

Ruminant Nutrition: Small Ruminant

W397 Influence of *Salix babylonica* and *Leucaena leucocephala* extracts on ruminal fermentation activities in growing lambs. R. P. Hernández¹, A. Z. M. Salem*¹, R. R. Rojo¹, and D. L. Camacho², ¹Universidad Autónoma del Estado de México, Centro universitario UAEM – Temascaltepec, Km 67.5 Carr. Toluca – Tejupilco Estado de México CP 51300, México, ²Universidad Autónoma de Guerrero, Facultad de Medicina Veterinaria y Zootecnia, Carretera Altamirano – Iguala Km 3 CP 40660 Cd. Altamirano Guerrero, México.

Sixteen Katahdin × Pelibuey crossbreed male lambs 3 to 4 mo of age and 24 ± 0.3 kg BW were used to study effects of administration of extracts rich in secondary compounds from *Salix babylonica* (SB) and *Leucaena leucocephala* (LL) on ruminal pH and protozoal count as well as total and individual VFA and ammonia N concentrations. After 2 wk of adaptation consuming a total mixed ration (TMR; 219 and 141 g/kg of crude protein and NDF, respectively), lambs were weighed and distributed by BW into 4 groups of 4 lambs/group in a completely randomized design with: Control group TMR; SB group TMR (as Control plus *S. babylonica* extract at 30 mL/ lamb/d); LL group TMR (as Control plus *L. leucocephala* extract at 30 mL/ lamb/d); SBLL group TMR (as Control plus 30 mL/lamb/d of *S. babylonica* and *L. leucocephala* extracts in a (1:1, v:v) mixture) for a 63-d experiment. Data were analyzed using the MIXED procedure for repeated measures. A weekly stock volume of the individual extracts as well as their 1:1 mixture were prepared for daily administration. Extracts were orally administered before the 08:00 h feeding to each lamb. pH values were increased ($P = 0.004$) with SBLL (1:1, v:v) compared with other groups. Protozoal amounts were not affected ($P = 0.531$) by the administration of extracts to lambs. Individual extracts (SB or LL) increased ($P = 0.0435$) the propionic acid concentration versus control or SBLL groups. Ruminal acetic acid ($P = 0.5053$) and total VFA ($P = 0.2709$) were not affected by extracts administration, while butyric acid ($P = 0.0435$) and ammonia N concentrations ($P = 0.032$) were increased with the SB or LL extracts vs. SBLL or control. In conclusion, individual extracts of SB or LL had effective impacts on ruminal fermentation activities and increased the propionic acid concentrations that suggested an improvement in animal daily gain.

Key words: extracts, lambs, ruminal fermentation

W398 Effect of live yeast *Saccharomyces cerevisiae* (strain Sc 47) on ruminal parameters of growing Mehraban lambs. N. Baleghi¹, A. Taghizadeh², A. FarahAvar³, and H. Khalilvandi-Behroozyar*^{3,4}, ¹Islamic Azad University, Maragheh Branch, ²University of Tabriz, ³University of Tehran, ⁴Urmia University.

Yeast (*Saccharomyces cerevisiae*) products may exert beneficial effects on ruminant productivity by either increasing fermentability of fiber and/or allowing rumen microbes to more effectively metabolize end products of ruminal starch fermentation. The objective was to evaluate the possible effects of live yeast on different ruminal parameters in fattening Mehraban lambs. Twelve male lambs (average BW 34 ± 4.2 kg) randomly assigned to 3 groups: a) control, without additive b) 1 g/day/head and c) 1.5 g/day/ head *S. cerevisiae* (strain Sc 47) with 8 × 10⁹cfu per gram. Additives supplemented via gelatin capsules to TMR ration (alfalfa hay, wheat straw, barley grain, canola meal, wheat bran, Mineral-vitamin mix, calcium carbonate and salt) formulated for 200 g/d weight gain using CNCPS-S. Animals fed experimental rations for a period of 70 d in 2 equal meals. Ruminal fluid samples were taken from rumen at 4 h after morning meal in the last day of experi-

ment to determine rumen pH and concentration of NH₃-N and VFA. Gas chromatography was used to determine VFA profiles equipped with a packed column. Protozoal counts were determined using light microscopic numeration with hemacytometer. Data were analyzed by GLM procedure of SAS 9.1 with CRD design and Duncan test ($P \leq 0.05$). Treatments were failed to have statistically significant effects on measured variables, but there was a tendency ($P \leq 0.1$) for higher total VFA, acetate and ammonia nitrogen concentrations and protozoa counts in lambs receiving 1.5 g/head/ day compared with control.

Table 1. Characteristics of ruminal fermentation in sheep fed *Saccharomyces cerevisiae*

	1	2	3	SEM
Mean pH	6.32	6.38	6.61	0.081
Total VFA mM	66.91	76.00	84.1	4.85
Acetate (%)	39.77	51.71	52.85	9.34
Propionate+Isobutyrate	19.72	12.11	20.16	5.09
Butyrate (%)	6.15	10.81	9.52	1.86
Valerate (%)	0.75	0.82	1.02	0.01
Isovalerate (%)	0.52	0.55	0.55	0.01
NH ₃ -N (mg/dl)	7.21	7.95	8.22	0.65
Protozoal count (×10 ⁴ /mg ruminal fluid)	54.21	74.86	85.71	15.61

1: control, 2: 1 g/day/head of yeast, 3: 1.5 g/day/head of yeast.

Key words: *Saccharomyces cerevisiae*, ruminal parameters, Mehraban lambs

W399 Intake and digestibility by wethers fed a fresh ryegrass-based diet intraruminally infused with *Acacia mearnsii* tannins. F. Hentz*¹, C. J. Härter², G. V. Kozloski¹, S. C. Ávila¹, and D. S. Castagnino², ¹Universidade Federal de Santa Maria, Santa Maria, RS, Brazil, ²Universidade Estadual Paulista, Jaboticabal, SP, Brazil.

Eight Polwarth × Texel wethers (30 ± 4.8 kg BW), housed in metabolic cages and offered fresh ryegrass (*Lolium multiflorum*) ad libitum (10% refusals) were used in a 4 × 4 Latin Square-designed experiment to evaluate the effects of infusing *Acacia mearnsii* tannin extract (containing 0.625 g/g of condensed tannins) on intake and whole tract apparent digestibility. Treatments consisted of no tannin (0) or intraruminal infusion of 20, 40 or 60 g tannin/kg of ingested DM, according to the DMI of the previous day. Experimental periods lasted for 15 d (10 d adaptation, 5 d collection periods). Feed, orts and fecal output were recorded daily on d 10 to 15 and samples collected and composited within animal and period. Data was analyzed using the MIXED procedures of SAS. When the treatment effect was significant ($P < 0.05$) or tended to be significant ($0.05 < P \leq 0.10$), the means of different treatments were compared by orthogonal contrast (0 vs. tannins), and the effect of levels of tannin infusion was analyzed by regression for linear and quadratic effects. There were no quadratic effects for any variable. Total DM, OM and digestible OM intake and digestibility were greatly reduced ($P < 0.05$) with tannin infusion (Table 1). Moreover, this negative effect increased linearly at increased levels of tannin infusion for OM digestibility and digestible OM intake ($P < 0.05$). Although N intake tended to decrease ($P = 0.077$) and N digestibility decreased ($P < 0.01$) with tannin infusion, they did not vary ($P > 0.05$) within the levels of tannins. In conclusion, dietary inclusion

of *Acacia mearnsii* extract in concentrations above 20 g/kg of DMI negatively affect nutrients supply to wethers fed a temperate grass-based diet.

Table 1. Intake and total tract digestibility by wethers fed a fresh ryegrass-based diet intraruminally infused with *Acacia mearnsii* tannins (n=8 per treatment)

Item	0	20	40	60	SEM	(P > F)	Linear
						0 vs.	regression
						tannins	(tannins)
Total intake, g/d							
DM	639	556	423	389	36.4	0.021	0.101
OM	573	492	374	344	33.0	0.019	0.106
N	21.1	19.9	16.1	13.7	1.29	0.077	0.133
Digestible OM	450	357	235	213	29.6	0.009	0.047
Apparent digestibility							
DM	0.74	0.69	0.60	0.58	0.01	0.003	0.034
OM	0.78	0.72	0.63	0.61	0.01	0.001	0.048
N	0.78	0.72	0.68	0.63	0.01	<0.001	0.301

Key words: condensed tannins, digestion, nutrients supply

W400 Effect of sorghum grain supplementation on glucose metabolism 2: Ovine. M. Aguerre*¹, C. Cajarville², A. L. Astessiano³, M. Carriquiry³, and J. L. Repetto¹, ¹Departamento de Bovinos, Facultad de Veterinaria, Universidad de la República, Montevideo, Uruguay, ²Departamento de Nutrición Animal, Facultad de Veterinaria, Universidad de la República, Montevideo, Uruguay, ³Departamento de Producción Animal y Pasturas, Facultad de Agronomía, Universidad de la República, Montevideo, Uruguay.

Corriedale × Milchschaaf lambs (n = 12; 45.6 ± 6.2 kg), blocked by BW, were used to evaluate the effects of sorghum grain supplementation (0 vs. 1.5% BW, S0 vs. S1.5, respectively) on plasma glucose, insulin and glucagon concentrations, and on hepatic expression of genes related to glucose metabolism. Lambs were fed ad libitum fresh *Lotus corniculatus* (31.8% DM, 12.4% CP, 41.8% NDF). At the end of treatments (31 d) blood samples were taken every 2h from 0 to 6h post-supplementation, to determine glucose by colorimetry and insulin and glucagon by RIA. Liver biopsies were collected to quantify abundance of pyruvate carboxylase (PC), phosphoenolpyruvate carboxykinase (PCK-1) and insulin receptor (IR) mRNA by SYBR-Green real time PCR, using hypoxanthine-guanidine phosphoribosyltransferase as endogenous control. Data were analyzed with MIXED procedure (SAS). No differences on glucose levels were found between treatments (60.0 vs. 58.3 ± 5.61 mg/dL, P = 0.756; for S0 and S1.5 respectively) and the shape of the curves was similar over the 6h post-supplementation. Mean insulin concentrations were not different between treatments (10.1 vs. 8.80 ± 2.04 µUI/mL, P = 0.404; for S0 and S1.5 respectively), recording a 2-fold increase from 0 to 2h in S0 group (5.55 vs. 12.3 ± 2.51 µUI/mL, P = 0.028) and from 0 to 4h in S1.5 group (6.06 vs. 14.2 ± 2.88 µUI/mL, P = 0.026) returning to baseline at 6h in both groups. Glucagon concentrations were lower in S0 than S1.5 (50.1 vs. 63.7 ± 5.27, P = 0.053) but no interaction between hour and treatment was found (P = 0.415). Plasma glucagon tended to be negatively correlated with OM intake (r = -0.52, P = 0.101). The IR and PC mRNA did not differ between treatments (11.3 vs. 12.8 ± 2.23, P = 0.663 and 38.9 vs. 35.9 ± 7.82, P = 0.758 for S0 and S1.5 respectively), but PCK-1 mRNA was greater in S0 than S1.5 (11.2 vs. 8.60 ± 2.66, P = 0.048). In conclusion no major changes were observed in the glucose metabolism

of lambs after sorghum grain supplementation. The results were consistent with a decrease in OM intake in supplemented lambs.

Key words: grazing sheep, hormones, liver mRNA

W401 Inter-individual variability in in vitro methane production by ruminal microorganisms from sheep fed different diets. M. J. Ranilla*^{1,2}, M. L. Tejido^{1,2}, C. Saro^{1,2}, and M. D. Carro^{1,2}, ¹Dpto. Producción Animal, Universidad de León, León, Spain, ²IGM (CSIC-ULE), Finca Marzanas s/n, Grulleros, León, Spain.

A large variability in methane emissions between individual sheep and cattle has been repeatedly reported. The aim of this study was to investigate the inter-individual variability in methane production in batch cultures of ruminal microorganisms (BCRM) inoculated with ruminal fluid from sheep fed different diets. Our hypothesis was that potential differences between inocula may be masked by the homogeneous conditions (pH, temperature, retention time) in the BCRM. Six rumen-fistulated sheep (S1 to S6) were fed 4 diets differing in their forage:concentrate ratio and type of forage in a partially replicated 4 × 4 Latin square design. In each period, ruminal fluid from each sheep was used to inoculate BCRM containing 500 mg of the same 4 diets as substrate. Cultures were incubated at 39°C, and methane production was measured after 8 and 24 h of incubation. Mean values of methane production for each sheep (pooled values for all diets and substrates) at 8 h of incubation ranged from 299 to 519 µmol, with a coefficient of variation of 0.241. Methane production at 24 h of incubation was rather consistent in BCRM inoculated with ruminal fluid from S1, S4, S5 and S6 (mean values of 650, 716, 669 and 671 µmol, respectively), with a mean value of 677 µmol and a coefficient of variation of 0.041. Values for S2 and S3 were 552 and 858 µmol, respectively. When data from all 6 sheep were pooled together, the mean value (686 µmol) was similar to the one obtained for S1, S4, S5 and S6, but the coefficient of variation increased to 0.155. Because the study was conducted in vitro, differences between BCRM inoculated with ruminal fluid from different sheep fed the same diet can only be attributed to differences in microbial populations in the inocula and the survival of microbes over the incubation. These results support previous observations on the considerable variation in the amount of methane produced by individual animals, despite of the homogeneous incubation conditions in the BCRM, and illustrate the importance of using mixed inocula from more than 1 single animal for in vitro studies.

Key words: methane, in vitro ruminal fermentation, inter-individual variability

W402 Influence of sugar cane molasses levels on apparent digestibility of diets for finishing lambs. L. R. Flores*¹, J. J. Lomeli¹, I. A. Vazquez¹, I. Quintero¹, J. E. Borbolla¹, J. E. Guerra², and R. Barajas¹, ¹FMVZ-Universidad Autónoma de Sinaloa, Culiacán, Sinaloa, México, ²FA-Universidad Autónoma de Sinaloa, Culiacán, Sinaloa, México.

Four Katahdin lambs 24.8 ± 0.9 kg were used to determine the influence of sugar cane molasses levels on apparent digestibility of diets for finishing lambs. In agreement with a Latin Square Design lambs were assigned to the following dietary treatments: 1) Corn-soybean meal based-diet with 87% of concentrate and 13% of roughage (16% CP; 2.45 Mcal of DE/kg), and no cane molasses added (CTRL); 2) Diet similar to CTRL with 8% of sugar cane molasses substituting corn in dry matter basis (M8); 3) Diet similar to CTRL with 16% of sugar cane molasses substituting corn in dry matter basis (M16); and 4) Diet

similar to CTRL with 24% of sugar cane molasses substituting similar proportion of corn in the dry matter of the diet (M24). Data was analyzed by ANOVA; CTRL (0 molasses added) vs. all other treatments (8, 16, and 24% of molasses) were compared by orthogonal contrast; linearity of increasing molasses levels on dietary digestibility was tested using polynomial procedures. Molasses inclusion at any tested-level increased ($P < 0.05$) fecal excretion of DM and organic matter. CP excretion was increased linearly ($P < 0.05$) as cane molasses level was augmented in the diet. Cane molasses inclusion decreased ($P < 0.05$) apparent digestibility of dry matter (80.3 vs. 75.7%), organic matter (82.0 vs. 77.1%), and crude protein (78.0 vs. 70.6%). Observed/expected CP digestibility was 9% lower in molasses diets compared with CTRL ($P < 0.05$). By substitution method using corn as reference, energetic value of sugar cane molasses was estimated to be 2.92 Mcal/kg of DM that is 85% of its expected value, and complete digestive tract digestibility of crude protein of Molasses was calculated in 17%. It is concluded, that sugar cane molasses substitution for corn in finishing diets for lambs, decreases diet-digestibility, and the expected energy content of sugar cane molasses would be near of 2.9 Mcal of DE kg of DM⁻¹.

Key words: digestibility, lambs, sugar cane molasses

W403 Influence of additional tannins-extract level on feedlot-performance of finishing lambs. R. Barajas*¹, B. Ortiz¹, A. Camacho¹, N. E. Villalba², L. R. Flores¹, J. J. Lomeli¹, and J. A. Romo¹, ¹FMVZ-Universidad Autónoma de Sinaloa, Culiacán, Sinaloa, México, ²Agrícola Ganadera Mojolo, Culiacán, Sinaloa, México.

An experiment was conducted to determine the influence of additional tannins-extract level on feedlot-performance of finishing lambs. Thirty 6 weaned lambs 24.5 ± 0.36 kg, 18 lambs of 3/4 Katahdin x 1/4 Pelibuey breed ; and remainder 18 lambs of 3/4 Dorper x 1/4 Pelibuey Breed, were used. Animals were blocked by breed and weight and placed in groups of 3 in 12 elevated pens. Lambs were assigned in a complete randomized block design to be fed with a 5:95 roughage:concentrate corn-soybean meal based-diets (14% CP; 2.07 Mcal of NEm/kg) containing DM basis 0, 0.3 or 0.5% of a tannins-extract (TE). Tannins extract was supplied from a blend of condensed-tannins of quebracho trees, with soluble-tannins of cheese-nut trees (Silvafeed-Bypro; SilvaTeam-Inudor, S.A., Argentina). Lambs fed with 0.3% tannins diet had the highest final weight ($P = 0.02$), and a quadratic response ($P < 0.01$) of final weight to tannins-extract level was observed. Final weight values were 36.7, 38.8 and 37.7 kg, for tannins-extract levels of 0.0, 0.3, and 0.5%, respectively. Average daily gain was improved in 12% ($P = 0.02$) by 0.3% of tannins-extract level compared with no additional tannins treatment. ADG of lambs fed 0.3% of TE was 7% higher than observed in 0.5% of TE fed-lams ($P = 0.08$). Average daily gain shown a quadratic response ($P = 0.03$) to tannins-extract level in the diet, mean values were 0.32, 0.35, and 0.33 kg/day, for treatments with 0.0, 0.3, and 0.5% of TE, respectively. Dry matter intake and gain/intake ratio were not affected by tannins extract level ($P > 0.20$). It is concluded, that addition of an extract-blend of condensed and soluble tannins in concentrations close to 0.3% of dietary DM improves performance of finishing lambs

Key words: feedlot-performance, lambs, tannins