W473 Effects of the level of fish oil in the diet on lamb performance, ruminal fermentation and leptin gene expression. Pedro Hernandez[1], German Mendoza*[2], Nallely Sanchez[2], Jose Martinez[2], and Fernando Plata[2], *[1]Universidad Autonoma del Estado de Mexico, Amecameca, Mexico, Mexico, [2]Universidad Autonoma Metropolitana Unidad Xochimilco, Mexico, D.F., Mexico.*

The objective of this study was to evaluate the effects of fish oil on lamb performance, carcass yield, ruminal fermentation, and leptin gene expression. Thirty-two lambs (24.10 kg initial BW, Katahdin × Pelibuey) were used in a completely randomized design. Dietary treatments were: 1) 0 fish oil and 30% corn (DM), 2) 1% fish oil and 25% corn, fish oil substituted for corn (DM), 3) 2% fish oil and 20.5% corn (DM), and 4) 3% fish oil and 17% corn (DM). The lambs were weighed on consecutive days at the beginning (d 0 and 1) and at the end (d 55 and 56) of the trial. Ruminal fluid samples were collected on d 56 to evaluate the ruminal fermentation pattern. The lambs were slaughtered on d 56; the perirenal adipose tissue samples were collected, and the carcass yields were recorded. The VFA, ammonia N and leptin mRNA expression were not affected ($P > 0.05$) by the dietary treatments. However, the DMI, ADG, final BW and the hot carcass yield (HCY) showed linear or quadratic responses ($P < 0.05$) as fish oil was increased in the ration; the estimated optimal responses were obtained with fish oil levels of 1.16% for the final BW, 1.03% for the HCY, 1.12% for the ADG, and 0.78% for the DMI. Additionally, the feed efficiency and the back fat showed a quadratic response ($P < 0.05$) as fish oil was increased in the diet; the estimated optimal responses were obtained with fish oil levels of 1.4% for feed efficiency and 1.6% for back fat. Increasing fish oil in the diet did not have a negative impact on ruminal fermentation or leptin mRNA expression; however, levels of 1% fish oil improved lamb performance and allowed for a reduction in the amount of grains in the rations.

Key Words: finishing lamb, fish oil, leptin mRNA

W474 Growth rates of females from a Romane sheep breed flock reared in rangelands and effects of an early or late first mating regime on their offspring. Eliel González-García*[1], Didier Foulquié[2], François Bocquier[1], Dominique François[3], and Dominique Hazard[3], *[1]INRA UMR Systèmes d'élevage Méditerranéens et Tropicaux (SELMET), Montpellier Cedex 1, France, [2]INRA UE0321, Domaine de La Fage, Roquefort-sur-Soulzon, France, [3]INRA UMR1388 Génétique, Physiologie et Systèmes d'Elevage (GenPhySE), Castanet-Tolosan Cedex, France.*

Benefits in lifetime production of the ewe is often determined by the particular characteristics of the growth during the first stages of their life, including the related decision of the age at first mating. The objective of this work was to characterize the growth rates of the young female (from birth to first mating) from the Romane sheep breed, in a flock reared under the Mediterranean rangelands conditions of France. The effects of 2 contrasted first mating regimens (Early; 7 mo vs. Late; 19 mo old) on the individual growth rate of the ewe lamb and their first offspring were also evaluated. A database was built based on historical data that were extracted from the INRA database (GEEDOC). Data from 1359 females born during the period 2002–2012 were collected, processed and interpreted using SAS (9.3). From the total, 762 and 597 females were submitted to the Early or Late regimen, respectively. The effects of the litter size at their birth (singletons; SING vs. multiple; TWIN) and the age of their dams at birth (primiparous, PRIM vs. multiparous, MULT) were considered. The growth curves were built for both population (Early; 39.7 ± 0.07 kg and Late; 50.6 ± 0.04 kg BW at first mating) of ewes lambs. Significant interactions of the litter size at birth and the dam's parity were found for BW at birth and BW at weaning. Overall, the ewes lambs born from MULT × SING and PRIM × TWIN dams showed the highest (4.7 ± 0.03 and 26.2 ± 0.15 kg) and lowest (3.3 ± 0.01 and 22.5 ± 0.09 kg) BW at birth and weaning, respectively. Even if submitting the ewes lambs from the actual flock to the Late regimen constituted a change on the reproductive management policy of the farm (from 2010), data showed that females submitted to Late corresponded to those having a weaker growth from birth to weaning. When analyzing the growth traits of their first offspring, the first litter size (1.8 ± 0.01 vs. 2.1 ± 0.01 lambs/lambing) and its total weight (6.2 ± 0.03 vs. 7.4 ± 0.02 kg) were different ($P < 0.0001$) for ewes submitted to the early or late regimen, respectively. Other related carry over effects during the whole productive life of this females' population and their offspring are currently being analyzed.

Key Words: growth rate, Romane female lamb, mating regimen

W475 Effects of maternal lines and mating systems on susceptibility to parasitism in a pasture-lambing, low-input production system. Shuna A. Jones*[1], Chadwick C. Chase[1], Michael Heaton[1], Karen K. Shuck[2], Kreg Leymaster[1], and John Keele[1], *[1]US Meat Animal Research Center, Clay Center, NE, [2]Great Plains Veterinary Educational Center, Clay Center, NE.*

Internal parasites are a concern for industry as they negatively affect growth, survival, and reproduction. The objective was to evaluate the susceptibility of maternal lines to parasite infection, with the goal of developing genetic tests for this trait in US sheep. Purebred and Texel-sired lambs were born to Polypay, Katahdin, and Easycare (1/2 Romanov, 1/4 Katahdin, 1/4 White Dorper) ewes. Lambs were born on one of four 10-acre pastures, in a low-input system, 391 lambs were weaned at 70 d of age. Variation was accounted for by having all combinations of maternal lines and mating systems in each pasture. At weaning, a fecal sample was collected from individual lambs and the McMaster fecal egg count test (FEC) was performed on each sample. Data from 282 lambs were analyzed. For genetic evaluation, parentage was determined by allelic exclusion with genotype data from an international panel of 109 parentage SNPs. Data, log (FEC + 1), were analyzed using a mixed animal model with maternal line, mating system, maternal line × mating system, sex, and pasture as fixed effects. Variance components for additive genetic and environmental effects were estimated by REML using the iterative MIVQUE algorithm. Variance component estimates converged at positive values ensuring that the estimates were REML. Heritability was calculated as the additive genetic variance divided by the phenotypic variance after adjustment for fixed effects. The pasture effect for log (FEC + 1) was highly significant ($P = 9.38 \times 10^{-16}$). Mean log (FEC + 1) of the 4 pastures were 2.66, 3.29, 3.90, and 2.93 ± 0.12, and the corresponding median FEC (back-transformed from log-normal distribution) were 454, 1944, 7927, and 845 eggs/g. However, breed cross and sex were not significant, with P values of 0.99 and 0.49, respectively. The heritability estimate was 0.28 ± 0.17 which is moderate and significantly different from 0 ($P = 0.0025$) based on the restricted likelihood ratio test. These results indicate that the fecal

egg count phenotype for sheep raised in central Nebraska is affected by parasite exposure and host genetics.

Key Words: sheep, internal parasite, heritability

W476 GnRH at moment or 24 hours after hCG treatment upon reproductive outcomes in anestrous goats. VH Gonzalez-Alvarez[1], CA Meza-Herrera[2], AS Alvarado-Espino[1], JM Gillen-Muñoz[1], R. Rodriguez-Martinez[1], G. Arellano-Rodriguez[1], PA Robles-Trillo[1], and FG Veliz*[1], *[1]Antonio Narro Autonomous Agricultural University, Torreon, Coahuila, Mexico, [2]Chapingo Autonomous University, Regional Universitary Unit on Arid Lands, Bermejillo, Durango, Mexico.*

The aim of this study was to evaluate if GnRH incorporation to the hCG treatment improves the reproductive parameters of seasonal anestrous goats in northern Mexico (26°N). Adult anovulatory adult (n = 36) were divided into 4 groups (n = 9), according to live weight and body condition score. On May 2, all goats were treated with progesterone (20 mg) intramuscular (im). Twenty-four hours before (d 0), Gc was treated with physiological saline (0.5 mL), Gh with hCG im (100 IU), G3 with hCG (100 IU) + GnRH (8.4 µg), and G4 with hCG (100 UI) + GnRH (8.4 µg) 24 h before hCG administration. The same day, all goats received PGF2α (7.5 mg) intravenously. Estrous was determined twice a day, from d-0 to d-5, using multiracial bucks provided with an apron; females were considered to be in estrus when allowed to be mounted. To determine ovulation occurrence, a transrectal ultrasonographic scanning (US) (Aloka SSD 500, Richmond, BC, Canada) was performed on d-10 in all goat; ovulation considered the presence of well defined corpus luteum at either ovary. Chi-squared test was performed to determine the differences among all groups concerning the reproductive traits measured (SYSTAT, Version 10, 2006), with a 95% interval confidence. The Gc group had no response in estrus, ovulation and gestation (0%, 0/9). The Gh-group had the highest percentages ($P < 0.05$) of both estrus (88.8%, 8/9) and pregnancy (71.4%, 5/9) and, along with G4, the highest ovulating rate (55.5%, 5/9). Results suggest that GnRH inclusion at moment or 24-h before hCG treatment negatively affects the reproductive outcomes of seasonally anestrous goats.

Key Words: goat, hCG, GnRH

W477 Application of 40 mg progesterone prior to the ram effect induces estrus response and ovulatory activity in Dorper sheep. LM Tejada*[1], CA Meza[2], O. Angel[1], R. Rodríguez-Martínez[1], MV Perales[1], E. Carrillo[3], G. Arellano[1], and FG Véliz[1], *[1]Universidad Autónoma Agraria Antonio Narro, Torreon, Coahuila, México, [2]Universidad Autónoma Chapingo Unidad Regional Universitaria de Zonas Áridas, Bermejillo, Durango, México, [3]Instituto Tecnológico de Torreón, Torreón, Coahuila, México.*

The aim of this study was to determine whether the application of intramuscular progesterone induces estrus activity in anovulatory Dorper sheep exposed to the male effect. A total of 20 ewes diagnosed as anovulatory, were divided into 3 homogeneous groups in terms of weight and body condition. Ewes had no contact with males at least 3 weeks before exposure to the male. While a group of ewes (G1; n = 6) received a single dose of 20 mg i.m. progesterone (day −2 of breeding), a second group (G2; n = 7) received a single dose of 40 mg i.m. of progesterone (day −2 of breeding), and the third group (GE n = 7) were inserted with a intravaginal sponge with 20 mg of progesterone (day −6 breeding) which was removed one day before introduction of the male. This experimental breeding was performed with males previously treated daily with testosterone (25 mg i.m.) during 15-d before mating to induce an intense sexual activity. Three males (one per group) were rotated every 12 h among experimental groups. Estrus activity was evaluated twice daily 1 h during 15-d. On d-12 after male introduction, an ultrasonographic scanning was performed to determine the percentage of ovulated females. Percentage of ewes depicting estrus and ovarian activity were compared using chi2, using the program SYSTAT 12. While no females from the G1 group expressed estrus activity (0/6, $P < 0.05$), all ewes of both the G2 and GE showed estrus activity ($P > 0.05$). In addition, most of the females from all the experimental groups depicted ovulatory activity (G1 5/6; G2 5/7 and GE 7/7 $P > 0.05$). The application of 40 mg i.m. of progesterone before the male effect was demonstrated to be as effective as the traditional use of intravaginal sponges to induce estrus response and ovulation in previously anovulatory females exposed to the male effect. Yet, the use of i.m. progesterone is significantly cheaper and easier to apply.

Key Words: sheep, progesterone, ram effect

W478 Evaluation of the use of hCG to promote the induction of reproductive activity in anovulatory Alpine goats. Alan S. Alvarado-Espino[1], Cesar A. Meza-Herrera[2], Vicente H. Gonzalez-Alvarez[1], Juan M. Guillen-Muñoz[1], Martha V. Perales-Garcia[1], Raymundo Rivas-Muñoz[3], Evaristo Carrillo[3], and Francisco G. Veliz*[1], *[1]Universidad Autonoma Agraria Antonio Narro, Torreón, Coahuila, Mexico, [2]Universidad Autonoma Chapingo-Unidad Regional Universitaria en Zonas Aridas, Bermejillo, Durango, Mexico, [3]Instituto Tecnologico de Torreon, Torreon, Coahuila, Mexico.*

The aim of this study was to evaluate the efficacy of the use of human chorionic gonadotrophin hormone (hCG) to induce reproductive activity in Alpine goats during seasonal anestrous in northern Mexico (26°N). Adult anovulatory goat (n = 30) were randomly divided into 3 groups according to body condition score (1.96 ± 0.32) and weight (37.36 ± 8.48). On July 23 (day −1), all goats received intra-vulvo-submucosal (ivs) administration of 20 mg of progesterone. On day 0 (D0), goats in the groups G300, (n = 10) received an ivs administration of 300 UI of hCG, the group G100, (n = 10) received 100 UI of hCG while the control group GC, (n = 10) received 0.5 mL of saline solution plus intramuscular administration (im) of 7.5 mg of synthetic prostaglandin. After D0, the onset of estrous behavior was evaluated twice a day for 5 min during the first 5-d after hCG administration by a sexually active buck. Goats were scanned by transrectal ultrasound (7.5 MHz probe) on d-45 after breeding for detection of pregnancy. Goats depicting estrus behavior were similar between groups (G100: 100% and G300: 90%, $P > 0.05$), with not estrus behavior in the GC-goats. The onset of estrous occurred earlier in G100 than G300 (54 ± 6.32 h vs 76 ± 30 h, respectively; $P < 0.05$). No differences were found ($P > 0.05$) in pregnancy rate between G100 (100%) and G300 (70%) groups. The kidding rate and prolificacy were similar ($P > 0.05$) in the G100 and G300 (80 vs 70% and 1.5 ± 0.56 vs 1.57 ± 0.53, respectively). These results indicate that administration of 100 UI of hCG could be used without a reduction in both estrus behavior and reproductive outcomes in anestrous Alpine goats at 26° N.

Key Words: hCG, induction, estrous

W479 Effects of mixing two different tannin-containing diets to evaluate rumen fermentation and microbial population changes in goats. D. Perkins*[1], B. R. Min[1], C. Wright[1], N. Gurung[1], T. Terrill[2], J.-S. Eun[3], W. H. McElhenney[1], R. Shange[1], and Y. Uyeno[4], *[1]Tuskegee University, Tuskegee, AL, [2]Fort-Valley*

State University, Fort Valley, GA, [3]Utah State University, Logan, UT, [4]Shinshu University, Minamiminowa, Japan.

Study was performed to investigate the influence of different sources of condensed tannins (CT) supplementations on ruminal fermentation and rumen microbial diversity changes of goats. The objective of this study was to determine whether the tannin-containing sericea lespedeza leaf pellet (SL, Lespedeza cuneate; 13.6% CT), ground pine bark (PB; Pinus; 16.3% CT), or its combination (SL+PB) would have effects on rumen fermentation and microbial diversity in meat goats. Twenty-four Kiko-crossbreed intact male goats (Capra hircus; BW = 38.6 ± 2.7 kg) were randomly assigned to 4 treatments (n = 6): 1) 30% bermudagrass hay and 70% grain mix, 2) 30% PB and 70% grain mix, 3) 30% SLP and 70% grain mix, and 4) 15% PB, 15% SL pellet, and 70% grain mix. Each treatment diet (30% DM) was mixed with remainder of each diet (70% DM) contained 70% commercial sweet feed and 30% alfalfa pellets. Feed intake and BW were monitored every 2 wks for 42 d. Rumen fluid samples were taken using a stomach tube at the d 0, 20, and 42 for microbial DNA analysis. Overall, there were no differences in DMI and BW gain among treatments. However, goats supplemented with PB and SLP+PB diets decreased ($P < 0.05$) concentrations of acetate, isobutyrate, and isovalerate compared with those in the control and SLP diets. There were no differences in rumen microbial kingdom (fungi, bacteria, and archaea) and phylum diversity. However, green algae population in rumen fluid was greater ($P < 0.01$) for control diet than for other treatments. In this study, Bacteroides (30 to 55%) and Firmicutes (30 to 47%) were the major bacterial phylum, while Prevotella spp. was the most predominant rumen bacterial species in the percentage of 22.1, 42.2, 28.9, and 23.9 for control, PB, SLP, and mixed diets, respectively. The population of rumen bacterial species in PB-supplemented group was greater for Bacteroides spp. ($P < 0.02$), Marinifilum spp. ($P < 0.04$), and Oribacterium spp. ($P < 0.03$) compared with other treatment groups. However, population of Fibrobacter succinogenes was greater ($P < 0.05$) for SLP than for other treatments. Supplementing tannins in goat diets such as PB and SLP diets has a potential to modify rumen bacterial population.

Key Words: goat, rumen microbial diversity, tannins

W480 Reproductive efficiency of anovulatory goats through bucks treated with testosterone and (or) estrogenized females in northern México. Juan M. Guillén-Muñoz[1], César A. Meza-Herrera[2], Rafael Rodríguez-Martínez[1], Pedro A. Robles-Trillo[1], Carlos Leyva-Orasma[1], Evaristo Carrillo[3], Francisco Gerardo Veliz[1], and Gerardo Arellano-Rodríguez*[1], *[1]Universidad Autónoma Agraria Antonio Narro, Torreón, Coahuila, México, [2]Universidad Autónoma de Chapingo, Bermejillo, Durango, México, [3]Instituto Tecnologico de Torreon, Torreón, Coahuila, México.*

The aim of this study was to evaluate the effect of treated males with testosterone and (or) estrogenized female upon reproductive efficiency in anovulatory goats in northern México (26°N). Multiparous mix-dairy breed anestrous goats (n = 80) were randomly assigned to one 4 treatment groups: (GT; n = 20) exposed to testosterone-treated bucks (25 mg, 3 d x 3 weeks); (GTH; n = 20) joined to testosterone-treated bucks and expose to estrogenized females x 3-d (pen of bucks were separated of females by a metal mesh); (GH; n = 20) exposed to estrogen-treated females (kept in a pen aside to another pen whit 2 estrogenized females x 2-wk) and (GC; n = 20) exposed to untreated bucks. All goats in this study received an I.M. injection of 25 mg progesterone, 24-h before exposure to males. Response variables considered estrus response during 14-d, ovulatory response and pregnancy rate of goats. Percentages were analyzed through a chi-squared test (SYSTAT 12). Results from the treatment groups (GC; GT; GTH; GH) give important evidence that both treatments: testosterone-treated bucks and (or) exposure of males to estrogenized females were equally effective to promote not only estrus induction (75–90%) but also both an increased ovulatory response (70–90%) as well as pregnacy rates (70–90%; $P < 0.05$) respectively, in dairy mix-breed anovulatory goats under subtropical conditions.

Key Words: buck, testosterone, reproductive efficiency

W481 Impact of adequate or reduced mineral supplementation on rumen function and growth in lambs. Abrigail M. Temple*[1], Gbenga A. Ayangbile[1], Dustin R. Vandermyde[1], Calvin R. Vandermyde[2], and Dan J. Schauff[1], *[1]Agri-King Inc., Fulton, IL, [2]Morrison Veterinary Clinic, Morrison, IL.*

Mineral supplementation is vital for optimum production and efficiency in livestock, but it is an added feed cost. We hypothesized a reduction in supplemental minerals in a ration may have minimal effect on rumen function and performance of lambs fed Ru-Mend, a product designed to enhance nutrient absorption. Sixty Katahdin wethers (average BW 13 ± 3 kg) 55 d of age were fed an ad lib corn silage plus alfalfa haylage-based diet with Ru-Mend, and either adequate (FULL) or reduced (RED) mineral supplements for 52 d. The total mixed rations were analyzed and RED diet found to be 30% lower in Co, Cu, Mn and Zn, 15% in S, 10% in Ca and Mg, and 5% in P as compared with the FULL diet. Diets were balanced for K, Na and Cl, but Na was 10% lower in the RED diet. Lambs were penned in groups of 15 with 2 pens per treatment. ADG was calculated for each animal from their initial and 44 d weight. DMI was calculated from pen daily intake. Lambs were euthanized on d 52, and tissues collected for analysis. Data were analyzed by ANOVA completely randomized design. Pearson correlations were used for comparison. Final rumen content pH was between 5.2 and 6.0 for all lambs. Lambs fed the FULL diet had higher DMI (640.71 vs. 513.13 g/d; $P < 0.0001$) and ADG (102.15 vs. 72.17 g/d; $P = 0.003$) than RED lambs. FULL lambs' ADG correlated with lower rumen ammonia ($P = 0.02$). The rumen fluid contents of FULL-fed lambs had higher total amino acids ($P = 0.004$) and essential amino acids [arginine, isoleucine, lysine, phenylalanine, threonine and valine] ($P \leq 0.03$) than RED-fed lambs. The lower ammonia and higher amino acids may indicate positive effect of minerals due to increased DMI and reduced protein degradation. Rumen osmolality and acetate were higher ($P = 0.05$) for FULL lambs. RED lambs had lower rumen and ileum contents Co, Cu and Mn ($P \leq 0.02$) and rumen Fe, Mg, P and S ($P \leq 0.03$). Lower ADG of RED lambs correlated with reduced ileum K, P and S ($P \leq 0.05$) and numerically less rumen Mg, Ca and Co ($P \leq 0.10$). This may indicate lambs fed the RED diet did not benefit from Ru-Mend, thus minerals needed for energy metabolism, growth and weight gain were unavailable.

Key Words: mineral, amino acid, rumen

W482 Tissue mineral deposition in growing lambs fed adequate or reduced levels of mineral supplements. Abrigail M. Temple[1], Gbenga A. Ayangbile*[1], Dustin R. Vandermyde[1], Calvin R. Vandermyde[2], Dan J. Schauff[1], and Jeff G. Horst[1], *[1]Agri-King Inc., Fulton, IL, [2]Morrison Veterinary Clinic, Morrison, IL.*

Ru-Mend is a supplemental product designed to enhance nutrient absorption in the ruminant. Previous research shows animals fed Ru-Mend had increased mineral uptake and blood glucose versus the control. The objective of this study was to determine whether Ru-Mend supplementation would be a cost-effective way to improve mineral uptake and prevent performance issues in ruminants fed inadequate minerals by examining

blood metabolites and tissue mineral deposition. Sixty Katahdin wethers (average BW 13 ± 3 kg) approximately 55 d of age were split into groups and fed an ad lib corn silage plus alfalfa haylage-based diet with Ru-Mend, and either adequate (FULL) or reduced (RED) minerals for 52 d. The total mixed rations (TMR) were analyzed and RED diet found to be 30% lower in Co, Cu, Mn and Zn, 15% in S, 10% in Ca and Mg, and 5% in P as compared with the FULL diet. Diets were balanced for K, Na and Cl, but there was a 10% reduction in Na for the RED TMR. Lambs were penned in groups of 15 with 2 pens per treatment. Jugular blood samples were analyzed for each animal during wk 0, 2, 5, and 7. Animals were euthanized on d 52, tissues collected and prepared for analysis. Data were analyzed by ANOVA completely randomized design. Lambs on FULL supplement had higher blood hemoglobin and hematocrit ($P = 0.02$) and a tendency for higher glucose ($P = 0.09$). However, lambs on RED supplement had higher blood Cu ($P = 0.0001$) and a tendency for higher Fe ($P = 0.06$). Lambs fed RED treatment had significantly lower liver Ca, Cu, Mn and S ($P \leq 0.03$) and a tendency for lower Zn ($P = 0.06$). In addition, RED lambs had lower duodenum tissue Cu and Mn ($P < 0.03$), but higher spleen Ca, Cu, K, Mg, P and Zn ($P < 0.04$). This may suggest the spleen acted as an organ of sequestration. FULL TMR-fed lambs had higher hoof covering minerals of Co, Mn and Na ($P \leq 0.01$), whereas hoof bones were higher in Ca, Mn and P ($P \leq 0.04$). These results may indicate lambs receiving RED supplementation did not benefit from Ru-Mend as observed by lower blood hemoglobin and hematocrit as well as lower liver, duodenum, and hoof mineral levels compared with FULL-fed lambs.

Key Words: mineral, tissue, glucose

W483 Nutrient digestibility in growing lambs fed adequate or reduced levels of mineral supplements. Abrigail M. Temple, Gbenga A. Ayangbile, Dustin R. Vandermyde, Dan J. Schauff*, and David A. Spangler, *Agri-King Inc., Fulton, IL.*

Minerals can be a costly addition to a livestock ration, and farmers may choose to reduce mineral supplementation to reduce feed costs. Ru-Mend is a product designed to enhance nutrient absorption in the ruminant. Previous research demonstrated animals fed Ru-Mend had improved rumen osmolality, mineral digestibility and blood glucose versus the control. We hypothesized Ru-Mend supplementation could be a cost-effective way to improve mineral uptake and prevent performance issues in ruminants fed inadequate mineral levels. The objective of this study was to observe the effect of Ru-Mend on nutrient digestibility in ruminants fed reduced levels of supplemental minerals. Sixty Katahdin wethers (average BW 13 ± 3 kg) approximately 55 d of age were split into groups and fed an ad libitum corn silage plus alfalfa haylage-based diet with Ru-Mend, and either adequate (FULL) or reduced (RED) minerals for 52 d. The total mixed rations (TMR) were analyzed and RED diet observed to be lower by 30% in Co, Cu, Mn and Zn, 15% in S, 10% in Ca and Mg, and 5% in P compared with the FULL diet. Diets were balanced for K, Na and Cl, but there was a 10% reduction in Na for the RED TMR. Lambs were penned in groups of 15 with 2 pens per TMR treatment. For determination of DMI, digestibility, and nutrient utilization, 9 animals from each treatment were placed in digestibility crates for 5 d sample collection of orts, fecal and urine. ADG was calculated for each animal from their initial and 44 d body weight (BW). Data were analyzed by ANOVA completely randomized design. Lambs fed FULL treatment had significantly higher DMI (427.49 vs. 332.68 g/d; $P < 0.0001$) and ADG (102.15 vs. 72.17 g/d; $P = 0.003$) compared with RED. Also, FULL TMR-fed lambs had significantly higher digestibility of ADF, CP and NDF ($P \leq 0.03$) and numerically higher DMD ($P = 0.14$). In addition, FULL lambs had significantly improved digestibility of Ca, Cu, Fe, K and S ($P < 0.04$) compared with RED. The data suggests lambs did not adequately benefit from Ru-Mend in the analyzed nutrient digestibility parameters or BW gain when the diet's mineral level was insufficient, as in the RED diet.

Key Words: mineral, digestibility

W484 Adipocyte differentiation-related protein promotes lipid accumulation in goat mammary epithelial cells. Hengbo Shi, Kang Yu, and Jun Luo*, *College of Animal Science and Technology, Northwest A&F University, Yangling, Shaanxi, China.*

Milk fat originates from the secretion of lipid droplets (LDs) synthesized within mammary epithelial cells. Adipocyte differentiation-related protein (ADRP; also known as PLIN2) is an LD binding protein that is crucial for synthesis of mature LD. The hypothesis was ADRP regulate LD production and metabolism in goat mammary epithelial cells (GMEC), thus, play a role in determining milk fat content. The objective of the present study was to investigate the function of ADRP in milk fat metabolism by ADRP overexpression and knockdown in GMEC using an adenovirus system. The expression of ADRP mRNA was determined by RT-PCR, and concentration of triacylglycerol (TG) extracted from GMEC was quantified on a micro-titer plate reader. Immunocytochemical staining revealed that ADRP localize to the surface of LDs. Supplementation with oleic acid (OA) enhanced its localization on the LDs surface and lipid accumulation. Overexpression of ADRP increased lipid accumulation and the concentration of triacylglycerol in GMEC. In contrast, morphological examination revealed that knockdown of ADRP decreased lipid accumulation even when OA was supplemented. This response was confirmed by the reduction in mass of cellular TG when ADRP was knockdown. The fact that knockdown of ADRP did not completely eliminate lipid accumulation at a morphological level in GMEC without OA suggested that some other compensatory factors may also aid in the process of LD formation. ADRP reversed the decrease of LD accumulation induced by Adipose triglyceride lipase (ATGL). This indicated that ADRP promote TG stability within LD by preventing access to ATGL. Collectively, these data provide direct in vitro evidence that ADRP play a key role in LD formation and stability in GMEC. Further experiments need to explore the mechanisms for enlargement of LD via ADRP activity in GMEC.

Key Words: milk lipid droplet, Adipocyte differentiation-related protein (ADRP), goat mammary epithelial cells

W485 Activation of liver X receptor α and SREBP-1 promotes fatty acid synthesis in goat mammary epithelial cells. Huifeng Xu and Jun Luo*, *College of Animal Science and Technology, Northwest A&F University, Yangling, Shaanxi, China.*

Liver X receptor α (LXRα) and sterol regulatory element binding protein-1 (SREBP-1) are key transcription factors regulating lipid synthesis in mammals, but the joint function of *LXRα* activation and *SREBP-1* maturation in milk fatty acid synthesis of lactating goat remains unclear. The objective of the present study was to determine the regulating function of LXRα and SREBP-1 in fatty acid metabolism of goat mammary gland using RT-qPCR. Goat mammary epithelial cells (GMEC) were treated by T0901317, a synthetic agonist of *LXRα*, to explore the regulatory function of *LXRα-SREBP-1* pathway in goat mammary gland. The results showed that there was no significant change in the mRNA level of *LXRα* following treatment with different concentrations of T0901317, but a dose-dependent increase were observed for levels of mRNA, protein and relative luciferase activity of *SREBP-1*.

Immunofluorescence results showed a clear accumulation of mature *SREBP-1* in cell nucleus by the addition of T0901317. Activation of *LXRα-SREBP-1* pathway increased significantly the mRNA expression of genes related to de novo fatty acid synthesis, fatty acid desaturation, elongation, transportation, and TG synthesis including *FASN*, *ACCα, SCD1*, *IHD1*, *ACSS2*, *Elovl6*, *FABP3*, *DGAT1*, *DGAT2*, *AGPAT6, LPIN1* and *PLIN2* ($P < 0.01$). One micro Mole T0901317 treatment caused a 20% increase of total content of cellular TG compared with the control ($P < 0.01$). Furthermore, addition of T0901317 remarkably increased the proportion of C16:1 and C18:1, while decreased that of C16:0 and C18:0. In conclusion, the *LXRα* regulates the expression and proteolytic maturation of *SREBP-1* in GMEC, which implied that the crosstalk between *LXRα* and *SREBP-1* may play an important role in the transcriptional regulation of de novo fatty acid synthesis and TG synthesis in goat mammary gland.

Key Words: LXRα, fatty acid synthesis, goat mammary epithelial cell

W486 Evaluation of different doses of intramuscular progesterone to induce reproductive activity in anestrous goats.
Viridiana Contreras*[1], Cesar Meza[2], Gerardo Arellano[1], Rafael Rodriguez[1], Ma de los Angeles De Santiago[1], Miguel Mellado[1], Raymundo Rivaz[3], and Francisco G. Veliz[1], *[1]Universidad Autonoma Agraria Antonio Narro, Torreon, Coahuila, Mexico, [2]URUZA-UACh, Bermejillo, Durango, Mexico, [3]Instituto Tecnologico de Torreon, Torreon, Coahuila, Mexico.*

The use of different doses of intramuscular progesterone for sexual activity induction in anestrous goats (26°N) was evaluated. During late May, mix-breed anovulatory adult goats (n = 15) were divided in 2 homogeneous groups regarding body condition score and body weight; 4 mix-breed bucks treated with testosterone were also used. Does grazed from 1000h to 1600h. Group 1 (10 mg; n = 7) received 10 mg i.m. progesterone + 200 IU i.m. eCG, while group 2 (20 mg; n = 8) received 20 mg i.m. progesterone + 200 IU i.m. eCG. Does were penned and kept there during 5-d and were fed with alfalfa hay ad libitum, 200 g commercial mix (14% CP, per animal/d) and trace mineral salt blocks and water ad libitum. Estrus activity was evaluated by introducing a male in each experimental group 15 min (morning) 15 min (noon) and 15 min (afternoon). Females depicting signs of heat were moved to a different pen with 2 males. A transrectal ultrasonographic scanning (TUS) was performed to detect ovulation (10 d) and pregnancy (45 d) after estrus detection. The percentage of females depicting estrus, ovulation and pregnancy were compared with a chi2. Reproductive response from both experimental groups is presented on Table 1. Results obtained allow us to conclude that administration of intramuscular progesterone, at 10 or 20 mg, induces sexual activity of goats during the normal anestrous season.

Table 1 (Abstr. W486). Reproductive response of mixed-breed anestrous goats receiving either 10 or 20 mg i.m. progesterone

	Group	
Sexual response	10 mg	20 mg
Estrus (no.)	6/7[a]	7/8[a]
Ovulation (no.)	7/7[a]	8/8[a]
Gestation (no.)	5/6[a]	5/8[a]

[a,b]Different superscript within variables denote differences $P < 0.05$.

Key Words: progesterone, anestrous, goat

W487 Induction of sexual behavior in Dorper rams treated with glutamate and/or testosterone during the natural sexual resting season at 26°N.
Ma. Guadalupe Calderón-Leyva*[1], Cesar A. Meza-Herrera[2], Oscar Ángel-García[1], Juan Ramón Luna-Orozco[3], Raymundo Rivas-Muñoz[4], Gerardo Arellano-Rodríguez[1], F. Gerardo Véliz-Deras[1], and Rafael Rodríguez-Martínez[1], *[1]Universidad Autónoma Agraria Antonio Narro, Torreón, Coahuila, México, [2]Universidad Autónoma Chapingo, Unidad Regional Universitaria de Zonas Áridas, Bermejillo, Durango, México, [3]Centro de Bachillerato Tecnológico Agropecuario No. 1, Torreón, Coahuila, México, [4]Instituto Tecnológico de Torreón, Torreón, Coahuila, México.*

The study was performed in northern Mexico (25°64′ N, 103°26′ LW) to evaluate the effectiveness of different treatments to stimulate sexual behavior of rams during spring. Dorper rams (n = 20; 81 ± 0.32 kg BW; 3.8 ± 0.16 BCS) were divided in 4 homogeneous groups in terms of body weight (BW), body condition score (BCS) and odor, and were randomly assigned to 4 experimental groups: Glutamate Group (GG, n = 5; treated 7 mg kg^{-1} BW of L-Glutamate i.m.), Testosterone Group (TG, n = 5; treated with 25 mg of testosterone i.m.), Glutamate + Testosterone Group, (GTG, n = 5; receiving 7 mg kg^{-1} BW of L-Glutamate + 25 mg of testosterone i.m.) and Control Group (CONT, n = 5; which received 0.5 mL of saline i.m.). Odor score of rams was evaluated every 2 weeks by smelling the base of the horns at a distance of 15 cm and using a 0–3 scale. After 30 d of treatments, 2 males were randomly selected from each treated group and placed in one of 4 groups of anovulatory ewes (n = 14 each; 42 ± 2.36 kg BW; 3.04 ± 0.22 BCS) to evaluate the male sexual behavior, considering the appetitive sexual behavior (ASB), the consummatory sexual behavior (CSB) and isolation behavior (ISL), during 2-h daily x 2 d. While odor data were evaluated by ANOVA, sexual behavior considered X^2 (SYSTAT 12.0). No differences ($P > 0.05$) regarding odor score was observed in the first sample among experimental groups. Yet, at the end of the experimental period, the GTG showed the highest values (1.5 ± 0.29, $P < 0.05$) compared with groups GG and TG (0.75 ± 0.34 and 0.65 ± 0.75, respectively; $P > 0.05$). In the ASB, the GTG depicted the highest percentage of performed behaviors regarding GG, TG and CONT (43 vs 29, 11 and 18% respectively); only statistical differences ($P < 0.05$) occurred with respect to TG and CONT. In the CSB-phase, GG and GTG (37%) and the CONT (23%) did not differ ($P > 0.05$), yet, the TG depicted the lowest CSB performance ($P < 0.05$). In the case of ISL, the CONT accumulated the highest percentage (62%; $P < 0.05$) regarding GTG, GG and TG (25, 13 and 0%, respectively).Results demostrate that Dorper rams treated with glutamate + testosterone promoted not only an increased sexual behavior but also an augmented odor score during spring.

Key Words: rams, glutamate, testosterone

W488 Reproductive outcomes in nulliparous ewes exposed to dorper rams treated with glutamate and/or testosterone during increased photoperiods.
Ma. Guadalupe Calderon-Leyva[1], Cesar A. Meza Herrera[2], Oscar Angel-Garcia[1], Juan Ramon Luna-Orozco[3], Raymundo Rivas-Muñoz[4], Gerardo Arellano-Rodriguez[1], F. Gerardo Veliz-Deras[1], and Rafael Rodriguez-Martinez*[1], *[1]Universidad Autonoma Agraria Antonio Narr, Unidad Laguna, Torreon, Coahuila, Mexico, [2]Universidad Autonoma Chapingo, Unidad Regional de Zonas Aridas, Bermejillo, Durango, Mexico, [3]Centro de Bachillerato Tecnologico Agropecuario No 1, Torreon, Coahuila, Mexico., [4]Instituto Tecnologico de Torreon, Torreon, Coahuila, Mexico.*

The aim of this study was to evaluate the ability to induce sexual activity in nulliparous Droper ewes during the anestrus season throughout the male effect in northern Mexico (26° N). Dorper rams (n = 8; 83 ± 3.6

kg BW) and 55 nulliparous anovulatory ewes (42 ± 2.36 kg BW) were used. Before to be in contact with males, ewes received 60 mg i.m. of progesterone to avoid short cycles and expect ovulation once estrus activity occurred, then ewes were divided in 4 homogeneous groups in terms of BW and BCS. Prior exposure to females, males were randomly divided in 4 experimental groups and treated during 30-d with: Glutamate (GG, n = 14 ewes; 2 males treated with 7 mg kg^{-1} BW of Glutamate, i.m.), Testosterone (TG, n = 14 ewes; 2 males treated with 25 mg i.m. of testosterone), Glutamate + Testosterone (GTG, n = 14 ewes; 2 males received 7 mg kg^{-1} BW of L-Glutamate and 25 mg of testosterone) and Control (CONT, n = 13; 2 males received 0.5 mL of saline). Since the first day of contact with males, estrus response and interval to estrus onset (h) were registered. Thereafter, embryo implantation rate was determined on d-45 from male exposure throughout transrectal ultrasound scanning. Data regarding the onset of estrus were analyzed using *t*-test, while the estrus response and implantation rate considered X^2 (SYSTAT 12.0). Ewes exposed to rams treated with glutamate or glutamate + testosterone showed the best reproductive outcomes ($P < 0.5$), depicting, in average, the shortest interval to estrus (37.7 h) while the largest implantation (100%) and estrous response (100%) rates. Therefore, glutamate administration in rams emerges as an interesting option to improve the male effect. Nonetheless, it is futher required to elucidate the role played by testosterone in the GTG group, because ewes exposed to rams treated with testosterone alone (TG group) had the lowest reproductive outcomes.

Key Words: nulliparous ewe, male effect, glutamate

W489 Quality parameters of goat meat as influenced by dietary condensed tannins from pine bark. Jolethia O. Jones*[1], Jung Hoon Lee[1], Byeng R. Min[2], Govind Kannan[1], and Brou Kouakou[1], *[1]Fort Valley State University, Fort Valley, GA, [2]Tuskegee University, Tuskegee, AL.*

This study was conducted to evaluate the quality characteristics of goat meat (chevon) from meat goats fed ground pine bark (PB, *Pinus* spp.) containing up to 13% condensed tannins (CT) on a DM basis. Twenty-four intact male Kiko goats (8 mo of age; BW = 39.7 ± 2.55 kg) were randomly assigned to pastures for a grazing trial. Goats were grazed in a winter rye grass-dominant pasture, and supplemented with either bermudagrass hay (BG) or PB pellet (n = 12 goats/supplementation). Each supplement consisted of alfalfa pellet, molasses, and mineral mixtures with either BG or PB powder, provided at 1.5% of BW at individual feeding stations. The dietary supplements were isocaloric and isonitrogenous. After 50 d grazing, goats were slaughtered and kept at 2°C for 24 h. *Longissimus muscle* (LM) pH was measured from individual carcasses and each carcass was fabricated to obtained 2.5-cm thick loin chops for meat quality analysis. All data were analyzed as a completely randomized design. The LM pH of goats was not significantly different ($P > 0.05$) between BG-hay and PB-pellet supplementations (5.65 and 5.70 ± 0.048, respectively). No significant differences were found in the CIE L* (lightness) and b* (yellowness) values of loin chops from goats supplemented either BG-hay or PB-pellet. However, the CIE a* (redness) values of chops from goats fed BG-hay were higher ($P < 0.05$) than those from goats fed PB-pellet. No differences ($P > 0.05$) were found in the proximate composition of LM from the loin chops of goats fed the 2 different supplements. Furthermore, the thiobarbituric acid reactive substances (TBARS) values of LM from the loin chops were not significantly different between the 2 different supplements. No significant differences were found in the Warner-Bratzler shear values (3.90 vs 3.86 ± 0.13 kg) and cooking losses (20.1 vs 22.4 ± 1.12%) of loin chops from goats supplemented either BG-hay or PB-pellet. The results indicate that supplementing with pine bark pellet did not change the quality of chevon but it might influence the fresh red meat color of chevon.

Key Words: quality, goat meat, pine bark

W490 Fatty acid composition of different fat depots from hair and wool x hair sheep supplemented with soy hull on pasture. Beruk B. Lemma[1], Jung Hoon Lee*[1], Stephan A. Wildeus[2], Brou Kouakou[1], and Govind Kannan[1], *[1]Fort Valley State University, Fort Valley, GA, [2]Virgina State University, Petersburg, VA.*

Terminal sire mating and supplementation were used to improve growth rate and muscling in hair sheep breeds. However, their effect on the fatty acid profile of different fat depots in lambs has not been reported. Forty-seven lambs (5-mo old), 23 purebred hair sheep (Barbados Blackbelly or BB, BW = 16.2 ± 1.9 kg; St.Croix or SC, BW = 19.5 ± 2.0 kg) and 24 crossbred wool (Dorset, D) x hair (BB; BW = 21.7 ± 2.3 kg or SC; BW = 21.7 ± 2.9 kg) of both sexes were rotationally grazed on predominately tall fescue with or without soy hull supplementation during summer. Soy hull was provided at 2.0% of BW at individual feeding stations. After 90 d of grazing, lambs were harvested, and intramuscular, subcutaneous and kidney fats were obtained from each carcass. Total lipids from each fat depot sample were extracted by the chloroform-methanol method. Extracted lipids were prepared for the fatty acid methyl esters (FAME) and then analyzed by a gas chromatography. All data were analyzed as a completely randomized design with breed type (pure- or cross-bred), supplement (with or without soy hull), and sex (male or female) as main effects. The fatty acid profiles of different fat depots from experimental lambs were significantly influenced by supplementation and sex. Compared with lambs fed supplement, pasture-only fed lambs had higher ($P < 0.01$) concentrations of linoleic (C18:2n6, 6.83 vs 4.96%), arachidonic (C20:4n6, 4.08 vs 2.27%), docosapentaenoic (C22:5n3, 1.41 vs 0.73%) and docosahexaenoic (C22:6n3, 0.45 vs 0.25%) acids in intramuscular fat; a higher ($P < 0.01$) concentration of stearic (C18:0, 26.0 vs 22.4%) acid, but lower ($P < 0.01$) concentrations of C16:0 (19.4 vs 22.2%) and C18:1n9 (31.4 vs 37.2%) in subcutaneous fat; and a higher ($P < 0.01$) concentration of C18:1n9 (38.7 vs 33.1%), but lower ($P < 0.01$) concentrations of C18:0 (23.7 vs 29.4%) and C18:2n6 (1.13 vs 1.76%) in kidney fat. The results indicate that fresh lamb from pasture only fed-lambs might have healthier fatty acid profiles compared with that from lambs supplemented with soy hull, regardless of breed types.

Key Words: wool and hair sheep, fat depot, soy hull

W491 Relationship among somatic measurements, body condition score, live weight and internal fat depots in Sarda ewes and Saanen goats in early lactation. Leonardo S. Knupp[1], Sheila N. R. Knupp[1], Mauro Ledda[2], Davide Rondina[1], Marco Acciaro[3], Carla Manca[3], Gesumino Spanu[1], Mondina F. Lunesu[1], and Antonello Cannas*[1], *[1]Dipartimento di Agraria, University of Sassari, Sardinia, Italy, [2]Dipartimento di Medicina Veterinaria, University of Sassari, Sardinia, Italy, [3]Agris Sardegna, Dipartimento di Ricerca nelle Produzioni Animali, Sardinia, Italy.*

Very little information is available on the relationship between BCS and LW in many dairy sheep and goat breeds. For these reasons, this work aimed to study in Sarda dairy ewes and in Saanen dairy goats: i) the relationship between BCS and LW; ii) the relationship between BCS, LW and the amount of internal body fat and its distribution in the abdominal cavity. Eight Sarda ewes (from 38.0 to 53.5 kg of LW and from 2.5 to 3.0 of BCS) and 8 Saanen goats (from 44.0 to 67.5 kg

of LW and from 2.25 to 3.0 of BCS) in the second month of lactation were used in this study. Nine different somatic measurements were taken on each animal. At slaughter, omental, mesenteric, kidney and other internal fat were separated and weighed. LW linearly increased as BCS increased ($R^2 = 0.85$; $P < 0.001$) in Sarda ewes. BCS was a better predictor of LW ($R^2 = 0.92$; $P < 0.001$) than somatic body measurements. For each unitary change of BCS, the LW increased 23.45 kg. In contrast, in Saanen goats the relationship between LW and BCS was low ($R^2 = 0.25$) and not significant. In this species, chest of girth was instead a very good predictor of LW ($R^2 = 0.91$). Kidney, omental, mesenteric and others fat weighted, respectively, 0.2 kg, 0.9 kg, 0.4 kg, and 0.1 kg and represented 12.4%, 53.5%, 24.3%, and 9.7% of the total visceral fat depots in Sarda ewes. In Saanen goat they weighted, respectively, 0.3 kg, 1.0 kg, 0.7 kg, and 0.2 kg and represented 13.7%, 41.9%, 36.2%, and 8.2% of the total visceral fat depots. The weight of the total internal fat in relation of the EBW was very similar in ewes and in goats (0.4% and 0.5%, respectively). The kidney fat was highly correlated with the total visceral fat in sheep and goats ($R^2 = 0.92$ and 0.87, respectively). BCS and LW predicted equally well total internal fat (in kg) ($R^2 = 0.65$) in Sarda ewes, while in Saanen goats the BCS was a slightly better predictor ($R^2 = 0.63$) than LW ($R^2 = 0.59$). In conclusion, BCS was the best predictor of total internal fat in both species.

Key Words: body condition score, somatic measurement, visceral fat

W492 Assessment of RNA stability within six ovine tissues postmortem. Fiona M. McGovern[1], Tommy M. Boland*[1], Francis P. Campion[1], Marion T. Ryan[1], and Torres Sweeney[2], *[1]School of Agriculture and Food Science, University College Dublin, Dublin , Ireland, [2]School of Veterinary Medicine, University College Dublin, Dublin, Ireland.*

Trancriptome analysis is commonly employed to evaluate biological processes in both human and livestock species. One of the prerequisites for this type of analysis is the possession of high purity, intact RNA. Postmortem tissue collection has inherent time delays and hence it is important to understand the temporal variation, both in the stability of total RNA and individual gene transcripts, with respect to particular tissues. The objective of this experiment was to both qualitatively and quantitatively assess the integrity of both total and mRNA species derived from ovine liver, spleen, thyroid, skeletal muscle, ileum and perirenal adipose tissue, which has been stored at ambient temperature and sampled at time points 0, 3, 6 and 9 h post-mortem. One hour after parturition, 6 lambs (5.12 ± 0.27 kg) were euthanized. Samples were collected from the liver, spleen, thyroid, skeletal muscle, ileum and perirenal adipose tissue and stored on a sterile Petri dish at ambient temperature. Approximately 1–2 g of tissue was then harvested at each time point (0, 3, 6, 9h), held for 24h in RNAlater and then stored at −80°C. The quality and quantity of total RNA was assessed on the NanoDrop spectrophotometer and Agilent 2100 Bioanalyzer, respectively. While postmortem sampling time had no effect on RNA quantity ($P \geq 0.05$) in 5 of the 6 tissue types analyzed, the RNA integrity number decreased over time and was significantly lower at 6 and/or 9 h postmortem in the spleen, thyroid, skeletal muscle, ileum and perirenal adipose tissues relative to the 0-h time point ($P < 0.05$). A reduction in the normalization factor in the liver, spleen, ileum and perirenal adipose tissues was observed over the time period ($P < 0.05$). In summary, the stability of total RNA remained intact within the first 3 h postmortem, regardless of tissue type, however tissue specific variation was evident in the RNA integrity across the 4 postmortem sampling times.

Key Words: ovine, RNA stability, postmortem

W493 A meta-analysis of net protein and energy requirements for growth of dairy goats. Anaiane Souza*[1], Normand St-Pierre[2], Marcia Fernandes[1], Amélia Almeida[1], Julián Vargas[1], and Izabelle Teixeira[1], *[1]Universidade Estadual Paulista, Jaboticabal, Sao Paulo, Brazil, [2]The Ohio State University, Columbus, OH.*

Several factors including age, genotype, and sex affect the rate of body protein and fat deposition and, thus, the nutritional requirements for growth. Thus, the objective of this meta-analysis was to develop equations for estimating net protein (NP_g) and net energy (NE_g) requirements for growth of different sexes in dairy goats. A database of 244 individual records of Saanen goats weighing between 4.61 and 51.0 kg of body weight, from 7 comparative slaughter studies was used. Allometric equations were developed for body protein and energy contents in the empty body weight (EBW) as dependent variables and EBW as the allometric predictor. Parameter estimates were obtained using a linearized (log-transformation) expression of the allometric equations using the MIXED procedure of SAS 9.4. The model used included the random effect of study, and the fixed effects of sex (intact male, castrated male, and female; n = 93, 79, and 72, respectively). Net requirements for growth were estimated as the first derivative of the allometric equations. The NP_g equations differed across sexes ($P = 0.083$). The allometric equation for intact and castrated males was $\log_{10}$ EBW protein (g) = 2.221 ± 0.0224 + 1.015 ± 0.0165 x $\log_{10}$ EBW (kg); and for females: $\log_{10}$ EBW protein (g) = 2.277 ± 0.0288 + 0.958 ± 0.0218 × $\log_{10}$ EBW (kg) ($\sigma_e = 0.0374$; $\sigma_s = 0.0196$). The NP_g requirements for males were nearly 10% greater than those of females. The NE_g equations also differed between sexes ($P < 0.001$). The allometric equation for intact males was: $\log_{10}$ EBW energy (kcal) = 2.988 ± 0.0323 + 1.240 ± 0.0238 x $\log_{10}$ EBW (kg); for castrated males: $\log_{10}$ EBW energy (kcal) = 2.873 ± 0.0377 + 1.359 ± 0.0283 x $\log_{10}$ EBW (kg); and for females: $\log_{10}$ EBW energy (kcal) = 2.820 ± 0.0377 + 1.442 ± 0.0281 x $\log_{10}$ EBW (kg) ($\sigma_e = 0.0472$; $\sigma_s = 0.0309$). The NE_g requirements of castrated males were nearly 14% greater than those of intact males, and nearly 15% less than those of females. These results indicate that NP_g and NE_g requirements differ among sexes in growing dairy goats. This distinction is not done in the prevalent nutritional requirement systems (FAPESP grant # 2014/14734–9).

Key Words: allometry, Saanen, sex

W494 Effect of selenium supplementation on reproductive activity of Saanen bucks. Khoboso C. Lehloenya*, Mamokou M. Mojapelo, and Jannes B. van Ryssen, *University of Pretoria, Pretoria, Gauteng, South Africa.*

Some parts of South Africa have soils deficient in selenium leading to selenium deficiency in animals grazing pastures or fed forages produced from these areas. Selenium deficiency is not only associated with poor fertility but also occurrences of several ruminant diseases. This study evaluated the effect of selenium supplementation on reproductive activity of Saanen bucks. Forty Saanen kids aged ± 3 mo were allocated into 2 groups comprising of selenium supplemented and the control. The study was conducted over a period of 6 mo. The Kids were fed lucerne ad libitum and had free access to water throughout the experiment. The supplemented group received sodium selenite orally at 3-mo intervals. Body weight and testicular measurements were recorded every 2 weeks while sexual behaviors were evaluated at weekly intervals. Semen was collected bi-weekly using an electro ejaculator from 5 mo of age. The supplemented group were significantly ($P < 0.01$) heavier (21.09 ± 4.1 kg) than the control group (19.03 ± 1.5 kg) and also they had larger ($P < 0$ 05) scrotum circumference (22.77 ± 3.2 cm vs 20.94 ± 3.7 cm) and testicular length ($P < 0.01$) (8.92 ± 1.61 cm vs 8.20 ± 1.71cm).

Body weight had a positive correlation with the scrotal circumference; testicular length and width while it had a negative correlation with the expression of the mounting sexual behavior. Semen volume, mass motility and pH were not affected by selenium supplementation. However, the supplemented group had higher sperm concentration (2063.07×10^6 mL^{-1} vs 1748.91×106 mL^{-1}), live sperm (77.50 ± 13.0% vs 76.64 ± 10.5%) than the control group. The percentage of dead sperm (22.50 ± 13.0 vs 23.36 ± 10.5) and secondary abnormalities (8.07 ± 7.6 vs 8.48 ± 9.7) was lower in the supplemented group than the control group. The higher morphologically abnormal sperm cells observed from the supplemented group was mostly due to higher percentage of primary abnormalities, which cannot be contributed by selenium supplementation. It is therefore concluded that selenium supplementation increased body weight however heavier bucks expressed mounting behavior at later age than lighter bucks. Selenium supplementation also improves the sperm quality and viability.

Key Words: goat, testicular measurement, semen characteristic

W495 Fatty acid profile of the meat of goats fed diets with soybean meals substituted with peanut cake. Thadeu M. Silva*[1], Ariosvaldo N. Medeiros[2], Ronaldo L. Oliveira[1], Severino Gonzaga Neto[2], Rita C. R. E. Queiroga[3], and Rebeca D. X. Ribeiro[1], *[1]Federal University of Bahia, Salvador, Bahia, Brazil, [2]Federal University of Paraíba, Areia, Paraíba, Brazil, [3]Federal University of Paraíba, João Pessoa, Paraíba, Brazil.*

Peanut cake is a by-product of biodiesel and contains relatively elevated lipid content. The inclusion of vegetable lipid sources in the diets can cause changes to the animal's fatty acid profile. This study was conducted to determine the effect of substituting soybean meal with peanut cake in the feeding of goats on meat fatty acid profile. Forty goats were assigned at a completely random design, to 1 of 4 diets. The concentrate was composed of corn bran, soybean meal, and mineral premix; soybean meal was substituted with peanut cake at substitution rates of 0.0, 33.33, 66.67, and 100%. Tifton-85 (*Cynodon* sp.) hay, was used at 50% of TMR. After 62 d of feeding, the animals were slaughtered. The left loin of each animal was collected and subjected to lipid extraction, methylation, and the quantification of the fatty acid esters were obtained through gas chromatography analysis. A general linear model was used to perform linear and quadratic regression with 5% significance. The sum of fatty acid and atherogenicity index was not influenced by the substitution of soybean meal with peanut cake (Table 1). Peanuts possess an elevated content of oleic acid (C18:1) compared with soy, which is rich in linoleic acid (C18:2). However, it is important to consider that these ingredients compose, at most, 21% of the total diet, so their lipid characteristics were diluted by the other ingredients. Another important factor is the ruminal biohydrogenation, which tends to convert oleic, linoleic and linolenic acids into stearic acid (C18:0). The peanut cake can replace completely the soybean meal in goat diet with no effect on fatty acid profile of the meat.

Table 1 (Abstr. W495). Sum of fatty acids as the percentage of total fatty acids and atherogenicity index in the loin of goats fed diets with soybean meal substituted with peanut cake

	Amount of substitution (%DM)					*P*-value	
Item	0.0	33.3	66.6	100.0	SEM	Lin	Quad
S Saturated	53.41	58.28	55.4	56.55	1.25	0.29	0.17
S Unsaturated	46.59	41.72	44.6	43.45	1.25	0.29	0.17
S Polyunsaturated	3.36	3.75	3.09	3.53	0.45	0.96	0.97
Unsaturated: Saturated	0.87	0.72	0.81	0.77	0.04	0.22	0.16
n-6:n-3	15.89	14.81	15.47	19.52	2.86	0.13	0.18
Atherogenicity index	0.89	1.00	0.91	0.97	0.06	0.59	0.73

Key Words: biodiesel, omega fatty acid, ruminant

W496 Digestibility of nutrients in rams diets feed with fruit residue. Elenice Conceição dos Santos[1], Darcilene Maria Figueiredo*[1], Dorismar David Alves[2], Aldrin Vieira Pires[1], Paulo Gustavo Macedo de Almeida Martins[1], Janaína Leite Barbosa[1], Mônica Lopes Paixão[3], Cassiane Gomes dos Santos[1], and Marianne Schorer[1], *[1]Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, MG, Brazil, [2]UNIMONTES, Montes Claros, MG, Brazil, [3]Universidade Federal de Viçosa, Viçosa, MG, Brazil.*

The objective of this study was to evaluate the digestibility of nutrients after the inclusion of pineapple (*Ananas comosus* L.), banana (*Musa* sp.), mango (*Mangifera indica*) and passion fruit (*Passiflora* sp.) residue in diet for confined rams replacing 75% corn silage. Twenty 5 Santa Ines crossbred rams, rumen fistulated, castrated were used with approximate initial age of 24 mo, and initial body weight of 45.4 ± 6.1 kg. Experiment was conducted in Latin square design (5 × 5), with 5 treatments, 5 animals per treatment, and 5 experimental periods of 13 d each. The forage: concentrate diet was 40:60 (% dry matter), and the forage in control diet was composed of 100% corn silage. To estimate the fecal nitrogen, animal feces were collected during 96 h using bag collectors. Samples of feces, bulky concentrates, and scraps of food provided were recorded. In all the samples we analyzed the chemical composition to estimate the digestibility of dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE), neutral detergent fiber (NDF), neutral detergent fiber corrected for ash and protein (NDFap), total carbohydrates (TC), and non-fibrous carbohydrates (NFC). The results were analyzed by ANOVA and Dunnett test at 5% probability, using the Statistical Analysis System. The inclusion of pineapple residue promoted increase ($P < 0.05$) in digestibility of OM, and TC, respectively, 2.5 and 4.5%, compared with control diet, which may be related to fermentation processes caused by this food, as there was a greater ($P < 0.05$) digestion of NDF, and NDFap with their inclusion in the diet. The diet containing banana residue decreased ($P < 0.05$) the EE digestibility by 23.6%, however provided an increase ($P < 0.05$) of the digestibility of NDFap in 7.78%. With the addition of mango residue, there was a reduction ($P < 0.05$) in DM by 1.5%. We concluded that the use of fruit residue instead of 75% corn silage (DM) do not cause reduction in the total apparent digestibility of nutrients in rams.

Key Words: alternative foods, confinement, sheep

W497 Nitrogen balance in sheep fed with fruit residue. Elenice Conceição dos Santos[1], Darcilene Maria Figueiredo*[1], Paulo Gustavo Macedo de Almeida Martins[1], Aldrin Vieira Pires[1], Dorismar David Alves[2], Mônica Lopes Paixão[3], Janaína Leite Barbosa[1], and Marianne

Schorer[1], [1]*Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, MG, Brazil,* [2]*UNIMONTES, Montes Claros, MG, Brazil,* [3]*Universidade Federal de Viçosa, Viçosa, MG, Brazil.*

The objective of this study was to evaluate the effect of inclusion of pineapple (*Ananas comosus* L.), banana (*Musa* sp.), mango (*Mangifera indica*), and passion fruit (*Passiflora* sp.) residue in replacement of 75% corn silage in diets for confined sheep on nitrogen balance. Twenty 5 Santa Ines crossbred sheep male, rumen fistulated, castrated were used with approximate initial age of 24 mo, and initial body weight of 45.4 ± 6.1 kg. Experiment was conducted in Latin square design (5 ×5), with 5 treatments, 5 animals, and 5 experimental periods of 13 d each. The diets were formulated to contain approximately 72% total digestive nitrogen, and 14.7% crude protein. The forage: concentrate diet was 40:60 (% dry matter), and the forage in the control diet was composed of 100% corn silage. We carried out daily records of food provided and the remains of these, to ensure 10% of leftovers. To estimate the fecal nitrogen, total feces were collected during 96 h, using bag collectors. The urinary nitrogen were estimated collecting urine during 72 h. Nitrogen balance was measured by subtracting the total nitrogen intake and total nitrogen excreted in feces, and urine. The results were analyzed by ANOVA, and Dunnett test at 5% probability, using the Statistical Analysis System. There was no difference ($P > 0.05$) among fruit residue, and corn silage for nitrogen values (intake, fecal, urinary, absorbed, and retained). N itrogen balance was positive, and presented a mean value of 15.73 g day of nitrogen retained in animal body, representing 51.27% ingested nitrogen, indicating better utilization of nitrogen by sheep. The amount of nitrogen intake averaged 30.69 g day^{-1}, and fecal and urinary losses represented, respectively, 28.87 and 19.87% ingested nitrogen. We conclude that the use fruit residue to replace 75% corn silage DM is viable and do not interfere the nitrogen balance and nitrogen retention.

Key Words: alternative foods, urinary nitrogen, fecal nitrogen

W498 Ruminal parameters of sheep fed with fruit residue. Elenice Conceição dos Santos[1], Darcilene Maria Figueiredo*[1], Dorismar David Alves[2], Aldrin Vieira Pires[1], Paulo Gustavo Macedo de Almeida Martins[1], Janaína Leite Barbosa[1], Mônica Lopes Paixão3,1, Adriano Cardoso dos Reis[3], and Marianne Schorer[1], [1]*Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, MG, Brazil,* [2]*UNIMONTES, Montes Claros, MG, Brazil,* [3]*Universidade Federal de Viçosa, Viçosa, MG, Brazil.*

The objective of this study was to evaluate the digestibility of nutrients after the inclusion of pineapple (*Ananas comosus* L.), banana (*Musa* sp.), mango (*Mangifera indica*) and passion fruit (*Passiflora* sp.) residue, in diet for confined sheep, replacing 75% corn silage. Twenty-five Santa Ines crossbred sheep male, rumen fistulated, castrated were used with initial age of 24 mo and initial body weight of 45.4 ± 6.1 kg. Experiment was conducted in Latin square design (5 × 5), with 5 treatments, 5 animals, and 5 experimental periods with 13 d each. The forage: concentrate diet was 40:60 (% dry matter), and the forage in the control diet was composed of 100% corn silage. At 13th day of each experimental period, rumen fluid samples were collected via ruminal fistula, to determine pH, and ammonia nitrogen (NH_3-N) in the following collections times: 0h (immediately prior the morning feeding), 2, 4, 6 h and 8 h after the morning feeding. Data collection was analyzed by regression, and to compare control diet with treatments, was performed by Dunnett test at 5% probability, using the Statistical Analysis System. There was no effect ($P > 0.05$) on the ammonia concentration levels ($N\text{-}NH_3$) in rumen fluid of animals fed with fruit residue, and obtained as an average value of 21.52 mg dL^{-1}. In the different collections (0, 2, 4, 6 and 8 h) of ruminal fluid was observed a quadratic effect ($P < 0.05$) for $N\text{-}NH_3$ ($N\text{-}NH_3 = 19.64 + 3{,}11t - 0{,}44t2$; $R2 = 0.63$), where the highest concentration at this time was at 3.53 h post-treatment, which may be related to the lower diets fibrousness. Diet containing pineapple residue presented lowest ($P < 0.05$) pH value, with an average between 6.13 collection times. Quadratic effect was observed ($P < 0.05$) for pH ($pH = 6.40 - 0{,}10t + 0{,}011t2$; $R2 = 0.61$) as rumen fluid collection time, with lowest value of pH occurred at 4.54 h post-treatment. We conclude that the use of all fruits residue do not decrease the amount of $N\text{-}NH_3$ available for rumen microorganisms, and not interfere with the pH of rumen fluid suitable for the microbiota.

Key Words: alternative foods, confinement, lamb

W499 Effects of increasing dried distillers grains with solubles on intake, digestibility, blood and rumen metabolites of sheep consuming bermudagrass or eastern gamagrass hay. Lamin Touray[1,2], Brou Kouakou*[1], and Jung H. Lee[1], [1]*Fort Valley State University, Fort Valley, GA,* [2]*University of Alabam at Birmingam, Birmingam, AL.*

In the southern United States, bermudagrass (*Cynodon dactylon*) is the predominantly used warm season forage. Eastern gamagrass (*Tripsacum dactyloides* L.) is being evaluated as an alternative to bermudagrass. The objective of this study was to determine intake and digestibility of bermudagrass or eastern gamagrass hay supplemented with increasing levels of dried distillers grains with solubles (DDGS) by sheep. In Experiment 1 (Exp. 1), bermudagrass hay (BG) was supplemented with 0, 10, 20, and 30% DDGS, and in Experiment 2 (Exp. 2), eastern gamagrass hay (EG) was also supplemented with the same levels of DDGS. In each experiment, a total of 4 crossbred wether sheep (Katahdin × Dorper; one year old, 33.2 ± 1.7 kg, BW) were used. The sheep were individually housed in pens and randomly assigned to each of the 4 diets. Each treatment consisted of 4 periods of 14 d/period (10 d adjustment and 4 d sample collection). Animals received hay ad libitum after the supplement was completely consumed. At the end of each period, a 7-mL blood sample was collected from each animal and analyzed for PUN, glucose, and NEFA concentrations and rumen fluid samples were also collected and analyzed for ruminal ammonia nitrogen (NH_3-N) and volatile fatty acids (VFA) concentrations. Nutrient digestibility was estimated using the total fecal (bag) collection method. Data from each experiment were analyzed as a separate Latin square design using SAS. DDGS supplementation did not ($P > 0.05$) affect BG hay DMI but increased ($P < 0.05$) EG hay DMI. In both experiments, DM, OM, ash, NDF and ADF digestibilities were not affected ($P > 0.05$) but CP and EE digestibilities increased ($P < 0.05$) with DDGS supplementation. Although DDGS supplementation did not affect total VFA concentrations in Exp. 1, it tended ($P = 0.09$) to decrease in Exp. 2. Plasma urea nitrogen (PUN) concentrations increased with DDGS supplementation in both experiments. Plasma glucose, NEFA, or rumen NH3-N, pH concentrations were not affected ($P > 0.05$) by DDGS in both experiments.

Key Words: DDGS, digestibility, metabolites

W500 Performance and feed efficiency of feedlot lambs fed different sources of non-protein nitrogen and carbohydrate. Larissa Goltz, Ricardo D. Kliemann, Jean C. S. Lourenço, Eduardo M. Nascimento, Dayanna Pastal, Tiago M. Santos, Sergio R. Fernandes, and Américo F. Garcez Neto*, *Federal University of Paraná, Palotina, Paraná, Brazil.*

Despite of the huge availability of agricultural lands and good weather conditions to forage growth in Brazil, feedlots have been an effective

way to increase animal production. The aim of this trial was to evaluate the performance and feeding efficiency of feedlot lambs fed diets with different non-nitrogen protein (NPN) and carbohydrates (CHO) sources in the concentrate. We used 20 non-castrated lambs with 4 mo of age and 26 kg of body weight. Lambs were fed ad libitum for 45 d with diets composed by 57% of grass hay (*Brachiaria* hybrid) and 43% of concentrate. The hay was harvested at late mature stage with high (72.4%) neutral detergent fiber and low (4.9%) crude protein. Four concentrates were formulated from the combination of 2 CHO (ground corn: starch; whey permeate: lactose) and 2 NPN (fast and slow release urea) sources. The diets were isoenergetic (2.32 Mcal/kg ME) and isoproteic (11% CP). Lambs were slaughtered at the end of trial after 45 d with a mean body weight of 30.4 ± 1.0 kg. A completely randomized design was used with 4 diets and 5 replicates. Data were analyzed by ANOVA following a 2 × 2 factorial scheme. Body weight gain (BWG), average daily gain (ADG), dry matter intake (DMI), gross feed efficiency (GFE) were analyzed. There was no interaction between CHO and NPN source ($P > 0.05$) and NPN had no effect on any variables ($P > 0.05$). Animals that were fed corn had higher BWG (5.28 vs. 3.54 kg), DMI (1.010 vs. 0.937 kg day^{-1}), ADG (117.30 vs. 78.60 g day^{-1}) and GFE (116.80 vs. 84.3 g kg^{-1} DM) than those fed whey permeate. The best performance and high intake of diets with corn can be related to a possible microbial growth limitation and the depression of fiber degradation in diets containing whey permeate. Lactose provides less carbon than starch on a mass basis and has a higher potential for energy-spilling due to its faster fermentation. The source of NPN in the concentrate feed had no effect on performance of finishing lambs fed a low quality diet. Ground corn was a better ingredient for concentrate feed in diets containing low quality forage.

Key Words: energy, intake, urea

W501 The use of Chambourcin grape extract as a natural anthelmintic in goat kids. Kimberly A. Cash*[1], James D. Caldwell[1], Bruce C. Shanks[1], Amy L. Bax[1], Luke S. Wilbers[1], Heather L. Hilsenbeck[1], Andrea T. McKnelly[1], Taylor N. Drane[1], Kelsey L. Basinger[1], Jessica K. Clark[1], Haley L. Bartimus[1], and Harley D. Naumann[2], *[1]Lincoln University, Jefferson City, MO, [2]University of Missouri Columbia, Columbia, MO.*

Gastrointestinal nematode parasitism is one of the greatest economic threats to goat production in the United States. With elevated incidences of anthelmintic resistance there is an increased interest in alternative natural dewormers, such as plants containing condensed tannins. Therefore, the objective of this study, supported by the NCR-SARE graduate grant program, was to evaluate the effects of fermented Chambourcin grape extract on parasite level and performance of goat kids. On October 14, 2014, a total of 45 mixed-breed goat kids (17.17 kg ± 0.79) were stratified by fecal egg count, weight, breed, and sex, and were allocated randomly to one of 3 treatments: 1) an oral dose (10 mL per 4.54 kg of BW) of fermented Chambourcin grape extract at 7-d (D7) intervals, 2) the same dose at 14-d (D14) intervals, or 3) control (30 mL oral dose of water at 14-d intervals). Condensed tannins were extracted, purified, and standardized by the Protein-Precipitable Phenolics method and found to have a concentration of 0.33 mg/mL. Goats were naturally exposed to gastrointestinal parasites on pasture consisting primarily of endophyte-infected tall fescue [*Lolium arundinaceum* (Schreb.) Darbysh] and mixed browse with access to 16% crude protein corn-soybean meal based creep feed for the duration of the 63-d study. Fecal egg counts, packed cell volumes, FAMACHA scores, weights, and body condition scores were measured every 7 d. Data were analyzed by the PROC MIXED procedure of SAS and treatments were reported as least squares means. Two contrast statements were used to compare the mean of control versus D7 and D14 and the mean of D7 versus D14. Animal was the experimental unit. Start, final, and change from start to final fecal egg counts, packed cell volumes, FAMACHA scores, and body condition scores did not differ ($P \geq 0.12$) across treatments. Average daily gain and total weight gain also did not differ ($P \geq 0.42$) across treatments. Therefore, fermented Chambourcin grape extract may not be an effective natural anthelmintic for controlling nematodes in creep-fed goat kids.

Key Words: natural anthelmintic, condensed tannin, grape extract

W502 Urushiol is not detected in blood or milk of Saanen dairy goats fed poison oak. Massimo Bionaz*, Claudia Ingham, Jennifer Belveal, Kristine Gomez, and Mark Keller, *Oregon State University, Corvallis, OR.*

Urushiol, the allergen present in *Toxicodendron diversilobum* (western poison oak), is responsible for contact dermatitis. More than 70% of adults have a reaction to urushiol, making this an important problem in the Northwest of US. Many anecdotal stories exist about desensitization to poison oak contact dermatitis acquired by drinking milk from goats fed poison oak. This has not been experimentally tested. In a previous study (Kouakou et al., 1992), urushiol was not detected in milk of goats fed 100% poison oak. To produce preliminary data for a large clinical trial, we have performed a pilot study in which 2 lactating Saanen goats were fed poison oak for 2 weeks. The experiment was carried out in the first 2 weeks of October 2014. The goats were at 80 d of lactation, weighed 70 ± 2 kg, produced 3 ± 0.7 kg/milk per day, and both were nursing triplets. The goats were kept in individual pens and fed twice a day with approx. 10% dry matter of fresh poison oak. Samples were obtained from each collection of poison oak. Feces, milk, and blood samples were collected at −1, 7, and 14 d after starting the experiment. Samples were spiked in with 2-dodecylphenol as internal standard and urushiol was extracted using 100% methanol. The extracted samples were purified using C-18 Solid phase Extraction columns before being injected into a Flexar HPLC (Perkin Elmer) equipped with a 5µm C18 HPLC column (Phenomenex). We were able to detect all 4 major congeners composing urushiol in the poison oak. We measured > 6 mg urushiol/g of fresh poison oak leaves (>14.0 mg/g of dry matter). Feces also contained urushiol (>1 mg urushiol/g of dry matter). We did not observe any urushiol in whole blood, plasma, or milk. The heptadecatrienylcatechol, the congener with the highest unsaturation and also the most irritant, was > 70% of the total extracted urushiol both in poison oak and feces. Our data confirmed the absence of detectable urushiol in milk; thus, milk from goats fed poison oak is safe to be consumed and handled by urushiol-sensitive people. Lack or minimal intestinal absorption and/or an extreme high clearance by the liver are inferred based on the absence of urushiol in blood.

Key Words: dairy goat, poison oak, milk

W503 Performance and carcass parameters of lambs fed high grain diets with different fiber contents. T. Brochado*, S. B. Gallo, M. C. Freua, P. R. Leme, and R. A. Brandi, *Faculty of Animal Science and Food Engineering, University of Sao Paulo, Pirassununga, SP, Brazil.*

Although high concentrate diets are commonly used for finishing lambs, literature about the effect of minimum levels of NDF on performance is limited. The purpose of this study was to evaluate the effects of increasing dietary fiber levels on performance and carcass parameters of in finishing lambs fed high concentrate diet. Twenty-four male lambs

(initial BW of 24 ± 3 kg, 90 d old) were randomly assigned to 24 individual pens, in a complete randomized design with 3 treatments and 8 replicates. Treatments were dietary NDF levels of 12, 15 and 18% on DM basis. Diets were isoproteic, composed of corn, soybean meal, minerals and corn silage, and were offered twice a day with refusals daily measured to determine dry matter intake (DMI). Animals were weighed weekly and slaughtered after 50 d of feedlot, with average BW of 40 ± 4 kg. Hot and cold carcass weight (HCW and CCW) as well as hot and cold carcass yield (HCY and CCY) were measured. Data were submitted to polynomial regression analysis, with initial BW as a covariate, using the statistical software R. There was a linear increase in DMI ($P < 0.01$) from 1.26 ± 0.13 to 1.47 ± 0.21 kg/animal/d and a linear decrease on residual feed intake ($P < 0.01$) from 0.09 ± 0.11 kg/d to −0.06 ± 0.19 kg/d as dietary NDF increased. There was no difference in ADG ($P > 0.05$, 0.320 ± 0.06 kg/d) and feed conversion ($P > 0.05$, 4.27 ± 0.64 kg/kg) among treatments. There was a linear decrease ($P < 0.05$) on HCW (21.08 ± 1.10 to 19.65 ± 2.20 kg), HCY (51.93 ± 1.99 to 49.71 ± 2.47%) and CCY (50.04 ± 2.02 to 47.98 ± 2.64%) as dietary NDF increased. There was a trend of linear decrease ($P = 0.06$) for CCW from 20.31 ± 1.08 to 18.97 ± 2.15 kg as dietary NDF increased. In conclusion, although ADG was not affected by treatments, carcass weight and carcass yield increased as dietary levels of NDF decreased.

Key Words: feedlot, lamb, neutral detergent fiber

W504 Sheep performance under grazing supplemented with lime-hydrolyzed feather meal as a source of protein in their diet during the dry season in Mexico's Central Highlands. Francisca Avilés Nova*[1], José M. Castro Salas[3], Octavio A. Castelán Ortega[2], Luis M. Ríos García[1], and Anastacio García Martínez[1], *[1]Centro Universitario Temascaltepec. Universidad Autónoma del Estado de México., Temascaltepec, Estado de México, México, [2]Facultad de Medicina Veterinaria y Zootecnia de la Universidad Autónoma del Estado de México, Toluca, Estado de México, México, [3]Unidad académica de Ciencias Agropecuarias y Ambientales. Universidad Autónoma de Guerrero, Iguala de la Independencia, Estado de Guerrero, México.*

The sheep continuous grazing on tropical forages during dry season requires supplementation with protein-based feed to improve production efficiency.The objective of this study was to evaluate the productive performance of grazing lambs supplemented with diets using 2 levels of inclusion of lime-hydrolyzed [$Ca(OH)_2$] feather meal. Experimental work was conducted at Rancho of the Temascaltepec University Center of the Autonomous University of the State of Mexico, from February to May. The treatments were: T1: grazing+diet with 6% feather meal; T2: grazing+diet with 9% feather meal; and T3: grazing+diet with 14% soybean meal.The diets were isoprotein (15.7%) and isoenergetic (4.6 Mcal/kg) and prepared with ground grain sorghum, wheat bran, molasses and minerals. The variables evaluated were daily weight gain, forage intake and feed conversion.Thirty lambs (Katahdin × Pelibuey) (initial weight of 26.1 kg ± 3.076) were used in the study. All lambs were weighed at the beginning of trial and thereafter every week before grazing.The lambs were randomly distributed among the 3 treatments. They grazed for 6 h daily in 3 mixed paddock (1.0 ha) of *Panicum* (Tanzania and Mombasa) and *Brachiaria* (Insurgente and Mulato II). At the beginning of each week the forage supplied was measured, and at the end of the week, the remaining forage was measured. Grass was cut using grass shears utilizing the quadrat. After grazing each day, each lamb was fed 250 g of the corresponding supplement.The lambs were kept in individual pens. A totally random design was used, with 3 treatments and 10 repetitions (each lamb representing one repetition). The Tukey's test was used ($P < 0.05$).The highest daily weight gain ($P < 0.05$) was obtained with the T2 (59.9 g d^{-1}) and T3 (67.6 g d^{-1}) treatments. No statistical difference ($P > 0.05$) in feed conversion was found between the T2 and T3 treatments, obtaining relations of 11:1 and 10:1, respectively. We concluded that lime-hydrolyzed feather meal may be used as a protein supplement, when it represents 9% of the diet of grazing lambs during the dry season, and may thus replace soybean meal in their diet.

Key Words: lamb, supplemented, lime-hydrolyzed feather meal

W505 Replacing corn with different levels of passion fruit by-product and its effects on feed intake, performance and digestibility in crossbred feedlot lambs. Josemir S. Gonçalves*[1], Raimundo Neilson L. Amorim[2], Raquel L. Salgado[2], and Eric H. C. B. Van Cleef[1], *[1]UNESP-Univ Estadual Paulista, Faculdade de Ciências Agrárias e Veterinárias, Jaboticabal, São Paulo, Brazil, [2]UFERSA-Federal University of Semi-arid, Mossoró, Rio Grande do Norte, Brazil.*

Two studies were conducted to evaluate effects of corn grain replacement with passion fruit by-product (PFB) in finishing lambs on feed intake, feedlot performance, carcass traits and digestibility. In study 1, 20 Morada Nova ram lambs (21.8 ± 0.4 kg BW) were used in a completely randomized design with 4 treatments: isonitrogenous (19% CP) experimental diets contained 30% Tifton-85 bermudagrass hay and 70% concentrate (soybean meal, wheat meal, corn and 0, 25, 50, or 75% PFB). Over a period of 21 d, lambs were housed in digestibility cages (14 d adaptation and 7 d data collection) and DM, CP and NDF digestibilities estimated by total fecal collection technique. In the study 2, 32 Morada Nova ram lambs (22.4 ± 3.2 kg BW) were housed in individual pens and assigned to a randomized block design (initial BW) and fed the same diets of study 1 for 78 d (14 d adaptation and 64 d data collection). DM and nutrient intakes, average daily gain (ADG) and gain to feed (G:F) were evaluated and after slaughter (32 kg), yields of hot carcass (HCY) and cold carcass (CCY) were calculated. Data from study 1 were analyzed using the GLM procedure of SAS and means were compared with Tukey test ($P < 0.05$). For the study 2, data were analyzed with MIXED procedure with each animal as the experimental unit, and model effects included block and treatment. DM and CP digestibilities were not affected by PFB when it was added up to 50% (74.98 ± 2.0 and 77.38 ± 2.8%, respectively; $P > 0.05$). However, DM and CP digestibilities decreased in 75% PFB diet (69.7 ± 0.7 and 72.5 ± 1.1%, respectively). NDF digestibility was unaffected by treatments ($P > 0.05$), averaging 49.4 ± 3.4%. There were no differences in DM and digestible nutrient intakes ($P > 0.05$). No differences were evidenced ($P > 0.05$) in ADG (152 ± 0.03 g), G:F (0.147 ± 0.01 kg), HCY (46.6 ± 1.0%) and CCY (45.0 ± 1.0%). The data indicate that although passion fruit by-product decreases diets DM and CP digestibility, it is a suitable replacement for corn grain in diets for feedlot lambs when used at up to 75%.

Key Words: by-product, intake, sheep

W506 Effects of the utilization of increasing doses of aromatic plants on ruminal metabolism in Sarda dairy lactating ewes. Roberta Boe, Oscar Boaventura Neto, Roberto Rubattu, Antonio Fenu, Antonio Mazza, and Antonello Cannas*, *Dipartimento di Agraria, Sezione di Scienze Zootecniche, Università di Sassari, Sassari, Italy.*

The objective of this study was to investigate the effects of increasing doses of 3 aromatic plants *Carum* sp. (CAR), *Coriandrum* sp. (COR) and

Satureja sp. (SAT) as a natural dietary additive on ruminal metabolism in Sarda dairy sheep. Forty-four Sarda dairy ewes (BW = 45.11 ± 4.62 kg) were randomly divided into 4 groups (11 ewes per group) assigned to an aromatic plant or to the control (CON). The 3 plants were tested, for each group in chronological order, at 3 increasing doses (low = 25g, medium = 75g and high = 125g), each supplied individually for 21 d during the 2 daily machine milkings. The ewes also received during the day dehydrated alfalfa, beet pulp, corn and pea meals. Rumen samples were taken by using a stomach tube. Rumen pH (mean value 6.87) was influenced by type of aromatic plant and dose level ($P < 0.004$), but not by their interaction. The ammonia content was higher in CON and COR groups (18.20 and 19.45 mg/dL, respectively) compared with CAR and SAT (14.79 and 15.87 mg/dL, respectively), and it was influenced by plant ($P < 0.001$) but not by dose or their interaction. The molar proportions of acetate and propionate were affected by diet and dose level ($P < 0.05$), with the higher values in CON and SAT (41.8% and 11.0%; 38.1% and 10.3%, respectively), while their ratio was influenced only by the dose level (increased from 3.19 to 4.34 for the low and high dose respectively). The molar proportion of butyrate was affected only by the type of plant, with the lowest value in COR and CAR (7.86% and 7.80%, respectively). A strong interaction ($P < 0.001$) between type of aromatic plants and dose level was detected in the concentration of odd-branched-chain (OBCFA), saturated (SFA), monounsaturated (MUFA) and polyunsaturated (PUFA) fatty acids. In particular, CON and SAT groups had the higher concentration of OBCFA (7.93 and 7.86 g/100g FA, respectively) and PUFA (5.04 and 4.42 g/100g FA), while the concentration of SFA and MUFA were higher in CAR and COR groups. These results suggest that the aromatic plants used altered the FA profile of the rumen.

Key Words: aromatic plant, ruminal metabolism.

W507 Effect of crude glycerin on in situ dry matter and neutral detergent fiber degradability in sheep. E. H. C. B. van Cleef*[1,2], M. T. C. Almeida[1], H. L. Perez[1], H. B. Bussioli[1], I. Monsignati[1], J. R. Paschoaloto[1], E. S. Castro Filho[1], and J. M. B. Ezequiel[1], *[1]São Paulo State University, Jaboticabal, São Paulo, Brazil, [2]FAPESP, São Paulo, Brazil.*

Eight ruminally cannulated crossbred male sheep (64.5 ± 8.5 kg) were used to evaluate the effect of inclusion of up to 30% crude glycerin, totally replacing corn, on dry matter intake, and DM and NDF in situ rumen degradability of rations. Animals were assigned into a replicated 4 × 4 Latin square design and, in pairs, were fed 1 of the 4 experimental treatments. Diets were composed of corn silage, soybean hulls, soybean meal, mineral premix, and crude glycerin (83% glycerol) replacing 0 (G0), 10 (G10), 20 (G20), or 30% (G30) corn cracked grain (DM basis), in a roughage:concentrate ratio of 40:60. Each experimental period lasted 21 d, composed of 14 d of adaptation and 7 d of data collection. Feed delivered and refused were weighed every morning to assess DMI. The 4 rations incubated in the rumen for 3, 6, 12, 24, 48, 72, and 96 h. The fraction "a" was determined by washing the bags in water and the residue after 96 h incubation was considered the fraction "c." The potential degradability was calculated with the model: $P = a + b (1 - e^{kt})$, and the effective degradability with the model: $P = a + b * [k / (k + K_p)]$. Treatments tented to promote a quadratic effect in DMI, with increased values observed for G10 and G20 ($P = 0.09$). Increasing crude glycerin linearly increased fraction "a" of DM and NDF of diets ($P < 0.0001$), and linearly decreased its fraction "c" ($P = 0.004$), increasing considerably the effective DM degradability ($P < 0.0001$). However, degradation rate of DM was unaffected by treatments, while degradation rate of NDF decreased in glycerin treatments ($P = 0.01$). No effects of crude glycerin was observed in effective degradability of NDF, regardless the passage rate evaluated (2, 5, and 8%/h). The addition of up to 20% crude glycerin seems to improve DMI. This by-product (up to 30% in dry matter basis) is a suitable energetic ingredient to replace corn in diets for sheep since it improves effective degradability of DM without affecting effective degradation of NDF.

Key Words: degradation kinetics, glycerol, sheep

W508 Effect of increasing concentration of babassu meal in diets for feedlot crossbred lambs on apparent total-tract digestibility of dry matter and nutrients. J. M. B. Ezequiel*[1], O. R. Serra[1,2], J. R. S. T. Souza[2], A. L. Lima[2], and E. H. C. B. van Cleef[1], *[1]São Paulo State University, Jaboticabal, São Paulo, Brazil, [2]Maranhão State University, São Luiz, Maranhão, Brazil.*

The objective of this study was to evaluate increasing concentrations of babassu (*Orbignya phalerata*) meal partially replacing Tifton-85 bermudagrass hay on dry matter and nutrients digestibility. Twenty-seven crossbred male lambs (90 d of age, 19.57 ± 0.41 kg BW) were randomly assigned to 1 of 3 experimental treatments. Isoenergetic (2.4 Mcal/kg ME) and isonitrogenous (19.6% CP) diets were formulated with 0.63% Ca, 0.36% P, and 2350 IU/kg vitamin A, to meet nutrient requirements for weight gain of 200g/d and were composed of ground corn, soybean meal, mineral premix, Tifton-85 bermudagrass hay, and 0 (T0), 15 (T15), or 30% (T30) babassu meal. Total fecal collection technique was used in this trial. Animals were adapted for 14 d to experimental diets, and between d 37 and d 41, samples of diets, feces and orts were collected. Samples were dried, ground (1 mm), and analyzed for dry matter, crude protein, neutral detergent fiber, acid detergent fiber, ether extract, and mineral matter contents. Digestibility coefficients (DC) were calculated by using the formula: DC (%) = [(nutrient ingested – nutrient in feces)/ nutrient ingested] × 100. Data were analyzed as a completely randomized design by using mixed models. The animal was the experimental unit. Contrasts were used to determine linear and quadratic effect of babassu meal addition. The inclusion of babassu meal in the diets linearly increased digestibility of dry matter (T0 = 68.16, T15 = 74.38 and T30 = 79.63%), organic matter (T0 = 72.65, T15 = 78.06 and T30 = 82.44%), crude protein (T0 = 78.21, T15 = 83.19 and T30 = 87.13), ether extract (T0 = 79.62, T15 = 88.17 and T30 = 91.89), and neutral detergent fiber (T0 = 56.96, T15 = 62.91 and T30 = 68.30). Acid detergent fiber digestibility was unaffected by treatments and averaged 62.91%. In conclusion, babassu meal is a suitable feed ingredient to partially replace Tifton-85 bermudagrass in diets for finishing crossbred lambs and feasible for sheep producers, because this by-product is inexpensive when compared with grass hay, and improves dry matter and nutrient digestibility of diets when added up to 30% in dry matter basis.

Key Words: by-product, digestibility, sheep