

Ruminant Nutrition: General Ruminant Nutrition

850 Effects of crude glycerol supplementation on in vitro ruminal fermentation and Merino ewes performance. S. J. Meale*¹, S. Ding¹, T. A. McAllister², R. D. Bush¹, D. Palmer¹, and A. V. Chaves¹, ¹Faculty of Veterinary Science, University of Sydney, Sydney, NSW, Australia, ²Lethbridge Research Center, Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada.

The increasing availability of crude glycerol from the biodiesel industry has led to an interest in its use as an energy source in ruminant diets. However, its effects on ruminal fermentation patterns and CH₄ production are unclear and there are no reports on the effect of its inclusion in the diet on wool production or growth in Merino sheep. Thus, the objectives of this study were to determine the effects of increasing levels of crude glycerol on in vitro ruminal fermentation and CH₄ production and DMI, ADG, wool growth and quality in Merino ewes. Crude glycerol replaced whole wheat (DM basis) in the diet at levels of 0, 6 and 12% DM, in both in vitro and in vivo studies. In exp. 1, diets were dried and ground through a 1-mm screen and incubated twice for 24 h. Buffer and rumen liquor were mixed 3:1 and gas production and CH₄ concentration was measured after 6, 12 and 24 h of incubation with pH and IVDMD measured at 24 h. Data from both the in vivo and in vitro experiments were analyzed using the MIXED procedure of SAS. Cumulative gas (mL/g DM) and CH₄ production (mg/g DM) were similar ($P > 0.05$) among dietary treatments. In vitro DMD (%) increased ($P < 0.01$) and pH showed a tendency ($P = 0.07$) to decline, with increasing concentrations of crude glycerol. In exp. 2, 39 Merino ewes were randomly assigned to the 3 treatments (n = 13 ewes/treatment). Diets were available continuously for a 10 wk period through the use of automatic feeders. Ewes were weighed every 7 d. Wool yield was determined on mid-side patches of 100 cm² shorn at d 0 and d 70. Dye-bands were used to determine wool growth. Intake, ADG and G:F were similar among treatments ($P > 0.05$). Neither wool yield nor length were affected by diet ($P > 0.05$). Yet, spinning fineness declined ($P < 0.05$) in ewes fed 6% DM crude glycerol and fiber diameter (μm) showed a tendency ($P = 0.06$) to decline following the supplementation of crude glycerol. This indicates the potential for crude glycerol to be included in the diets of Merino sheep at up to 12% DM with the potential to marginally improve wool quality.

Key Words: Merino ewes, methane, wool production

851 Process development and nutritional evaluation of a supplemental byproduct feed for cattle from expired grocery foods. M. A. Froetschel*¹, C. L. Ross¹, and L. E. Brewer², ¹The University of Georgia, Athens, ²Viridium LLC, Cumming, GA.

An ensiling experiment and a feeding/digestibility trial were conducted in response to a commercial effort to recycle outdated vegetable foods from large scale grocery stores into cattle feed. A representative mixture of vegetable, fruit and bakery refuse from several Atlanta grocery stores was processed into a homogeneous slurry. Pre-ensiled grocery byproduct (GBP) was 5.06 pH and contained 20.8% DM, 85% predicted TDN, 53.7% WSC, 23.5% NDF 14.5% ash, 12.3% CP, 11.9% fat and 17.7% lactic and 2.3% acetic acid. GBP was ensiled in 8L lab silos with pre-ensiling treatments to increase its DM content including 0, 8, 16 and 24% additions of citrus pulp and 2 levels of oven drying (5 replications / treatment). After 8 wk of anaerobic storage all GBP mixtures were effectively preserved and stable for 72 h of aerobic exposure. Ensiled

GBP (100%) was 3.96 in pH, 20.6% DM, 80.1% predicted TDN, 1.7% WSC, 37.6% NDF, 13.8% ash, 14.3% CP, 11.6% fat and 18.6% lactic and 2.7% acetic acid. In the feeding trial, 8 yearling Holstein steers (267 kg BW, SD = 29 kg) were fed increasing dietary concentrations of the GBP (commercially processed as Read-Blend, Viridium LLC) in a replicated 4 × 4 Latin Square designed experiment. Steers were fed 0, 18, 36 and 54% ensiled GBP (DM basis) as part of a total mixed ration (TMR) substituted for a control TMR. The control TMR on a DM basis was 68% wheat silage and 32% concentrate (81% soyhulls, 9.5% soybean meal and 9.5% ground corn). The TMR rations averaged 35.9, 30.7, 26.8, and 23.8% DM with increasing supplemental GBP. Steers were fed rations daily to provide 1.2 times their previous day intake with chromic oxide included as a digestibility marker. Individual intakes were measured daily and BW was determined at wk intervals. Overall, steers exhibited 1.25 kg ADG during the 8 wk feeding trial. DM intake of rations, expressed as a percent of BW, was 2.12, 2.31, 2.23 and 2.07 (SE = 0.05) and increased in a quadratic manner ($P < 0.01$), respectively, with incremental levels of GBP. Supplemental GBP appears to be palatable and digestible as it increased DM intake 5 to 9% ($P < 0.01$), when included at 18 to 36% (DM basis) in a TMR that was very high in moisture content. Commercially processed ensiled GBP is an effective concentrate feed supplement for growing cattle.

Key Words: cattle feed, grocery byproduct, nutritive value

852 Biometrics of digestive tube of kids suckled up to 90 days fed different sources of goat milk replacers. L. S. Knupp, M. I. Marcondes*, M. M. S. Santos, N. O. Souza, L. M. Carvalho, M. A. S. Novaes, J. V. F. Souza, and C. M. Veloso, Universidade Federal de Viçosa, Viçosa, MG, Brazil.

The organs of animals have different development rates; their maximum rates occur at different ages and body weight. The development rates of each organ can be influenced by plane of nutrition. This work aimed to evaluate the biometrics of the digestive tract of goats suckled up to 90 d with different sources of goat milk replacers. Twenty-four Saanen (12) and Alpine Brown (12) kids were randomly assigned to treatments and were slaughtered at 90 d. The animals were fed with coast-cross hay and starter, both ad libitum, and one liter of milk, or replacer, per day. The treatments were goat milk (GM), cow milk (CM), fermented cow colostrum (FC) and lactal - commercial milk replacer (LAC). The organs were separated and weighed with and without digesta. The parameters analyzed were: Rumen, omasum, abomasum, small and large intestine. Data were analyzed using a complete randomized design, using the initial weight as a covariate. When occurred difference between treatments, the Tukey test was applied to evaluate the least squares means, using a significance level of 5%. The animals treated with CM had greater rumen weight ($P < 0.05$) than the ones fed with GM and FC (0.414 vs. 0.311 and 0.308, respectively), likely due to greater starter and hay intake. Omasum, abomasum and large intestine were not affected by applied diets and their mean weights were 0.026; 0.105 and 0.256, respectively. The small intestine in animals treated with CM, were greater than those fed FC (0.490 vs. 0.334; $P < 0.05$). In conclusion, cow milk and lactal provided the best development of the digestive tract, especially for the rumen. Supported by CNPq/INCT-CA.

Key Words: abomasum, omasum, rumen

853 Evaluation of a prototype galactooligosaccharide supplement in milk replacer for neonatal calves. J. J. Castro^{*1}, C. R. Bromfield¹, H. J. Mangian¹, J. R. Loften², and J. K. Drackley¹, ¹University of Illinois, Urbana, ²Milk Specialties Global, Carpentersville, IL.

Digestive disorders are common during the first few weeks of life of the newborn calf, particularly under non-optimal sanitary conditions and immune status. Strategies to improve gut health and alleviate intestinal upsets during this period are required. Non-digestible oligosaccharides with good fermentation potential may function as prebiotics that modulate growth and activity of beneficial microbial populations, which results in enhanced gut health and function. Galactooligosaccharides (GOS) have demonstrated such prebiotic potential. In this study, the effect of GOS supplementation on intestinal health, development, function, and integrity as well as performance of dairy calves was evaluated under intensified feeding conditions. Eighty purchased male calves were assigned either to a control commercial milk replacer or to the same diet enriched with GOS (ca. 3% of DM). After 2 and 4 wk, 8 calves per treatment were slaughtered. Organ size was determined and samples of rumen, duodenum, jejunum, ileum, and colon were collected for in vitro nutrient transport, permeability, and histology analysis. The remaining 48 calves continued on trial to wk 8. Body growth, nutrient intake, and fecal and respiratory scores were measured throughout the trial. Calves on the control treatment showed significantly greater growth, nutrient intake, lower fecal scores and had fewer days with elevated fecal scores than GOS-supplemented calves. Size of digestive organs, nutrient transport, and epithelial permeability were not affected by treatment. Although digesta VFA concentrations were greater for control, intestinal villi height and width and crypt depth were greater in calves receiving GOS. Although total hydrolyzed monosaccharide content was similar between diets, lactose content of the GOS-supplemented diet was much lower than the control diet (19.7% vs. 43.6%), which may have limited growth. In conclusion, the GOS-supplemented milk replacer had a laxative effect and supported slightly lower performance while promoting greater intestinal epithelial growth.

Key Words: prebiotics, galactooligosaccharides, gut

854 Remote monitoring of individual animal mineral supplement intake by range cattle. T. Dal Molin^{*1}, D. Tolleson¹, J. Sprinkle¹, M. Sprinkle², D. Schafer¹, and B. McMurry³, ¹University of Arizona, Tucson, ²Intel Corporation, Hillsboro, OR, ³Cargill Animal Nutrition, Elk River, MN.

Individual animal intake and behavior associated with mineral supplementation of cattle on rangelands is largely undocumented. Our objective was to develop instrumentation to remotely obtain such information. We designed and constructed a solar powered high precision load cell and continuous (every 0.25 s) data acquisition system, configured to a standard range mineral feeder. The system was field tested in November 2010 and October 2011 at the V Bar V Ranch in central Arizona. Load cell precision varied with temperature and wind. Wind speed (kph) ranged from 0 to 23 and averaged 14 ± 0.3 in 2010. Corresponding values were 0 to 32 and 11 ± 0.4 respectively, in 2011. Temperature ($^{\circ}\text{C}$) ranged from -7 to 4 and averaged -2 ± 0.9 in 2010. Corresponding values were -1 to 11 and 2 ± 1.1 respectively, in 2011. In pre-dawn hours when ambient conditions were relatively consistent, baseline variation of the load cells was ± 2 g. This value increased to ± 17 g during mid day. Individual cow identification was accomplished via time-stamped, motion activated digital photography. Feeding bouts were classified by predetermined acute weight change thresholds and matched to a cow by visual inspection of images. Duration of feeding bouts (min) ranged from 1 to 16 and averaged 3 ± 0.4 in 2010, and 1 to 21 and 4 ± 0.4

respectively, in 2011 ($P > 0.1$). Mineral intake (g/feeding bout) ranged from 1 to 679 and averaged 109 ± 16.0 in 2010, and 2 to 1598 and 226 ± 25.4 respectively, in 2011 ($P < 0.05$). Measured total daily intake (g/cow) ranged from 1 to 1009 and averaged 190 ± 26.0 in 2010, and 2 to 1009 and 218 ± 48.6 respectively, in 2011 ($P < 0.05$). Intake rate (g/min) ranged from 1 to 182 and averaged 45 ± 5.2 in 2010, and 1 to 446 and 82 ± 8.0 respectively, in 2011 ($P < 0.05$). Correlation of the classification protocol was tested between 2 independent observers. For discrete ($n = 5$) bouts, $r^2 = 0.95$, $\text{SE} = 5.3$ ($P < 0.05$), and for multiple animal ($n = 7$) bouts, $r^2 = 0.75$, $\text{SE} = 18.0$ ($P < 0.05$). This system, as tested, is capable of providing individual animal intake of mineral supplement under rangeland management conditions.

Key Words: individual animal intake, mineral supplement, remote measurement

855 Effect of corn processing on growth performance and fecal nutrient composition in dairy bull calves fed whole or steam-flaked corn diets from pre-weaning to 8 weeks post-weaning. J. D. Allen^{*1}, L. W. Hall¹, C. D. Burrows¹, and G. C. Duff^{2,1}, ¹University of Arizona, Tucson, ²Montana State University, Bozeman.

A study was conducted to investigate the effect of corn processing on growth performance and fecal nutrient concentrations in dairy bull calves fed from 8 weeks pre-weaning to 8 weeks post-weaning. Sixteen individually housed dairy bull calves (8 Holstein and 8 Jersey; average initial BW = 34.2 ± 8.13 kg) were separated within breed into 1 of 2 treatments: diets (starter and growing) containing either steam-flaked (SF) or whole (WC) corn. Body weights were collected on arrival, at weaning, and at study completion. Feed intakes were recorded daily. Fecal samples were collected every 7 d from 8 weeks before weaning through 8 weeks post-weaning when the first steer reached feedlot weight (125 kg). Samples were dried at 100°C until dry and ground in a Wiley mill to pass through a 1 mm screen. Ground samples were analyzed for all or part of the following: DM, ADF and NDF (Ankom 200 fiber digester, Ankom, Macedon, NY), CP (TC400; Leco Corp., St. Joseph, MI), and starch. Starch analysis was performed using an amyloglucosidase colorimetric assay. Data were analyzed as a complete random design using the mixed procedure of SAS (Cary, NC) with animal as the experiment unit and week from weaning as the repeated measures. Growth performance, including BW (initial, weaning, and final), ADG (pre- and post-wean), pre-wean DMI, and feed efficiency were similar ($P > 0.10$) across treatments, with SF animals tending ($P < 0.10$) to have higher overall DMI and lower post-wean G:F compared with WC animals. Post-weaning DMI was greater ($P < 0.05$) for SF calves versus WC calves. Pre-weaning fecal components were similar for both groups ($P > 0.10$). Fecal NDF and ADF were higher ($P < 0.01$) and starch content was lower ($P < 0.01$) in the SF group post-weaning versus the WC group. We conclude that corn processing does not affect dairy calf performance through 8 weeks post-weaning. However, fecal starch concentrations between whole and steam-flaked corn begins to diverge once the dairy calf has been weaned.

Key Words: corn processing, dairy calf, fecal nutrient

856 Effects of short-term feed restriction on ruminal function. S. Zhang^{*1}, D. R. Barreda², J. R. Aschenbach³, and G. B. Penner¹, ¹University of Saskatchewan, Saskatoon, SK, Canada, ²University of Alberta, Edmonton, AB, Canada, ³Free University of Berlin, Berlin, Germany.

This study was conducted to evaluate whether the severity of short-term feed restriction (FR) affects ruminal function. Eighteen ruminally

cannulated heifers were blocked by BW and randomly assigned to 1 of 3 treatments differing in the severity of FR; 75, 50, or 25% of ad libitum intake relative to the baseline period. Each heifer was exposed to 14 d for adaptation, 5 d for baseline, 5 d of FR, and 3 wk of recovery (R1, R2, and R3). Heifers were fed the same diet (60% forage: 40% concentrate) throughout the study and were fed ad libitum during the baseline and recovery periods. Water was available at all times. Ruminal pH and DMI were measured daily and absorptive function was evaluated using the temporarily isolated and washed reticulo-rumen technique. There was a treatment \times period interaction for DMI ($P < 0.01$) with lowest values for 25% (2.65 kg/d), intermediate for 50% (5.3 kg/d), and greatest for 75% (8.2 kg/d) during FR, but differences were not observed among treatments within other periods. Treatment \times period interactions were also detected for nadir ($P < 0.01$), mean ($P < 0.01$) and maximum ($P < 0.01$) ruminal pH. Generally, heifers fed 25% increased pH to a greater extent during FR but decreased to a greater extent during R1 when compared with those fed 50 and 75%. The area ($P < 0.01$) that pH < 5.5 was smaller during FR (0.4 pH \times min/d) and greater during R1 (80.4 pH \times min/d) than baseline (24.2 pH \times min/d), but R2 and R3 (44.9 and 36.2 pH \times min/d, respectively) did not differ from baseline. The absolute rate (mmol/h) for acetate absorption ($P < 0.01$) was greater during baseline (332.1 mmol/h) than FR (253.5 mmol/h) with the rate being faster in R3 relative to FR; however, the rates did not differ between R1 (320.0 mmol/h) and R3 (343.8 mmol/h). Absolute rates for propionate and butyrate absorption (period effect, $P \leq 0.04$) also followed a similar pattern as for acetate, except that baseline and FR values did not differ. The results of this study indicate that 5-d FR increases the risk for ruminal acidosis, regardless of the severity of FR imposed, which may be linked to negative carry-over effects of FR on acetate absorption.

Key Words: feed restriction, ruminal pH, short-chain fatty acid absorption

857 Identifying improbable feed samples using a multivariate procedure. P. S. Yoder,* N. R. St-Pierre, and W. P. Weiss, *The Ohio State University, Wooster.*

Individual feed analyses can be in error and unrepresentative of a feed population. Erroneous feed samples within a feed summary will decrease the accuracy of summarized nutrient statistics and may reduce ration formulation accuracy. Our objective was to implement a robust multivariate procedure for identification of improbable samples and to create an accurate database summarizing nutrient means, SD, and covariances of feeds. The covariance of nutrients is critical for understanding complex nutrient variation and the NRC (2001) feed library does not provide covariances. The procedure examines 3 statistics; individual nutrient concentrations of a single sample, the covariance of a single sample, and the joint covariance of multiple samples. The SAS (version 9.3) procedures were univariate, principal component analysis (PCA), and two-stage clustering (TSC), respectively. Specific removal criteria were: nutrient concentrations > 3.5 SD from the mean, PCA scores > 3.5 SD from the mean PCA, and concurrent global peaks of pseudo F-statistic and pseudo T-Square. The proposed procedure results in minimal statistical changes ($< 1\%$) when applied to a simulated normal population free of outliers. Adding simulated erroneous samples greatly affected the covariance in some situations and application of the procedure removed problematic samples and resulted in similar statistics of interest compared with the normal population. The procedure was applied to 133,677 corn silage samples and 18,237 samples were removed (83% of the removed samples by PCA and TSC). After removal of improbable samples, the ash with lignin correlation decreased from 0.65 to 0.30, SD changes ranged from 0.02 to 1.04 units, and minor changes of the means

were observed. Correlations of -0.31 (NDF with lignin), -0.37 (NDF with starch) and -0.29 (NDF with CP) were observed in the removed outlier clusters compared with correlations of 0.70, -0.88 , and 0.18 in the proposed corn silage population, respectively. Evaluating multiple nutrients of a feed sample using a multivariate procedure is more robust compared with examining one nutrient and is important for obtaining accurate covariance estimates.

Key Words: covariance, multivariate

858 Application of meta-analysis to build new feed unit systems for ruminants based on absorbed nutrients and animal responses in France. D. Sauvant*¹, J. L. Peyraud², and P. Nozière³, ¹*AgroParisTech-INRA, Paris, France*, ²*INRA-AgroCampus, Rennes, France*, ³*INRA UMR Herbivores, Clermont-Ferrand, France.*

A steering group is now working in France to update the Feed energy, protein systems for cattle, sheep and goat by 2013. A major goal of this project is to simply model the main digestive events to predict the absorbed flows of VFA, amino acids, glucose and fatty acids. For cattle, a large database (2156 treatments, 818 experiments) was built from the literature to develop the updated systems. The attention is first focused on the fermentable organic matter (FOM) in the rumen, which is the key to predict productions of microbial protein, volatile fatty acids and gas. FOM ($54.4 \pm 11.0\%$ dry matter, DM) is predicted from diet digestible OM ($DOM = 63.8 \pm 8.1\%$ DM) minus the digestible fractions in the intestines of starch, protein, fatty acids and NDF ($FOM = DOM - DST - DPR - DFA - DNDF$). DOM is corrected for digestive interactions due to levels of dry matter intake, % of concentrate and the rumen protein balance (duodenal CP - ingested CP). Fractions DST ($8.2 \pm 5.5\%$ DM) and DPR ($5.5 \pm 1.8\%$ DM) are predicted from in sacco data, DFA ($3.4 \pm 1.2\%$ DM) and DNDF ($3.5 \pm 2.3\%$ DM) are predicted from regressions issued from meta-analysis. A second point focusing the interest is the prediction of the microbial growth efficiency ($MGE = 25.6 \pm 8.6$ gNm/kg of TDOMr) which is influenced by the fractional outflow rates of particles ($MGE = 21.3 + 1.06$ kp%/h, $n = 215$, $n_{exp} = 87$, $RMSE = 2.2$) and liquids ($MGE = 22.9 + 0.22$ kl%/h, $n = 297$, $n_{exp} = 117$, $RMSE = 2.3$). A third point of interest is the rumen undegradable protein (RUP) which are predicted from the in sacco effective degradability of N (EDN) corrected for actual transit ($RUP\%DM = CP\%DM * (1 - EDN)$, $n = 318$, $n_{exp} = 124$, $RMSE = 0.94\%$ DM). Afterward, the major empirical responses of digestion were integrated into a simple mechanistic model of the rumen with an optimization procedure to determine the optimal values of some less known parameters of digestion. The further step of the project is the updating animal requirements and their multiple responses to diet (efficiency, outflows of N, P and CH₄, composition of products...) to absorbed nutrients according to their nutritional and physiological status.

Key Words: feed unit, meta-analysis, ruminants

859 Sampling sites and inserting depth of oral stomach tube affects the fermentation parameters of ruminal fluid collected in dairy cows. J. S. Shen,* Z. Chai, L. J. Song, J. X. Liu, and Y. M. Wu, *Institute of Dairy Science, MoE Key laboratory of Molecular Animal Nutrition, College of Animal Sciences, Zhejiang University, Hangzhou, China.*

Six rumen-fistulated dairy cows (BW = 604 ± 36 kg; milk yield = 15 ± 2.4 kg) were used in 2 trials to validate the technique for collection of ruminal fluid by a Geishauser oral stomach tube (OST). Trial 1 was conducted to compare the difference of ruminal fermentation parameters

among rumen sites (cranial dorsal, cranial ventral, central, ventral, caudal dorsal and caudal ventral). Ruminal fluid was collected at 5 to 6 h after morning feeding for 3 consecutive days through rumen cannula (RC). The samples were analyzed for pH, volatile fatty acids (VFA), ammonia N, sodium, potassium, calcium, chloride, and phosphorus concentrations. Variables of ruminal fluid collected were analyzed using the mixed procedure of SAS. Compared with central or ventral rumen, cranial dorsal rumen had higher pH, ammonia and sodium concentrations, and lower VFA concentrations ($P < 0.05$), indicating that sampling site was one main factor contributing to the difference of ruminal fermentation parameters for samples collected via OST and RC. In trial 2, the fermentation parameters of ruminal fluid collected via OST at 2 inserting depth (180 or 200 cm) were compared with those of ruminal fluid collected via RC (ventral sac). When OST was inserted at a depth of 180 cm, the OST head was located in the cranial dorsal (atrium) of the rumen. Ruminal fluid collected via OST had higher pH and sodium concentration, and lower VFA, potassium, calcium and phosphorus concentrations than that collected via RC ($P < 0.05$). However, when OST was inserted at a depth of 200 cm, OST head could reach to the central rumen through the front rumen pillar. No differences were found in pH, VFA, ammonia, and ion concentrations between samples collected via 2 methods ($P > 0.05$). These results indicated that the OST should be inserted to reach the central rumen to obtain representative rumen fluid samples.

Key Words: oral stomach tube, fermentation parameters, dairy cows

860 Comparison of nutrient composition and in vitro digestion characteristics of spent mushroom soybean (*Pleurotus* spp.) substrate and soybean straw. J. P. Gafigi¹, M. Mutimura², and S. Uwituze*¹, ¹National University of Rwanda, Faculty of Agriculture, Department of Animal Productions, Butare, Rwanda, ²Rwanda Agriculture Board, Kigali, Rwanda.

Landholdings in Rwanda are small with over 60% of households cultivating less than 0.7 ha. This has resulted in low animal productivity;

hence the search for alternative animal feeds is encouraged in Rwanda. A study to compare nutritive values and in vitro digestibility characteristics of spent mushroom soybean substrates (SMS) and soybean straw (SBS) as potential animal feeds was conducted. Samples of SMS and SBS were analyzed for DM, OM, CP, P, Ca, NDF, and ADF. In vitro fermentation medium consisted of 1:2 ruminal fluid: McDougall's buffer and the experiment was a completely randomized design. Each sample (0.2 g, DM basis) was put in a gas syringe and there were 3 replicates per substrate. Syringes containing samples with 30 mL of fermentation medium and 2 blanks were incubated in a water bath at 39°C for 72 h. Readings of gas volumes were recorded every 2 h. Gas accumulated within 24 h of incubation was used to calculate metabolizable energy (ME), OMD, and digestible crude protein (dCP). Data for in vitro gas production, ME, OMD, and kinetic coefficients of fermentation were statistically analyzed using PROC Nonlinear Model of SAS (9.3. Inc.). Results showed that SMS contained less ($P < 0.05$) OM, NDF, and ADF (91.7, 58.4, and 34.5% DM, respectively) compared with SBS (95.4, 74.2, and 59.79% DM for OM, NDF, and ADF, respectively), but SMS had higher ($P < 0.05$) CP (7.8% DM) than SBS (6.1% DM). SMS had less ($P < 0.05$) gas production than SBS over 72 h of incubation. SMS had less ME ($P < 0.05$) compared with SBS (1.39 vs. 1.53 Mcal/kg of DM), but more dCP ($P < 0.05$) than SBS (40.8 vs. 25.0 g/kg DM). SBS had greater ($P < 0.05$) portions classified as slow degradable, effective degradable and potential degradable than SMS. SBS required more time ($P < 0.05$) to be degraded in vitro than SMS, but both substrates had similar ($P > 0.05$) degradation rates. SMS had a high CP content but had less in vitro gas production. The low gas production might be attributable to *Pleurotus* spp., which contains complex compounds such as polyphenols and flavonides that are hardly degraded by ruminal microbes. Soybean straw is likely a better feedstuff than SMS based on its greater potential degradable portion, which is a good indicator of better quality feeds.

Key Words: digestibility, mushroom byproduct, soybean byproduct