

pasture mass difference was 3.29 kg/d in yr 1 and 3.79 kg/d in yr 2 and was not influenced by supplementation, while total OMI was increased ($P < .05$) by supplementation in both years. Pasture forage mass after grazing (2490 kg/ha) suggested that intake was not limited based on forage availability.

Key Words: Stockpiled fescue, Cottonseed

529 A novel system to estimate protein degradability in legume and grass hays. M.E. Dorshorst and P.C. Hoffman, *University of Wisconsin, Madison.*

Previous research from our laboratory has demonstrated that near-infrared reflectance spectroscopy (NIRS) has a utility in predicting RUP contents of legume and grass silages. This study was conducted to evaluate whether application of previous research techniques could yield a useful NIRS RUP prediction system for legume and grass hays. In 1998 and 1999, legume and grass hays ($n = 208$) from the north central region of the United States were collected. A portion of each sample was dried, ground (1 mm), and scanned on a NIR spectrophotometer and spectra saved. Center and select procedures using Infrasoft International[®] software (version 2) were implemented and 106 spectrally different legume and grass hays were selected for NIRS RUP equation development. The remaining portion of the legume and grass hay samples were dried, ground (2 mm) and evaluated for RUP using calibrated cow ($n = 4$) in situ procedures. Legume and grass hays were also evaluated for CP and NDF. The legume and grass hays ($n = 106$) were of desired variable quality with CP ranging from 10.7 to 29.7% of DM, and NDF ranging from 26.8 to 61.5% of DM. In situ RUP content ranged from 14.6 to 45.5% of CP, with a mean of 25.9% of CP. Development of an NIRS RUP equation for legume and grass hays proved to be fruitful. The R^2 and SE of calibration were 0.87 and 2.46% of CP, respectively. Validation procedures also indicated reasonably good performance of the equation with an r^2 of 0.83 and a SE of cross validation of 2.84% of CP. Data indicate NIRS can predict in situ RUP contents of legume and grass hays.

Key Words: Forage, Protein, Degradability

530 Genotypic differences in chemical composition and ruminal degradability of oat hulls. R. K. Thompson^{*1}, A. F. Mustafa¹, J. J. McKinnon¹, D. D. Maenz², and B. Rossnagel³, ¹University of Saskatchewan, Saskatoon, Canada, ²Prairie Feed Resource Center, Saskatoon, Canada, ³Crop Development Center, Saskatoon, SK, Canada.

A study, consisting of two trials, was conducted to determine differences in chemical composition and ruminal nutrient degradability of hulls derived from ten varieties of oat grown in western Canada. In trial one, chemical composition and IVDMD of the oat hull varieties were determined in a completely randomized design. Based on the results of the first trial, a second trial was conducted to compare in situ ruminal nutrient degradability of hulls from two of the oat varieties (AC Assiniboia and Calibre) with that of oat straw (Calibre) in a randomized complete block design. Results showed that relative to the other nine varieties, hulls derived from AC Assiniboia had a lower ($P < .05$) ADL and a

higher ($P < .05$) IVDMD. Relative to the average of the other nine varieties, AC Assiniboia had 79% less ADL and 44% higher IVDMD. There were no significant differences in ADF, NDF, and CP content between varieties. Results of the second trial showed that effective ruminal degradability of NDF and ADF for the AC Assiniboia hulls were similar to those of Calibre straw but higher ($P < .05$) than those of the Calibre hulls (22.5% vs. 11.8% and 22.3% vs. 12.5%, respectively). The higher effective degradability of the AC Assiniboia hulls relative to the Calibre hulls was due to a larger ($P < .05$) slowly degradable fraction. The results of this study show that due to their lower ADL content, hulls derived from AC Assiniboia oat have almost double the ruminal fiber degradability of Calibre hulls. The economic return for the oat milling industry may be increased by using an oat variety with a more valuable hull to sell into the feed market.

Key Words: Oat hulls, Chemical composition, Ruminal Degradability

531 Effect of undegradable intake protein supplements, forage protein level, and incubation time on *in vitro* fermentation. L.A. Richards^{*1}, M.K. Petersen², J.B. Richards², and M. Remmenga², ¹USDA-ARS Grazinglands Research Laboratory, El Reno, OK, ²New Mexico State University, Las Cruces.

High undegradable intake protein (UIP) supplements may interact with changing forage quality to affect ruminal fermentation. Two *in vitro* experiments investigated changes in OMD, NH_3 and VFA production when supplying UIP with range diet samples (3,8, or 13%CP) over 18 or 48 h. In Experiment 1, forage was not supplemented (NS); supplemented with wheat middlings (WM; 23%CP); WM + feathermeal (FM) at 7,16, or 23%UIP (32,44, or 55%CP); or CSM (16%UIP, 33%CP). In Experiment 2, forage was NS; supplemented with WM (17%CP); or WM + 9,12, or 15%UIP at 34%CP. Forage (F), supplement (S), and time (T) interactions were tested. In Experiment 1, OMD was increased by S vs NS (33vs40 \pm .4%; $P = .01$), T at 18 vs 48 h (29vs48 \pm .3%; $P = .01$), and F at 3,8, and 13%CP (31,40, and 45 \pm .3%; $P = .01$). Higher NH_3 (SxT; $P = .01$) was detected as UIP increased at 48 h. Acetate:propionate decreased as forage CP increased, but increased with NS and higher UIP (SxF; $P = .01$). Total VFA were increased as forage CP increased, but decreased as supplemental UIP increased (SxF; $P = .01$). While UIP source did not change OMD ($P = .3$) or NH_3 ($P = .7$), FM increased VFA (65vs61 \pm .8 mMol; $P = .01$) and decreased acetate:propionate (3.5vs3.7 \pm .03; $P = .01$) vs CSM. In Experiment 2, supplementation increased OMD in lower CP forage (SxF; $P = .02$). NH_3 was lowest ($P = .01$) in NS and highest ($P = .01$) in WM+FM at 9%UIP. Acetate:propionate was decreased by higher WM and higher forage CP (SxF; $P = .01$). Lowest isovalerate, valerate, and isobutyrate were found in NS and highest in 8% CP forage (SxF; $P = .04$). Total VFA was decreased ($P = .01$) at 48 h in NS vs S (60vs75 \pm 1.6 mMol) and increased ($P = .01$) at highest forage CP (68,69,79 \pm 1.3 mMol). Higher UIP in a moderate protein supplement optimized *in vitro* forage fermentation. Nutrient availability had less effect on fermentation of higher protein forage. While forage degradation was consistently increased in the first supplemental increment, additional inputs which alter nutrient flow may improve animal performance.

Key Words: UIP, forage, fermentation

GOAT SPECIES

532 Effects of individual vs group confinement and forage access on performance of artificially reared, confined Alpine kids. A.L. Goetsch^{*}, G. Detweiler, T. Sahl, L.J. Dawson, and S.S. Zeng, *E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK.*

Forty Alpine kids (20 females and 20 males) were used to determine effects on performance of individual vs group confinement and access to forage during the suckling period. Kids began the experiment at 3 to 9 d after birth (3.6 \pm .10 and 4.0 \pm .09 kg initial BW for females and males, respectively). Treatments were: individual confinement in 91 \times 91 cm cages (C1); confinement of two kids (one in the experiment and another older) in 182 \times 91 cm cages (C2); group confinement (with at least two older kids present) in a 2.43 \times 1.22 m pen (P); and P plus free access to alfalfa hay (PF). Milk was consumed ad libitum for 8 wk with free access to a concentrate-based starter diet, followed by a 4-wk post-weaning period, the first 5 d of which entailed restricted milk intake.

In the 8-wk suckling period, milk intake was similar among treatments (1.81, 1.80, 1.89, and 1.77 kg/d; SE = 34.8), whereas sex influenced the treatment response in ADG (interaction, $P = .02$) (female: 159, 154, 172, and 154 g/d; male: 175, 193, 162, and 182 g/d for C1, C2, P, and PF, respectively [SE = 6.3]). In the 4-wk post-weaning period, ADG was greater ($P < .05$) for P than for C2 and PF (75, 54, 112, and 49 g/d; SE = 16.4), although for the entire 12-wk experiment ADG was similar among treatments (137, 134, 149, and 128 g/d for C1, C2, P, and PF, respectively; SE = 6.7). In conclusion, housing two or more Alpine kids together vs alone and offering hay during the suckling period did not enhance performance during or shortly after suckling.

Key Words: Goat, Suckling, Performance

533 Effect of chromium picolinate supplementation on the number of blood leukocytes and weight gain of early-weaned goat kids. F.G. Rios^{*1}, F.A. Nuñez², G. Zambrano², J.A. Ortega², and R. Barajas¹, ¹Universidad Autonoma de Sinaloa, ²Universidad Autonoma de Chihuahua, Mexico.

The objective of this experiment was to examine the effect of chromium (Cr) picolinate supplementation on the number of blood leukocytes and ADG of early-weaned goat kids. Fifty goat kids (male and female; Alpine, Saanen and Toggenburg breed) were used. Animals were weaned five days after birth and divided into five groups of 10 goats. Each group was randomly assigned to one of five treatments: 1) No Cr supplementation (control); 2) 100 ppb Cr (from chromium picolinate) supplemented in milk substitute (Cr-Pic 100); 3) Feed supplement with 200 ppb Cr (Cr-Pic 200); 4) Feed supplement with 300 ppb Cr (Cr-Pic 300); and 5) Feed supplement with 400 ppb Cr (Cr-Pic 400). Goat kids were fed the experimental supplements for four weeks. Body weight were taken at the start and end of the experiment. Blood samples were taken weekly from the jugular vein in vacutainer tubes without anticoagulant. One week after weaning, Cr supplementation decreased ($P < 0.05$) the number of blood leukocytes (23,585 vs 17,802 leukocyte/mm³). Two weeks after weaning, Cr-supplemented goats showed lower ($P < 0.05$) leukocyte numbers (19,686 vs 14,307 leukocyte/mm³). In the third week after weaning, goat kids supplemented with 200 to 400 ppb Cr showed lower leukocytes values ($P < 0.05$) than the control (13,172 vs 10,324 leukocyte/mm³). Four weeks after weaning, Cr supplementation had not effect ($P > 0.10$) on the number of blood leukocytes (mean: 7,420 leukocyte/mm³). Compared to the control, ADG increased ($P < 0.05$) 24.8% by addition of Cr-Pic 300 (145 vs 181 g/d), and 29.7% by addition of Cr-Pic 400 (145 vs 188 g/d). Chromium supplementation with 100 and 200 ppb had not effect ($P > 0.10$) on ADG. It is concluded that Cr picolinate supplementation reduced the number of blood leukocytes and that levels higher than 300 ppb improved ADG in early-weaned goat kids.

Key Words: Chromium, Picolinate, Goat

534 Effects of dietary protein level on performance of weaned Boer crossbred and Spanish wethers. I. Prieto¹, A.L. Goetsch¹, S.A. Soto-Navarro^{*1}, V. Banskalieva¹, M. Cameron¹, R. Puchala¹, L.J. Dawson¹, and S.W. Coleman², ¹E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK, ²Grazinglands Research Laboratory, USDA, ARS, El Reno, OK.

Boer (3/4) × Spanish (1/4) (BC; n = 23) and Spanish (SP; n = 22) wethers, approximately 4.5 mo of age and 17.6 and 19.4 kg initial BW, respectively (SE = .57), were used to determine effects on growth of protein level in 70% concentrate diets consumed ad libitum for 30 wk. Diets offered were 10.2, 14.2, 18.3, and 23.6% CP (DM basis), and CP concentration in consumed DM was 9.3, 13.8, 17.1, and 22.1% (P1, P2, P3, and P4, respectively), with supplemental protein from soybean meal for P1 and P2 and from soybean meal plus a blend of blood, fish, and feather meals for P3 and P4. Dry matter intake was similar between breeds and among diets (732, 712, 698, and 740 g/d for P1, P2, P3, and P4, respectively; SE = 27.0). Average daily gain was greater for P2 ($P = .07$) and P4 ($P < .05$) than for P1 (76, 90, 85, and 100 g/d for P1, P2, P3, and P4, respectively; SE = 5.3) and for BC vs SP (97 vs 78 g/d, SE = 3.7; $P = .05$). Similarly, ADG:DMI was lowest ($P < .05$) among diets for P1 (.106, .126, .121, and .132 for P1, P2, P3, and P4, respectively; SE = .0053) and greater ($P < .05$) for BC than for SP (.135 vs .108; SE = .0037). In conclusion, with 70% concentrate, dietary protein levels above 14% DM did not improve performance for either weaned Boer crossbred or Spanish wethers.

Key Words: Goat, Protein, Growth

535 Effect of dietary protein degradability and liveweight on blood metabolites in prepubertal female goats. G. Cufre*, O. Forchetti, M. I. Vazquez, L. Godio, and M. Chaves, Universidad Nacional de Rio Cuarto, Cordoba, Argentina.

The objective of this work was to determine the effects of BW and dietary protein degradability level on the onset of puberty by measuring changes of some blood metabolites as indicators of the metabolic status of goats. The experiment was carried out at Rio Cuarto, Argentina (33°08'S, 64°20'W) between February and August, under natural photoperiod condition. Four-month old prepubertal Creole female goats

were assigned to three treatments (n = 9) differing in protein degradability: 70% (HD), 63% (MD) and 60% (LD), and formulated to be isonitrogenous (20% crude protein) and isocaloric (2.64 Mcal/kg DM). Does were stratified by BW in two subgroups: 15.8 ± 1.4 (HW) and 11.9 ± 1.4 (LW) at the beginning of the experiment. Feed was offered in individual cages from 0800 to 1600. Body weight was recorded at monthly intervals. Estrus behavior was recorded twice daily using a vasectomized male. Ultrasonography was performed on d 4 and 6 after estrus to record corpus luteum. Blood samples were collected every 2 wk to measure blood urea nitrogen, cholesterol, glucose, and non-esterified fatty acids (NEFA). A 2 × 3 factorial with two BW and three protein degradability levels was analyzed in a randomized complete block design. Puberty was defined as occurrence of estrus and presence of corpus luteum. Puberty occurred in 23 of 27 goats within an interval of 20 d. There were no differences in blood metabolite levels between the two subgroups of goats (HW and LW). Glucose concentration was always within the range of reference values, although it was higher in LD ($P < .01$) than in HD or MD. The NEFA levels did not differ between diets but were always below 0.5 mmol/L. As puberty approached, cholesterol concentrations increased in all goats. Puberty age was not affected by diet and BW (HW 20.3 ± 2.2 kg and LW 16.3 ± 1.4 kg). Results from this study indicate that once a certain maturity is achieved, puberty appears to be controlled by metabolic status reached regardless of BW.

Key Words: Metabolic Status, Prepubertal Goats, Protein Degradability

536 Intestinal digestible protein and ruminal ammonia-N in grazing goats: strategies to estimate supplement requirements. A.S. Juarez-Reyes*, G. Nevarez-Carrasco, and M.A. Cerrillo, Universidad Juarez del Estado de Durango, Durango, Dgo. Mexico.

The objective of this study was to use the intestinal digestible protein (IDP) system to evaluate the energy and nitrogen balance from the diet consumed by goats in a kid production system in a semiarid region of Northern Mexico. Four ruminally and esophageally fistulated female goats (38 ± 1.7 kg BW) from a flock of 250 grazing goats were used for a period of 12 mo to obtain ruminal fluid and diet samples. Crude protein (CP), OM, IVDMD, *in situ* degradability of CP and EE from the diet were used to estimate the intake of intestinal digestible protein (IIDP) that originated from nitrogen (NIDP) and energy (EIDP), and the intake of metabolizable energy (IME). Ruminal samples were analyzed for ammonia-N (NH₃-N) concentrations. Data were analyzed in a randomized complete block design. Annual means for CP, IVDMD, *in situ* degradability of CP, EE, IME and IIDP were: 15.0%, 54.6%, 36.0%, 1.6%, 2.6 Mcal/d and 112 g/d, respectively. The mean ruminal fluid concentration of NH₃-N registered during the dry season (February-June) was 4.8 mg/dL, whereas a range of 6 to 19 mg/dL was recorded during the rainy months (July-December). The mean content of the diet in IDP throughout the year was 82 g/kg DM. This intake of IDP is sufficient to meet maintenance requirements and to produce 500 mL of milk. However, significant effects ($P < 0.05$) between EIDP (mean 90 g/kg DM) and NIDP (mean 75 g/kg DM) were observed during the dry season. The 15 g/kg difference in favor of EIDP suggests the necessity to incorporate this amount of digestible protein to the diet of goats during the harsh season to increase the intake of metabolizable protein.

Key Words: Goats, Grazing, Intestinal Digestible Protein

537 Estimating fecal crude protein excretion in goats. A.L. Adams^{*1}, J.E. Moore², A.L. Goetsch¹, and T. Sahu, ¹E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK, ²Department of Animal Science, University of Florida, Gainesville.

As part of an overall goal to estimate protein requirements of goats using the factorial method, equations were developed and tested to estimate fecal CP excretion. Data from 54 trials (n = 189) on CP intake and apparent digestibility in goats were compiled. There were 78 unsupplemented roughages (14 grass hays, 12 legume hays, 4 grain silages, 4 straws, 9 mixed roughage sources, and 35 browse and mixed browse/hay diets) and 111 mixed roughage/concentrate diets in the database. Hypotheses were 1) metabolic fecal CP as a proportion of DMI is constant and 2) true digestibility of CP is constant, and were tested by regressing apparent digestible CP (DCP, % diet DM) on total CP (% DM). Excluding extreme outliers, the equation was: DCP = .899 (CP) - 3.14; n = 179; r² = .96; intercept = metabolic fecal CP excretion (% DM); and

slope = true digestibility of CP. Coefficients from the regression equation were used to compute expected fecal CP (EFCP, g/d): $EFCP = .0314 (TDMI) + [1 - .899 (CP/100)(TDMI)]$, where TDMI = total DM intake (g/d). To evaluate the EFCP equation, the main database was divided into subsets for equation development (n = 107) and evaluation (n = 68). Subsets were balanced for TDMI, CP intake, CP digestibility, dietary forage % (FORG), presence or absence of browse in the diet (BRWZ; 1 vs 0, respectively), animal age, breed, and initial BW. Regression of actual fecal CP excretion (AFCP, g/d) on EFCP using the development set yielded the equation: $AFCP = 1.160 (EFCP) - 2.30$; $r^2 = .89$, RMSE = 11.4. The slope of the equation was different from 1 ($P < .0001$). Multiple regression analysis conducted on the development set, using factors chosen with the stepwise selection option of PROC REG, gave the following equation: predicted fecal CP (PFCP, g/d) = $-9.79 + 1.181 (EFCP) + 12.32 (BRWZ) + .0522 (FORG)$; $r^2 = .92$; RMSE = 9.9. Testing this equation with the evaluation subset showed that the regression of AFCP on PFCP was close to ideal (i.e., intercept = 0, slope = 1, $r^2 = .93$, RMSE = 9.3). In conclusion, when predicting fecal CP excretion by goats, forage concentration and presence or absence of browse in the diet should be considered in addition to dietary CP concentration and TDMI.

Key Words: Protein, Excretion, Goats

538 Effect of saltbush (*Atriplex amnicola*) on performance of goats on saline rangelands. S. H. Raza^{*1}, M. Riaz¹, and P. N. Raza², ¹University of Agriculture, Faisalabad, Pakistan, ²Hi-Tech Feeds, Rawalpindi, Pakistan.

Fifteen lactating Beetal goats were randomly allotted to three diets. In diet A (control), goats were fed hay containing Lucerne (*Medicago sativa*) and Mott grass (*Pennisetum purpureum*) in an equal ratio. In diets B and C, 20 and 40% DM of diet A was replaced with an equal percentage of DM from saltbush (*Atriplex amnicola*). Diets were fed individually; goats had ad libitum access to diets for a period of 6 wk in a completely randomized design. Dry matter intake (DMI), organic matter intake (OMI), water intake (WI) and milk production (MP) were recorded and feed conversion ratio (FCR) was calculated. Increasing dietary saltbush level led to decreases ($P < .05$) in DMI (1.28, 1.00, and .79 kg/d), OMI (1.13, .83, and .66 kg/d) and MP (.44, .41, and .31 kg/d) for A, B, and C, respectively. The WI was increased ($P < .05$) with increasing saltbush intake (1.69, 3.31, and 3.93 L/d for A, B, and C, respectively). No differences were seen in ADG for A, B and C. Inclusion of different levels of saltbush affected MP and milk composition ($P < .05$) for solid not fat, acidity, and ash. No difference ($P < .05$) were found in protein, specific gravity, and total solid of milk. Correlations between diet and DMI, ADG or OMI/kg W^{.75} were negative, whereas WI and diet were positively correlated. Diet had no effect on ADG and FCR, although FCR showed a positive correlation ($r = .3$) with saltbush addition. Milk production was not affected by replacing Lucerne and Mott grass hays with 20% saltbush. However, when replacing Lucerne and Mott grass hays with 40% saltbush, MP was reduced ($P < .05$). Results suggested that under range conditions and during periods of feed scarcity, saltbush could be added to goat diets up to 20% DM.

Key Words: *Atriplex amnicola*, Saltbush, Goat

539 PEG supplementation of kids and effects of early post-weaning nutritive plane upon subsequent growth. R.C. Merkel^{*1}, A.L. Goetsch¹, T. Sahl¹, and N. N. Silanikove², ¹E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK, ²Volcani Center, Bet Dagen, Israel.

Forty-eight 50% Boer × Spanish doelings (4 mo of age, 20.9 ± 2.4 kg) were randomly assigned to three treatments to test the effects of polyethylene glycol (PEG) supplementation of grazed sericea lespedeza and early post-weaning nutritive plane on subsequent growth. Treatments were: barn (B) where goats were kept in individual pens for the 24-wk trial and fed free-choice a 70% concentrate diet (17% CP, 69% TDN); PEG (P); and control (C). In the first 6 wk (Phase 1), P and C doelings grazed .44-ha lespedeza paddocks supplemented with 88 g/d of concentrate with or without an additional 25 g/d PEG. In the subsequent 6 wk (Phase 2), C doelings resided in previously ungrazed 1-ha paddocks dominated by crabgrass, whereas P doelings grazed 1-ha lespedeza paddocks supplemented with approximately 1.5% BW of the B

diet. In Phase 3, the final 12 wk, all doelings had ad libitum access to the 70% concentrate diet in confinement. Body weights were determined at 3-wk intervals and ADG was calculated by regression using initial BW as a covariate. Phase 1 ADG ranked ($P < .05$) B>P>C (157, 97, and 47 g/d; respectively, SE = 10.9). The ADG in Phase 2 (B 70, P 55, and C 57 g/d; SE = 9.3), Phase 3 (B 80, P 85, and C 73 g/d; SE = 7.6), and the whole trial (B 87, P 73, and C 56 g/d; SE = 8.2) were similar among treatments ($P > .05$). In conclusion, PEG may have potential to improve ADG by goat kids grazing tannin-containing sericea lespedeza, although testing over a longer time frame is needed. Differences in ADG in the early portion of the grazing period did not elicit increased ADG later with feeding of a concentrate-based diet relative to continuous concentrate consumption reflecting an absence of compensatory growth.

Key Words: Goats, Polyethylene Glycol, Sericea Lespedeza

540 Vegetation management with goats and steers in the Appalachian region of North Carolina. J-M Luginbuhl^{*}, J. T. Green, and M. H. Poore, North Carolina State University, Raleigh.

A field study was initiated to evaluate the effectiveness of utilizing cattle (*Bos taurus*) alone or in combination with goats (*Capra hircus*) to manage vegetation in an overgrown mountain pasture (7.8 ha) that had not been grazed for two years and to control encroaching multiflora rose (*Rosa multiflora*) bushes and black locust trees (*Robinia pseudoacacia*). The site was divided into 9 unequal sections consisting of 3 control (CTL) plots, three plots rotationally grazed by cattle (C; 6 steers) and three plots rotationally grazed by goats and cattle (GC; 12 goats and 6 steers). Measurements of herbaceous vegetation at permanent pegs placed along transect lines using a 10 × 100-cm rectangle and of tagged trees were taken immediately before and after each grazing season. Over four grazing seasons, managed defoliation resulted in an increase in percent vegetation as grass ($P < .01$), and in increased frequencies of white clover (*Trifolium repens*; $P < .02$), bluegrass (*Poa pratensis*; $P < .01$) and dandelion (*Taraxacum officinale*; $P < .01$) but also horsenettle (*Solanum carolinense*; $P < .01$) in C and GC plots, and in respective decreases in CTL. White clover was practically eliminated from CTL plots. Percent vegetative ground cover decreased in CTL (75 to 40%; $P < .01$) but remained similar in C and GC plots (avg 81%). Tall fescue (*Festuca arundinacea*) frequency was not affected and remained similar during the course of the study (avg: 67.5%). Black locust trees were practically eliminated over the four grazing seasons in both C and GC plots ($P < .01$) but grew to a height of 5.3 m in CTL. Height of multiflora rose bushes were kept low in GC (avg .6 m) but increased to 1.8 m in C and 2.5 m in CTL (C vs GC: $P < .04$; CTL vs C + GC: $P < .01$) and the number of dead multiflora rose canes (stems) increased to 59% in GC but remained at 4.5% in both C and CTL. Multiflora rose canopy area (C vs GC: $P < .05$; CTL vs C + GC: $P < .01$) increased in CTL (.5 to 11 m²) and C (.6 to 7 m²), but did not change in GC (avg .5 m²). These results indicate that goats grazed with cattle are a viable management tool for the control of unwanted vegetation in mountain pastures.

Key Words: Goat, Cattle, Vegetation Management

541 Nutrient digestibility of bean straw-based diets by goats. M.A. Cerrillo and A.S. Juarez-Reyes, Universidad Juarez del Estado de Durango, Durango, Dgo. Mexico.

Four dry non-pregnant Spanish Criollo goats fitted with ruminal and duodenal cannulae were used in a 4 × 4 Latin square design to study the effects of supplementing urea-ammoniated straw, alfalfa hay and ground milo to a bean straw-based diet on the site and extent of nutrient digestion. Four diets containing A) bean straw fed ad libitum, B) bean straw, ammoniated straw and milo, in proportions of 68, 19 and 10% respectively, C) bean straw, alfalfa and milo (75, 11 and 11%), and D) bean straw, alfalfa, ammoniated bean straw and milo (69, 10, 7 and 10%) were fed. Intakes of DM and OM, and ruminal digestibilities of DM (avg: 63.4%) and OM were similar across diets. Ruminal digestibility of NDF and ADF were higher when ammoniated straw and milo were fed ($P < .10$). Total tract digestibilities of DM (avg: 77.1%), OM, NDF and ADF were not affected by diet. Diet effects were observed in N intake ($P < .01$) and flow of microbial N to the duodenum ($P < .01$). There were no differences ($P > .7$) in microbial efficiency across diets. In conclusion, addition of ammoniated bean straw, alfalfa hay and

ground milo to a bean straw-based diet fed to goats resulted in minimal differences in digestibility.

Item	A	B	C	D	SEM	P
Intake, g/d						
DM	805	950	870	929	77.7	.13
OM	721	851	779	832	69.7	.13
Apparent ruminal digestion, %						
OM	46.0	48.6	45.0	45.5	6.1	.85
NDF	56.0	57.2	47.8	51.8	4.1	.06
ADF	58.9	59.4	52.4	53.6	2.4	.01
Apparent total tract digestion, %						
OM	58.7	65.1	62.1	64.6	4.8	.32
NDF	58.4	61.7	56.0	58.5	5.2	.54
ADF	58.0	60.8	50.8	57.6	4.7	.09
N Intake, g/d	4.8	8.3	8.4	8.6	.48	.01
Microbial-N flow, g/d	5.0	4.6	4.3	7.5	.37	.001
Microbial efficiency ^a	9.1	7.5	7.4	11.5	.35	.78

^a g bacteria-N/kg OM truly dig. in rumen.

Key Words: Goats, Bean Straw, Digestibility

542 Effect of whole cottonseed on intake, apparent digestibility and rate of passage in goats. Y. Smoot*, S. Solaiman, and Q. McCrary, *Tuskegee University, Tuskegee, AL.*

Four mature Nubian crossbred wethers were fed diets containing 0, 15, 30, and 45% whole cottonseed (WCS) in a 4 x 4 Latin square design to determine intake, digestion and passage as affected by WCS. Each diet consisted of 50% bermudagrass hay (BGH) with or without WCS supplement mixes. Periods were 21 d with 16 d of adjustment followed by 5 d of total collection of feces & urine. Ytterbium- (Yb) labeled BGH was pulse dosed on d 1 of each collection period. Feed and feces samples were analyzed for DM, CP, EE, NDF, ADF and ash to determine DMI and digestion of different nutrients. Fecal samples were analyzed for Yb to estimate passage rate. The BW were recorded at the end of each adjustment period. There were no differences ($P > .05$) in BW among animals fed the different diets. Goats fed the 15 % WCS diet showed higher ($P < .05$) DMI (16.2 g/kg BW) when compared to goats fed the 30 %WCS (14.0 g/kg BW) and 45% WCS (12.2 g/kg BW) diets; however, they had similar ($P > .05$) DMI than goats receiving 0% WCS (15.7 g/kg BW). Dry matter digestibility (DMD) was similar ($P > .05$) for 0 and 15% WCS diets but decreased ($P < .05$) with 30% and 45% WCS diets, mainly due to a depression ($P < .05$) in digestibility of fiber components (NDF and ADF). Ether extract digested (g/kg BW) was higher ($P < .05$) and N excreted in urine was lower ($P < .05$) for animals fed WCS. Passage kinetics associated with BGH were similar ($P > .05$) among diets. Addition of 15% WCS to the diet of these goats did not affect DMI, DMD and passage of BGH, improved EE utilization and lowered urinary N loss.

Key Words: Whole Cottonseed, Digestion and Passage, Goat

543 Broiler litter and urea-treated wheat straw as feedstuffs for Alpine doelings. G. Anmut*, R.C. Merkel², G. Abebe³, T. Sahl², and A.L. Goetsch², ¹*Alemaya University of Agriculture, Dire Dawa, Ethiopia*, ²*E (Kika) de la Garza Institute for Goat Research, Langston University, Langston, OK*, ³*Awassa College of Agriculture, Awassa, Ethiopia*.

Thirty-two Alpine doelings (15 wk of age, 12 ± 2.05 kg) were randomly allocated to four treatments to evaluate the use of deep-stacked broiler litter (BL) and urea-treated wheat straw (UWS) as feedstuffs. In all treatments, UWS or untreated wheat straw (WS) was fed for ad libitum consumption along with a concentrate supplement fed at a prescribed percentage of BW. Treatments were: U a corn-based concentrate (1.3% N) fed at 1.5% BW with UWS (2.1% N); S a corn:soybean meal concentrate (3.2% N) fed at 1.9% BW with WS (.5% N); LL a corn:BL concentrate (2.3% N, BL at .8% BW) fed at 2.2% BW with WS; and HL a corn:BL concentrate (2.7% N, BL at 1.6% BW) fed at 3.0% BW

with WS. Animals were housed individually and fed once daily. Body weights were determined at 2-wk intervals prior to daily feeding during the 12-wk trial and ADG was calculated by regression. HL doelings consumed a greater amount of DM ($P < .05$) throughout the trial than LL, S and U animals (54.7, 45.0, 35.9, and 36.4 kg, respectively, SE = 11.64). The ADG did not vary among treatments ($P > .05$) and was 66, 63, 70, and 61 g/d (SE = 7.1) for HL, LL, S, and U, respectively. Feed efficiency was lower ($P < .05$) for HL and LL than for S doelings, whereas U doelings had a feed efficiency similar to S and LL but greater ($P < .05$) than HL (170, 145, 122, and 103 g gain/kg DMI for S, U, LL, and HL, respectively; SE = 11.6). Results indicate that both BL and UWS can be used as feedstuffs for replacement Alpine doeling growth during the early post-weaning period. The possibility of using modified crop residues and animal by-products as feedstuffs for goats is very important in countries such as Ethiopia where the availability and use of more conventional feedstuffs is limited.

Key Words: Broiler Litter, Wheat Straw, Goats

544 Intake, growth and body composition changes in Spanish and Tennessee Stiff-legged goats. C. O. Smith*, J. M. Dzakuma¹, E. Risch¹, P. M. Johnson¹, and H. D. Blackburn², ¹*Prairie View A&M University, Prairie View, TX.*, ²*USDA/ARS/National Animal Germplasm Program, Fort Collins, CO.*

The objective of this study was to perform growth curve analyses on different goat genotypes under varying nutritional regimes. Two breeds of goats, Spanish (SP) and Tennessee Stiff-legged (TS), were fed three levels (100% or *ad libitum*, 85% and 70%) of the same ration containing approximately 18% CP. These goats were classified as intermediate (SP) or small (TS) in size. They were individually penned and fed. Feed intake amounts, excreta, and bi-weekly weights were collected. After weaning at 70 d of age, 24 kids (12M,12F) from each breed were divided into three groups of 8, by sex, and put on the ration. Twenty four goats (4M, 4F from each dietary level) were slaughtered at 6 mo of age and carcass data collected. The other 24 goats were slaughtered at 12 mo of age. All weights are expressed in kilograms. Feed intake amounts, respectively, for SP and TS goats were virtually the same (51.3 and 50.5) from weaning to 6 mo, and (67.7 and 66.7) from 9 to 12 mo, even though SP breed is a heavier breed compared to TS breed. Growth weights differed ($P < .01$) for SP and TS breeds, respectively, at birth (3.2 vs 2.5) and weaning (12.8 vs 10.1); however, not at 6 mo (19.1 vs 18.6) nor 12 mo (25.8 vs 25.9). The growth weights of these breeds were fitted to the Brody (1945) growth equation, using average mature weights of 47.5 for SP and 36.8 for TS. The same maturing rate (.00268) was obtained for SP as well as TS breed. Significant differences ($P < .01$) were observed in weight of goats at the 3 dietary levels (100%, 85%, 70%) at 6 mo (21.0, 18.3, 17.2) and at 12 mo (28.5, 23.4, 25.7). Goats fed the 100% level of the diet were also heavier ($P < .05$) for SP and TS (5.3 vs 4.4), respectively, but did not differ at 12 mo (7.6 vs 7.4). Fat weights for the two breeds at 6 mo and 12 mo were not statistically significant. Sex means indicated that at 12 mo, males were heavier ($P < .01$) than females in body weight (27.9 vs 23.8) and contained more lean mass (8.3 vs 6.7); however, males deposited less fat ($P < .05$) than females (1.7 vs 2.2).

Key Words: Spanish Goat, Tennessee Stiff-legged Goat, Maturing rate

545 Effect of live weight at slaughter on goat kid meat quality. A. Arguello*, A. Marichal¹, N. Castro¹, R. Gines¹, J.L. Lopez¹, and S. Solomon², ¹*Animal Production Unit, Las Palmas de Gran Canaria University, Arucas, Las Palmas, Spain*, ²*USDA, Agricultural Research Service, Beltsville, MD.*

In Mediterranean countries live weight at slaughter (LWS) for kid goats is lower than in Arabian or African countries. Logically, increasing LWS could increase a farmer's profit margin. For that purpose, 20 twin, male Canary goat kids were slaughtered at 6 (n = 10) and 25 kg (n = 10). Carcasses were chilled (4°C) for 24 h post-slaughter at which time triiceps brachii (TB) and longissimus (LM) muscles were removed from each carcass. pH, color (L, a*, croma and hue), shear force (WBSF), water holding capacity (WHC), chemical composition (moisture, protein, fat, ash, collagen solubility), and muscle fiber morphology was measured. pH ($P < .05$), L ($P < .001$), hue ($P < .001$), WHC ($P < .001$), moisture ($P < .01$), ash ($P = .056$) and type IIA fiber percentages ($P < .05$) were less in 25 than 6 kg LWS kids. The LWS did not affect fat, collagen solubility or type I fiber percentages. The a* value ($P < .001$),

croma ($P < .01$), WBSF ($P = .089$), protein ($P < .05$), type IIB fiber populations ($P < .05$), and all three fiber type areas ($P < .05$) were higher in 25 kg LWS kids. Lean tissue from 25 kg LWS kids was darker, firmer, and drier. Few differences between LM and TB muscles were observed. Results suggest that increasing LWS (6 vs 25 kg) for kids does not have any negative effect on meat quality and would result in more kilogram of meat to be marketed.

Key Words: Meat Quality, Live Weight at Slaughter, Goat

546 Changes in Warner Bratzler shear values and mechanical strength of intramuscular connective tissue of chevon due to storage condition. G. Kannan^{*1}, C. B. Chawan², B. Kouakou¹, and S. Gelaye¹, ¹*Agricultural Research Station, Fort Valley State University, Fort Valley, Georgia*, ²*Alabama A&M University, Normal*.

Chevon (goat meat) is considered to be lower in tenderness compared to beef, pork, or lamb. The objectives of this study were to determine the effects of storage time (ST) and conditions (SC) on tenderness and changes in intramuscular connective tissue (IMCT) strength of chevon. Spanish does (8 mo of age, avg BW 25 kg) were slaughtered ($n = 12$), carcasses kept at 4°C for 24 h, and then fabricated into 2.5 cm-thick leg, arm, and loin/rib cuts. The cuts from six carcasses were vacuum packed and wet aged at 2°C for 0, 4, 8, or 12 d. To assess the influence of oxidation on postmortem tenderization, the cuts from the remaining six carcasses were placed on styrofoam trays, wrapped with polyvinyl-chloride film, and stored at 2°C for similar periods. At each ST, longissimus dorsi (LD), semimembranosus (SM), and triceps brachii (TB) muscles were assessed for Warner Bratzler shear (WBS) values. The IMCT samples were prepared by treating LD tissues in NaOH solution and then embedding in an acrylamide solution. The NaOH-treated samples were prepared for scanning electron microscopy (SEM) using standard dehydration protocol, followed by freeze-drying and gold-coating. Intact perimysium and honeycomb structures of endomysium with no muscle fiber elements were observable under SEM. Neither SC nor ST influenced the mechanical strength of IMCT preparations, as measured by a texture analyzer, although raw LD shear values decreased over time. Cooked meat WBS values in both SC were different ($P < .01$) for the three muscles studied, with the values high in SM, low in LD, and intermediate in TB. The WBS values were also higher ($P < .01$) at 0 h than at other ST. However, there was no SC x ST interaction to indicate any adverse influence of oxidation on tenderization of chevon. The results suggest that IMCT may be a major factor contributing to chevon toughness.

Key Words: Chevon, Aging, Tenderness

547 Manipulation for out of season breeding in Spanish goats. T. Wuliji^{*1}, A.L. Goetsch¹, A. Litherland², T. Sahl¹, R. Puchala¹, and L.J. Dawson¹, ¹*E (Kika) de la Garza Institute for Goat Research, Langston University, OK*, ²*AgResearch Grasslands, Private Bag, Palmerston North, New Zealand*.

The manipulation of seasonal breeding in goats could improve profitability of meat goat production by producing out-of-season meat kids for Christmas festive markets and increasing the number of kids born per female. Therefore, the objective of this experiment was to evaluate

means of manipulating the breeding season. Three Spanish bucks were conditioned for 2 mo of long-day photoperiod (16 h light:8 h dark) starting January 19, 1999, followed by a single dose of a continuous-release melatonin implant (18 mg, Regulin, Schering Pty. Ltd). Eighty Spanish does (15 two years of age and 65 yearling doelings) were allotted to three treatments of zero, melatonin implant, or oral administration of melatonin (Sigma Chemical Co., St. Louis, MO). Half of each melatonin group also received three pellets of bromocryptine mesylate (215 mg) implants (Innovative Research of America, Sarasota, FL). Therefore, treatments were: control (C), melatonin implant (MI), melatonin and bromocryptine mesylate implants (MIB), melatonin oral delivery (MO, 3 mg/d), and melatonin oral delivery and bromocryptine mesylate implant (MOB). At the end of the treatment period (April 13), does were randomized and bred in three single-sire groups for two estrus cycles (34 d). The number of does bred was 14, 14, 14, 14, and 15; number of does pregnant at ultrasonographic scanning was 5, 10, 12, 12, and 11; number of does kidded was 5, 10, 11, 8, and 8; and number of kids born was 8, 18, 18, 13, and 18 for C, MI, MIB, MO, and MOB, respectively. There was no difference among treatments in number of does bred, whereas the melatonin-treated groups had a greater ($P < .05$) number of does that kidded and number of kids born than the control. In conclusion, melatonin regardless of delivery mode increased the number of does kidding in the late summer/early fall.

Key Words: Goat, Melatonin, Breeding

548 Effects of physiological status and energy intake on cortisol, thyroid hormones and blood metabolites in dairy goats. B. Kouakou^{*1}, S. Gelaye¹, O.S. Gazal², G. Kannan¹, T.H. Terrill¹, and E.A. Amoah¹, ¹*Agricultural Research Station, Fort Valley State University, GA*, ²*Department of Biological Sciences, Saint Cloud State University, MN*.

Yearling does (BW = 42 ± 6.4 kg; $n = 10$) were used in a completely randomized design experiment to determine the effects of physiological status (non-pregnant vs pregnant) and energy intake on serum cortisol, triiodothyronine (T_3) and thyroxine (T_4), non-esterified fatty acid (NEFA), and blood urea nitrogen (BUN). Animals were stratified by BW then randomly assigned to be individually fed a 16% CP diet (2.9 MCal DE/kg DM) at either maintenance (M) or twice maintenance level (2M) for 21 d. Animals were weighed and blood samples taken weekly. At the end of this non-pregnant period, animals were pen-fed the station basal diet of concentrate and hay, their estrous cycles were synchronized using a standard luteal regimen, and they were bred to a single buck within 48 h after the last injection. On d 42 post breeding, pregnancy was determined in all does by progesterone assay (100% pregnancy rate). On d 43 of pregnancy, the does were weighed and put back on experiment under similar pre-breeding conditions. Serum samples were assayed for cortisol, T_3 and T_4 , BUN, and NEFA. Overall, cortisol level was lower ($P < .005$) with maintenance intake. Dietary treatment did not affect ($P > .10$) thyroid hormones. Blood urea nitrogen was higher ($P < .001$) for M relative to 2M-fed does regardless of physiological status. Levels of NEFA were greater ($P < .001$) in M-fed than 2M-fed animals. Within the M-fed, the non-pregnant had higher ($P < .05$) NEFA than the pregnant does. However, NEFA concentrations were similar among the 2M-fed goats regardless of physiological status.

Key Words: Goats, Hormones, Metabolites, Intake Level

GRADUATE STUDENT PAPER COMPETITION ADSA NORTHEAST BRANCH - ASAS NORTHEAST SECTION

549 Growth hormone (GH) response to growth hormone-releasing hormone (GHRH) in beef cows divergently selected for milk production. T.L. Auchtung^{*1}, D.S. Buchanan², C.A. Lents², S.M. Barao¹, and G.E. Dahl¹, ¹*University of Maryland, College Park*, ²*Oklahoma Agricultural Experiment Station, Stillwater*.

In dairy cattle, increased circulating growth hormone has been associated with selection for greater milk yield. This study tested the hypothesis that beef cows divergently selected for milk production would have differing GH responses to a challenge dose of GHRH. GH response to a challenge of GHRH was measured in 36 Angus sired cows ranging from 2 to 10 yr of age. The cows were classified as HIGH ($n=20$) or LOW

($n=16$), on the basis of their sires' Milk EPD. Mean Milk EPDs (kg) were 16.6 and -14.4 for HIGH and LOW, respectively. Mean BW (kg ± SD) was 592 ± 61 and 607 ± 43 for HIGH and LOW cows, respectively. Blood samples were taken immediately prior to and 10 min following a clearance dose of 4.5 µg GHRH/100 kg BW (injected i.v.) and, 3 hr later, immediately prior to and 10 min following a challenge dose of either 1.5 or 4.5 µg GHRH/100 kg BW. Each animal received both challenge doses; the doses were randomly assigned across the 2 d of blood collection. The GHRH was a bovine analog (1-30) GHRH. Concentrations of GH and IGF-1 in serum were measured by RIA. IGF-1 was measured in the baseline blood sample on Day 1. A positive relationship ($r = .35$, $P < .03$) was found between the cows' rankings for each dose of GHRH, i.e. high responders to the low dose were high responders to the