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***In vitro* evaluation of olive stones and sorghum used as forage in ruminant diets**N. Kellali<sup>1,2</sup>, N. Merino<sup>2,3</sup>, E. Mata-Nicolás<sup>2,3</sup>, I. Mateos<sup>2,3</sup>, C. Saro<sup>2,3</sup>, N. Lakhdara<sup>1</sup> and M.J. Ranilla<sup>2,3</sup><sup>1</sup>Institute of Veterinary Sciences (University of Mentouri Brothers), Road of Guelma, 25100 El Khroub, Algeria, <sup>2</sup>Universidad de León, Campus Vegazana, s/n, 24071 León, Spain, <sup>3</sup>Instituto de Ganadería de Montaña (CSIC-Universidad de León), Finca Marzanas, s/n, 24346 Grulleros, Spain; mjrang@unileon.es

Tannins are secondary compounds with anti-nutritional factors. If they are present in feed ingredients they could affect ruminal fermentation of the diet. A trial was designed to test the effect of tannins present in sorghum and olive stones when these ingredients are included in diets and incubated *in vitro* for 24 hours. Two diets were formulated including 60% sorghum or olive stones, 22% wheat bran, 10.2% corn, 7.2% soybean meal and 0.4% vitamin-mineral supplement. Diets were incubated either with or without the addition of polyethylene glycol (PEG) to assess fermentation end products. Volume of gas produced was measured. Methane and volatile fatty acids were assessed by gas chromatography and disappearance of dry matter and neutral detergent fibre were determined. When sorghum was included in the diet, ml of gas produced increased by 15.8% ( $P<0.05$ ) when PEG was added to incubation medium. When olive stones were used as ingredient of the diet gas and methane produced increased by 29.7 and 30.4% respectively ( $P<0.05$ ) when PEG was added. No effect of PEG was detected for any of the diets in the volatile fatty acid production or proportions of individual fatty acids with the exception of the proportion of isobutyrate that decreased by 38% ( $P<0.05$ ) when PEG was added and sorghum was included as ingredient of the diet. Disappearance of dry matter or neutral detergent fibre was unaffected by the addition of PEG for both diets. Under the conditions of the present study, the effect of the tannins on ruminal fermentation was strongest in olive stones than in sorghum.

**Preservation of agro-industrial co-products as silage for ruminant feed**K. Paulos<sup>1,2</sup>, C. Costa<sup>2</sup>, J.M.S. Costa<sup>2</sup>, L. Cachucho<sup>3,4</sup>, P.V. Portugal<sup>2</sup>, J. Santos-Silva<sup>2,3</sup>, F. Lidon<sup>1</sup>, M.R. Marques<sup>2</sup>, E. Jerónimo<sup>4,5</sup> and M.T.P. Dentinho<sup>2,3</sup><sup>1</sup>Geobiotec, Departamento de Ciências da Terra, FCT Nova, Lisboa, Portugal, <sup>2</sup>INIAV, Fonte Boa, Santarém, Portugal, <sup>3</sup>CIISA, Avenida Universidade Técnica, Lisboa, Portugal, <sup>4</sup>CEBAL, Centro de Biotecnologia Agrícola e Agro-Alimentar do Alentejo, Beja, Portugal, <sup>5</sup>MED, Instituto Mediterrâneo para a Agricultura, Ambiente e Desenvolvimento, Beja, Portugal; katia.paulos@iniav.pt

Every year, considerable amounts of agro-industrial co-products are produced in Portugal that can be used in animal feed, ensuring nutritious and low-cost diets. Sweet potato (SP), brewers' grains (BG), and tomato pomace (TP) are a few examples of co-products that have great nutritional value but must be preserved for usage outside of their production season due to their high moisture content. This research aimed to characterize these co-products chemically and nutritionally and to preserve them as ingredients in silage mixtures. The silages were prepared to contain 40% dry matter (DM) and 14% crude protein (CP). Wheat bran (WB) and grass hay (GH) were added to the mixtures to attain the DM content. Sweet potato has high starch (32.8% DM) and sugar (23.3% DM), and tomato pomace and brewer's grains are good protein sources (19.6 and 29% DM, respectively). So, two silages were prepared: (1) SP/BG silage (30% SP + 35% BG + 20% WB + 15% GH); and (2) SP/TP silage (30% SP + 35% TP + 20% WB + 15% GH). After 4 months of ensiling, well-preserved silages were obtained, with low pH ( $4.11\pm0.03$  and  $3.90\pm0.02$  in SP/BG and SP/TP, respectively),  $\text{NH}_3\text{-N}<10\%$  of total N and soluble N $<50\%$  of total N. The CP level was 15 and 14% in DM in SP/BG and SP/TP silages, respectively. Organic matter digestibility was higher in SP/TP than in SP/BG silage ( $55.33\pm1.23$  vs  $51.77\pm0.50\%$ ). Ensiling these co-products in mixtures is a good method of preserving them, resulting in stable and nutritionally balanced feed for ruminant nutrition. This work is funded by PRD2020 through the FEADER, project SubProMais (PDR2020-101-030988, PDR2020-101-030993) and by National Funds through FCT – Foundation for Science and Technology projects UIDB/05183/2020 (MED) and UIDP/CVT/00276/2020 (CIISA).

**Evaluation of legumes for fermentability and protein fractions using *in vitro* rumen fermentation**B.Z. Tunkala<sup>1</sup>, K. Digiacoimo<sup>1</sup>, P.S. Alvarez Hess<sup>2</sup>, F.R. Dunshea<sup>1,3</sup> and B.J. Leury<sup>1</sup><sup>1</sup>The University of Melbourne, Agricultural Sciences, Parkville campus, 3010, Parkville VIC, Australia, <sup>2</sup>Agriculture Victoria Research, 1301 Hazeldean Road, 3821, Ellinbank VIC, Australia, <sup>3</sup>Faculty of Biological Sciences, The University of Leeds, Leeds, LS2 9JT, United Kingdom; btunkala@student.unimelb.edu.au

A total of eight forage legumes including *Peltophorum pterocarpum*, *Neptunia monosperma*, *Acacia sutherlandii*, *Gliricidia sepium*, *Bauhinia hookeri* and three *Desmanthus* species were collected to assess their *in vitro* fermentability, degradable and undegradable protein fractions using *in vitro* fermentation technique. Soybean meal and lucerne hay were used as control. The total gas production ranged from 12.8 ml/g in *P. pterocarpum* to 127.3 ml/g in soybean meal. There was no difference in the total gas and volatile fatty acid (VFA) production between *Desmanthus* cultivars,  $P < 0.001$ . The total VFA concentration from *G. sepium* (117.7 mM/l) and *A. sutherlandii* (111.3 mM/l) was larger than other legumes except for soybean meal (157.1 mM/l) and lucerne hay (130.4 mM/l),  $P < 0.001$ . The methane gas percentage (1.98 and 2.08%) and total VFA (97.0 mM/l and 96.9 mM/l) were not different between *B. hookeri* and *P. pterocarpum*,  $P < 0.001$ . The maximum *in vitro* digestible crude protein (IVDP) was calculated for soybean meal (91%) and lucerne hay (85%), followed by *A. sutherlandii* (73%) and *G. sepium* (58%),  $P < 0.01$ . *B. hookeri* and *P. pterocarpum* showed a negative IVDP after 4 h incubation and reached 25 and 33% after 24 h, respectively. The percentage of fraction 'a' was larger in JCU9 (55.1% crude protein (CP)), and *G. sepium* (47.2%CP), and lower in *B. hookeri* (1.09%CP) and *P. pterocarpum* (1.48% CP),  $P < 0.001$ . Soybean meal (61.3%CP), lucerne hay (44.9%CP) and *A. sutherlandii* (38.6%CP) exceeded others in the proportion of fraction 'b', followed by *G. sepium* (27.2%CP) and JCU5 (20.7%CP),  $P < 0.001$ . The unavailable fraction increased with increasing phenolic content and reached more than 94% for both *B. hookeri* and *P. pterocarpum*. The findings indicate the possibility of using *A. Sutherlandii* and *G. Sepium* as a substitute for lucerne hay for their greater protein potential. However, these legumes need to be tested *in vivo* before promoting for further use to confirm the variability reported here.

**Dehydration temperature- effect on physicochemical and nutritional characteristics of byproducts**M. Alves<sup>1</sup>, K. Paulos<sup>2,3</sup>, C. Costa<sup>3</sup>, D. Gonçalves<sup>1</sup>, T. Orvalho<sup>1</sup>, J.M.S. Costa<sup>3</sup>, L. Cachucho<sup>4,5</sup>, J. Santos-Silva<sup>3,4</sup>, E. Jerónimo<sup>5,6</sup> and M.T.P. Dentinho<sup>3,4</sup><sup>1</sup>INOVLINIA, TAGUSVALLEY – Science and Technology Park, 2200-062 Abrantes, Portugal, <sup>2</sup>Departamento de Ciências da Terra, Geobiotec, FCT Nova, 2829-516 Caparica, Portugal, <sup>3</sup>Instituto Nacional de Investigação Agrária e Veterinária, Quinta da Fonte Boa, 2005-424 Vale de Santarém, Portugal, <sup>4</sup>Centro Investigação Interdisciplinar em Sanidade Animal, University of Lisbon, 1300-477 Lisboa, Portugal, <sup>5</sup>Centro de Biotecnologia Agrícola e Agro-Alimentar do Alentejo, IPBeja, 7801-908 Beja, Portugal, <sup>6</sup>Mediterranean Institute for Agriculture, Environment and Development, CEBAL, 7801-908 Beja, Portugal; teresa.dentinho@iniav.pt

The aim of this work was to test the dehydration conditions of sweet potato (SP) and carrot (C) wastes and tomato pomace (TP) with temperature and air speed control for use as animal feed. The effects on colour, water activity ( $a_w$ ), chemical and nutritional composition and cost were evaluated. Carrot was dehydrated at 60, 70 and 80 °C and SP and TP were dehydrated at 70 and 80 °C. Dehydration was conducted until weight loss stabilized. Freeze-dried samples were used as Control for chemical and nutritional composition. Except SP at 70 °C the moisture in all samples was reduced to values below the critical limit that ensures microbial stability. In SP dehydrated at 70 °C the value was 0.7% above the critical limit. However, all samples had a low  $a_w$  ( $\leq 0.35$ ), which suggests microbiological and chemical stability. Organic matter digestibility was not affected by temperature but in SP, starch was significantly reduced (24, 19 and 13% in dry matter in Control, 70 and 80 °C, respectively). The energy cost to process 1 kg of fresh by-products was lower at 60 °C for C (€0.39-0.44), 70 °C for SP (€0.51-0.57) and 80 °C for TP (€0.80), assuming an electricity cost of €0.15/kWh. With these dehydration conditions, it is possible to ensure product stability at a lower cost. In an industrial setting, process, costs can be reduced by increasing the scale of production and with more efficient dehydrators. This work is funded by PRD2020 through the FEADER, project SubProMais (PDR2020-101-030991, 030988, 030993) and by National Funds through FCT-Foundation for Science and Technology projects UIDB/05183/2020 (MED) and UIDP/CVT/00276/2020 (CIISA).