

Small Ruminant: Sheep Production 2

W439 The effects of high dietary protein levels in Afshari ewes during late gestation. H. Amanlou, A. Karimi, and E. Mahjoubi*, *Zanjan University, Zanjan, Iran.*

It has been shown that due to declining DM intake during prelambling period, protein intake can be compromised unless dietary crude protein (CP) levels are increased. However results on the impacts of increasing the dietary CP level in prelambling ewes are contradictory. Thus, the aim of current study was to investigate the effects of dietary crude protein (CP) level in late pregnancy on colostrum production, colostrum components and lamb survival. Forty-one Afshari ewes were randomly assigned to three treatment groups in a completely randomized design since 3 weeks before lambing. The experimental diets were isoenergetic and included: 1) 120 g CP/kg DM (n = 14), 2) 140 g CP/kg DM (n = 13), and 3) 160 g CP/kg DM (n = 14). The offering high CP level did not influence dry matter intake (DMI) between treatments during last 3 weeks before lambing (1.81 ± 0.14 , 1.77 ± 0.26 and 1.83 ± 0.21 , treatments 1 to 3, respectively; $P > 0.05$). Increasing dietary CP did not affect colostrum volume (1379.2 ± 79.38 , 1398.2 ± 43.85 and 1410.3 ± 67.2 kg, respectively; $P > 0.05$), however, significantly increased crude protein content of colostrum (118.8 ± 10.6 , 121.5 ± 14.5 and 142.3 ± 12.7 g/kg, respectively; $P < 0.05$). Fat, lactose and SNF content of colostrum were not affected by treatments. It also decreased lamb birth weight (4.85, 4.61 and 4.11 kg, respectively; $P < 0.05$). Although increasing CP level had no effect on lamb survival rate from birth to weaning, it was numerically lower for treatment groups 2 and 3 (100, 95.23 and 86.66%, respectively). A tendency was detected for lower BW at weaning (34.6, 32.7 and 29.4 kg, respectively; $P < 0.12$) with added CP level. In general, because of the adverse effect of high dietary protein nutrition during late gestation on lamb birth weight and expense of protein in diet, feeding high protein diet to pregnant ewes with aim to increase colostrum production and lamb survival rate in Afshari ewes is not recommended.

Key Words: prelambling, Afshari ewe, CP level

W440 Fertility and prolificacy of primiparous Suffolk ewes bred by fixed-timed artificial insemination or artificial insemination at detected estrus. G. Jasso-Diaz¹, O. Mejia², J. I. Aguilera-Soto^{*1}, F. Mendez¹, M. A. Lopez-Carlos¹, R. Rincon¹, and C. F. Arechiga¹, ¹*Universidad Autonoma de Zacatecas, Zacatecas, Mexico*, ²*Universidad Nacional Autonoma de Mexico, Mexico, D.F.*

The purpose of the present study was to determine and compare fertility in Suffolk female sheep (n = 29) exposed to two different insemination procedures: 1) timed-artificial insemination (TAI) or 2) artificial insemination by detection of estrus (AIDE). In both treatments: 1) Timed artificial insemination sheep (n = 15) were treated with an intravaginal sponge containing 20 mg of fluorogestone acetate (FGA) from d -12 to 0, followed by an eCG intramuscular injection on day of sponge removal. Fixed-time intrauterine insemination was performed 56 h after intravaginal sponge removal at d 0 (without detection of estrus). 2) Insemination based on detection of estrus (AIDE; n = 14), female sheep were inseminated based on detection performed at 24 and 36 h after intravaginal sponge removal and eCG injection and inseminated at 48 h. Pregnancy diagnosis was determined firstly by non return to estrus (TAI= 93.3%; 14/15 ewes vs. AIDE=72.7%; 8/11 ewes), with non-significant differences within treatments ($P > 0.05$). Pregnancy diagnosis was performed at 45 d post-insemination by real time ultrasonography (5Mhz) confirming previous pregnancy diagnosis (93.3%

vs. 72.7% for TAI and AIDE, respectively). Prolificacy was not affected by insemination procedure (1.42 vs. 1.25, for TAI and AIDE, respectively). In conclusion, use of timed insemination did not compromise pregnancy, neither prolificacy in Suffolk female ewes.

Key Words: sheep, artificial insemination, estrus detection

W441 Intake and performance of sheep supplemented with brewer waste (ensiled and dried) grazing under the rainy season of tropical. F. P. Portilho*, S. L. S. Cabral Filho, H. Louvandini, and B. A. O. Macedo, *University of Brasilia, Brasilia, DF, Brazil.*

At reduced costs industrial wastes enable usage of protein mineral mixtures as ingredients in the formulation to improve the productive capacity. The protein supplementation with residue of brewery provide rapid weight gain in the finishing phase on pasture, avoiding a possible protein deficiency in the case of high stocking rates and lower availability of fodder. The objectives of this study were to evaluate the dry matter intake and performance of finishing sheep in pasture during the rainy season and to evaluate replacement of traditional protein source (soybeans meal) by sources of low degradability in the rumen like cotton meal and brewery waste (dried and ensiled). We used forty male sheep of Santa Inês breed, with average weight of 22.04 ± 3.14 kg, grazing on Aruana grass (*Panicum maximum*), receiving supplementation of 100 g / animal / day for four treatments, plus a control without supplementation. Treatments were represented by supplementation offered for sheep grazing at the end of the rainy season during 30 days (between March and April). The treatments were composed as follows: T1) mostly of dried brewer grain (RDC), T2) by silage of waste brewery (SRC), T3) by cotton meal (FA), T4) by soybean meal (FS) and T5) without supplementation (control-FSM). The experimental design was randomized blocks. Differences were observed for final weight between treatments evaluated ($P < 0.01$). The dry matter intake and weight gain varied among the treatments and there were differences ($P < 0.05$) in weight gain while comparing supplements (RDC, SRC, FA and FS) and control (FSM), with 0.131, 0.123, 0.101, 0.082 and 0.022 kg / day respectively. The feed efficiency had better trend for RDC and the worst one for the control animals (FSM). However, there were no differences ($P > 0.05$) among the treatments for feed efficiency. Therefore, the use of brewer waste in the diet of lambs at the end of the wet season can be an economical alternative as a substitute for soybean meal and yield good performances, as well as additional intake effects.

Key Words: brewer grains, supplementation, sheep

W442 Intake and performance of sheep supplemented with dried brewer grains, cottonseed meal and soybean meal grazing under tropical rainy season. F. P. Portilho* and S. L. S. Cabral Filho, *University of Brasilia, Brasilia, DF, Brazil.*

The usage of supplements in the rainy season provides benefits to the plants and animals. The objective of this study was to evaluate the DMI and performance of lambs during the rainy season, kept in the Tifton 85 pasture, and supplemented with different mixtures (energy and protein) with high (soybean meal) and low rumen degradable protein (dried brewery waste and cottonseed meal). Between March and April of 2007, 32 Santa Inês ewes, with average BW of 26.4 ± 4.9 kg, were kept on pasture forage of *Cynodon dactylon* cv. Tifton 85 and received supplementation of 100 g /ewe/ day. Treatments consisted of 2 formulations of protein supplements with dried brewery waste (DBW) and cottonseed meal

(CM), an one energy supplement with soybean and maize meal (SMM), and a control test with only a mineral mix (MM). The experimental design was completely randomized. We observed differences in DMI (% BW), which decreased for treatments in the following order: DBW > CM > SMM > MM ($P < 0.05$). The results of ADG were higher for the energetic supplementation (SMM) with 149.16 g / d compared with CM and MM at 69.58 and 62.08 g / d, respectively ($P < 0.01$), and without changes for RDC (103.75 g / day). For the feed efficiency, there were significant differences ($P < 0.05$), with better results for SMM with 12.09 and the worst for CM, with an average of 19.18 among all treatments. We observed an increase of pasture consumption (CP) of 0.456 and 0.336 kg / day for DBW and CM having an additional effect of stimulating consumption of grass from these supplements and mild increase of 0.025 kg / day for SMM, causing a substitution effect with stimulus. Therefore, by not existing different performance between SMM and the DBW, it becomes economically viable the usage of DBW.

Key Words: brewer grains, cotton meal, soybean meal

W443 Evaluation of rhizoma peanut hay (*Arachis glabrata*) in sheep diets: Chemical composition, in vitro degradability, intake, and digestibility. A. A. Rodríguez*, G. Emmanuelli, W. González, and P. Randel, *University of Puerto Rico, Mayaguez.*

The effects of inclusion of *Arachis glabrata* (AG) on the chemical composition, in vitro degradability, and intake and digestibility by sheep of tropical grass hay (TGH) was determined. The legume was harvested, sun dried, and manually mixed with TGH at three different proportions: 100:0, 50:50, and 0:100 w/w. Triplicate samples from each combination were analyzed to determine OM, inorganic matter (IM), CP, ADIN, available CP (ACP), NDF, ADF, and lignin (L) content. IVDMD and in vitro NDF (IVNDFD) degradability were determined after 48 h of incubation. Data were analyzed using the GLM procedure of SAS in a randomized complete design and means separated with Bonferroni t-test. To determine forage consumption and digestibility a 3 by 3 Latin square experiment was conducted using crossbred lambs as experimental units. Lambs were assigned to the three diets. Each experiment period consisted of a 7-day diet adjustment and 5 d of data collection. OM content was lower and IM content was higher ($P < 0.05$) in mixtures containing 100% AG than 50% or 0%. CP, ACP, ADIN, ADF, and L increased as percentage of AG increased in the mixtures, but NDF content decreased. IVDMD also increased ($P < 0.05$) as proportion of AG increased, but IVNDFD decreased ($P < 0.05$). Forage consumption was similar ($P < 0.05$) in lambs fed 100% and 50%AG (1020 vs. 1056 g/d, respectively), however, while animals fed TGH alone had the lowest DM consumption (956 g/d). Daily consumption as % of animal body weight was lower ($P < 0.05$) in lambs fed TGH alone (3.17%) than those fed 50 (3.46%) or 100% AG (3.33%). Sheep fed diets containing increasing levels of AG had higher ($P < 0.05$) DMD (100% AG =62.7%, 50% AG=58.1%), CPD (100% AG=65.7%, 50% AG=62.8%) and NDFD (100% AG=57.7%, 50% AG= 53.1%) than animals fed TGH alone (DMD=54.4%, CPD=58.7%, NDFD=46.9%). In summary, CP, NDF contents and IVDMD were improved as percentage of AG increased in TGH:AG mixtures. Inclusion of AG at 50% of the total forage offered in TGH-based diets increased forage dry matter intake in sheep, while DM, CP and NDF digestibilities increased at both higher levels of AG.

Key Words: legumes, *Arachis glabrata*, sheep

W444 Metabolic profile in pregnant ewes fed oat straw-based diets supplemented with wheat hydroponic forage. E. Herrera-Torres¹,

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A study was conducted to determine the effect of supplementing wheat hydroponic forage (WHF) to pregnant ewes fed oat straw-based diets on serum glucose, non-esterified fatty acids (NEFA) and blood urea N (BUN) at late gestation. Thirty-nine primiparous Katahdin ewes (T1 = 43.8 ± 4.8, T2 = 39.2 ± 1.4, T3 = 38.1 ± 3.0 kg BW) were randomly assigned to 3 experimental dietary treatments: T1: 72% oat straw (OS), 28% WHF, T2: 64% OS, 13% WHF, 5% cotton seed meal (CSM) and 18% rolled corn (RC), and T3: 70% OS, 8% CSM and 20% RC. Diets were calculated to meet ewes requirements according to the Intestinal Digestible Protein French System (T1 = 85, T2 = 76 and T3 = 76g/d of metabolizable protein, respectively). Jugular blood samples were collected in vacutainer tubes early in the morning before feeding monthly. Glucose, NEFA and BUN were quantified with colorimetric procedures. Statistical analysis was based on a completely randomized design for repeated measurements. Highly significant interactions ($P < 0.001$) between month and treatment were registered in serum glucose and NEFA concentrations. Ewes fed diets with more WHF (T1) had less serum glucose concentrations during the third month of pregnancy ($P < 0.05$) than ewes fed T2 and T3. Values for NEFA were similar ($P > 0.05$) between treatments; nonetheless, a numerical increment in serum NEFA was observed in ewes fed T1 in the fifth month of pregnancy. No interactions ($P > 0.05$) between month and treatment were registered in BUN, therefore, just the means of concentrations of the BUN are presented and they were: 10.2, 10.2 and 11.3 (mMol/L) for T1, T2 and T3, respectively. The observed plasma levels of glucose, urea, and NEFA indicated that an increased intake of energy may be outlined mainly for ewes fed T1 to ensure an adequate nutritional status of the animals during late pregnancy.

Table 1. Least squares means of the concentrations of blood metabolites in pregnant ewes (mMol/L)

Month of gestation	T1	T2	T3	SE±
	Glucose			
3	2.9 ^b	3.6 ^a	4.2 ^a	0.18
4	2.9 ^a	3.2 ^a	3.3 ^a	0.18
5	2.2 ^a	2.3 ^a	2.5 ^a	0.18
	NEFA			
3	0.38 ^a	0.36 ^a	0.46 ^a	0.13
4	0.47 ^a	0.54 ^a	0.41 ^a	0.13
5	1.07 ^a	0.88 ^a	0.74 ^a	0.13

^{ab}Means within rows with different superscript differ ($P < 0.05$).

Key Words: metabolites, wheat hydroponic forage, pregnant ewes

W445 Performance and voluntary intake of ewe lambs in integrated crop livestock systems in the dry season. S. L. S. C. Filho^{*1}, B. A. O. Macedo¹, F. P. Portilho², H. Lovandini¹, and C. M. Pimentel¹, ¹University of Brasilia, Brasilia, Distrito Federal, Brazil, ²EMBRAPA CERRADO, Brasilia, Distrito Federal, Brazil.

The objective of this study was to evaluate the performance of lambs at pasture, comparing nutritional quality of pastures that were reserved (set aside) during the raining season with those that were grazed after silage

or grain production. Four treatments were tested: *Brachiaria humidicula* with corn (BC), reserved *Brachiaria humidicula* pasture (RB), *Panicum maximum* cv. Aruana with corn (AC) and reserved *Panicum maximum* cv. Aruana pasture (RA). Thirty two crossbred Santa Inês × Ille de France ewe lambs aged from three to six months and weighing 22 ± 4.47 kg were used. The experimental design was completely randomized with two replicates per treatment, using eight experimental units (0.25ha), with four ewe lambs (testers) each. Voluntary intake and digestibility were measured with Cr_2O_3 and indigestibility ADF markers. The corn grain yield was 5.9 ± 1.1 t/ha and 4.1 ± 0.7 t/ha for BC and AC, respectively, with estimated silage yield for these treatments being 33.8 ± 6.0 t/ha and 31.3 ± 6.0 t/ha, respectively. There was no difference between the treatments ($P > 0.05$) in terms of CP, NDF and ADF of the pasture over the experimental period. The availability of dry matter before grazing was 3191, 3562, 3048 and 6565 kg/ha for the treatments BC, RB, AC and RA, respectively with daily weight gain being 108.5 ± 28.9 ; 38.5 ± 18.9 ; 89.5 ± 30.4 and 37.4 ± 4.5 g/day, respectively. The treatments with corn showed improved performance compared to the reserved pastures ($P < 0.05$). No significant differences were found between treatments for voluntary intake ($P > 0.05$), the average being 591.8 ± 175.44 g DM/animal/day. The dry matter digestibility for BC and RB was 43.7 ± 9.2 and $44.9 \pm 6.9\%$, and for AC and RA was 51.1 ± 8.4 and $37.4 \pm 4.5\%$. The AC treatment showed higher digestibility than RA, and digestibility of these did not differ from BC and RB ($P < 0.05$). The integrated pasture-crop system promoted higher performance of ewe lambs in the dry season compared to reserved pasture management, as well as providing additional silage or grain for the sheep farm.

Key Words: integrated crop livestock systems, humidicula, dry season management

W446 The effect of persimmon (*Diospros kaki* L.) vinegar supplement on feed intake, digestibility, and ruminal fermentation indices in sheep. J. H. Shin^{1,2}, Y. D. Ko¹, and S. C. Kim^{*1,3}, ¹Department of Animal Science, Gyeongsang National University, Jinju, South Korea, ²Department of Animal Sciences, University of Florida, Gainesville, ³Institute of Agriculture and Life Science, Gyeongsang National University, Jinju, South Korea.

This study estimated the effect of fermented persimmon (*Diospros kaki* L.) extract (FPE) supplement on feed intake, digestibility, nitrogen (N) balance, and rumen fermentation indices in sheep. Five male sheep (Corriedale × Polwarth, BW = 48.6 kg) were housed at metabolism crates and assigned to a 5 × 5 Latin square design with consecutive five 20-d periods which consisted of 14-d of adaptation and 6-d of data collection. The sheep were fed a diet containing concentrate and rice straw in a 3:7 ratio ad libitum. The five treatments were FPE supplemented at 0 (Control), 5, 10, 20, and 30 g/kg of concentrate. Tukey test and polynomial contrasts were used to identify differences ($P < 0.05$) and estimate the effects of FPE supplement level, respectively. Intakes of DM, OM, NDF, ADF, and nitrogen free extract (NFE) increased quadratically ($P < 0.05$) with increasing intake of FPE supplement and maximized (828, 710, 418, and 288 g/d, respectively) at 10 g/kg FPE. The digestibilities of DM, OM and NFE increased quadratically ($P < 0.05$) by increasing amount of FPE supplement, and sheep fed 5 and 10 g/kg diets had greater (52 vs. 49%, 55 vs. 52%, 60 vs. 55%; $P < 0.05$) DM, OM, and NFE digestibilities than Controls. By increasing FPE supplement concentration, N intake and fecal N increased linearly ($P < 0.05$), whereas N digestibility, retained N, and retained N ratio increased quadratically ($P < 0.05$). Retained N was maximized ($P < 0.05$) in sheep fed 5 and 10 g/kg diets (2 and 1.7 g/d). There was a quadratic increase ($P < 0.05$) of mean rumen ammonia N concentration and a linear increase

($P < 0.01$) in mean rumen VFA and acetate concentrations. The mean concentration of rumen propionate in sheep fed all FPE supplemented diets was greater (2.2 vs. 1.78 mmol/dL; $P < 0.05$) than Control, but the mean ratio of rumen acetate to propionate in sheep fed 5 and 10 g/kg diets was lower (2.6 vs. 2.9; $P < 0.05$) than that of Control sheep. In conclusion, FPE supplemented at 5-10 g/kg of concentrate improved feed intake, digestibilities of DM, OM and NFE, N metabolism, and rumen fermentation indices of sheep.

Key Words: persimmon, digestibility, sheep

W447 Prediction of rumen pH and digestibility of diets containing soybean hulls fed to ram lambs by the Small Ruminant Nutrition System. R. S. Gentil^{*1}, I. Susin¹, A. Cannas², A. V. Pires¹, C. Q. Mendes¹, E. M. Ferreira¹, G. H. Rodrigues¹, A. S. Atzori², and L. O. Tedeschi³, ¹Escola Superior de Agricultura Luiz de Queiroz (ESALQ)/University of São Paulo, Piracicaba, São Paulo, Brazil, ²University of Sassari, Sassari, Sardinia, Italy, ³Texas A&M University, College Station.

The Small Ruminant Nutrition System (SRNS) predicts feed values based on carbohydrate and protein fractions and their digestion rates, forage, concentrate and liquid passage rates, microbial growth, and physically effective fiber (peNDF). Data from four experiments with lambs were used to compare observed OM digestibility (OMD), NDF digestibility (NDFD), and pH with predictions made by the SRNS model v. 1.8.7. All experiments were designed to study soybean hulls (SH), a byproduct that is rich in digestible fiber but poor in peNDF. SH substituted corn meal in experiments 1, 2 and 3 and coastcross hay in experiment 4. To compare OMD and NDFD estimates with measured values, two values of degradation rate of B2 carbohydrate fraction (potentially digestible NDF) of SH (kd = 8, as in the SRNS feed library, and 14%.h⁻¹) were used. In the SRNS the kd of B2 carbohydrate fraction is reduced if pH decreases below 6.2. Thus, OMD and NDFD were predicted by using the rumen pH predicted by the SRNS (pH = 5.425 + 0.04229 × peNDF) or a fixed value of 6.46. The digestibility predictions were more precise and accurate when kd was assumed to be 14%. h⁻¹ and fixed pH were used (OMD: mean bias (i.e. observed-predicted values; MB) = 0.57%, r² = 0.70 and root of mean square prediction error (RMSPE) = 3.05%; and for NDFD: MB = 2.25%, r² = 0.52, RMSPE = 5.24%). Rumen pH was slightly overpredicted (MB = -0.03, r² = 0.61, RMSPE = 0.17%). Thus, the SRNS predictions had good precision and accuracy for rumen pH, while OMD and NDFD digestibility were correctly predicted only if the kd of the B2 carbohydrate fraction of SH was greater than that reported in the SRNS feed library and not reduced when pH decreased.

Key Words: digestibility, rumen pH, SRNS

W448 Okara as a protein supplement for early lactating ewes. L. B. Harthan^{*} and D. J. C. Cherney, Cornell University, Ithaca, NY.

Livestock producers must use cost-efficient feedstuffs if they are to remain profitable in the face of decreasing market prices and increasing feed prices. The objective was to evaluate the feeding value of wet okara, waste pulp remaining after production of soy milk, as a protein supplement for lactating ewes with twin lambs. A 4 × 4 Latin square replicated twice was conducted to examine the influence of concentrate mix (okara or not) and type of forage (silage or hay) on ewe milk composition and growth of lactating lambs. Ewes (multiparous; 55 to 74.8 kg) were 12.5 ± 3.5 DIM, and were raising twins. The 4 diets were formulated to have the same TDN (% of DM). Treatment periods were 14 days (7 days adaptation and 7 days collection), and ewes were fed

1 of 4 diets: a wheat middling and corn concentrate with mixed grass hay (TSH), okara and corn with mixed grass hay (OSH), soybean and wheat middlings fed with hay crop silage (TSS), and okara and corn with hay crop silage (OSS). Forages were fed separately from concentrate mixes. Ewes fed hay diets (TSH and OS) had lower forage DM intakes than ewes fed hay crop silage (TSS and OSS; $P > 0.05$). Intake of okara supplement was much higher ($P < 0.05$) with OSH (3.64 kg/d) than with OSS (1.70 kg/d) possibly a result of the high moisture content of the okara. There was no difference in supplement intake between TSH and TSS. Despite differences in DMI, there were no differences among diets for either ewe daily gain or lamb daily gains. There were no differences in ewe milk compositions among the diets. Based on similar ewe growth efficiencies, and average weekly gain of lambs, okara is an effective source of protein for lactating ewes.

Key Words: okara, protein, lamb

W449 Use of pinto bean waste on finishing hair-type lambs. G. Villalobos, F. Castillo*, D. Dominguez, H. Castillo, and J. A. Ortega, *Universidad Autonoma de Chihuahua, Chihuahua, Chihuahua, Mexico.*

Feeds price increment has obliged sheep producers to look for new alternatives in animal feeding; one of them is waste pinto bean grain. The objective was to evaluate the effect of three waste pinto bean grain levels (in concentrate dry matter) on dry matter intake (DMI), average daily gain (ADG) and gain efficiency (GE) of finishing hair lambs. Treatments were: Control (C= 0%), low waste pinto bean (LWB= 12.5%) and high waste pinto bean (HWB= 25%). Seventy two crossbred hair lambs (Dorper × Pelibuey and Kathadyn × Pelibuey) were used (36 females and 36 males), all lambs being twins, with 18.69 ± 3.89 Kg initial body weight and 75 ± 6 d old. Lambs were fed ad libitum with isoenergetic and isonitrogenous (2.6 Mcal/Kg ME; 17.9% CP) diets (80:20 concentrate:forage ratio) during 70 d, with an adaptation period of 18 d. Lambs were assigned to blocks by initial body weight (3 lambs per block, 4 female blocks and 4 male blocks by treatment) and then randomly assigned to the treatments (C, LWB and HWB; n= 24 per treatment) and were weighted every 14 d for ADG. In the last 5 d of each period DMI was measured for each block and then GE was estimated. Data for DMI, ADG and GE was analyzed with PROC MIXED in a completely random block arrangement where the treatment, gender and their interaction effects were evaluated, likewise a tendency analysis was made for each variable. For DMI (Kg) a quadratic effect was found ($P < 0.05$), but treatments were not different ($P = 0.0657$) (C= 1.22, LWB= 1.14 and HWB= 1.05). Data for ADG (Kg) showed a quadratic response for each treatment ($P < 0.05$) (C=0.26, LWB=0.23 and HWB=0.21) during the test. Final body weight lsmeans (Kg) were C= 37.67, LWB= 34.22 and HWB= 33.27. For GE (Kg) a clear general tendency was not found, with no differences between treatments ($P = 0.6001$) during the test (C= 6.53, LWB= 6.94 y HWB= 6.94). Gender and its interaction treatment by gender effect were not found ($P > 0.05$) for any variable. The best productive performance of treatments in this research was found for C, so that the waste pinto bean grain use on finishing hair lambs is not a recommendable alternative for this productive stage.

Key Words: hair lambs, waste pinto bean grain, feedlot lambs

W450 Effect of cull-chickpeas on apparent digestibility and energy concentration of feed in growing Pelibuey sheep. A. Estrada-Angulo*^{1,4}, H. Bernal-Barragán^{2,4}, M. A. Cerrillo-Soto^{3,4}, E. Gutiérrez-Ornelas^{2,4}, A. S. Juárez-Reyes^{3,4}, J. F. Obregon^{1,4}, J. J. Portillo-Loera^{1,4}, and F. G. Rios^{1,4}, ¹FMVZ-Universidad Autonoma de Sinaloa, Culiacan, Sinaloa, Mexico, ²FA-Universidad Autonoma de Nuevo Leon, Monter-

rey, Nuevo Leon, Mexico, ³FMVZ-Universidad Juárez del Estado de Durango, Durango, Durango, Mexico, ⁴Red Internacional de Nutrición y Alimentación en Rumiantes, Culiacán, Sinaloa, Mexico.

A study was performed to determine the effect of cull chickpeas (CCP) substituting corn-soybean meal on apparent digestibility and energy concentration in growing sheep. Five Pelibuey males (30.0 ± 1.1 kg BW) were used in a 5 × 5 Latin square design with 6-day adjustment and 4-day collection phases. Experimental diets consisted of: 1) control; Sudan hay (10%), whole corn grain (67.6%), soybean meal (13.1%), sugarcane molasses (6%), sodium bicarbonate (0.6%) and mineral premix (2.7%); 2) CCP15; CCP (15%), whole corn grain (58.1%), soybean meal (7.6%); 3) CCP30; CCP (30%), whole corn grain (48.5%), soybean meal (2.2%); 4) CCP45; CCP (45%), whole corn grain (35.7%); and 5) CCP60, CCP (60%), whole corn grain (20.7%). All diets were isoenergetic (3.60 Mcal of DE/kg). Crude protein content for treatments 1, 2 and 3 was 16.0% while CP content for treatments 4 and 5 was 17.2 and 19.3%, respectively. Dry matter intake was adjusted to 1000 g/head/day (500g at 0800; 500 g at 1500). Fecal and feed samples were oven dried and analyzed for DM, OM, CP, and apparent digestibility of DM. Digestible energy content (Kcal/kg) was calculated by: 43.97 (digestible DM %) - 94. Data were analyzed by ANOVA. No treatment effects ($P > 0.05$) were registered in DM fecal excretion (140.6, 139.7, 148.4, 150.3, and 150.3 g/d) or apparent DM digestibility (85.9, 86.0, 85.2, 85.0 and 85.0%) for Control, CCP15, CCP30, CCP45 and CCP60, respectively. Meanwhile, neither the DE concentration (3.68, 3.69, 3.65, 3.64 and 3.64 Mcal/kg DM) nor the observed/calculated DE ratio (1.02, 1.03, 1.01, 1.01, and 1.01) differed ($P > 0.05$) among treatments. Data suggested that a whole corn grain-soybean meal mixture can be substituted up to 60% with CCP without affecting apparent digestibility of DM and energy concentration in diets for growing Pelibuey sheep.

Key Words: hair sheep, cull chickpeas, apparent digestibility

W451 Fiber digestibility of a finishing lamb diet supplemented with Fibrozyme. D. Domínguez, J. E. Cruz*, G. Villalobos, H. Castillo, L. Durán, E. Santellano, and L. Carlos, *Universidad Autónoma de Chihuahua, Chihuahua, Chihuahua, México.*

Fibolytic enzymes can enhance rumen microbial enzyme activity under low ruminal pH conditions improving fiber digestion. This study evaluated the effect of Fibrozyme addition on fiber digestion of a finishing lamb diet. Six crossbreed lambs (Charolais × Pelibuey; 30 ± 6.1 kg) fitted with ruminal cannula were individually housed and randomly assigned to three levels of Fibrozyme (Alltech Inc.): 0.0 (T-0.0), 0.1 (T-0.1) y 0.2 g/kg of body weight (T-0.2) added to concentrate. The experimental design was a replicated 3 × 3 Latin square. Lambs were fed ad libitum with a diet containing 2.9 Mcal ME/kg DM and 15.9% CP, based on 20% alfalfa hay and 80% concentrate (% DM). Each experimental period last 17 d, with an adaptation phase of 7 d. Dry matter intake (DMI) was determined daily and individually from 8th to 12th d. Ruminal pH was determined on 13th d at 0, 1, 2, 4, 8, 12, 18 and 24 h after morning feeding. Fecal samples were taken on 15th to 17th d, to determine fiber digestibility using indigestible ADF. Content of NDF and ADF were sequentially determined in period composite samples of forage, concentrate, and fecal grabs. Dry matter intake and digestibility data were analyzed with PROC GLM, while ruminal pH data were analyzed as repeated measurements on time using PROC MIXED. DMI was similar among treatments (1.44, 1.48 and 1.48 kg, respectively; $P > 0.05$). Rumen pH for all treatments was lower than 6.0 during 14 h (from 4th to 18th h after feeding). Dry matter digestibility was not affected by treatments (76.6, 75.1, and 77.6%, respectively; $P > 0.05$). However, NDF and ADF digestibility was higher for T-0.2 vs.

T-0.0 and T-0.1 (15.0 vs. 12.7 and 8.9%; and 17.3 vs. 11.2 and 13.3%, respectively; $P < 0.05$). Hemicellulose digestibility was similar among treatments (14.4, 8.8 and 14.7%, respectively; $P > 0.05$). Adding Fibrozyme at 0.2 g/kg of body weight to finishing lambs diet improved fiber digestibility.

Key Words: Fibrozyme, fiber digestibility, hair lambs

W452 Effect of variety and maturity state of oat hay on performance of ewe lambs. D. Domínguez¹, S. Ramírez*¹, J. J. Salmerón², R. González², G. Villalobos¹, J. A. Ortega¹, and L. Carlos¹, ¹Universidad Autónoma de Chihuahua, Chihuahua, Chihuahua, México, ²INIFAP, Cuauhtémoc, Chihuahua, México.

Oat hay is an important forage source in the sheep industry of Chihuahua, México. This study evaluated the effect of genotype and maturity stage on nutritional value of oat hay and their effect on performance of ewe lambs. Karma (K), Cevamex (C) and Bachiniva (B) oat varieties were cultivated under non irrigated conditions and harvested at soft-dough (SDS) and hard grain stage (HGS). Ninety hair ewe lambs of commercial crosses with an initial average weight of 30.2 ± 2.5 kg were randomly assigned to six treatments (n=15, 5 pens and 3 lambs per pen) in a 3×2 factorial design. Animals were fed ad libitum a 80:20 forage:concentrate diet (% DM) containing 2.4 Mcal ME/kg DM and 16.0% CP. Production of DM per hectare (DM/ha), and content of CP, NDF, ADF, and ADL were determined for oat varieties. Dry matter intake (DMI) was determined daily per pen, while body weight, average daily gain (ADG) and gain efficiency (GE) were recorded individually every 14 d, and apparent digestibility of DM, CP and NDF at the final of the study. Data was analyzed as a complete random blocking design in a factorial arrangement, using PROC MIXED. There was no effect of oat variety on DM/ha, but it was higher for HGS (5,211 vs. 4,293 kg/ha; $P < 0.05$). Genotype and maturity stage did not affect chemical composition. Content of CP, NDF, ADF and ADL for SDS and HGS were: 11.5 and 10.2; 51.8 and 51.1; 28.4 and 27.7; and 2.75 and 2.90%, respectively. DMI, final body weight, ADG and GE were not affected by treatments, average for SDS and HGS were: 1.29 and 1.22; 36.4 and 35.5; 0.116 and 0.110 kg; and 14.2 and 14.3, respectively. Dry matter and NDF digestibility was higher ($P < 0.05$) for C-SDS (67.6 and 59.5%), while CP digestibility was similar among treatments. Harvesting and feeding

oat hay at SDS showed small benefit on nutritive value of forage, but did not improve animal performance.

Key Words: oat variety, maturity stage, ewe lambs

W453 Influence of substitution of alfalfa hay for dried grape pomace on performance and carcass characteristics of growing sheep. Y. Petriz-Celaya*, J. F. Calderon-Cortes, C. Perez, M. F. Montaña, and A. Plascencia, *Instituto de Investigaciones en Ciencias Veterinarias, Universidad Autónoma de Baja California, Mexicali 21100, Baja California, México.*

The comparative feeding value of unfermented dried grape pomace (DGP; 1.09 Mcal/kg of DE, 12% CP) was evaluated in an 84-d feeding trial involving 16 individually fed ewe lambs (17.2 kg initial wt). In the experimental diets DGP replaced (DM basis) 0, 10, 20 or 30% of late bloom alfalfa hay. Lambs were allowed ad libitum access to feed and water. Feed intake and orts were recorded daily. Initial and final shrunk weights were obtained following a 12-h withdrawal of feed. The trial analyzed as a randomized block design experiment. Substitution of DGP for alfalfa hay did not affect ($P > 0.10$) ADG, DMI/ADG, hot carcass wt, and dressing %, however DMI was slightly higher with T2 (10%) and T4 (8%) than T1, and ribeye muscle area was 11% greater with T4 than with T1. We conclude that DGP can replace up to 30% of late bloom alfalfa hay in diets for lambs without adversely affecting animal growth and carcass characteristics.

Table 1. Effect of the substitution of alfalfa hay by dried grape pomace on growing sheep performance and carcass characteristics

Grape pomace, %	T1, 0	T2, 10	T3, 20	T4, 30	SEM
Final wt, kg	26.16	26.40	25.32	26.28	0.94
ADG, g	0.11	0.11	0.10	0.11	0.01
DMI, kg/d	1.15a	1.27b	1.12a	1.24b	0.03
DMI/ADG	10.85	11.66	11.63	11.62	0.55
Hot carcass wt, kg	11.5	13.5	12.5	13.3	0.74
Dressing, %	44.17	51.49	49.35	50.75	3.07
Ribeye muscle, cm ²	4.09a	3.78a	3.84a	4.53b	0.19

^{ab}Means in the same row that do not have a common superscript differ ($P < 0.05$).

Key Words: dried grape pomace, sheep, carcass characteristics