

W77 Effect of level oil supplementation and carcass cooling temperature on beef tenderness of pasture-finished steers. E. Pavan^{*1,2} and S. Duckett¹, ¹University of Georgia, Athens, ²Instituto Nacional de Tecnología Agropecuaria, Balcarce, Bs. As., Argentina.

Eighteen Angus steers grazing a tall fescue pasture were randomly assigned to three levels of corn oil supplementation (LO: 0, 0.075 and 0.15% BW) and slaughtered after 117 d of grazing. For the first 12 h postmortem, the left side of each carcass was hung in a 2.2°C cooler with forced air circulation (LOW); whereas the right side was hung in a 2.2°C cooler with no air circulation (HIGH). HIGH sides were moved into the -2.2°C after 12 h. LM temperature and pH were evaluated during the first 24 h in both sides. Steaks were removed from LM and aged for 1, 3, 7, 14 or 28 d to evaluate tenderness, sarcomere length, free calcium and troponin-T degradation. Data were analyzed as a split-plot design using LO as whole-plot and cooler temperature (CT) as sub-plot, and repeated measures used for time effects. Temperature of the LM was influenced ($P < 0.01$) by CT; however LO did not alter temperature decline even though differences in carcass s.c. fat levels were observed. Ultimate pH was reached faster in 0.075 and 0.15 than in 0 ($P = 0.10$). Free calcium concentration and troponin-T degradation increased ($P < 0.01$) with postmortem aging, but did not differ ($P > 0.10$) by CT. Oil supplementation had no effect ($P > 0.10$) on free calcium concentration, but decreased ($P = 0.02$) troponin-T degradation ($P < 0.01$). The effect of aging on initial ($P < 0.01$) and overall ($P = 0.03$) sensory tenderness or on Warner-Bratzler shear force values (WBS; $P = 0.09$) varied with LO. Aging 28 d instead of 7 d increased ($P < 0.05$) initial and overall sensory tenderness in 0 and 0.15, but not ($P > 0.05$) in 0.075. These results show that oil supplementation of pasture finished steers alters the rate of postmortem aging. Cooler temperature alters temperature decline in LM but did not influence tenderness or interact with LO supplementation.

Key Words: Beef, Forage, Tenderness

W78 Effect of feeding eastern gamagrass on growth of meat goats. A. Faucette*, J. Bartlett, and E. Rhoden, *Tuskegee University, Tuskegee, AL.*

Eastern gamagrass (*Tripsacum dactyloides* L.) is a warm-season forage grass which has high energy and moderate crude protein. Bermuda grass (*Cynodon dactylon* L.) is a common forage in the South and is used as a standard for measuring the quality of other grasses. Goat production is becoming an important source of income on small-scale farms in the southeast. Coupled with this fact, there is limited research on the performance of goats fed eastern gamagrass. Therefore, the objective of this study was to evaluate weight gain, feed intake and carcass weight of meat goats fed eastern gamagrass (EGG) and Bermuda grass (BG). The study utilized 24 Boer cross goats (4-5 months old), housed in individual pens and fed one of four dietary treatments: 80:20 (A); 70:30 (B); and 60:40 (C) (EGG: concentrate); and 60:40 (D) (BG: concentrate) for 12 weeks. Forages were 12.38% CP and 50.31% TDN (BG) and 12.63% CP and 52.66% TDN (EGG). Concentrate was Sweet StuffTM containing 12% CP and 36.5% TDN. Water and mineral blocks were provided. Goats were fed at 5% of their body weight. Feed intake and refusals were monitored daily and feed offered was adjusted on a weekly basis. Body weights were recorded weekly after

an overnight fast. Animals were slaughtered at the end of 12 weeks and hot and cold carcass weights recorded. Average daily intake did not differ significantly among the diets with 1020.2 g, 1178.3 g, 1112.6 g, and 1196.1 g for diets A, B, C, and D, respectively. There were no significant differences in overall weight gain among the diets. Animals fed diet C had the highest average daily gain of 94.71 g/day while the animals on diet B had the lowest (64.97 g/day). Gain: feed was 0.068, 0.055, 0.085 and 0.056 for diets A, B, C, and D, respectively. There was no significant difference in either hot or cold carcass weights among animals fed the various diets. However, the percent shrinkage was minimal for the various diets ranging from 0.26% for diet D to 1.45% for diet C. Eastern gamagrass compares well with BG and shows significant potential as a high quality feed for goats.

Key Words: Eastern Gamagrass, Bermuda Grass, Goats

W79 Enhancing conjugated linoleic acids (CLA) and omega-3 fatty acids in milk from cows fed green chopped forage. T. R. Dhiman^{*1}, S. A. Hagos¹, J. L. Walters¹, and S. Tamminga², ¹Utah State University, Logan, ²Wageningen University, Wageningen, The Netherlands.

The objective of this research was to enhance the proportions of healthful fatty acids (FA), such as conjugated linoleic acid (CLA), *trans*-11 C_{18:1} (trans vaccenic acid; TVA) and omega-3 FA, in milk from cows fed fresh green chopped alfalfa forage. Twenty Holstein dairy cows were randomly assigned to four treatments. The experimental design was completely randomized with five replicates. Experimental duration was 60 d. First 40 d were considered as an adaptation to the diets, and measurements were made during the last 20 d of the experiment. Cows in four treatments were fed 98% fresh green chopped alfalfa forage with either 2% calcium-salts of palm oil FA (Megalac[®], CTL), 0.7% menhaden fish oil plus 1.3% Megalac[®] (FO), 1.3% linseed oil plus 0.7% Megalac[®] (LO), or 0.7% fish oil plus 1.3% linseed oil (FLO) on DM basis. Daily feed intake and milk yield were recorded. Milk samples were collected from two consecutive a.m. and p.m. milkings every 4 d during the measurement period and analyzed for composition and FA profile. Dietary FA contents were 4.9, 5.1, 5.2, and 5.3% in CTL, FO, LO and FLO treatments, respectively. Daily feed intakes were: 22.7, 23.9, 23.3, 23.8 kg/d and total FA intakes were: 1.18^b, 1.27^a, 1.28^a, 1.35^a kg/d ($P < 0.01$) in CTL, FO, LO and FLO treatments, respectively. Cows produced 19.9, 20.7, 20.6, and 23.6 kg/d of energy corrected milk in CTL, FO, LO and FLO treatments, respectively. Milk fat and protein contents did not differ among treatments. The proportions of CLA were: 1.28^c, 1.67^b, 1.44^{bc}, and 2.07^a % and TVA was: 3.05^c, 3.83^b, 3.55^b and 4.83^a % in milk FA of CTL, FO, LO and FLO treatments, respectively. Supplementation of linseed oil (LO) increased the proportions of total omega-3 FA in milk compared to CTL. The ratio between omega-3:6 FA was 0.59^b, 0.78^a, 0.86^a and 0.89^a in CTL, FO, LO and FLO treatments, respectively. The results from this study suggest that CLA and TVA contents of milk from cows fed fresh green chopped alfalfa forage can be enhanced up to 60% by feeding 475 g/d of linseed oil plus menhaden fish oil at a 65:35 ratio without any negative effects on feed intake, milk yield or milk composition.

Key Words: Milk, Fatty Acid, Forage

Goat Species: Nutrition Grazing, and Forages

W80 Grazing behavior and energy expenditure by sheep and goats co-grazing grass/forb pastures at three stocking rates. G. Animut^{*1,2}, A. L. Goetsch¹, G. E. Aiken³, R. Puchala¹, G. Detweiler¹, C. R. Krehbiel², R. C. Merkel¹, T. Sahl¹, L. J. Dawson⁴, and Z. B. Johnson⁵, ¹Langston University, Langston, OK, ²Oklahoma State University, Stillwater, ³USDA ARS Dale Bumpers Small Farms Research Center, Booneville, AR, ⁴Oklahoma State University, Stillwater, ⁵University of Arkansas, Fayetteville.

This study examined the effects of stocking rate (SR) on grazing behavior and energy expenditure (EE) by growing sheep and goat wethers co-grazing grass/

forb pastures. Grazing was for 16-wk periods in 2002 and 2003. Pastures consisted of various grasses, primarily bermudagrass and johnsongrass, and forbs such as ragweed. Sheep (Katahdin) and goats ($\geq 75\%$ Boer) averaged 21 ± 0.7 and 21 ± 0.5 kg initial BW, respectively, and were 4 to 5 mo of age when grazing began. Stocking rates were four (SR4), six, (SR6), and eight (SR8) animals per 0.4-ha pasture, with equal numbers of sheep and goats. The nine pastures (three/treatment) were divided into four paddocks that were rotationally grazed in 2-wk periods. In wk 3, 8, and 13 of both years, EE was determined for one goat and one sheep in each pasture via heart rate. Grazing behavior using IGER Grazing Behavior monitoring system units was measured over 24-h peri-

ods on the same animals. The number of steps increased linearly ($P < 0.05$) with increasing SR (2,279, 2,707, and 2,788 for SR4, SR6, and SR8, respectively [$SE = 96.4$]), but was similar for the two species (2,633 and 2,550 for sheep and goats, respectively [$SE = 69.9$]). As SR increased time spent eating increased (7.4, 8.4, and 9.6 h) and time spent lying (11.0, 10.2, and 8.9 h), ruminating (7.9, 7.7, and 6.8 h), and idling (8.6, 8.0, and 7.6 h for SR4, SR6, and SR8, respectively) decreased ($P < 0.05$). Goats spent less time eating (1.1-h difference) and more time idling (0.7 h-difference) than did sheep ($P < 0.05$). Stocking rate, species, and year interacted ($P < 0.05$) in EE of wethers (year 1, sheep: 510, 569, and 572 kJ/kg BW^{0.75}; year 2, sheep: 572, 597, and 648 kJ/kg BW^{0.75}; year 1, goat: 524, 524, and 640 kJ/kg BW^{0.75}; year 2, goat: 499, 496, and 551 kJ/kg BW^{0.75} for SR4, SR6, and SR8, respectively [$SE = 17.0$]). In summary, influences of SR on grazing time and EE can vary with grazing season. Under the forage conditions of this study, SR had similar effects on grazing behavior of sheep and goats when co-grazing. Effects of SR on EE may contribute to ADG response by small ruminants.

Key Words: Goats, Grazing, Sheep

W81 Goat preference of five tropical legumes. S. Pietroseoli*, F. Arenas, D. Bermudez, O. Peley, and A. Casanova, *La Universidad del Zulia, Maracaibo, Zulia, Venezuela.*

Forage palatability is an important factor in goat production, particularly when forages are expected to provide a major part of the daily nutrient intake. Preference by goats for *Indigofera hirsuta*, *Cannavalia spp.*, *Tephrosia cinerea*, *Teramnus spp.* and *Clitoria ternatea* harvested at two stages of maturity, 42 and 74 d, was evaluated using four lactating French Alpine X Nubian goats (4 years old, 29.1 kg BW). The experimental forages were grown in an ecologically dry forest area of Zulia, Venezuela. In the preference study, before grazing, 200 g of each forage, freshly harvested, was simultaneously offered for 25 min to each individually-penned goat, after which fresh matter was removed and weighed. A completely randomized experimental design was used. The study was replicated three times for each maturity stage. *Indigofera hirsuta* (155.8 and 166.9 g DM at 42 and 74 d, respectively), *Clitoria ternatea* (161.4 and 159.5 g DM at 42 and 74 d, respectively) and *Canavalia spp.* (141.2 g DM at 42 d), showed the highest intake, albeit without statistical differences among them. Intake of these three legumes at these stages of maturity, were statistically different ($p \leq 0.01$) from intakes of *Tephrosia cinerea* and *Teramnus spp.*. Maturity stage affected *Canavalia spp.* ($p \leq 0.01$) and *Tephrosia cinerea* ($p \leq 0.05$) intake with lowest values at 74 d (93.4 g and 68.7 g DM, respectively). *Teramnus spp.* intake was not affected by maturity (98 and 106.2 g DM at 42 and 74 d, respectively). *Indigofera hirsuta* and *Clitoria ternatea* showed the highest intake at both stages of maturity, whereas the lowest intake was recorded for *Tephrosia cinerea* at 42 d (68.7 g DM). Results of this study indicated that some legume species were consumed by goats in greater quantities than others. Intake variations were also observed to be influenced by maturity stage, leading to quantifying various chemical and physical characteristics of these forage legumes to determine their relationship to palatability.

Key Words: Preference Study, Palatability of Forages, Tropical Legumes

W82 A comparison of herbicide, goats and mowing for control of woody vegetation species. S Hart*, J Joseph, A. Goetsch, and J Brokaw, *E Kika de la Garza American Institute for Goat Research, Langston, OK.*

The objective of this study was to compare herbicide, goats and mowing for control of woody vegetation species and impact on herbaceous species. The study site was a native tallgrass prairie which had been invaded by woody species (blackberry, buckbrush, winged elm and sumac). Two replicate 2.0 ha pastures were stocked with goats for two summers (15 and 10 hd/ha), in early June and were removed each fall. Replicate 0.4 ha plots were used for other treatments. Herbicide treatment consisted of 1.2 L of Grazon P+D and 1.2 L of Remedy in 200 L of water/ha applied during the growing season each year. Woody vegetation cover was measured by the line intercept method on five-30 M permanent transects/pasture and herbaceous species identified at 0.3 meter

intervals on the transect. Herbicide treatment reduced percent ground cover of blackberry (17.7 vs 1.9 $P < 0.10$), flame leaf sumac (16.2 vs 0, $P < 0.10$), smooth sumac (1.2 vs 0, NS) rose (5.7 vs 2.0, NS) and sassafras (1.1 vs 0, NS) but winged elm, buckbrush and greenbriar were not controlled by herbicide. Goats reduced percent ground cover for blackberry, (18.5 vs 13.7, $P < 0.10$), sumac (21.1 vs 17.0, NS), rose (3.7 vs 2.2, NS), poison ivy (1.5 vs .7, NS), and dogwood (9.1 vs 4.2, NS), but buckbrush and persimmon cover increased despite being defoliated by goats (25.1 vs 33.3, NS; 2.9 vs 5.7, NS). Only ground cover of buckbrush and flame leaf sumac were decreased by mowing (1.4 vs 0, NS; 10.2 vs 4.2, NS). Grazing by goats reduced cheat, broomsedge bluestem, hogwort and sericea lespedeza as a percent of species. However, Scribners panic, velvet panic and black medic were increased as a percent of species. Mowing reduced percentage of common yarrow, and inland rush, but increased sedge, bermudagrass, Scribners panic, velvet panic and beaked panic grass. Herbicide reduced percentage of common yarrow, hogwort, and yellow oxalis but increased cheat, Scribners panic, beaked panic and tall fescue. In this two year study, herbicide was very effective at reducing woody species and goats were more effective than mowing but their effectiveness was limited by the short duration of the study.

Key Words: Goat, Brush, Herbicide

W83 Postweaning performance by crossbred Boer kids consuming pelleted alfalfa subsequent to grazing at different stocking rates. A. Asmare^{1,2}, A. K. Patra^{*1}, R. Puchala¹, G. Detweiler¹, T. A. Gipson¹, T. Sahlul¹, and A. L. Goetsch¹, ¹Langston University, Langston, OK, ²Alemaya University, Dire Dawa, Dire Dawa, Ethiopia.

Thirty-two crossbred Boer kids were used to determine effects of different preweaning grazing treatments, influencing ADG, on subsequent postweaning performance while consuming dehydrated alfalfa pellets. Pastures used in the 76-d grazing period (0.4 ha) consisted of grasses such as bermudagrass and johnsongrass and various forbs, particularly ragweed. Stocking rates were 4, 6, and 8 does, each with two kids, per pasture (L, M, and H, respectively). In addition, a fourth treatment (C) entailed 8 does per pasture but with kid access to another 0.4-ha pasture containing mimosa trees. One-half of the does were Boer x Spanish and others were Spanish, with all having kids from Boer bucks. There were two groups per treatment, and four paddocks within each pasture were sequentially grazed in 7- to 14-d periods. Kids were weaned after grazing, with the 84-d subsequent growth phase (four 21-d periods) starting 3 wk later. Four kids from each pasture were used (one from each of four does), distributed into four pens each equipped with an automated feeding system. Initial BW was 17 kg ($SE = 3.0$) and preweaning ADG while grazing was 76, 61, 37, and 81 g for L, M, H, and C, respectively ($SE = 6.7$). Postweaning ADG was similar among treatments (56, 42, 49, and 69 g for L, M, H, and C, respectively; $SE = 13.8$), greater ($P < 0.05$) for wethers than for doelings (71 vs 37 g), not affected by genotype, and not correlated with preweaning ADG ($r = 0.09$; $P < 0.63$). Energy expenditure (EE), estimated each period from heart rate and the ratio of EE to heart rate determined for each animal, was similar among treatments (520, 554, 545, and 551 kJ/kg BW^{0.75} for L, M, H, and C, respectively; $SE = 20.7$) and correlated with ADG ($r = 0.40$; $P < 0.0001$). In conclusion, differences among preweaning grazing treatments in ADG were not compensated for in a postweaning confinement phase with a pelleted alfalfa diet.

Key Words: Goats, Performance, Grazing

W84 Growth and carcass traits of percentage and crossbred boer wether goat kids raised under different production systems. C. Shoemaker^{*1}, S. Solaiman², C. Kerth¹, W. Jones¹, and D. Bransby¹, ¹Auburn University, Auburn, AL., ²Tuskegee University, Tuskegee, AL.

The effect of production systems on growth and carcass traits of percentage (87.5%) or crossbred (50.0%) castrated Boer goat kids was determined. Twenty four percentage (BW 23.0 +/- 0.74 kg; 8/treatment) and twenty one crossbred (BW 19.0 +/- 0.79 kg; 7/treatment) kids were randomly assigned within breed to one of three production treatments: 1) concentrate grain diet (CONC) con-

taining 40% dairy pellets, 40% soybean hulls, and 20% Bermudagrass hay; 2) Bahiagrass pasture (BG) supplemented with 150 g/head/day dairy pellets; 3) Mimosa browse (MB) supplemented with 100 g/head/day of cracked corn. The growth period consisted of 14 wk. Animals were harvested when a final BW of 35.0 \pm 5.0 kg was obtained or when the forage season ended. Yield measurements were collected 48 h postmortem. There were no breed-type differences after adjusting for initial weight, harvest weight or days to harvest using analysis of covariance. Percentage and crossbred Boer goat kids receiving the BG treatment had lower ADG (46.0 g/day \pm 5.22; $P < 0.0001$) than goats receiving the MB treatment (81.0 g/day \pm 5.28; $P < 0.0001$) and required more days on feed to reach harvest end points. Goats receiving the CONC treatment exhibited the highest ADG (141 g/day \pm 5.37; $P < 0.0001$) and reached harvest end point two to four weeks faster than BG or MB treatments. Goats from the CONC treatment had heavier harvest, hot carcass, and cold carcass weights ($P < 0.05$) with higher dressing and shrinkage percentages ($P < 0.05$) than did carcasses of the BG or MB treatments. No differences were observed ($P > 0.10$) in kidney pelvic fat, back fat, adjusted fat thickness, bone weight, percent lean weight or carcass selection grade between treatment groups. Carcasses from the CONC and MB treatments had heavier lean carcass weight and larger longissimus muscle area (LMA) ($P < 0.05$) than carcasses of the BG treatment. These results indicated that feeding percentage or crossbred Boer goat kids the CONC diet increases ADG, produces a heavier carcass with more lean weight and larger LMA than goats receiving grain supplementation on BG or ML systems.

Key Words: Goat, Production Systems, Carcass traits

W85 Effect of initial body condition of Boer x Spanish yearling wethers and level of nutrient intake on change in mass of internal organs and tissues. A.T. Ngwa^{*1}, L.J. Dawson², R. Puchala¹, G. Detweiler¹, R.C. Merkel¹, I. Tovar-Luna¹, T. Sahlul¹, and A.L. Goetsch¹, ¹Langston University, Langston, OK, ²Oklahoma State University, Stillwater.

Yearling Boer x Spanish wethers (54) were used to assess effects of initial body condition and level of feed intake on change in mass of internal organs and tissues. Before the experiment, 27 wethers were fed to achieve high body condition score (BCS; 1 to 5) and BW (IF) and 27 were fed for low BCS and BW (IT). During the experiment, IF wethers were fed low amounts of a pelletized diet and IT wethers received high amounts. Measures were determined before the experiment and after 12 and 24 wk. BCS was 3.8, 3.2, 2.6, 1.9, 2.8, and 3.5 (SE = 0.11) and live BW was 53.3, 46.2, 42.4, 36.6, 40.1, and 48.2 kg (SE = 2.03) for IF-0 wk, IF-12 wk, IF-24 wk, IT-0 wk, IT-12 wk, and IT-24 wk, respectively. Mass of noncarcass components was 24.7, 21.6, 20.2, 14.7, 17.7, and 22.3 kg (SE = 0.73) for IF-0 wk, IF-12 wk, IF-24 wk, IT-0 wk, IT-12 wk, and IT-24 wk, respectively. There were substantial declines in mass of many internal organs with advancing time for IF compared with relatively small change for IT. Examples include the reticulo-rumen (1,030, 589, 516, 865, 778, and 729 g; SE = 41.2), abomasum (229, 161, 128, 196, 187, and 191 g; SE = 10.0), small intestine (594, 269, 227, 546, 325, and 364 g; SE = 20.5), large intestine (397, 240, 240, 325, 325, and 264 g; SE = 17.2), liver (864, 454, 419, 556, 604, and 669 g; SE = 30.7), heart (252, 162, 165, 185, 156, and 169 g; SE = 8.9), and kidneys (138, 90, 89, 101, 105, and 103 g for IF-0 wk, IF-12 wk, IF-24 wk, IT-0 wk, IT-12 wk, and IT-24 wk, respectively; SE = 5.1). Conversely, change in visceral fat was much greater for IT vs IF (5.7, 3.9, 2.8, 0.6, 2.5, and 5.1 kg for IF-0 wk, IF-12 wk, IF-24 wk, IT-0 wk, IT-12 wk, and IT-24 wk, respectively; SE = 0.33). In conclusion, these results suggest that initial body condition can impact change in mass of energetically expensive internal organs with different planes of nutrition as well as of energy storage depots such as visceral fat, which may influence nutrient requirements and efficiency of energy use.

Key Words: Goats, Body Condition, Body Composition

W86 Change in energy expenditure by meat goats with varying levels of feed intake. A. Asmare^{1,2}, R. Puchala¹, R.C. Merkel^{*1}, T. Sahlul¹, and A.L. Goetsch¹, ¹Langston University, Langston, OK, ²Alemaya University, Dire Dawa, Ethiopia.

Twelve yearling meat goat wethers (7/8 Boer) were used in a 16-wk experiment to determine effects of different levels of nutrient restriction and a maintenance

level of intake after restriction on energy expenditure (EE; kJ/kg BW^{0.75}). Dehydrated alfalfa pellets were fed throughout the experiment. During the first 4 wk for adaptation, wethers were fed near maintenance. In wk 5 to 10, six wethers were fed at 60% of the maintenance level and in wk 11 to 16 were again fed near maintenance (60/100). The other six wethers were fed at 80 and 60% of maintenance in wk 5 to 10 and 11 to 16, respectively (80/60). BW and EE were measured on the last day of most weeks, with EE determined from heart rate and the previously determined ratio of EE to heart rate for each wether. BW did not differ between treatments (40.7, 38.9, 38.6, 37.1, 36.5, 37.1, 37.3, 37.4, 37.9, and 39.4 kg for 60/100, and 39.2, 38.2, 38.3, 37.5, 35.9, 37.5, 36.9, 36.3, 36.7, and 37.9 kg for 80/60 in wk 5, 6, 7, 9, 10, 11, 12, 13, 15, and 16, respectively). EE, expressed relative to BW at the end of the adaptation period, was not different between treatments in wk 4 (362 and 342; SE = 23.1), 5 (361 and 385; SE = 15.9), 6 (320 and 308; SE = 15.2), or 7 (280 and 302; SE = 13.2), but was numerically lower for 60/100 than for 80/60 in wk 9 (261 and 283 (SE = 7.3); $P < 0.08$) and 10 (259 and 276 kJ/kg BW^{0.75} (SE = 6.8) for 60/100 and 80/60, respectively; $P < 0.13$). After the change in plane of nutrition, EE was less ($P < 0.05$) for 60/100 than for 80/60 in wk 11 (258 and 289; SE = 7.2) and greater ($P < 0.05$) for 60/100 in wk 12 (328 and 266; SE = 13.5), 13 (328 and 256; SE = 13.7), and 15 (332 and 257 kJ/kg BW^{0.75} (SE = 7.8) for 60/100 and 80/60, respectively). In summary, there appears a 1- to 2-wk delay or lag in change in EE by goats in response to a marked decrease in feed intake or increase after a severe restriction. Change in EE upon nutrient restriction may be complete within 4 wk, but that with increased intake up to maintenance after a severe restriction can occur more quickly.

Key Words: Energy, Feed Intake, Goats

W87 Effect of shrub, tree and cacti foliage supplementation on rumen fermentation parameters in goats. A. Juarez-Reyes*, G. Nevarez-Carrasco, R. Montoya-Escalante, and A. Cerrillo-Soto, Universidad Juarez del Estado de Durango, Durango, Dgo. Mexico.

Five rumen-cannulated Spanish criollo goats were used to estimate the effect of supplementing an oat straw-based diet with shrub, tree and cacti foliage commonly selected by grazing goats in the semiarid region of North Mexico on rumen VFA, Ammonia-N and pH. Treatments consisted of oat straw (47% of the diet), alfalfa hay (22%), ground corn (11%), soybean meal (7%) and foliage from *Quercus grisea* (T1), *Q. eduardii* (T2), *Acacia shaffneri* (T3) and *Opuntia spp* (T4) at a level of 13%. A control treatment (T5) had no supplement. The diets were isonitrogenous (10.6% CP). Data were analyzed by ANOVA according to a 5 x 5 Latin Square experimental design using PROC GLM. Total VFA concentrations ranged from 92 mM/l in goats fed the control diet to 80 mM/l in goats supplemented with *Q. grisea* ($P < 0.05$). Supplementation affected the molar proportions of acetate ($P < 0.01$), propionate ($P < 0.05$) and butyrate ($P < 0.001$). Goats supplemented with *Q. eduardii* registered the higher proportions of acetate and butyrate (67.7% and 12.7%, respectively), whereas animals supplemented with *Opuntia spp* had the higher proportions of propionate (17.7%). Rumen NH₃-N concentrations were affected by supplementation ($P < 0.001$) (mean = 5.7 mg/dl). Goats fed *Q. eduardii* registered higher NH₃-N concentrations (6.8 mg/dl) whereas lower concentrations (4.7 mg/dl) were observed in animals supplemented with *Opuntia spp*. The pH level in rumen fluid ranged from 6.54 to 6.74 with a mean of 6.65 ($P < 0.001$). Data indicate that under these conditions, total VFA concentrations are within the range of a normal forage diet. Mean NH₃-N concentrations are adequate for microbial growth. The level of pH indicate that cellulolytic activities were not negatively affected by shrub, tree and cacti foliage supplementation. The utilization of *Q. eduardii* and *Opuntia spp* species as supplements may help to alleviate energy deficiencies in grazing goats during the dry season.

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Key Words: Supplements, North Mexico, Harsh Season

W88 Tea saponins affect rumen fermentation and growth performance in Growing Boer Goats. W.-L. Hu^{*1}, J.-X. Liu¹, Y.-Q. Guo¹, Y.-M. Wu¹, J.-A. Ye¹, X.-W. Ye², Y.-M. Wang², and H.-W. Ye², ¹Zhejiang University, Hangzhou, P. R. China, ²Hangzhou Zhengxing Animal Industries, Lin'an, Zhejiang, P.R. China.

Two experiments were conducted to investigate the effects of tea saponins (TS) on rumen fermentation and growth performance in growing Boer Goats. In Experiment 1, the Reading Pressure Technique (RPT) system was used to investigate the effect of addition of TS (0, 0.2, 0.4 and 0.8 mg/ml) on the ruminal fermentation *in vitro*. The 24h gas production and methane emission were significantly decreased when the TS was included. Compared to the control, the TS had little effects on pH values and the amounts of total volatile fatty acids in the rumen fluids. However, the fermentation patterns were changed, reflective of higher proportions of propionate. Ammonia-N concentration and protozoa counts were significantly reduced, while microbial protein yield were increased by the TS addition, suggesting that the TS could modify the rumen fermentation and inhibit the release of methane. In Experiment 2, twenty-seven growing Boer goats were used to evaluate the effects of the TS addition on growth performance. The animals received the same basal diets, and added with the TS at levels of 0 (C), 3¼T1¼4‰ and 6 g (T2) per day. The experiment lasted for 60 days with the first 15 days for adaptation. Blood samples were obtained by jugular venipuncture before the morning feeding on the final day of the experiment. The dry matter intakes, average daily gain and feed conversion ratio in group T1 were higher than in other two. Serum total protein, albumin, high density lipoprotein cholesterol, Ca and P and alkaline phosphatase levels were higher in group T1 than those in C and T2, whereas the blood urea nitrogen, creatinine and total cholesterol were lower in the TS-added groups. The concentrations of glucose, glutamic-oxaloacetic transaminase and glutamic-pyruvic transaminase were not affected by the TS. From the results obtained in this study, it is inferred that the TS could modify the rumen fermentation and that proper doses of TS may have some potentials in improving the animal growth performance, whereas at high doses, it may have adverse effects on animal production.

Key Words: Tea Saponin, Rumen Fermentation, Grow Performance

W89 Relationship between *in vitro* gas production and cell wall compounds in the diet selected by goats grazing a poor quality rangeland in North Mexico. A. Cerrillo-Soto^{*}, G. Nevarez-Carrasco, R. Montoya-Escalante, and A. Juarez-Reyes, Universidad Juarez del Estado de Durango, Durango, Dgo, Mexico.

The study was performed to determine the *in vitro* gas production characteristics of the diet selected by goats grazing a poor quality rangeland. Four esophageally cannulated Spanish criollo goats (33 kg BW) were used to collect extrusa samples during Spring (Apr-Jun), Summer (Jul-Sep), Autumn (Oct-Dic) and Winter (Jan-Mar). Samples were collected for two days each month, morning and evening. Samples (200 mg DM) were incubated in glass syringes using ruminal fluid from three sheep fed alfalfa hay *ad libitum*. Gas volumes were recorded at 0,3,6,9,12,24,48,72 and 96h post-inoculation. Data were fitted to the equation $p = a + b(1 - e^{-ct})$, where p represents gas volume at time t , a the intercept, $a + b$ the potential gas production, and c the constant rate of gas production during incubation. Data were analyzed by ANOVA for a completely randomized design. Simple linear correlation coefficients between chemical composition and *in vitro* gas production parameters were computed by PROC

REG (SAS). Higher $a + b$ values ($P < 0.05$) were recorded in Spring (during the new growth period of shrub species), whereas Autumn (at the beginning of the dormant forage season) registered lower values (47.6 and 34.8 mL/200 mg DM, respectively). Differences ($P < 0.05$) were recorded in the constant rate of gas production c . Higher values were obtained during the regular rainy season (summer = 0.069 h^{-1}) and lower values were recorded in winter (when vegetative species are dormant = 0.047 h^{-1}). Negative correlations were recorded between $a + b$ and NDF ($r = -0.77$), ADF (-0.82) and lignin ($r = -0.59$). On the contrary, positive correlations were obtained between the constant rate of gas production c and CP ($r = 0.79$). It is concluded that differences in the c parameter between seasons indicate variations in nutrient availability. Negative correlations between cell wall constituents and *in vitro* gas production parameters indicated that such compounds have a detrimental effect on gas production.

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Key Words: Grazing, Semiarid Region, North Mexico

W90 In situ ruminal digestion kinetics and volatile fatty acid production rate in goats fed premium quality dehydrated alfalfa hay supplemented with three levels of a concentrate mix. N. E. Brown^{*}, J. Bing, and R. N. Corley, III, Tuskegee University, Tuskegee, AL.

Three non-lactating, mature, Nubian does fitted with permanent ruminal cannulas were used in a 3 x 3 Latin Square design to examine the kinetics of *in situ* DM disappearance and the rate of VFA production. The diets consisted of Premium Quality Dehydrated Alfalfa Hay (US Alfalfa) supplemented with 30% (high forage diet), 50% (medium forage diet) and 70% (low forage diet) Nutrena Sweet Stuff[®]. Proximate analysis and measurements of NDF, ADF, were also determined. The high, medium and low forage diets, had DM (92.6, 92.6 and 92.6%), CP (20.8, 18.8, 16.7%), NDF (33.8, 37.0, 40.1%) and ADF values (26.4, 28.0, 30.0%) respectively. Ruminal digestion kinetics of the high, medium and low forage diets respectively, estimated 50, 50, 53% soluble, 24, 22, 18% was potentially degradable, 26, 29, 29%, was indigestible and the fractional rate of digestion was 10, 15 and 8%h⁻¹. There were no differences ($P > .05$) in the soluble and indigestible fraction ($P > .05$) among diets. The low forage diet was less degradable ($P < .05$) than the high and medium forage diets which did not differ ($P > .05$). The medium forage diet had a faster fractional rate of disappearance ($P < .05$) than the high or low forage diets which differed ($P < .05$) from each other.

Estimates of daily VFA production were 3.5 mol/day for the high forage diet, 4.5 mol/day for the medium forage and 7.8 moles/day for the low forage diet. Although not significant ($P > .05$) there was a numerical increase in daily VFA molar production as commercial grain mix increased in the diet. Estimates of molar proportions of the high, medium and low forage diets respectively were 64:22:10, 61:24:12 and 62:22:12 for acetate, propionate and butyrate. No differences ($P > .05$) were seen in the molar proportions among the diets.

Increasing the ratio of commercial grain mix to the dehydrated alfalfa diets in this study did not result in significant ($P > .05$) benefits, but did result in numerical increases in VFA production rates in goats.

Key Words: Goats, Zero VFA Production, Dehydrated Alfalfa

Growth and Development: Physiology of Growth and Development

W91 DNA regulatory activity and RNA expression of the sequence surrounding the callipyge mutation. A. Skipwith^{*1}, A. Perkins¹, T. Shay², S. Eng², D. Moody¹, N. Cockett², and C. Bidwell¹, ¹Purdue University, West Lafayette, IN, ²Utah State University, Logan.

The callipyge mutation is a single base pair transition from A (normal) to G (callipyge) in an imprinted gene cluster on chromosome 18 in sheep. The muta-

tion occurred in a highly conserved 12 bp motif in the intergenic region between DLK1 and GTL2. The mutation alters the expression of several genes within the 215 kb cluster when the mutation is inherited in *cis*. Therefore, it has been hypothesized that the mutation occurred in a long range control element. In addition, a transcript named CLPG1 has been detected from the region containing the callipyge mutation. The objective of this project was to analyze the genetic regulatory role and transcriptional activity of the sequence around the