

Small Ruminant: Nutrition and Parasites

423 Nitrogen balance of growing West African Dwarf ewe fed Mexican sunflower leaf meal based diets. A. H. Ekeocha,* *University of Ibadan, Ibadan, Oyo, Nigeria.*

After a previous 84-d performance phase, a study was conducted using 16 West African Dwarf (WAD) ewes. Ewes (Initial BW 17.5 ± 0.19 kg) were used in a completely randomized design to study the effects of increasing level of Mexican sunflower leaf meal (MSLM) on nitrogen balance. The experimental animals were assigned to 4 treatment groups A (0%MSLM), B(15%MSLM), C (30%MSLM) and D (45%MSLM) of 4 replicates each and were fed with grass (*Panicum maximum*) plus concentrate diet mixture of Mexican sunflower leaf meal (MSLM) and wheat bran (WB) such that 0%, 15%, 30% and 45% of WB was replaced by weight with MSLM gravimetrically. About 60% of the diet came from the concentrate while 40% came from grass. The experiment lasted for one week. Digestibility was determined using a 6-d total urine and fecal collection. Ewes were given ad libitum access to feed and water and routine vaccination and medication followed standard procedures. Parameters measured were nitrogen intake (NI), nitrogen balance (NB), nitrogen apparent digestibility (NAD) and nitrogen retention(NR). Data were analyzed using descriptive statistics and ANOVA. Concentrate DMI (CDMI) ranged from 181.8 g/d (45%MSLM) to 536.8 g/d (15%MSLM) and grass DMI (GDMI) ranged from 130.6 g/d (0%MSLM) to 215.9 g/d (30%MSLM) and this was significant ($P < 0.05$). Positive NB was observed for animals on all treatments. This suggested that the various diets were able to meet the protein need of the animals for maintenance and production. Urinary nitrogen g/d was greater ($P < 0.05$) with increasing inclusion of MSLM in the ration while protein retention increased from treatment A (0%MSLM) to treatment B (15%MSLM) (90.4 - 90.8%) and subsequently decreased from treatment B (15%MSLM) to D (45%MSLM) (90.8 - 85.0%). Data obtained for N-balance in this study ranged from 6.28 – 15.0 g/d. Animals on treatment B (15.01g/d) had the greater N-balance, and this was significantly ($P < 0.05$) greater compared with animals on treatment D (6.28g/d) but numerically more ($P > 0.05$) than observed values for animals on treatments C (9.05g/d) and A (9.32 g/d). This suggested that the fermentable OM in the WB apparently encouraged greater N digestibility and it is an indication that a favorable energy: N balance resulted from diet B. This trend was the same for nitrogen intake (7.39 – 16.5g/day) and absorbed (6.36 – 15.1 g/d). Nitrogen balance was positively related to DMI and N intake. The overall regressions were $NB = 2.39 + 0.07 DMI$; $R^2 = 0.93$, ($P = 0.37$) and $NB = 0.72 + 0.91 NI$; $R^2 = 0.99$, ($P = 0.13$). This study showed that a greater level of NI and DMI improved ($P < 0.05$) N-balance. The low level of nitrogen balance in animals on treatment D could have been due to the level of feed intake. Mexican sunflower leaf meal incorporation in the diets of sheep improved nitrogen intake, balance and retention.

Key Words: nitrogen balance, West African dwarf ewe, Mexican sunflower leaf meal

424 Excess iodine intake by the ewe in late pregnancy programs on the lamb for reduced immunoglobulin G absorption. T. M. Boland,* *University College Dublin, Lyons Research Farm, New-castle, Co. Dublin, Ireland.*

The lamb is born hypoiimmunocompetent as the placenta prevents the in utero transfer of antibodies from mother to offspring. Therefore, the lamb is dependent on the postnatal absorption of antibodies from colostrum to confer disease resistance in early life. Several maternal and

nutritional factors influence this transfer, but perhaps none so dramatically as high level iodine intake by the pregnant ewe in late gestation. Several studies were conducted over several years with the objective of determining the mechanisms involved in the reduced antibody transfer following high level iodine supplementation. This abstract represents a synthesis of these studies to better describe this phenomenon. The lamb's ability to absorb colostral immunoglobulin G (IgG) is greatly impaired by high (11 to 40 mg/ewe/day) level iodine intake by the pregnant ewe during the last 6 weeks of pregnancy. While these levels of intake are in excess of requirements they do represent the voluntary iodine intake of ewes when offered free access mineral blocks. Vitamin E absorption from colostrums is affected in a similar manner. The response to this high level iodine intake is rapid with supplementation during the final 2 weeks of pregnancy sufficient to produce the response. A 2 week supplementation period earlier in pregnancy has no effect. This is a dose dependent response with greater reductions seen at higher levels of intake. The lamb is preprogrammed in utero for this effect and the quality or availability of colostral IgG is unaffected by iodine supplementation. In the small intestine, the primary site of IgG absorption there are alterations in mRNA expression of several genes, namely β 2-microglobulin (B2M) and a lower expression of upstream stimulator factor 2 (USF2), interleukin-4 (IL-4) and thyroid hormone receptor β (THR β) ($P < 0.05$) potentially mediated through alterations in thyroid hormone metabolism. These findings indicate the pathway involved in the observed reduction in IgG absorption and the need for a downward revision (to approximately 40% of current values) of the iodine toxicity levels for ewes during late pregnancy.

Key Words: iodine, IgG, lambs

425 Effects of different NFC/NDF ratios of TMR on ruminal pH and VFA in meat sheep. J. Liu,* Q. Y. Diao, Y. Tu, Y. G. Zhao, X. H. Gao, and L. H. Zhao, *Key Laboratory of Feed Biotechnology of Ministry of Agriculture/Feed Research Institute, Chinese Academy of Agricultural Sciences, Beijing, China.*

This study examined the effect of different NFC/NDF (nonfiber carbohydrates/NDF) ratios of TMR (total mixed ration) on ruminal pH and VFA in meat sheep. Twelve crossbred rams (Dorper σ \times Thin-tailed Han ρ) fitted with ruminal cannulas and BW of 47.2 kg (± 1.01 kg) at the start of trial were used in an incomplete 12×4 Latin square arrangement. Period length was 16 d, and the first 14 d of each experiment were for ration adaption, with sampling during d 15 to 16 of each period. The rams were fed rations with different NFC/NDF ratios, which the ratios were 0.25 (1), 0.34 (2), 0.36 (3), 0.52 (4), 0.60 (5), 0.80 (6), 0.87 (7), 1.13 (8), 1.30 (9), 1.58 (10), 2.17 (11), and 2.49 (12), respectively. Diets were fed as pelleted TMR once daily at 08:00. The amount of feed offered was restricted to 1.2 kg/d. Ruminal fluid was sampled from rams at 08:00, 14:00, and 20:00 on d 15 and at 02:00, 05:00, 11:00, 17:00, and 23:00 on d 16 of each period. Data were analyzed using the GLM procedure of SAS software. The results showed that, with increasing NFC/NDF ratios, ruminal pH decreased ($P < 0.01$), total VFA and butyrate percentage changed with cubic curve ($P < 0.05$), percentage of propionate, valerate and isovalerate in rumen increased ($P < 0.01$), while acetate percentage and A/P (acetate/propionate) ratio decreased ($P < 0.01$). It was concluded that NFC/NDF ratios of TMR had significant effect on ruminal pH and VFA. Increasing dietary NFC/NDF ratios decreased ruminal pH, acetate percentage and A/P ratio and increased percentage of propionate, valerate and isovalerate in rumen.

Key Words: NFC, rumen fermentation, sheep

426 Protein supplementation of low-quality forage: Effects of amount and frequency on intake and nutrient digestibility by lambs. M. L. Van Emon^{*1,2}, C. S. Schauer², and D. W. Bohnert³, ¹Department of Animal Sciences, North Dakota State University, Fargo²Hettinger Research Extension Center, North Dakota State University, Hettinger, ³Eastern Oregon Agricultural Research Center, Oregon State University, Burns.

The objectives of this research were to determine the effects of protein supplementation and frequency on intake and nutrient digestibility by lambs. Seven lambs were utilized in a 4 × 7 incomplete Latin square design. Dietary treatments were arranged in a 2 × 3 factorial design (2 levels of CP and 3 supplementation frequencies); CON = unsupplemented control; D = supplemented daily 0.28% of BW of soybean meal (SBM); 5D = supplemented 1.4% of BW of SBM once every 5 d; 10D = supplemented 2.8% of BW of SBM once every 10 d; 1/2 D = supplemented at 50% of D; 1/2 5D = supplemented at 50% of 5D; 1/2 10D = supplemented at 50% of 10D. Full CP refers to D, 5D, and 10D and half CP refers to 1/2 D, 1/2 5D, and 1/2 10D dietary treatments. Lambs were supplemented with SBM immediately before feeding of low-quality forage (Chewings fescue grass seed straw). Each experimental period was 30 d, with intake measured d 19 to 28. Feces, urine, and blood were collected d 21 to 30. Straw and SBM DMI, total DMI, straw OM intake, OM intake, ADF intake, and NDF intake were not different ($P \geq 0.26$) due to supplementation. Supplementation increased ($P \leq 0.02$) DM, OM, and NDF digestibility compared with the CON. The CON lambs had reduced ($P \leq 0.002$) N intake, urine N excretion, N balance, N digestibility, and digested N retained compared with supplemented lambs. Plasma urea N was increased in the supplemented lambs ($P = 0.004$) compared with the CON lambs as well as for full CP compared with half CP lambs ($P = 0.03$). Lambs supplemented with full CP had increased ($P \leq 0.03$) urine N excretion and N digestibility compared with the half CP lambs; however, digested N retained was not different ($P = 0.94$) due to supplementation amount. As supplementation frequency decreased, N digestibility was also reduced ($P = 0.01$). Both DM and OM digestibility increased ($P \leq 0.04$) as supplementation interval increased. These results suggest that increasing the supplementation interval may be utilized to maintain intake, digestibility, and reduce the labor costs associated with more frequent supplementation.

Key Words: lambs, nitrogen balance, supplementation frequency

427 Effect of feeding differently processed sweet sorghum (*Sorghum bicolor* L. Moench) bagasse based complete diet on nutrient utilization and microbial N supply in growing ram lambs. N. Nalini Kumari¹, Y. Ramana Reddy^{*1}, M. Blummel², T. Monika¹, B. V. S. Reddy³, and Ch. Ravinder Reddy³, ¹S.V. Veterinary University, Tirupati, Andhra Pradesh, India, ²International Livestock Research Institute (ILRI), Patancheru, Andhra Pradesh, India, ³International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Andhra Pradesh, India.

This study was carried out to identify appropriate processing method for efficient utilization of sweet sorghum bagasse (SSB), an agro-industrial by product of bio-ethanol industry after blending with concentrate in sheep. The SSB based complete diet with roughage to concentrate ratio of 50:50 was processed into mash (SSBM), expander extruded (SSBP) and chop form (SSBC) and evaluated in a growth- cum-metabolism trial using growing ram lambs in comparison to sorghum stover based complete diet (50:50) in mash form (SSM). Mash form of diet is prepared by grinding the roughage and concentrate portion of the ration after batching through hammer mill using 8mm sieve and mixing the grind material in a horizontal mixer. Expander extruded pellets are prepared

by using expander extruder which combines the futures of expanding (application of moisture, pressure and pressure) and extruding (pressing the feed through constrictions under pressure). Twenty-four growing Nellore × Deccani ram lambs (10.6 ± 0.23 kg BW) were randomly divided into 4 groups of 6 animals each in a completely randomized design and the experimental complete diets were allotted at random to each group. A metabolism study was conducted at the end of the growth trial of 180 d to assess the nutrient utilization, and energy, nitrogen (N), calcium (Ca) and phosphorus (P) balance. The daily intestinal flow of microbial nitrogen (g/d) was calculated from total urinary purine derivatives (PD) (mmol/d). The average DMI (g/d or g/kg^{0.75}) was greater ($P < 0.01$) in lambs fed SSBP diet than those fed SSBC, SSBM and SSM diets. The lambs fed expander extruded (SSBP) diet could digest more ($P < 0.01$) DM, OM, CP ($P < 0.01$) than those fed SSBC, SSBM and SSM diets. Cellulose digestibility was greater ($P < 0.05$) in lambs fed SSBP diet than those fed SSM and SSBC diets. The intake of ME was more ($P < 0.01$) in lambs fed SSBP diet but comparable among SSM, SSBC and SSBM diets. The SSBP diet had greater ($P < 0.01$) DCP content compared with SSM, SSBC and SSBM diets, whereas the ME ($P < 0.05$) content was greater than SSBC and SSM diets. The DCP and ME values were comparable between SSBM and SSM diets. There was greater N, P ($P < 0.05$) and Ca ($P < 0.01$) balance in lambs fed SSBP diet compared with those fed the other 3 diets. Expander extrusion of SSB based complete diet resulted in improved ($P < 0.01$) efficiency of microbial protein synthesis. It is concluded from the results of the present study that, sweet sorghum bagasse is comparable with that of sorghum stover in nutritional value and processing SSB based complete diet into expander extruded pellets improved the nutrient utilization and microbial protein synthesis in growing sheep.

Key Words: sweet sorghum bagasse, processing, nutrient utilization

428 Effect of the dietary cation-anion difference on the lactation performances of dairy ewes at early-mid lactation. M. M. Youssef, G. Caja,* A. A. K. Salama, A. Ait-Saidi, and E. Albanell, Grup de Recerca en Remugants (G2R), Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain.

Lactating ewes from 2 dairy breeds (Manchega, n = 20, Lacaune, n = 20) at 82 ± 3 DIM were used to study the lactational effects of diets varying in dietary cation-anion difference taking into account S (DCAD:S). Ewes were allocated in balanced groups of 5 ewes according to breed, BW and milk yield (Manchega, 68.3 ± 1.7 kg BW, 0.84 ± 0.05 L/d; Lacaune, 71.8 ± 2.1 kg BW, 1.46 ± 0.09 L/d), to which the dietary treatments were randomly assigned. Diets were fed for 8 wk and consisted of a total mixed ration (forage-to-concentrate ratio = 60:40) with 4 different DCAD:S values (22.5, 31.9, 45.9 and 64.9 mEq/100 g DM) formulated by adding anionic or cationic salts. Individual intake was calculated using polyethylene glycol 6000 as indigestible marker. Milk yield and milk composition were recorded weekly and biweekly, respectively. Blood and urine samples, for studying acid-base balance, were taken at wk 4 and 8, and wk 8 respectively. There were no effects of DCAD:S on feed intake, but milk yield showed a positive linear response to DCAD:S ($P < 0.001$). Effects of DCAD:S on milk composition differed by breed, showing a negative linear response in Lacaune ewes ($P < 0.01$) and no variation in Manchega. There was no DCAD:S effect on blood acid-base indicators (pH, HCO₃⁻, pCO₂, AGap, BEx), indicating that ewes were in a neutral stage, but blood glucose and urea showed positive and negative linear effects of the treatments ($P < 0.001$), respectively. Blood fixed ions (Na⁺, K⁺, and Cl⁻) did not vary and urine pH varied in a linear and positive manner by DCAD:S treatments ($P < 0.001$). Urinary urea and minerals showed different responses to

DCAD:S according to breed, with negative effects on urea, Ca and S ($P < 0.05$), and positive effects on Na ($P < 0.001$), which agreed with their respective intakes and with a metabolic stage of Ca mobilization. According to the obtained results, cationic diets (DCAD:S ~60 mEq/100 g DM) are recommended for lactating dairy sheep, which is markedly greater than previously reported in dairy cows and in dairy goats.

Key Words: dairy sheep, DCAD, electrolytic balance

429 Factors affecting dry matter intake of grazing goats in the Brazilian rangelands. M. A. D. Bomfim^{*1,2}, L. O. Tedeschi², and N. F. De Paula^{3,2}, ¹Embrapa Goats and Sheep, Sobral, Ceara, Brazil, ²Texas A&M University, College Station, ³Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil.

Feed intake of grazing goats is a critical factor to determine their nutrient requirements. Research has shown that DMI varies with BW when diet DM digestibility (DMD) is lower than 66%, but other factors may affect DMI, such as pasture or environmental variables. A DMI database of grazing goats under the Brazilian rangeland conditions was built from 10 studies and had 61 data points. This database was used to determine key variables that could explain the variation in DMI. The recorded variables were age, BW, ADG (g/d), DMI (g/d), pasture area (AREA, ha), stocking rate (SR, goat/ha), pasture offer (PO, kg/goat/d), forage availability (FA, kg/ha), legume (LEG, % forage), pasture CP (PCP, %DM), pasture DM (PDMD) and OM digestibility (POMD), supplement CP (SCP, %DM) and ME (SME, Mcal/kg), supplement DMI (SDMI, g/d), minimum and maximum temperatures, and relative humidity (RH). The OM intake (OMI) was converted to DMI assuming an average of pasture ash content of 11.5% DM obtained from several publications. A stepwise regression was performed to identify the variables that explained the variation in the DMI. Then, a random coefficient model was used to obtain the fixed effect coefficients of the selected variables by assuming study as a random variable. The BW, FA, LEG, and their interactions explained more than 88% of the variation in the DMI. The study-variation free multiple regression was $DMI (g/d) = 708.3 - 7.91 \times BW - 0.172 \times AVAIL + 0.00875 \times BW \times AVAIL - 6.8 \times LEG + 0.304 \times BW \times LEG$ ($n = 26$, root of mean square error (RMSE) = 79.4 g/d, $R^2 = 0.883$). When only BW was used, approximately 75% of the variation in the DMI was explained and the study-variation free polynomial regression was $DMI (g/d) = 368.9 - 6.56 \times BW + 0.6 \times BW^2$ ($n = 61$, RMSE = 104.5 g/d, $R^2 = 0.75$). Our results suggested that although BW was able to explain the majority of the variation in the DMI of these grazing goats, additional variation could be explained when forage availability and legume in the pasture were used. Although our database included most of the research carried out under these conditions, more studies are needed to confirm our findings.

Key Words: caatinga, caprine, ingestion

430 Effects of diet on carcass quality and consumer taste panel acceptance of intact or castrated hair lambs. J. D. Kohler^{*1}, W. W. Miller¹, J. L. Vest¹, J. M. Burke², M. A. Brown³, K. R. Maddock Carlin⁴, M. D. Hudson¹, and E. L. Walker¹, ¹Missouri State University, Springfield, ²Dale Bumpers Small Farms Research Center, Booneville, AR, ³USDA ARS Grazinglands Research Laboratory, El Reno, OK, ⁴North Dakota State University, Fargo.

Forty hair-type lambs were examined in a 70-d study to determine the effects of gender (castrate; C vs. intact; I) and forage type on carcass traits and sensory acceptability. Lambs were procured from a single source in Missouri and one-half were randomly castrated. Lambs were

randomly assigned to treatment and housed in individual pens. Equal number of each gender were assigned to 1 of 2 isonitrogenous dietary treatments: alfalfa (*Medicago sativa*; AL) or sericea lespedeza (*Lespedeza cuneata*; SL). Lambs were slaughtered and carcasses fabricated 48 h postmortem. Wholesale loins were split, vacuum packaged, and randomly assigned to an aging time of 48 h or 14 d before freezing. Minolta color scores were taken on the lateral surface of the loin after 15 min bloom time. A consumer taste panel was conducted using 64 untrained panelists. Approximately 13.5 cm of the loin was cooked to 71°C, cut into 12.7-mm x 12.7-mm pieces, and served at room temperature. Panelists scored samples for color, aroma, texture, aftertaste, juiciness, and overall appeal (1 = strongly disliked and 8 = highly desirable). Data were analyzed using Proc Mixed. The model included the fixed effects of gender, forage, panelist gender, and postmortem aging and all interactions. Non-significant interactions were removed. Initial BW was not different ($P = 0.89$). At slaughter, I lambs were 4.36 kg heavier and had greater HCW (18.8 vs. 16.6 kg; $P \leq 0.05$) than C lambs. Castrate lambs had greater ($P \leq 0.05$) a* and b* values than I lambs. Color was rated highest for C than I lambs (5.4 vs. 5.0; $P \leq 0.01$). Aging for 14 d had a positive effect on texture and aftertaste ($P \leq 0.05$) and there was a diet by lamb gender interaction on texture ($P \leq 0.01$). Female panelists preferred the aroma of AL vs. SL lambs (5.3 vs. 4.9; $P < 0.04$) and male panelists had a greater acceptance of aftertaste than females (5.2 vs. 4.8; $P = 0.017$). Castrate lambs fed AL were juicier and with a more desirable aftertaste (5.3 vs. 4.9; $P = 0.07$). Overall, male panelists preferred lamb more than females (5.4 vs. 4.9; $P = 0.002$). Consumer acceptance of lamb is influenced by diet, gender, and aging of lamb.

Key Words: lambs, carcass quality, consumer panel

431 Exploring the combined effects of dietary tannins and saponins on sheep infected with *Haemonchus contortus*. G. Copani¹, H. Hall², J. Miller³, A. Priolo¹, and J. Villalba^{*2}, ¹University of Catania, Catania, Sicily, Italy, ²Utah State University, Logan, ³Louisiana State University, Baton Rouge.

The feeding behavior of lambs and the anthelmintic properties of tannins and saponins when offered in single rations or as a choice between rations were determined. Thirty 5 lambs were randomly assigned to 5 groups (7 lambs/group) and fed for 12 d: beet pulp (Group BP); BP + 8% quebracho tannins (Group CT); BP + 1.5% quillaja saponins (Group SAP), or a choice between BP + 8% quebracho tannins and BP + 1.5% quillaja saponins (groups CH-P parasitized and CH-NP non-parasitized). After this period, lambs in all groups, except those in CH-NP, were dosed with 5,000 and 27 d later with 8,000 infective larvae of *Haemonchus contortus*. After 23 d, all lambs were exposed to their respective diets for 12 d. Feed intake and fecal egg counts (FEC) were analyzed as a split-plot design with lambs (random factor) nested within group and day as the repeated measure. Lambs in BP, CH-P and CH-NP ate more feed than lambs offered just tannins (CT) or saponins (SAP) in single rations ($P < 0.05$). Groups offered choices (CH-P and CH-NP) did not differ in food intake ($P > 0.05$) and preferred the saponin- over the tannin-containing ration ($P < 0.05$). Before exposure to the experimental diets, groups had similar FEC ($P > 0.05$). In contrast, after being exposed to the experimental diets for 12 d, lambs in CT and SAP showed lower FEC than lambs in BP and in CH-P ($P < 0.05$). Thus, even when lambs exposed to a choice of rations containing tannins and saponins consumed more total feed than animals exposed to single rations, the effect at reducing FEC was less effective, suggesting that a combination of saponins and tannins have synergistic effects on food intake but antagonistic effects on parasitic loads.

Key Words: plant secondary compounds, food choice, endoparasites

432 Effect of feeding sericea lespedeza pellets on *Haemonchus contortus* in goats. D. S. Kommuru*¹, T. H. Terrill¹, N. C. Whitley², J. E. Miller³, and J. M. Burke⁴, ¹Fort Valley State University, Fort Valley, GA, ²North Carolina A&T State University, Greensboro, ³Louisiana State University, Baton Rouge, ⁴USDA/ARS/DBSFRC, Booneville, AR.

Due to increased prevalence of anthelmintic resistance in sheep and goat gastrointestinal nematodes (GIN), there is a critical need for alternative control methods. Sericea lespedeza (SL; *Lespedeza cuneata*) has been shown to have activity against small ruminant GIN, but the mechanism of action has not been determined. Three experiments (Exp) with Spanish or Boer crossbred goats were designed to study the effect of feeding SL leaf meal pellets fed for 10% orts in confinement on *Haemonchus contortus* larvae during establishment (Exp 1; 75% SL; mature bucks group fed; n = 8/treatment) and after establishment (Exp 2; 75% SL; mixed sex kids individually fed; n = 18/treatment) or fed at 0.9 kg/head/day while grazing (Exp 3; 75 and 95% SL; young bucks; n = 10/treatment). Control animals in each study were given commercial forage-based pellets. A

total of 5 adult female *H. contortus* recovered from the abomasum of 2 animals from each treatment group in each experiment were examined for evidence of surface damage using scanning electron microscopy. There was no evidence of damage on worms processed from Exp 1, indicating little effect of feeding SL pellets on establishment of *H. contortus* larvae in mature goats. There were constricted folds and a disheveled cuticular surface on 2 worms (40%) and damage on the cuticular surface on one worm (20%) from the 75% SL leaf meal pellet treatment group in Exp 2, with no damage observed on control worms. In Exp 3, all 5 worms (100%) observed from both the 75% and 95% SL leaf meal pellet treatment goats (but not control goats) showed a disheveled surface. As previously reported, fecundity of worms in Exp 2 and 3 was reduced ($P < 0.05$) by SL, and total adult worm numbers were reduced ($P < 0.05$) by SL in Exp 3. Together, this work suggests that SL may have a direct effect on the cuticle of female *H. contortus*.

Key Words: goats, *Haemonchus contortus*, sericea lespedeza