

Goat Species I

M120 Identification of ATP binding cassette transporter G2 (ABCG2) gene in mammary gland of Xinong Saanen Goat and its expression profile during lactation. H. J. Wu¹, J. Luo¹, N. Wu^{*2}, K. Matand², L. J. Zhang¹, B. J. Yang¹, X. F. Han¹, H. B. Wang¹, N. Zhang¹, G. Yu¹, and C. Y. Shan¹, ¹Northwest A&F University, Yangling, Shanxi, P. R. China, ²Langston University, Langston, OK.

The ABCG2 gene codes for a protein that belongs to a trans-membrane proteins superfamily that mediates the ATP-dependent translocation of a variety of lipophilic substrates. The effect of ABCG2 gene on milk yield and composition has been reported in dairy cattle. However, there is limited information on ABCG2 gene structure, expression or functional analysis in dairy goats. This is the first report on ABCG2 gene coding region nucleotide sequence and expression pattern during the lactation period of the Chinese Xinong Saanen goats. The full sequence of this goat's gene coding region was sequenced and deposited into the GenBank nucleotide database (Accession number - DQ904356). This gene's complementary DNA contained an open reading frame of 1977 nucleotides that encoded a putative protein of 658 amino acids. The similarities between the nucleotide and peptide sequences of goat ABCG2 gene and putative protein compared with the bovine, human, and mouse homologs were 96%, 89%, 85% and 96%, 85%, 79%, respectively. Further, bioinformatical analysis showed that most of the goat ABCG2's virtually translated polypeptide sequence were predictably similar to those of bovine's and human's. However, the significant differences that were observed in coil-helix structures and optional motifs were species specific. When Real-time reverse transcription-polymerase chain reaction analysis was employed to explore the gene expression profile during lactation, the result showed a five-fold increase in expression level during peak yield, compared with the onset of lactation. Overall the results suggested that ABCG2 gene might be involved in goat milk synthesis probably by mediating lipophilic substrates translocation during early, peak, and mid-lactation stages.

Key Words: ABCG2, DNA, Polypeptide

M121 Differentially expressed gene profile during dairy goat whole lactation period. H. J. Wu¹, J. Luo^{*1}, N. Wu², K. Matand², L. J. Zhang¹, B. J. Yang¹, X. F. Han¹, H. B. Wang¹, N. Zhang¹, G. Yu¹, and C. Y. Shan¹, ¹Northwest A&F University, Yangling, Shanxi, P. R. China, ²Langston University, Langston, OK.

The profile of mammary gland differentially expressed genes during the whole lactation of Chinese Xinong Saanen goat was determined by using suppression subtractive hybridization (SSH) approach. Mammary gland-subtracted cDNA libraries of different lactation stages were also constructed to facilitate target genes isolation. Real-time reverse transcription-polymerase chain reaction was applied to validate SSH results. Five target genes coding for serum amyloid A3 (SAA3), ATP-binding cassette subfamily G2 (ABCG2), heart fatty acid-binding protein (hFABP), xanthine dehydrogenase (XDH) and zinc-finger Ubi-d4 proteins (ZNP) were identified and analyzed. The expression level of ABCG2 and hFABP genes showed a significant increase from early to peak lactation stages. The results showed that their expression trends were similarly highest during peak yield and gradually decreased through mid, late and end of lactation. The results also reflected active functional involvement of proteins that were profiled in this

study. ABCG2 and hFABP gene proteins seem to be involved in the mediation of ATP-dependent translocation of a variety of lipophilic substrates and lipid metabolism, respectively, during the peak of lactation; whereas XDH, a major constituent of the milk fat globule membrane, showed the expression trend similar to that of ABCG2 and hFABP, but with a mild increase during early and peak lactation stages. The expression pattern of SAA3, a lipid metabolism and cell proliferation protein, increased during early and late lactation, with a subsequent decline to baseline at the end of the lactation. Unlike other genes, ZNP gene expression increase began at the end of the middle lactation stage, with the highest point at the end of lactation. This results suggest a potential role of this gene's protein in cell apoptosis.

Key Words: ABCG2 Gene, hFABP Gene, Polymerase Chain Reaction

M122 Initial gene expression analysis of Chinese Xinong Saanen goat mammary gland. X. F. Han¹, J. Luo¹, N. Wu², K. Matand^{*2}, B. J. Yang¹, H. J. Wu¹, L. J. Zhang¹, and H. B. Wang¹, ¹Northwest A&F University, Yangling, Shanxi, P. R. China, ²Langston University, Langston, OK.

Goat is a major source of income and animal nutrients, primarily in developing countries. It is also an important animal research bio-system, but genomic studies are scarce in this species. This has resulted in a lower pace for genomic resources generation that could be used for goat production improvement. This pioneering study on goat mammary gland genomics was designed to construct and assess the functional quality of the mammary gland cDNA library and clones on Chinese Xinong Saanen goat. The results showed that the cDNA library was of high quality and contained 1.4×10^7 cfu with an average insert size of 1000 bp and recombinant rate of 96%. Sequencing analysis revealed that about 55.7% of sequenced clones were redundant, whereas 25% of them or 56.9% of the clone clusters represented novel genes. Functional analysis also showed that, although milk proteins which included beta-lactoglobulin, beta-casein, α s2-casein, kappa-casein and prealpha-lactalbumin were the most abundant. Other proteins involved in ribosomal structure, metabolism, immune response, and translation were also identified through sheep, cow and human cross-species genomic comparisons.

Key Words: cDNA, Genome, Goat

M123 Lactation curve characteristics of the Sarda goat breed. R. Steri¹, N. Bacciu¹, P. Fresi², A. Cappio-Borlino¹, and N. P. P. Macciotta^{*1}, ¹Dipartimento di Scienze Zootecniche, Università di Sassari, Sassari, Italia, ²Associazione Nazionale della Pastorizia, Roma, Italia.

The Sarda is the largest Italian goat breed. Its main feature is represented by a high fitness to difficult environmental conditions that make this breed able to produce in areas that cannot be exploited with other species. A consistent strategy of genetic improvement should be preceded by a deepening of the knowledge on main productive characteristics of the animal and of main factors that affect these traits. In this study, 10,150 test day records for milk yield of 1,832 Sarda

breed goats were fitted with the incomplete gamma function of wood (WD) in the log-linear form and ($\log Y = \log a + b \log t + ct$) The WD model was fitted both to individual lactation curves and average lactation curves of goats with different parity (1st to 5th), kidding season (winter and spring) type of kidding (single or twins) and altitude of the flock (mountain, hill or plain). Estimated individual curves were ranked according to five levels of adjusted R-squared (ADJRSQ) and were classified as standard or atypical (presence or absence of the peak) on the basis of the signs for parameter b. Goodness of fit showed a wide range of variation, although about 38% of individual curves had and ADJRSQ > 0.80. About 42% of individual curves show an atypical shape. The days in milk at which the peak occurs tends to increase with parity (from about 33 for first kidding goats to 23 for goats at the fifth kidding), with the number of kids born (15 vs 27 for one and two kids, respectively), with the season of kidding (25 vs 39 for winter ad spring) and with the altitude of location of flocks (14, 23 and 28 in flocks located on plain, hill and mountain, respectively). Milk yield at peak tend to increase with parity (from 1,32 liters for first kidding goats to 1.56 lt for goats at the fifth kidding), number of kids born (1.46 vs 1.55 for one and two kids , respectively), with the season of kidding (1.46 vs 1.60 for winter ad spring) and with the altitude of location of flocks (1.63, 1.43, 1.07 in flocks for plain, hill and mountain, respectively).

Key Words: Dairy Goats, Lactation Curve, Wood Model

M124 Milk production in goats supplemented with different levels of ruminally protected methionine. G. A. Flores, R. E. Gutierrez, D. D. Ruiz, F. X. Plata*, A. A. Ramirez, S. Vega, and G. D. Mendoza, *Universidad Autónoma Metropolitana Xochimilco, Mexico, D.F., Mexico.*

Twelve lactating multiparous Saanen goats (55.9 ± 5.6 kg) were fed a basal diet (14.4% CP, 26.71% RUP, 2.44 Mcal ME) with alfalfa, wheat bran, soybean meal, sorghum grain, corn grain, molasses, corn silage and oat straw (forage:concentrate ratio, 67:33). Goats were randomly assigned to the treatments, which consisted of three levels of ruminally protected methionine (RPM): 0, 2.5 or 5.0 g/d (Mepron M85 Degussa Co). Experiment was conducted for 30 days with measurements of milk production, composition and changes in body weight. Milk production was reduced ($P \leq 0.05$) with higher doses of RPM (1441^{ab}, 1698^a, 1390^b g/d for 0, 2.5 and 5.0 g/d respectively). Milk protein was reduced with 2.5 g of RPM (3.18^a, 2.86^b, 3.01^{ab}). No treatment effects were observed in milk fat or body weight. Higher doses of ruminally protected methionine affects negatively milk production in dairy goats presumably because the ratio lysine:methionie was reduced. More research is needed to determine optimum doses of ruminally protected methionine in lactating goats.

Key Words: Goat, Methionine, Milk

M125 In vivo prediction of body composition in goat dams 2) Relationship between IGF-I, body weight and body composition. C. A. Mejia*^{1,2}, G. Dominguez², E. Villagomez^{1,3}, M. Montaña^{1,2}, R. Basurto^{1,2}, H. Jimenez^{1,2}, and H. Vera^{1,2}, ¹*Cenid-Fisiologia INIFAP, Queretaro, Mexico*, ²*FESC-UNAM, Queretaro, Mexico*, ³*Cenid-Microbiologia INIFAP, D.F., Mexico.*

The objective of this research was to establish if plasma concentrations of IGF-I are related to weight and body composition of goat dams. A

total of 64 goats from 2 genetics (Saanen and Creole) and 3 to 4 years of age, were used. Dams were divided in three groups according to their body score (BS, 1-5): LOW (1.5 - 2), MID (2.5 - 3) or HIGH (>3). Each of these groups received an integral diet for 12 weeks varying the offered amount to keep or establish these differences. At the end of this period (day 0), live weight (LW) and BS were registered. LW and BS were recorded 42 days later. This same day, a blood simple was obtained in the morning and another one in the afternoon. Plasma concentrations of IGF-I were determined by RIA, using a commercial kit. Dams were slaughtered at day 43 and inner fat was registered, and carcasses were weighed and stored in a cold chamber at 4°C. After 24 h, the left half of each carcass was dissected in fat (FAT), muscle (MUS), and bone tissue (BT). Data were analyzed by ANOVA and correlation using SAS software. There were no differences in plasma concentrations of IGF-I related to day time ($P > 0.30$). Saanen dams had higher ($P < 0.001$) IGF-I concentrations than Creole dams (262 vs 113 ± 15 ng/ml, respectively). The average of the two daily measures was used to make the correlation analyses. Despite the group ($n=64$), IGF-I correlations to LW ($r=0.68$), FAT ($r=0.64$), MUS ($r=0.69$; $P < 0.001$) and BT ($r=0.24$; $P < 0.07$) were meaningful. When data were analyzed by group, the correlation values of IGF-I to LW, FAT, and MUS continued being meaningful ($r=0.57$ a 0.77 ; $P < 0.03$) for HIGH ($n=21$), MID ($n=21$) and LOW ($n=22$). However, correlation of IGF-I to BT was not meaningful in any of the three groups ($r=0.05$ a 0.20 ; $P > 0.15$). We conclude that plasma concentrations of IGF-I are positively associated to body weight and body composition of goat dams.

Key Words: Body Composition, Goat, IGF-I

M126 Evaluation of the FAMACHA® system in lactating goats. M. Rovai*¹, T. A. Gipson¹, and L. J. Dawson^{1,2}, ¹*E (Kika) de la Garza American Institute for Goat Research, Langston University, Langston, OK, USA*, ²*Oklahoma State University. College of Veterinary Medicine, Stillwater.*

The FAMACHA system has been adopted as a useful tool in meat goats for identifying clinical anemia associated with parasitism. However, the applicability of this method in dairy goats remains uncertain. The relation between FAMACHA system (FAM; scale based on the ocular conjunctiva color; 1–2 healthy, 3 border line, and 4–5 pale), fecal egg counts (FEC) and blood packed cell volume (PCV) were studied in 24 Alpine dairy goats measured every 2 wk throughout 7 month of lactation. All does were drenched with an anthelmintic at kidding. Samples for FEC were determined using modified McMaster method and classified as: low (≤ 750) and high (> 750) eggs per gram feces. For PCV, measured by the microhaematocrit method, values of ≤ 19 , 20–25, and > 25 were considered anemic, border line, and healthy, respectively. A false positive result was defined as animals with FAM 4–5 but not anemic and a false negative as animals with FAM 1–2 but anemic. The FEC values, log transformed, were affected by FAM ($P < 0.05$) where scores 4 and 5 showed low FEC (2.42, 2.49, and 2.23 for scores 1–2, 3, and 4–5, respectively). Moreover, high FEC had a tendency ($P = 0.07$) for low PCV values (2.52, 2.37, and 2.24 for anemic, border line, and healthy, respectively). For low FEC, 37% of animals were classified as FAM 4–5, 48% as border line, and only 15% FAM 1–2. The relation between FEC and PCV also presented a negative tendency ($P = 0.07$) which reaffirms the presence of high FEC with low PCV and, consequently, anemia. About 8.5% of goats would have been correctly treated with eye scores of 4–5 and low PCV values. However, 21% of the goats were false positive and would have

been treated unnecessarily. Although there is a physiological relation between FEC and PCV, the FAM system was not sufficient in itself for identifying anemia in dairy goats. Other causes (e.g., lactation stress) can be responsible for anemia, therefore FAM scores of 4–5 should be validated with FEC analysis.

Key Words: Dairy Goat, FAMACHA, Fecal Egg Count

M127 Protein and/or energy supplementation does not change forage digestibility in growing meat goat kids. J. M. Patterson^{1,2}, B. D. Lambert^{1,2}, and J. P. Muir¹, ¹Texas Agricultural Experiment Station, Stephenville, ²Tarleton State University, Stephenville, TX.

The nutritive value of supplements may affect feed intake and weight gains in growing goats. Our objectives were to determine the effects of protein and energy supplementation on growth, forage intake, forage apparent digestibility, and nitrogen retention in meat goat kids. In Experiment 1, an 18% crude protein complete goat grower was added to the diet of wethers eating coastal bermudagrass (CB) (12.2% CP, 67.5% NDF, 37.5% ADF), Tifton 85 bermudagrass (T85) (6.8% CP, 78.2% NDF, 45.1% ADF), or sorghum-Sudan (SS) (8.3% CP, 73.7% NDF, 47.9% ADF) hays. This experiment used seventy-two wether goats and measured the effects of the supplement on average daily gain (ADG) of goats fed one of three grass hays with or without supplemental levels (1% body weight daily) or *ad libitum* access to a complete goat grower. In Experiment 2, four wether goats were used in a 4x4 Latin square design and fed a SS basal diet (8.3% CP, 73.7% NDF, 47.9% ADF). Goats were confined to metabolic crates to facilitate total urine and fecal collection. Treatments consisted of no supplement, supplemental urea (200mg•(kg BW)⁻¹(d⁻¹), supplemental dextrose (0.2% BW^{-d}), or urea + dextrose ((200mg•(kg BW)⁻¹(d⁻¹), 0.2% BW^{-d}, respectively). In Experiment 1, ADG were -3.80, -4.97, and -6.56 for CB, T85, SS, respectively. ADG for hay plus supplement were 69.22, 61.62, and 58.12 for CB, T85, SS, respectively. Supplementation in Experiment 1 increased (*P* < 0.01) ADG for all hays by a factor of 5 over hay-only diets. Additionally, goats with *ad libitum* access to the complete feed had increased ADG compared to all treatments. In Experiment 2, protein and energy supplementation increased (*P* < 0.01) nitrogen retention. However, no differences (*P* > 0.05) were shown for digestibility of dry matter, organic matter, acid detergent fiber, or neutral detergent fiber. We conclude that the beneficial effects of supplements in Experiment 1 and the increase in nitrogen retention in Experiment 2 cannot be explained by improvements in ruminal fiber utilization and could be due to post-ruminal energy and/or protein supply to the animal.

Key Words: Coastal Bermudagrass, Sorghum-Sudan, Tifton 85 Bermudagrass

M128 *In situ* dry matter degradation of cacti and fruits commonly selected by goats in the semi-arid region of North México. M. Guerrero-Cervantes¹, R. G. Ramirez-Lozano², R. Montoya-Escalante¹, A. S. Juárez-Reyes¹, and M. A. Cerrillo-Soto*¹, ¹Universidad Juárez del Estado de Durango, Durango, Durango, Mexico, ²Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, Mexico.

The aim of this study was to determine the parameters of *in situ* DM degradability of cacti and fruits commonly selected by range goats in

the semiarid region of North Mexico. Immature pods of *O. leucotricha*, *O. imbricata* and *O. leptocaulis*, and fruits of *O. leucotricha* and *O. imbricata* were collected, burned and milled. To determine the parameters of degradability, 5 g DM of samples were incubated in nylon bags for 0, 3, 7, 12, 24, 48, 72 and 96 h, in the rumen of 3 sheep fed alfalfa hay:concentrate (75:25). Results of DM degradability were fitted to exponential equation $P = a + b(1 - e^{-ct})$; where **a** is the intercept, **b** is slowly degradable fraction, **c** is the rate constant of disappearance of **b** fraction, and **a+b** is the potentially degradable fraction. Data were analyzed by analysis of variance for a completely randomized design. The DM degradability was different among species (*P* < 0.05). The values for the fraction **a** were 20.9% higher in the fruit of *O. leucotricha* (white prickly pear) than the fruit of *O. imbricata*. The slowly degraded fraction **b** ranked the species *O. imbricata* higher and the fruit of *O. leucotricha* lower. *O. leucotricha* ranked intermediate (*P* < 0.05). No differences (*P* > 0.05) were recorded in the constant rate **c**. However, a numerical increment was observed in white prickly pear. The potential gas production **a+b** was 16.7% higher (*P* > 0.05) in *O. imbricata* and *O. leucotricha* than the lowest counterpart (Fruit of *O. imbricata*). A similar trend was observed with effective degradability. Results indicated that white prickly pear, which is the fruit of *O. leucotricha* and *O. imbricata* represent valuable scarcity feeds in hot semiarid environments.

Table 1. *In situ* degradation of cacti and fruits commonly consumed by goats in the semiarid region of Mexico

Species	Parameters				
	a (%)	b (%)	c (% ^{-h})	a+b (%)	ED (%)
<i>O. leucotricha</i>	54.2 ^b	36.2 ^b	0.042	90.4 ^a	70.7 ^a
<i>O. leptocaulis</i>	55.5 ^b	31.4 ^c	0.059	87.0 ^{ab}	72.6 ^a
<i>O. imbricata</i>	48.5 ^c	47.2 ^a	0.030	94.0 ^a	65.5 ^{ab}
Fruit of <i>O. leucotricha</i>	58.1 ^a	22.8 ^d	0.088	78.3 ^{bc}	72.2 ^a
Fruit of <i>O. imbricata</i>	45.9 ^c	30.8 ^c	0.053	76.8 ^c	61.9 ^b
Mean	52.4	33.7	0.055	85.3	68.6
sem	0.99	1.68	0.02	3.37	2.75

a,b,c,d Means within columns with different superscript differ (*P* < 0.05)

Key Words: Degradability, Goats, *In situ*

M129 *In vitro* gas production parameters of fruits commonly selected by grazing goats. M. Guerrero-Cervantes¹, R. G. Ramirez-Lozano², R. Montoya-Escalante¹, A. S. Juárez-Reyes¹, and M. A. Cerrillo-Soto*¹, ¹Universidad Juárez del Estado de Durango, Durango, Dgo., Mexico, ²Universidad Autónoma de Nuevo León, Monterrey, N.L., Mexico.

The objective of the study was to determine the *in vitro* gas production parameters of fruits commonly selected by range goats in the semiarid region of North Mexico. Fruits from *P. leavigata*, *Opuntia leucotricha* (white prickly pear), *O. leucotricha* (red prickly pear), *O. imbricata* and *O. leptocaulis* were collected. Triplicate samples (500 mg DM) were incubated in 100 ml glass syringes. The gas production was registered at 3, 6, 9, 12, 24, 48, 72, and 96 h. Data were fitted to the equation: $p = a + b(1 - e^{-ct})$, where **p** represents gas volume at time **t**, **a** is the gas produced (ml) from the soluble fermentable feed fraction, **b** is the gas produced (ml) from the insoluble but fermentable feed fraction, **a + b** is the potential gas production (ml), **c** is the constant rate of gas production (% h⁻¹). Data were analyzed by ANOVA for a completely randomized design. Gas produced from the soluble **a**

fraction was highest for red and white prickly pear ($P < 0.05$) whereas the fruits of *O. imbricata* and *P. leavigata* were lowest. The gas produced from the slowly degradable fraction *b* followed the same pattern than the *a* fraction. White prickly pear from *O. leucotricha* resulted in higher values; *P. leavigata* recorded the lowest ($P < 0.05$). The constant rate of gas production *c* was highest for white and red prickly pears, whereas fruits from *P. leavigata*, *O. leptocaulis* and *O. imbricata* were lower ($P < 0.05$). The highest potential gas production *a+b* was recorded in white prickly pear, and the lowest in *O. imbricata*. Data supported the fact that fruits from *O. leucotricha* represent a valuable source of food in harsh conditions in semi arid regions.

Table 1. *In vitro* gas production parameters of fruits

Fruits	Parameters			<i>a+b</i> ml/500 mg DM
	<i>a</i> ml/500 mg DM	<i>b</i> ml/500 mg DM	<i>c</i> % h ⁻¹	
<i>P. leavigata</i>	23.3 ^c	81.1 ^c	0.049 ^b	104.4 ^d
<i>O. leptocaulis</i>	36.1 ^b	83.7 ^c	0.040 ^b	119.9 ^c
<i>O. imbricata</i>	23.2 ^c	81.9 ^c	0.053 ^b	105.2 ^d
<i>O. leucotricha</i> (red prickly pear)	43.3 ^a	96.1 ^b	0.083 ^a	139.5 ^b
<i>O. leucotricha</i> (white prickly pear)	46.7 ^a	108.9 ^a	0.086 ^a	155.7 ^a
Mean	34.5	90.3	0.062	124.9
SEM	2.10	3.31	0.005	3.34

Means within columns with different superscript differ ($P < 0.05$).

Key Words: Fruits, Goats, *In vitro* Gas Production

M130 Effects of dietary concentrate level on tissue and organ mass of Alpine does at different stages of lactation. A. T. Ngwa¹, L. J. Dawson², R. Puchala¹, G. Detweiler¹, R. C. Merkel¹, T. Sahl¹, C. L. Ferrell³, and A. L. Goetsch^{*1}, ¹American Institute for Goat Research, Langston University, Langston, OK, ²College of Veterinary Medicine, Oklahoma State University, Stillwater, ³US Meat Animal Research Center, Clay Center, NE.

Multiparous Alpine does (42) were used to determine how dietary concentrate level and stage of lactation affect mass of organs and tissues. Initial measures were conducted with six does a few days after kidding (0 wk). Eighteen does were fed a 60% concentrate diet (C) and 18 received one based on forage (20% concentrate; F) for 8, 16, or 24 wk of lactation. Intake of DM was greater ($P < 0.05$) for F vs C (2.23, 2.14, 2.10, 2.42, 2.81, and 2.55 kg/d), ADG was affected ($P < 0.07$) by an interaction between diet and time (0, 24, 121, -61, 46, and 73 g), and 4% fat-corrected milk was less ($P < 0.05$) in wk 17-24 than earlier (3.60, 2.78, and 2.45 kg/d for C and 3.02, 3.00, and 2.14 kg/d for F in wk 1-8, 9-16, and 17-24, respectively). Measures at 0 wk in % empty BW (EBW) included 51.1% carcass, 2.01% liver, 14.88% internal fat, and 6.57% gastrointestinal tract (GIT). Carcass mass was greater ($P < 0.05$) for F vs C and similar among times (50.8, 52.1, and 51.2% EBW for C and 52.6, 53.0, and 52.2% EBW for F at 8, 16, and 24 wk, respectively). Liver mass was similar between diets ($P = 0.13$) and greatest among times ($P < 0.05$) at 8 wk (2.87, 2.46, and 2.23% EBW for C and 2.81, 2.63, and 2.58% EBW for F at 8, 16, and 24 wk, respectively). Internal fat mass was greatest among times ($P < 0.05$) at 24 wk and greater for C vs F (11.40, 14.27, and 18.59% EBW for C and 9.39, 11.43, and 13.70% EBW for F at 8, 16, and 24 wk, respectively). Mass of the GIT was less ($P < 0.05$) for C than for F and decreased ($P < 0.05$) with increasing time in lactation (9.26, 7.56, and

6.21% EBW for C and 9.24, 8.50, and 7.87% EBW for F at 8, 16, and 24 wk, respectively). In conclusion, though milk production was not affected by diet partially because of greater DMI for F vs C, based on tissue mass more energy was expended by the GIT of F vs C does. In this regard, it appears that considerable internal fat is mobilized in early lactation particularly with forage-based diets, with more rapid and a greater magnitude of repletion by does consuming diets with high vs moderate or low concentrate levels.

Key Words: Body Composition, Dairy Goats, Lactation

M131 Effects of dietary starch sources on intake, growth and blood variables in growing goats. S. P. Wang, W. J. Wang, B. Lin, Z. L. Tan*, S. X. Tang, Z. H. Sun, and J. Y. Zeng, Institute of Subtropical Agriculture, The Chinese Academy of Science, Changsha, P.R.China.

The effects of dietary starch sources on feed intake, growth and blood variables were investigated in growing goats. Sixteen Liuyang black wether goats (Local breed; 15.0 ± 2.5 kg) were randomly allocated to four dietary treatments (4/treatment) for 54 d feeding period. The rations consisted of maize stover and concentrate containing soybean meal, fish meal, fat meal, rice husk, and a vitamin and mineral premix. Extra dietary starch was supplied, respectively with wheat grain, maize grain, sorghum grain, or paddy grain, all grounded and mixed with the concentrate to form four treatment diets with the same CP, starch and DE level. Goats were fed maize stover ad libitum, and the concentrate was provided daily in two equal portions at 0800 and 1700 h. The feed offered andorts were weighed daily, while animals were weighed at the beginning and end of feeding trail. About 20 ml blood samples were collected from the jugular vein at day 53 from each goat. Dry matter intake (DMI) of maize stover and concentrate, and daily weight gain of goats did not differ ($P > 0.05$) among treatments. Dietary starch sources affected ($P < 0.05$) the leucocyte numbers, the numbers and percentage composition of lymphocyte, intermediate cell and neutrophilic granulocyte, and the distribution dispersion of thrombocyte volume in whole blood. However, treatment did not affect ($P > 0.05$) the erythrocyte numbers, haemoglobin mass, haematocrit, average volume of erythrocyte, the distribution dispersion of erythrocyte volume, the thrombocyte numbers, the average volume of thrombocyte and packed thrombocyte in whole blood. Although these data suggest that dietary starch sources from cereal grains have no effect on DMI and growth, it affected the blood cell numbers.

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Key Words: Blood Variables, Performance, Starch

M132 Effects of dietary starch sources on meat quality and serum hormonal concentrations in growing goats. S. P. Wang, W. J. Wang, B. Lin, Z. L. Tan*, S. X. Tang, Z. H. Sun, and J. Y. Zeng, Institute of Subtropical Agriculture, The Chinese Academy of Science, Changsha, P.R. China.

The objective of this study was to examine the effects of different dietary starch sources on serum hormone concentrations and meat quality of growing goats. Sixteen wether goats (15.0±2.5 kg) were randomly allocated to four dietary treatments (4/treatment). Ration

consisted of maize stover and concentrate. The concentrate contained soybean meal, fish meal, fat meal, rice husk, and a vitamin and mineral premix. Extra dietary starch was supplied respectively by wheat grain, maize grain, sorghum grain and paddy grain which were ground and mixed with the concentrate to form four treatment diets with the same CP, starch and DE level. Goats were fed maize stover ad libitum while concentrate was provided daily in two equal portions at 0800 and 1700 h. The feeding period lasted for 54 days. Blood samples were taken from the jugular vein on d 55 before the morning feeding to determine hormone concentrations. Thereafter the goats were slaughtered and about 350 g of longissimus dorsi from each goat were sampled for meat quality measurement. Dietary starch sources did not affect ($P>0.05$) the concentrations of insulin, growth hormone, T4, leptin, gastrin, and motilin in the serum. No significant differences ($P>0.05$) were observed in pH at 24 h after slaughter, drip loss for days 1, 3, 5, 7, 9, 14 and 21, cooked meat ratio, percentage of water loss between treatments. The pH at 45 min after slaughter, the content of total pigment and myoglobin were higher ($P<0.05$) in goats fed the paddy grain diet than the other diets. Crude protein content in the meat was higher ($P<0.05$) in goats fed the wheat diet than in goats fed the sorghum or the paddy diet. The current study demonstrated that different dietary starch sources could affect the pigment sediment and protein content of muscle tissues.

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Key Words: Hormone, Meat Quality, Starch

M133 Evaluating associative effects of different proportions of mixed forage species using gas production technique. S. X. Tang, Z. L. Tan*, Z. H. Cong, Y. Hu, Z. H. Sun, and M. Wang, *Institute of Subtropical Agriculture, The Chinese Academy of Sciences, Changsha, P.R. China.*

The objective of this study was to investigate the associative effects of different forage species mixed with the mixture of *Rumex* and *Trifolium* (50:50, RT) at the proportions of 0:100, 25:75, 50:50, 75:25 and 100:0 respectively. The forage species included *Pennisetum Purpureum* × *P. americanum* (PPPA), *Guimu No.1* (GM), *Secale carele L* (SCL), *Pennisetum Purpureum Schum. Cymott* (PPS), *Hemarthria japonica* (HJ), *Lolium perenne* (LP), and *Sorghum sudanens* (SS). Three goats (20±2 kg) were used. The goats were fed a diet consisting of 500 g kg⁻¹ concentrate and 500 g kg⁻¹ forage containing DE (3.15Mcal/kg DM) and CP (140 g/kg DM) and used as ruminal fluid donors for the preparation of inoculums. The gas production (GP) of the above forage combinations were measured in each vial after 12, 24 and 48 h of incubation. The associative effects were evaluated using their measured GP at 12, 24 and 48 h incubation time and their predicted GP. The predicted GP of combinative proportions was calculated according to GP of single RT and forage. The results were analyzed using completely randomized design in each incubation time with Duncan's multiple range test used for the comparison of means. The major combinations of RT and forages expressed significant positive associative effects ($P<0.05$) in gas production at different proportions. The negative associative effect ($P>0.05$) was only observed for the mixture of 25% RT and 75% GM at 12 h incubation time. The results indicated that the in vitro fermentation of forages could be improved through changing their combinative proportions.

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Table 1.

Incubation time, h	proportion, %	Associative effect, %	RT:PPPA					
			RT:GM	RT:SCL	RT:PPS	RT:HJ	RT:LP	RT:SS
12	25:75	5.3	-3.4	4.4	14.6*	8.6*	8.8*	5.7*
	50:50	6.6*	2.6	6.18	16.6*	8.3	8.5*	10.4*
	75:25	7.3*	7.0*	17.4*	13.8*	16.6*	9.0*	11.3*
24	25:75	7.9*	2.7	3.67	9.6*	6.0*	5.2*	6.2*
	50:50	8.0*	6.3	5.8	15.0*	4.1	4.5*	9.3*
	75:25	9.4*	9.1*	15.1*	13.9*	14.3*	6.5*	9.6*
48	25:75	9.0*	5.0	2.2	13.5*	5.8*	8.8*	1.7
	50:50	9.0*	6.7	5.0	18.1*	0.7	4.7*	7.8*
	75:25	8.9*	8.8*	15.1*	14.0*	13.3*	5.6*	8.7*

*, $p<0.05$. Associative effect=100×(Measured GP-Predicted GP)/Predicted GP.

Key Words: Associative Effect, Gas Production, Forage

M134 Ingestive behavior of goats fed with urea in the diet. L. S. Amorim*^{1,4}, C. A. A. Torres¹, E. A. M. Amorim^{1,4}, J. F. Fonseca², J. H. Bruschi³, and M. T. Rodrigues¹, ¹Federal University of Vicosa, MG, Brazil, ²Embrapa Small Ruminant Research Center, Sobral, CE, Brazil, ³Embrapa Dairy Cattle Research Center, Juiz de Fora, MG, Brazil, ⁴Colorado State University, Fort Collins, CO.

True protein supplements are the most expensive ingredients in diets. Therefore, substitution of a true protein supplement with a non-protein N source may significantly reduce the diet costs. However, studies have demonstrated that urea addition in the diets is related to increases in the ammonia concentrations in the serum and plasma blood, therefore has diminished the reproductive performance. A trial was conducted with 20 Toggenburg goats, not pregnant and nonlactating, averaging 48.55 ± 7.87 kg BW, 2.97 ± 0.5 ECC and 34.33 ± 20.80 months old distributed in five randomized blocks to evaluate the effect of the addition of high urea levels on the diet on feeding behavior. The goats were fed with two diets (TR1) contend 0 and 2.2% of urea in the total DM basis of the ration. Diets consisted of 60% of Tifton hay (*Cynodon ssp.*) and 40% of concentrate, formulated to be isonitrogenous (14% CP, DM basis). Treatments consisted of 0 (TRT1) and 2.2% of urea in the total DM basis of the ration (TRT2), that it was substituted by the meal corn in the concentrated mixture. The animals were allotted to individual pens. The data measured was time spent eating (TSA), time spent ruminating (TRU), time spent idle (TID), time spent on foot (TFO), time spent lying down (TLY), chewing time (TCH) and ruminating chewing by number bolus (RCB), was determined by means of the visual observation of the animals, at intervals of ten minutes, for a period 24 hour. During the nocturnal collection of the data, the environment was kept with artificial illumination. Data were analyzed by ANOVA using the glm procedure of SAS (version 8.7). No statistical difference was observed between treatments (TRT1 and TRT2, respectively) on TSA 283.4 vs. 290.86 min, TRU 392.16 vs. 399.62 min, TID 748.86 vs. 756.32 min, TLY 835.67 vs. 843.13 min, TFO 586.77 vs. 594.23 min, TCH 41.38 vs. 48.84 min and RCB 54.49 vs. 61.95. The urea in the diet did not change the feeding behavior of animals.

Key Words: Behavior, Goats, Urea