627 Use of a staphylococcal vaccine to reduce prevalence of mastitis and lower somatic cell counts in a registered Saanen dairy goat herd. Felicia Kautz, Stephen Nickerson*, and Lane Ely, *University of Georgia.*

The purpose of this investigation was to evaluate the efficacy of a staphylococcal bacterin in reducing the prevalence of staphylococcal mastitis and somatic cell counts (SCC) in a commercial dairy goat herd. Does were vaccinated or left as controls, and the levels of mastitis and SCC monitored over 18 mo. *Staphylococcus caprae* (42.5%), *S. xylosus* (15.1%), and *S. simulans* (10.0%) were the predominant causes of intramammary infections (IMI). The new infection rate was 1.64 IMI/doe among vaccinates, which tended to be lower ($P < 0.12$) than controls (2.67 IMI/doe). The spontaneous cure rate of existing IMI after immunization was 1.28 cures/doe in vaccinates, which was higher than that observed in controls (0.6 cures/doe; $P < 0.043$). Average SCC of milk samples from vaccinates showed a tendency to be lower than that of controls (1274×10^3/mL vs. 1529×10^3/mL, respectively; $P < 0.10$). Results support the continued study of mastitis vaccines for use in managing staphylococcal mastitis and SCC in dairy goats.

Key Words: dairy goat, mastitis, vaccination

628 Keeping trends and practices for various exotic, cross-bred, and indigenous sheep breeds in sub-tropical highlands of Pakistan. Muhammad Abdullah*[1], Muhammad Mudassir[1], Jalees Ahmed Bhatti[1], Abu Saeed Hashmi[2], Nisar Ahmad[1], and Umair Younas[1], *[1]Department of Livestock Production, University of Veterinary & Animal Sciences, Lahore, Punjab, Pakistan, [2]Department of Biochemistry, Institute of Biochemistry and Biotechnology, Lahore, Punjab, Pakistan.*

Northern areas of Pakistan are rich in natural resources including livestock as a major source of income for local residents and landless herders. The study objective was to fulfill the knowledge gap about herder's perception toward the relative performance and ecological adaptability of different sheep breeds and their crosses. The herds of 150 pastoralists were considered as case study to investigate their herds. The study was conducted at Kaghan valley of Mansehra district and Haripur according to availability of landless farmers during summer and winter season, respectively. Three pastoral units were selected each from Naran upland and Haripur/Attock lowlands. Herders (n = 20) were interviewed using questionnaire from each unit. The collected information were entered in to Epi-info software program (version 6.04b) for descriptive statistics. Various sheep breeds found in northern areas were Afghani, Kaghani, Crossbreed and Rambouillet. Average number of sheep belonging to Kaghani, Rambouillet (exotic), Ramghani (crossbreed) and Afghani sheep per herd were found to be 41%, 6%, 29% and 29%, respectively. Trends for keeping Kaghani, Afghani, Crossbreed and Rambouillet ram as an animal with beauty was among 28%, 40%, 26% and 16% herders. Kaghani sheep was found to be preferred by majority of population for its mutton quality. Highest replacement preference (44.3%) for ram was given to Kaghani breed as compared with Rambouillet which was given least preference (16.78%) due to its low disease resistance against our local conditions. Herders (92%) suggested that high disease resistance was noted in Kaghani breed. In conclusion, such survey studies helped in better understanding of landless farmer's preferences about keeping herd among indigenous, cross and exotic sheep breeds.

Key Words: Kaghani, Rambouillet, sheep

629 Motility of Boer buck spermatozoa stored fresh for 72 hours. Olumide A. Ajao*, Daniel M. Barry, and Kow K. Benyi, *University of Venda, Thohoyandou, Limpopo Province, South Africa.*

This study was aimed at evaluating the effects of Biladyl and Triladyl extenders, ambient and refrigerated temperatures (5°C, 12°C and 17°C) on the motility of Boer buck spermatozoa stored for 72 h period of storage. Four (n = 4) healthy Boer bucks aged 3.12 ± 0.55 years were ejaculated using artificial vagina (AV) once every 4 d for 6 replicates. The semen samples were pooled and divided into 2 equal halves. One half was extended in a 2-step Biladyl extender (semen sample plus Biladyl Fraction A made up half of the final volume) and the other with Triladyl, both at ratio 1: 5 v/v (semen to extender). Each of the extended semen divisions was further divided into 4 equal parts; one of the 4 was stored at ambient temperature and the others at 5°C, 12°C and 17°C. Data were analyzed by ANOVA for a 2 × 4 x 6 factorial in a completely randomized design, using the GLM procedure of Minitab (Minitab 2013). Spermatozoa motility was evaluated using Sperm class Analyzer (SCA) after every 12 h for 72 h. Extender type (E) and storage temperature (T) had highly significant effects ($P < 0.01$) on the total motility (TM) of Boer buck spermatozoa kept at the refrigerated temperatures after 72 h of storage compared with the TM of spermatozoa stored at ambient temperature which were the lowest in both extenders. Biladyl had 68% TM on spermatozoa kept at ambient temperature, 85% TM at 5°C, 89% TM at 12°C and 90% TM at 17°C; and Triladyl had 64% TM at ambient temperature, 88% TM at 5°C, 89% TM at 12°C and 90% TM at 17°C. The highest progression obtained after the 72 h was 34% as observed from the semen kept at 17°C in Biladyl and 45% in the semen kept at 17°C Triladyl. With suitable protocol, both extenders can maintain goat sperm motility at specific refrigerated temperatures when kept fresh for up to 72 h.

Key Words: Boer buck, ambient, artificial vaginal

630 *Salix babylonica* as a phytogenic anthelmintic alternative on sheep and goat farms in México. A. Z. M. Salem*[1], M. M. Y. Elghandour[1], A. E. Kholif[2], J. C. Vázquez-Chagoyán[1], R. M. de Oca-Jiménez[1], A. B. Pliego[1], and T. A. Morsy[2], *[1]Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma del Estado de México, Toluca, Estado De México, Mexico, [2]Dairy Science Department, National Research Centre, Giza, Egypt.*

There is an increased interest in screening phytogenic extracts and medicinal plants as alternatives to the traditional drugs. The efficacy of *Salix babylonica* (SB) extract as a alternative control of gastrointestinal and pulmonary parasites in sheep and goats at the commercial scale was tested. A sample of 20% of the population of 8 sheep and 7 goat farms was included. About 20 mL of SB extract was orally administered weekly at 0700–0900 h before morning feeding for 60 d. A fecal egg or oocyst count technique was performed after 0 (pre-extract administration), 1, 20, 40 and 60 d after the extract administration. Fecal samples were evaluated for the presence of coccidian oocysts, cestode and nematode eggs by a salt flotation technique. Afterward, oocysts or eggs were counted using the McMaster method. Significantly differences ($P < 0.01$) in the fecal oocyst and egg output of *Eimeria*, *Dictyocaulus*, and *Moniezia* were observed between sheep and goats. The treatment influenced ($P < 0.05$) egg outputs of *Cooperia*, *Dictyocaulus* and *Trichuris*. The fecal egg or oocyst counts of *Haemonchus contortus*, *Eimeria*, *Cooperia*, *Chabertia*, *Dictyocaulus*, *Moniezia* and *Ostertagia* were

time-dependent ($P < 0.05$). For sheep, administration of SB decreased ($P < 0.05$) the fecal eggs count of *H. contortus, Cooperia*, *Chabertia*, *Dictyocaulus*, *Moniezia* and *Trichuris*. After 20 d of treatment, no *H. contortus*, *Cooperia* or *Moniezia* were detected. For goats, only a few species were affected ($P < 0.05$) after the SB administration. The SB reduced ($P < 0.05$) the fecal eggs count of *H. contortus*, *Cooperia*, *Chabertia* and *Moniezia*. Quadratic decreases were observed ($P < 0.05$) for *Chabertia*, *Trichostrongylus* and *Ostertagia*. Eggs of *H. contortus* and *Moniezia* were not present in the feces of goats after one day of treatment; in contrast to the egg output of *Trichostrongylus* and *Ostertagia*. It is therefore concluded that weekly administration of SB at 20 mL weekly can be a promising alternative to the use of synthetic anthelmintics to treat gastrointestinal and lung nematodes of small ruminants in organic and conventional production systems.

Key Words: anthelmintic, *Salix babylonica*, small ruminants

631 A comparison of ewe colostrum and a colostrum alternative (Volostrum) as a colostrum source for artificially reared triplet lambs. Tommy M. Boland*[1], Fiona M. McGovern[1], Francis P. Campion[1], and Jessica Cooke[2], *[1]School of Agriculture and Food Science, University College Dublin, Dublin, Ireland, [2]Volac International Ltd., Orwell, Royston, UK.*

Prolificacy is a key driver of output and profitability in sheep-meat production systems. An increase in multiple births is associated with increasing prolificacy. Litter sizes of 3 or more lambs can potentially increase sheep meat production if managed appropriately however such litters are often associated with increased mortality and low post natal growth. Potential mechanisms to reduce these performance bottlenecks include artificially rearing one lamb of each triplet set. The objective of this study was to compare the pre-weaning, post-weaning and slaughter performance of triplet lambs, removed from their dams at birth. Animals were subjected to one of 2 treatments (n = 15 per treatment) for the first 24 h of life. Lambs received either ewe colostrum at one, 10 and 18 h postpartum (C) or they received a commercial colostrum alternative (Volostrum; V). From 24 h postpartum until weaning (at 6 weeks of age) all lambs received artificial milk replacer ad libitum (Lamlac). Concentrate feed was introduced at 10 d of age and lambs were weaned to an all concentrate diet, once daily concentrate intakes reached 250 g FW. Pre-weaning lamb growth rate averaged 384 g/d and did not differ with treatment. Post weaning lamb growth rate tended to be higher for lambs offered ewe colostrum in the first 24 h of life (412 vs. 325 g/d; $P = 0.06$). The C lambs had higher live weights at 10, 11 and 12 weeks of age ($P < 0.05$). There was a tendency for higher lifetime growth rates for the lambs offered ewe colostrum (392 vs. 324 g/d: $P = 0.07$). Lambs offered ewe colostrum during the first 24 h of life reached target slaughter weight (44 kg) 24 d earlier (109 d) than lambs offered Volostrum ($P < 0.01$) however other slaughter and carcass parameters did not differ with treatment. In conclusion, a colostrum alternative supports high pre-weaning and post-weaning lamb growth rates, however performance advantages in terms of post weaning growth rate and reduced days to slaughter are conferred when lambs consume ewe colostrum during the first day of life.

Key Words: colostrum, colostrum alternative, lamb

632 The relationship of body linear measurements and body weight with real-time ultrasound body composition measurements in Boer x Spanish yearling goats. Flavio R. B. Ribeiro*, Louis C. Nuti, Shaye K. Lewis, William B. Foxworth, Yoonsung Jung, Bianca Garza, Brandi Owens, Rosemarie Somers, and Gary R. Newton, *Cooperative Agricultural Research Center, Prairie View A&M University, Prairie View, TX.*

The objective of this study was to determine the relationship of body linear measurements such as hip height (HH), girth circumference (GC), point of the shoulder to hip length (HipShL), forearm circumference (FntLC) and BW with real-time ultrasound (RTU) measurements of body composition, in Boer × Spanish cross yearling goats (n = 90; n = 48 wethers and n = 42 doelings). The body composition traits measured by RTU were 12–13th rib longissimus lumborum muscle area (uLMA), 12–13th rib fat thickness (uBF), and rump fat thickness (uRUMP). Ultrasound measurements were taken using an Aloka 500 with a 12 cm 3.5 MHz transducer, hair was clipped and vegetable oil was used as a coupling agent to enhance image quality. Data were analyzed by gender and also pooled using the Proc CORR and Proc REG procedures of SAS. BW was highly correlated ($P < 0.0001$) to HH, GC, HipShL, FntLC, uLEA, uBF, and uRUMP (0.65, 0.85, 0.62, 0.70, 0.89, 0.75, and 0.70, respectively) with the pooled data. Similar results were observed when data were analyzed by gender. However, a lower correlation was observed between BW and HIpShL and FntLC with the doelings (0.46 and 0.48, respectively) and between BW and HH, uBF and uRUMP for the wethers (0.35, 0.38, and 0.36, respectively). Prediction equations were also developed to predict uLEA, and uBF. Predictions of uLEA had an R^2 of 0.75, 0.64, and 0.65 for the pooled, wether and doelings data, respectively, with BW and HipShL included in the pooled and doelings model and BW and FntLC in the wether model. Predicitons of uBF had an R^2 of 0.59, 0.23, and 0.68 for the pooled, wether and doelings data, respectively, with BW and HipShl included in the pooled and wether models and BW and HH in the doeling model. Results showed that RTU body composition traits are highly correlated to body linear measurements in yearling Boer × Spanish yearling goats and that different measurements within gender accounted for more variation within the RTU traits. More research is needed to refine the models and improve accuracy of prediction.

Key Words: ultrasound, body composition, goat

633 An investigation in to the interaction between ewe BCS and litter weights at key times of the production cycle. Francis P. Campion*[1], Fiona M. McGovern[1], Philip Creighton[2], Alan G. Fahey[1], and Tommy M. Boland[1], *[1]University College Dublin, Dublin, Ireland, [2]Teagasc Athenry, Co. Galway, Ireland.*

Ewe body reserve accumulation and mobilization is an essential part of the production cycle. The interaction between breed, ewe body condition score (BCS) and animal performance is an area that warrants investigation. Using 3 commercial flocks which are part of a national progeny testing scheme, BCS data was collected from twin bearing ewes at mating, mid-pregnancy, mid-lactation (~d 40 of lactation) and weaning (~d 100 postpartum). This data was then combined with ewe breed, maternal age, and litter weight at birth (BW), d 40 of lactation (D40) and weaning (WE) data. The objective of this study was to investigate if litter weight from birth to weaning of twin bearing ewes was influenced by ewe BCS. Lamb weights collected from each lamb at BW, D40 and WE were summed to calculate litter weight. Regression coefficients were estimated using PROC MIXED (SAS v9.4). The model included the fixed effects of flock, breed, time point and maternal age, and previous years litter size along with the continuous variables of lambing date and lambing difficulty, and BW, D40 or WE. Variables with a P-value > 0.10 were removed from the final model. Initially a correlation analysis was carried out on BCS and weight. Mid-lactation BCS and weaning BCS had a correlation of 0.63; all other time points had correlations less than 0.40. There was strong correlation between D40 and WE litter

weight (0.80) but not between BW and D40 (0.40) or BW and WE (0.23) litter weights. Changes in BW and WE litter weight were influenced by mid-pregnancy BCS ($P < 0.05$) and there was a tendency toward a relationship between D40 litter weight and BCS at mid-pregnancy and weaning ($P < 0.10$). There was no relationship between litter weight at any stage during the first 14 weeks of life and mating or mid-lactation BCS ($P > 0.10$). Farm, ewe maternal age and breed, time point and breed by time point interaction all had a significant effect on the relationship between BCS and litter weight ($P < 0.05$). These findings show that mid pregnancy BCS is the key BCS measurement linked to litter weight of twin bearing ewes at birth and weaning.

Key Words: BCS, litter weight, lamb.

634 Development of a low-density single nucleotide polymorphism panel for prolificacy in sheep. Thaisa Lacerda[1], Harvey Blackburn[2], Michel Yamagishi[3], Concepta McManus[1], Alexandre Caetano[4], and Samuel Paiva*[5,2], *[1]Universidade de Brasilia, Brasilia, DF, Brazil, [2]USDA-ARS National Center Genetic Resources Preservation, Fort Collins, CO, [3]Embrpa Informatica Agropecuaria, Campinas, SP, Brazil, [4]Embrapa Recursos Geneticos e Biotecnologia, Brasilia, DF, Brazil, [5]Embrapa Secretaria de Relacoes Internacionais, Brasilia, DF, Brazil.*

High-density SNP panels (e.g., 50,000 and 600,000 SNPs) have been used in exploratory population genetic studies with commercial and minor sheep breeds. Routine genetic diversity evaluations of large numbers of samples and panels are in general cost-prohibitive for gene banks. Lower cost panels based mostly on SNPs known to be associated with production traits of interest and may be more efficient for genetic diversity assessment and improvement of gene bank collections. The first phase of the study was to develop and validate a small SNP panel (29 SNPs) based on known prolificacy genes. SNP selection was based on known polymorphisms in major genes affecting sheep prolificacy (*GDF9*, *BMP15* and *BMPR1B*), as well as new polymorphisms mined from whole genome resequencing data from *GDF9* and *BMP15* by the International Sheep Genome Consortium. A total of 125 animals from 15 breeds with litter size information collected by the National Animal Germplasm Program were tested. Genotyping was performed with PCR-based KASP chemistry and 27 SNPs had a call rate higher than 98%. All *BMP15* and *BMPR1B* SNPs were monomorphic. In *GDF9* 8 SNPs were polymorphic - 3 are located in introns and 5 in exons. Three SNPs were non-synonymous AA changes. No significant allele frequency differences were found for GDF9_G4:E241K among from single or multiple births. The GDF9_G6:V332I allele was related to high prolificacy in 5 breeds with the following frequencies: Lincoln (0.416), Polypay (0.32), Navajo Churro (0.27), St Croix (0.125) and Suffolk (0.083). Allele GDF9_G7:V371M was found only in Polypay at a frequency of 0.35 which agrees with recent studies with the hyper-prolific Norwegian White Sheep. The other 10 breeds did not differ significantly. Our results suggest that the developed panel will be useful to identify possible genes/mutations associated with prolificacy in worldwide sheep breeds. Additional SNPs will be included as more information becomes available. In the next phase of this study, SNPs related to other economically important traits will be added to the panel to improve the characterization and management of gene bank sheep collections.

Key Words: *Ovis aries*, conservation genetics, gene bank

635 Influence of surgical castration on biochemical profile of rams. V. M. Storillo[1], M. B. R. Alves[1], E. C. C. Celeghini[1], B. Barcelos*[2], D. B. Birgel[2], V. F. P. Rispoli[2], W. C. Garcia[2], P. S. Silva[2], and E. H. Birgel Junior[2], *[1]Faculdade de Medicina Veterinária e Zootecnia da Universidade de São Paulo, São Paulo, São Paulo, Brazil, [2]Faculdade de Zootecnia e Engenharia de Alimentos da Universidade de São Paulo, Pirassununga, São Paulo, Brazil.*

Castration is often used in male sheep to prevent losses in meat palatability, improve subcutaneous adipose tissue and prevent undesirable pregnancies. But, there is insufficient research on how long for the changes in biochemical profile to take place and finally stabilize as well as which parameters are definitely altered after castration in adult rams. To elucidate this issue, this research was carried on using 31 White Dorper males at 36 mo of age, when biochemical changes are not expected, since they reached adulthood. Animals were surgically castrated, with removal of the scrotum apex, under tranquilization, local anesthesia and using sterile materials. Antibiotic and analgesia treatments were performed for 3 d. Blood samples for measurement of urea, creatinine, albumin, total protein, GGT, AST, CK, HDL, LDL, VLDL, cholesterol, β-hydroxybutyrate (BHB), NEFA and triglycerides, were collected days before castration (D0) and, after that, on d 1, 3, 7, 15, 30, 60 and 9 mo. Castration had no influence on GGT, creatinine, total protein and cholesterol. Up until 15 d after castration, the others parameters were altered because of stress and surgery. Urea increased ($P < 0.0001$) from 19,85 (D0) to 32,43mg/dL (9 mo). Albumin decreased after surgery, possibly due to exudation, and returned to the same values as D0 on D60. AST increased after surgery, then decreased gradually and returned to normal on D15. CK decreased ($P < 0.0001$) from 230,1 to 103,4 U/L, which can be explained for the tranquil temper of rams after surgery, with the absence of fights, that used to be common. The HDL, BHB and NEFA decreased on D3 and remained low. Triglycerides and VLDL decreased on D1 until D15, then raised on D30 to the same values as before castration. The LDL values only increased on D1and on D3 they were similar to D0. The results showed that surgical castration, even under ideal surgical conditions, causes important changes in biochemical profile, especially in the first 15 d after surgery, with stabilization of values in 30 d. The castration alters the behavior of rams, decreases HDL, BHB and NEFA values and raises urea amounts.

Key Words: orchiectomy, sterilization, metabolism

636 Effects of dairy slurry application and bale moisture concentration on voluntary intake and digestibility of alfalfa silage by sheep. Jessica K. Clark*[1,2], Bruce C. Shanks[1], James D. Caldwell[6], Ken P. Coffey[2], Wayne K. Coblentz[3], R. E. Muck[4], Dirk Phillip[2], M. A. Borchardt[3], Robert T. Rhein[2], Ashley N. Young[2], Marshal D. Basham[2], W. E. Jokela[3], Elizabeth A. Backes[2], Keith A. Center[2], M. G. Bertram[5], *[1]Lincoln University, Jefferson City, MO, [2]University of Arkansas, Fayetteville, AR, [3]USDA-ARS, Marshfield, WI, [4]USDA-ARS, Madison, WI, [5]University of Wisconsin, Arlington, WI, [6]Land O' Lakes.*

Dairy slurry is used commonly as a fertilizer in agriculture. However, residual effects of slurry application on intake and digestibility of alfalfa silage from subsequent harvests are not well known. The objective of this study was to determine if moisture concentration of alfalfa silage and timing of dairy slurry application relative to subsequent harvest affect intake and digestibility by sheep. Pregnant crossbred ewes (n = 18; 3–5 yr old; 47.6 ± 5.34 kg) were stratified by BW and allocated randomly each period to 1 of 6 treatments arranged in a 2 × 3 factorial consisting of high (HM; 46.8%) or low (LM; 39.7%) moisture at baling after no slurry application (NS), slurry applied to stubble immediately

after removal of the previous cutting (S0), or slurry applied 14 d after the previous cutting (S14). Period 1 consisted of a 14-d adaptation and a 7-d fecal collection. Period 2 immediately followed period 1 and consisted of an 11-d adaptation with a 7-d fecal collection. Ewes were housed individually in 1.4 × 4.3-m pens equipped with rubber mats and feces were swept from the floor twice daily, weighed, and dried at 50°C. Ewes had ad libitum access to water, were offered chopped silage based on 10% refusal, and were offered commercial sheep mineral (14 g) daily. Intake (g/d) of DM and OM and NDF digestibility (%) did not differ ($P \geq 0.13$) across moisture or slurry application treatments. However, DM and OM digestibility (%) tended ($P < 0.10$) to be greater from LM vs. HM. Total white blood cell concentrations, hematocrits, and red blood cell concentrations were greater ($P < 0.05$) from S0 and S14 vs. NS. Lymphocytes were greater ($P < 0.05$) from LM vs. HM and from NS vs. S0 and S14. Serum urea N concentrations did not differ ($P > 0.13$) across treatments. Therefore, moisture level of alfalfa silage and time of dairy slurry application may not affect voluntary intake or NDF digestibility, but moisture concentration may have a slight effect on DM and OM digestibility. Also, moisture concentration of alfalfa silage and time of dairy slurry application may affect specific blood hemograms.

Key Words: digestibility, silage, dairy slurry

637 Comparison of delayed weaning and mineral form on lamb growth and parasitism. Jefferson McCutcheon*, David Clevenger, Gary Lowe, and Francis Fluharty, *The Ohio State University, Columbus, OH.*

The objectives were to 1) compare a 60 d of age and a 120 d of age weaning on lamb growth and parasitism on pasture and lamb growth in a feedlot and 2) compare form of mineral (BLOCK and LOOSE) offered ad libitum on pasture on lamb growth and parasitism in lambs. Each weaning treatment consisted of 4 replicate fields/pens of 6 lambs per field/pen blocked by gender and initial starting weight. Twin lambs were used with one randomly weaned (WEAN) and one left with its mother for the pasture phase (NURSE). Subdivided perennial pastures were rotationally stocked. Paddocks size matched stocking density between ewes with lambs and weaned lambs. Mineral form was randomly assigned to both weaning groups. After the 63 d pasture phase, nursing lambs were weaned and intact groups were placed in feedlot pens and fed an alfalfa haylage based diet to a pen average final live weight of 54 kg. Statistics were run using SAS Proc Mixed with PDIFF for mean separation. At the end of the pasture phase lamb final live weight was greater for the NURSE lambs (LSM ± SEM) (39.64 ± 0.57 kg) compared with the WEAN lambs (30.26 ± 0.57 kg) ($P < 0.05$). The pasture ADG was greater for the NURSE (254 ± 6 g/d) than the WEAN (100 ± 6 g/d) lambs ($P < 0.05$). Packed Cell volumes were lesser for the WEAN lambs (2.6 ± 0.6) at 63 d than the NURSE lambs (1.1 ± 0.6) ($P < 0.05$). Log-transformed fecal egg counts were greater for the WEAN lambs (3.42 ± 0.29) at 42 d compared with the NURSE lambs (1.88 ± 0.29) ($P < 0.05$). Mineral form revealed greater ADG for the LOOSE lambs (195 ± 6 g/d) compared with (159 ± 6 g/d) for the BLOCK lambs ($P < 0.05$). Lamb ADG in the feedlot was similar ($P > 0.05$) for the WEAN (217 ± 6 g/d) and NURSE (233 ± 6 g/d) lambs, while days on feed was greater for the WEAN (71 ± 5 d) than the NURSE (96 ± 5 d) lambs ($P < 0.05$). Weaning at 120 d produced greater gains and lower measures of parasitism on pasture compared with weaning at 60 d. In the feedlot this translated to shorter time to final weight. Loose mineral produced greater ADG than block mineral when offered on pasture.

Key Words: lamb, growth, weaning