small particles that washed out of the bags and was assumed to be digested. The residue remaining after 96 h was assumed to be the indigestible NDF fraction (C). The pool size of the remaining, potentially degradable NDF fraction (B) was determined by difference. The C fraction was subtracted from the residue at each time point, and the natural logarithms of the resulting values were regressed against time to estimate the degradation rates (Kd) of the B fractions. The amount of ruminally digested NDF (RDNDF) for each forage was calculated using a rate of passage of .03/h for all forages. The A, B, and C fractions (% of total NDF), Kd/h, and RDNDF (% of total NDF) of BE, BR, FS, and PR were 7.4, 54.7, 37.8, .046, and 40.4; 4.4, 55.3, 40.3, .034, and 33.7; 11.8, 51.7, 36.5, .025, and 34.9; and 5.8, 57.8, 36.5, .031, and 34.7, respectively. Little difference was evident in the RDNDF or in the size of the B or C fractions; however, Kd was faster (P<.10) for BE than the other forages.

Key Words: Beef Cattle, Forage, Fiber

285 Agronomic and silage quality traits of forage sorghum cultivars in 1995. M. K. Siefers*, J. E. Turner, G. L. Huck, M. A. Young, S. A. Anderson, R. V. Pope, and K. K. Bolsen, *Kansas State University, Manhattan.*

Agronomic and silage quality traits were measured for 37 forage sorghum cultivars and three grain sorghum hybrids. The sorghums were planted on July 3, 1995, in a randomized complete block design with three replicate plots for each cultivar. The growing season was characterized by above avg rainfall in the spring and early summer and a hard freeze on September 22. The three grain sorghums and 11 of the 17 forage sorghums that had reached the early-milk to early-dough stage before the freeze were harvested between September 26 and October 6. The remaining 26 forage sorghums were harvested on October 19, which is near the avg annual first freeze date for the location of the plots. Chopped forage from each plot was ensiled in 10- × 35-cm PVC laboratory-scale silos and stored for 90 d. Sorghum cultivar significantly affected (P < .05) all agronomic and silage quality traits measured. The late planting date and low plant populations resulted in below normal whole-plant DM and grain DM yields. The preensiled, whole-plant DM content of the 37 forage sorghums ranged from 23.0 to 39.9%. All silages were satisfactorily preserved, as evidenced by a pH range of 3.7 to 4.0. As expected, the silage nutritive value traits of CP, NDF, and ADF were most favorable for the three grain sorghum hybrids and least favorable for the eight forage sorghum hybrids that were still in the boot stage when the freeze occurred.

		Whole-plant		Grain	Whole-plant silage		
Cultivar[1]	Plant ht	DM content	DM yield	DM yield	CP	NDF	ADF
	cm	%	tonnes/ha	tonnes/ha	% of the silage DM		
Grain sorghum (3)	111	37.5	7.8	2.8	10.4	46.8	27.9
Forage sorghum (w/grain) (17)	186	30.8	9.9	2.4	8.6	48.9	29.6
Forage sorghum (w/o grain) (20)	207	25.0	10.8	0	8.3	54.4	33.8

[1]Number of cultivars is shown in parenthesis.

Key Words: Sorghum, Forage, Silage

286 Effects of species and stage of maturity of fresh forages on in situ dry matter and crude protein degradation. J. C. Elizalde*, N. R. Merchen, and D. B. Faulkner, *University of Illinois, Urbana.*

Fresh forages of alfalfa (A) in vegetative, early bud, early flowering, and late flowering stages, and of bromegrass, and endophyte free and infected tall fescue (tillering, stem elongation, heading, and flowering stages) were evaluated for ruminal DM and CP degradation kinetics using non linear models. Duplicate Dacron bags were incubated for 0, 3, 6, 9, 12, 16, 24, 36, 48, and 60 h in 2 Simmental × Angus steers fitted with ruminal cannulas. The effects of animal, forage species (FOR), and maturity (MAT) within FOR were evaluated. Alfalfa (A) had higher (P<.05) soluble (36.6 %) and lower potentially digestible DM (43.0 %) and tended (P<.09) to have higher extent of DM degradation (66.2 %) than grasses (27.1, 53.5, and 54.6 % for soluble, potentially digestible DM, and extent of DM degradation, respectively). Extent of CP degradation was similar among FOR but A tended (P<.09) to have a higher CP degradation rate than grasses (16 %/h vs 13 %/h). Extent of degradation of DM and CP decreased (P<.05) with MAT in A (71 % to 57 %, 81 % to 72.8 %, respectively) and in grasses (67.2% to 39.6%, 81.1 % to 65.8 %, respectively). Undegraded CP (UCP, % of CP) was not different (P>.05) among FOR (22.6 %) but increased (P<.05) with MAT (16.3 % to 24.4 % in A, and 17.1 % to 32.1 % in grasses). Undegraded CP (g/kg DM) tended (P<.12) to be higher in A (38.6 g/kg) than in grasses (33.7 g/kg), and decreased (P<.05) with MAT in grasses (39.2 g/kg to 27.4 g/kg) but not in A due to a greater decrease (P<.05) in soluble and potentially degradable CP with MAT in grasses than in A. The amount of UCP which is potentially degradable in the rumen (g/kg DM) ranged from 2.3 g/kg in endophyte free tall fescue to 4.6 g/kg for the other FOR (P<.05) but remained constant across MAT in A (4.4 g/kg) and decreased (P<.05) in grasses (3.9 to 2.5 g/kg). Stage of maturity within FOR had a greater effect than FOR species on ruminal DM and CP degradation.

Key Words: Forage, Maturity, Degradation

287 Determination of the most favorable moment to make hay of *Panicum coloratum cv Klein*. G. Luna Pinto[1,2]*, R. A. Peuser[1], M. Corada[1], and A. Cabanillas[1], [1]*University of Cordoba and* [2]*EEA Manfredi, INTA.*

As phenologic stages progress, vascular plants increase the dry matter production. While the production of dry matter increases, the quality of forage decreases. The objective of this study is to determinate the most favorable moment to make hay stock of forage in *Panicum coloratum cv Klein* (PCK). We took 5 samples of 3 m^2 for each repetition (3) every 14 days during the grown period. Seven different moments were determined corresponding to 7 different phenologic stages. These stages were: Shoot (1), beginning of clusters (2), full clusters (3), beginning of floral stems (4), full blooming (5), beginning of seeds filling (6) and end of seeds filling (7). The following parameters were determined in the samples taken: dry matter production (DMP), crude protein (CP), neutral detergent fibre (NDF) and dry matter ruminal disappearance (RD). The experimental design was done in blocks at random with three replications. The results were subject to an ANOVA and the averages were compared through Duncan (pα0,05). Results are detailed in the following chart:

Moment	DMP	CP	RD	NDF
1	120[f]	12,14[a]	70[a]	41[a]
2	740[e]	9,17[b]	69[a]	45[a]
3	2030[d]	9 ,43[b]	63[b]	47[a]
4	2820[c]	8,22[bc]	62[b]	49[ab]
5	3580[b]	7,89[bc]	62[b]	53[b]
6	4190[ab]	6,2 [c]	59[b]	54[b]
7	5640[a]	5,32[c]	60[b]	59 [b]

*Different letters mean significant differences (pα0,05).

The content of cellular wall is seriously affected by the state of maturity in grasses. As the phenologic stages progress, the values of NDF increase considerably (pα0,05). The sudden fall in the dry matter disappearance is due to the fact that subtropical grasses need dense cellular walls that allow to solve the prominent anatomic structures.

Key Words: *Panicum coloratum cv Klein*, Quality, Hay

288 Feed intake and digestion by different breeds of ewes in early to mid-gestation consuming different hay harvests of two tropical grasses. A. L. Goetsch*, G. E. Aiken, and M. A. Brown, *Dale Bumpers Small Farms Research Center, USDA, ARS, Booneville, AR.*

Mature ewes (24; 21 mo of age), of four breed groups (St. Croix, S; St. Croix × Romanov, SR; St. Croix × Texel, ST; Gulf Coast Native, N) and in early to mid-gestation, were used (4 × 2 × 3 factorial; eight simultaneous 3 × 3 Latin squares) to determine effects and interactions in feed intake and digestibility of breed group, tropical grass source (Eastern gamagrass, GG; switchgrass, SG), and hay cutting treatment (1 = primary growth harvested on June 12, 1995; 2 = primary growth harvested on August 14, 1995; 3 = regrowth from June 12 to August 14, 1995). Soybean meal was supplemented; BW was 39, 49, 46, and 59 kg (SE 2.5) for S, SR, ST, and N, respectively. Interactions between breed groups and dietary forage treatments did not occur ($P > .10$). Hay DMI ranked ($P < .05$) hay cutting treatment 3 > 2 > 1 for GG and 2 < 1 and 3 for SG (59, 50, 67, 49, 38, and 46 g/kg $BW^{.75}$ for GG-1, GG-2, GG-3, SG-1, SG-2, and SG-3, respectively; SE 1.5), and was 60, 57, 48, and 40 g/kg $BW^{.75}$ for S, SR, ST, and N, respectively (SE 2.6). Hay OM digestibility was greater ($P < .05$) for GG vs SG and for cuttings 1 and 3 vs 2 (52, 41, 53, 36, 22, and 34% for GG-1, GG-2, GG-3, SG-1, SG-2, and SG-3, respectively; SE 2.1). Digestible hay OM intake differed among treatments as noted for hay intake (28.1, 20.1, 32.8, 16.8, 8.0, and 14.8 g/kg $BW^{.75}$ for GG-1, GG-2, GG-3, SG-1, SG-2, and SG-3, respectively; SE 1.22), and was 23.1, 23.5, 19.0, and 14.9 g/kg $BW^{.75}$ (SE 1.63) for S, SR, ST, and N, respectively. In conclusion, effects on intake and digestibility of grass source and hay cutting treatment were similar among breed groups, and grass characteristics impacting feed intake were affected by hay cutting treatment differently between GG and SG. St. Croix and SR may be better suited for early to mid-gestation consumption of such tropical grass hay sources compared with ST, and N may require supplementation for BW maintenance.

Key Words: Sheep, Breed, Grass

289 Stockpiled berseem clover or brown midrib sorghum × sudangrass forages as supplements for beef cows grazing corn crop residues. J. R. Russell*, M. A. Hersom, J. M. Western, K. J. Moore, and R. Kalton, *Iowa State University, Ames.*

In two years, four 6.07-ha fields were seeded either with corn or corn and an oat and berseem clover mixture on a 2-to-1 area ratio. Oat and berseem clover forage was harvested as hay twice before July 9 and August 8 in yr 1 and 2; after which forage was stockpiled for winter grazing. On July 26 in yr 2, a brown midrib (bmr) sorghum × sudangrass hybrid was seeded into replicated 1.21-ha fields at the end of 2.83-ha corn fields. After grain harvest, crossbred cows (BW, 633 kg; condition score, 5.3) in midgestation were allotted to each field at 1.01 ha/cow to strip-graze corn crop residues or corn crop residues and stockpiled berseem clover forage for 140 d in yr 1 and the previous treatments or corn crop residues followed by stockpiled bmr sorghum × sudangrass forage for 114 d in yr 2. In addition, 14 and 12 cows were allotted to replicated drylots in yr 1 and 2. All cows were fed alfalfa-grass hay to maintain a mean body condition score of 5 on a 9-point scale. Berseem clover forage had greater ($P<.05$) IVDOM and CP concentrations than corn crop residues at the initiation of grazing, but had a greater ($P<.05$) rate of decrease in IVDOM than corn crop residues. Brown midrib sorghum × sudangrass forage had a higher ($P<.05$) initial IVDOM concentration, but no difference in the rate of decrease in IVDOM concentration to corn crop residues in ungrazed areas of the field. Seasonal changes in body condition score of cows maintained in the drylot, grazing corn crop residues without or with berseem clover were 1.1, .2, and .9 in yr 1 and –.5, –.4, and –.1 in yr 2 while those of cows grazing corn crop residues and bmr sorghum × sudangrass in yr 2 were –.5. Amounts of hay DM fed per cow maintained in a drylot, grazing corn crop residues without or with berseem clover were 1872, 651, and 733 kg in yr 1 and 1764, 352, and 189 kg in yr 2 and were 181 kg for cows grazing corn crop residues and bmr sorghum × sudangrass.

Key Words: Beef cows, Grazing, Stockpiled forages

290 Source of energy supplement effect on forage utilization by beef cows grazing tall wheatgrass. H. Q. Winger*, K. C. Olson, B. R. Bowman, R. C. Rollim, and J. A. Walker, *Utah State University, Logan.*

Our objective was to evaluate the influence of nonstructural or structural carbohydrate-based energy supplements on diet digestibility and forage intake by beef cows grazing dormant tall wheatgrass (*Agropyron elongatum*) during the calving season. Energy treatments were control (C), barley grain (BG), or sugar beet pulp (SBP). All cows received alfalfa to meet protein requirements and make supplements isonitrogenous. The study was conducted for two years. In 1994, 30 cows were used in a 3 supplement by 2 initial body condition score (BCS=4 or 5) factorial. During 1995, 24 cows were used (all BCS=4). The study was conducted from initiation of calving (March 4 or 8) until initiation of breeding (May 22 or 24). Supplements were fed daily on an individual basis. One (1994) and two (1995) digestibility and intake sample periods were conducted. Three rumen-fistulated cows were used to collect diet samples using the rumen evacuation technique. Chromic oxide and indigestible acid detergent fiber were used as external and internal markers to estimate fecal output and digestibility, respectively. In 1994, energy and BCS treatments did not interact for any variable ($P \geq .20$). Barley depressed($P=.0001$) digestibility compared to C or SBP (51.99, 40.74, and 51.34% for C, B, and SBP, respectively). Supplements did not influence total intake ($P=.20$, 2.00% BW), but because supplement intakes were different ($P=.0008$, .73, .86, and 1.03% BW for C, B, and SBP, respectively), forage intake was depressed ($P=.02$) by B and SBP (1.41, .91, and .75% BW for C, B, and SBP, respectively). Initial BCS did not influence digestibility ($P=.24$) or supplement intake ($P=.79$), but BCS=4 cows had greater total and forage intake than BCS=5 cows (total: 2.1 and 1.7% BW, forage: 1.23 and .83% BW for BCS 4 and 5, respectively). In 1995, B and SBP both depressed digestibility ($P=.0085$), total intake($P=.0002$), and forage intake($P=.0002$). Supplement intake was greater ($P=.0001$) for B and SBP. Energy supplementation, regardless of carbohydrate form, depressed digestibility and substituted for forage intake.

Key Words: Beef cattle, Forage intake, Digestibility

291 Effect of urea level in protein supplements on the performance of beef cows grazing, tallgrass-prairie range. B. C. Woods, J. S. Heldt*, R. C. Cochran, C. P. Mathis, K. C. Olson, D. M. Grieger, and E. C. Titgemeyer, *Kansas State University, Manhattan.*

One hundred thirty-two Angus × Hereford cows (BW = 533 kg) were used to evaluate the effect of urea level in protein supplements on the performance of cows grazing tallgrass-prairie range. Urea provided 0, 15, 30, or 45% of the degradable intake protein (DIP; 0, 11, 22, or 34% of CP). Supplements were based on soybean meal and sorghum grain and were formulated to contain 30% CP (approximately 70% DIP and a N:S ratio of 10:1). The experiment began 11/30/95 and treatment supplements were fed until calving (average calving date = 3/8/96). Cumulative BW changes for the 0, 15, 30, and 45% treatments were –47, –56, –56, and –64 ± 3 kg (linear, $P < .01$) through calving, and –86, –91, –91, and –100 ± 4 kg (linear, $P = .06$) through breeding. Corresponding changes in body condition (BC; 1-9 scale) were –.30, –.29, –.35, and –.62 ± .05 (quadratic, $P = .04$) through calving, and –.53, –.64, –.71, and –.84 ± .04 (linear, $P < .01$) through breeding. At weaning, BW and BC changes were similar among treatments. Cow pregnancy rates and birth weights, ADG, weaning weights of calves were unaffected ($P \geq .40$) by treatment. Supplement palatability was not a problem within the range of urea inclusion studied. In general, increasing the level of urea increased BW loss through breeding. However, the magnitude of BC loss through calving was greater when urea comprised more than 30% of the DIP. Calf performance and pregnancy rates were unaffected by the treatment supplements when fed during the prepartum period.

Key Words: Urea, Protein, Beef Cows

292 Effect of supplement strategy on intake and digestion of prairie hay by beef steers. R. H. Greenwood*, E. C. Titgemeyer, C. A. Löest, and J. S. Drouillard, *Kansas State University, Manhattan.*

Twelve British and British cross steers (373 kg initial BW) were used in three simultaneous 4 × 3 incomplete Latin squares to evaluate the effects of supplemental corn (1.8 kg/d, .14 kg CP/d), rumen-protected methionine (RPM; 4.25 g DL-methionine/d), or cooked molasses block (.45 kg/d, .14 kg CP/d) on intake and digestion of prairie hay. Steers were provided ad libitum access to water and prairie hay (5.7% CP, 67.6% NDF on DM basis) and were provided 20 g/d of salt. Experimental periods were 21 d with a 14-d adaptation followed by a 7-d period for measuring intake and total fecal output. Steers that consumed the cooked molasses block ate more (P<.05) forage OM (7.0 kg/d) than control steers (6.2 kg/d), whereas forage intake was decreased (P<.05) by supplemental corn (5.5 kg/d). Forage OM intake was not different between RPM-supplemented steers (5.9 kg/d) and control steers. Total OM intake was similar between steers receiving RPM (5.9 kg/d) and control animals (6.2 kg/d), but was greater (P<.05) for those consuming the corn (7.0 kg/d) and cooked molasses block (7.3 kg/d). Total tract OM digestion, expressed as a percentage of intake, was numerically greatest for steers consuming the cooked molasses block, but was not significantly different among treatments. Digestible OM intake was similar between steers assigned to the RPM treatment (2.9 kg/d) and control (3.1 kg/d), but was greater (P<.05) for steers consuming the cooked molasses block (3.9 kg/d) and corn (3.6 kg/d). Plasma methionine concentrations were greatest (P<.05) for steers assigned to RPM. In summary, supplementation with a cooked molasses block increased digestible OM intake by increasing forage intake and digestion, whereas corn supplementation depressed forage intake but nonetheless increased total digestible OM intake. RPM was ineffective in stimulating forage intake or digestion.

Key Words: Digestibility, Forage, Intake

293 Effect of weaning and escape protein supplementation on spring born calves grazing subirrigated meadow regrowth. G. P. Lardy*, D. C. Adams, T. J. Klopfenstein, J. R. Ueckert, and R. T. Clark, *University of Nebraska, Lincoln and North Platte.*

Forty MARC II spring born calves were used in each of two years to examine the effects of weaning (WEAN vs NURS) and escape protein (EP) supplementation (SUPP vs NOSUP) for calves grazing subirrigated meadow regrowth in a 2 × 2 factorial design during September and October of each year. Calves were blocked by sex, assigned randomly to treatments and supplemented individually six d/week. The supplement used was an 80:20 blend of sulfite liquor-treated soybean and feather meals (SBM:FM). Supplemented-NURS received 0.5 kg SBM:FM/d (182 g EP, 260 g CP) and SUPP-WEAN received 0.91 kg/d (335 g EP, 478 g CP). During both years, steer calves were each given a Captec chromic oxide bolus for determination of fecal output. Contemporary steers given a bolus and fitted with fecal bags were used to obtain a corrected Cr release rate. Milk intake of nursing calves was determined using a 16-h weigh suckle weigh technique during and averaged 6 kg/d. Nursing calves gained faster and had lower forage intakes compared to WEAN calves. Calves receiving supplement had higher gains and similar forage intakes compared to NOSUP calves.

Item	NURS	WEAN	SUPP	NOSUP
ADG, kg/d	0.95[a]	0.59[b]	0.87[a]	0.66[b]
Forage intake, kg/d	2.38[a]	2.97[b]	2.60	2.74
Total intake, kg/d	2.61[a]	3.41[b]	3.30[a]	2.73[b]
Forage intake, % of BW	0.90[a]	1.30[b]	1.02	1.17
Total intake, % of BW	0.99[a]	1.48[b]	1.30	1.16

[a,b]Numbers with different letters within each main effect are different (P < .01).

Key Words: Calf, Grazing, Supplementation