Ruminant Nutrition: Feeds

T301   Evaluating the mineral composition of *Vernonia amygdalina* leaf. A. H. Ekeocha,* *University of Ibadan, Ibadan, Oyo, Nigeria.*

An experiment was conducted to determine the mineral composition of *Vernonia amygdalina* (Va). The atomic absorption spectrophotometer was used to determine any of the minerals (except P) using appropriate lamps. The P was determined with vanadomolybdate using spectrophotometer at 425nm.The principal elements present in Va are Ca, P, K, Na and Mg while the essential trace elements (macro nutrients) are Fe, Mn, Cu and Zn. The Va contained Ca 0.46%, P 0.13%, K 1.21%, Na 0.53%, Mg 0.27%, Fe 468.2mg/g, Cu 26.2mg/g, Zn 580.5mg/g. The high level of minerals found in Va was due to the high ash content recorded. Mineral assayed in this study in order of abundance was K 1.21%, Zn 0.58%, Na 0.53%, Ca 0.46%, Mg 0.27%, P 0.13%, Fe 468.2mg/g, Cu 26.2mg/g. Normally, plant materials are not good sources of Ca and P but the high levels reported in Va would easily satisfy animal needs if they occur in a readily available form. It is often postulated that a mineral supply in excess of dietary requirements is capable of blocking the availability of another. The result of mineral analysis on *Vernonia amygdalina* showed that the leaf contains high levels of micro and macro elements, which is an indication that the productivity of ruminant animals is sustainable.

Key Words: mineral composition, *Vernonia amygdalina* leaf

T302   Determination of the nutritional value of some perennial forage species for ruminants. C. Bayourthe*[1,2] and C. Julien[1,2], [1]*INRA, UMR1289 TANDEM, Tissus Animaux Nutrition Digestion Ecosystème et Métabolisme, Castanet Tolosan Cedex, France,* [2]*Université de Toulouse, INPT-ENSAT, INP-ENVT, UMR1289 TANDEM, Castanet Tolosan Cedex, France.*

Ruminal OM and CP degradability of cardoon (*Cynara cardunculus* L.; CY), switchgrass (*Panicum virgatum* L.; SW) and immature cereals (IC) were studied with in sacco technique. Two mid-lactating (185 d in milk) and ruminally cannulated Holstein cows were used and fed a TMR (22 kg/d DMI) composed on a DM basis by 63.3% corn silage, 17.4% soybean meal and 19.2% wheat during a 25-d experimental period (21 d of diet adaptation, 4 d of measurements). Ruminal degradation rate of OM and CP was estimated as percent OM (DgOM) and CP degradability (DgCP) from polyester bags incubated in rumen for 2, 4, 8, 16, 24, 48, and 72h. Data were fitted to the nonlinear regression equation: $Dg(t) = a + b(1 - e^{-ct})$ where Dg is percentage disappearance of OM or CP at time t, *a* the soluble fraction and *b* the less rapidly degradable fraction which disappears at the constant fractional rate *c* per time t. Intestinal digestibility of CP was estimated using the in vitro procedure of Calsamiglia and Stern (1995). Switchgrass had numerically greater crude cellulose (41.1% of DM) and lower CP (5% of DM) contents than the other forage sources. Cynara and SW had a low soluble CP fraction (13.9 and 18.6%). The potentially degradable CP fraction was numerically greater and the rate of degradation numerically lower for CY (66.3% and 3.7% h^{-1}) compared with SW and IC (respectively, 21.6% and 5.0% h^{-1}; 33.3% and 5.5% h^{-1}). Effective degradability of CP followed the order IC > CY > SW. Intestinal digestibility of CP was 19% for CY and SW, and 37% for IC. The PDIN and PDIE contents (g/kg DM) were respectively: 23 and 67 for CY, 22 and 45 for SW, and 51 and 70 for IC. Compared with IC and SW, CY exhibited a high estimated energy NE_L value (Mcal/kg DM): 1.77 *vs* 0.90 and 1.03. Immature cereals offer a better nutritional value than CY and SW.

Key Words: nutritional value, perennial forages, ruminal degradability

T303   Dry matter changes in corn silage with rain. H. A. Rossow[1], L. Kallaway*[1], N. Falcony[2], and T. Meister[3], [1]*Veterinary Medicine Teaching and Research Center, School of Veterinary Medicine, University of California-Davis, Tulare,* [2]*Alpha Dairy Consulting, Visalia, CA,* [3]*John Deere Forage Products, Moline, IL.*

Dry matter (DM) is the most important nutrient analysis because changes in DM effect total quantity of nutrients supplied in a ration. Since forages have the most variability associated with their DM content, forage DM is measured weekly and new values are entered into feed management software to correct weighing of forages in the ration. The purpose of this research is to determine how much forage (corn silage) DM changes with weather and how it affects ration DM. Corn silage and ration were sampled twice a day at feeding for 5 d and DM was measured according to AOAC methods using a forced-air drying oven at 100°C for 24 h. Corn silage DM was also measured using HarvestLab (near infrared reflectance stationary desktop model, John Deere). Corn silage on average accounted for 55% of the ration on an as fed basis and was correlated with ration DM ($P < 0.05$) with an R2 = 0.52 when ration DM regressed on corn silage DM. Rain (approximately 1 inch) occurred on the afternoon of the second sampling day and resulted in decreases of 3.6% corn silage DM and 6.6% in ration DM (AOAC method) and in a decrease of 2.28% corn silage DM (HarvestLab). By the next feeding, corn silage DM had increased back to pre-rain levels (34.3% vs. 33.9%). Corn silage DM was the primary source of moisture in the ration and rain caused a short-term decrease in ration DM because in a storm of short duration, most exposed silage was fed at the next feeding. Therefore it would be beneficial to adjust corn silage DM in the short-term according to rain events. Currently, feed management software does not allow storage of alternate DM settings that could be used for rain exposure. To determine how much DM should be adjusted for degree and duration of rain and predictability of DM using HarvestLab, more data are needed.

Key Words: dry matter, corn silage

T304   Canola meals from different production plants differ in ruminal protein degradability. G. A. Broderick*[1], S. Colombini[2], M. A. Karsli[3], L. Nernberg[4], and D. Hickling[4], [1]*U.S. Dairy Forage Research Center, Madison, WI,* [2]*University of Milan, Milan, Italy,* [3]*Yüzüncü Yıl University, Van, Turkey,* [4]*Canola Council of Canada, Winnipeg, MB, Canada.*

Lactation trials have shown that production and N-efficiency were improved when dietary soybean meal was replaced with equal CP from canola meal. Three or 4 canola meal samples were collected from each of 12 Canadian production plants (total = 37) and analyzed for differences in chemical composition and in vitro and in situ ruminal protein degradability. In situ incubations were conducted at 0 and 12 h only and estimated rates used to compute rumen-undegraded protein (RUP) assuming first-order degradation and a ruminal passage rate of 0.06/h. The Michaelis-Menten inhibitor in vitro (MMIIV) method was used as described by Colombini et al. (J. Dairy Sci., 94:1967–1977, 2011) to quantify degradation rates and RUP, assuming passage rates of 0.16/h and 0.06 for the soluble and insoluble protein fractions. Differences among plants were assessed using GLM in SAS; LSD-separated means are in the table. Although fraction B3 (NDIN – ADIN) was unaffected, there were differences among plants in CP and NDF contents of canola meals produced. There also were differences among plants in RUP estimated by MMIIV: the only expeller meal had the highest RUP (47.4%),

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but meals from 4 other plants had similar RUP values (43.0–46.3%). The RUP estimates from the other 7 meals were lower, including 4 that were different from the 4 meals with the highest RUP values. Estimates of RUP made using in situ methods tended to rank the meals differently from the MMIIV assay. Results indicated that, depending on the plant of origin, canola meal RUP may range from 37 to 47%, a difference greater than 25%.

Table 1.

Plant	Process	CP, % DM	NDF, % DM	B3, % CP	MMIIV RUP, % CP	In situ RUP, % CP
1	S	43.7[a]	23.8[de]	8.1	37.0[c]	50.5[d]
2	S	41.4[c]	28.2[ab]	21.1	40.0[bc]	65.9[ab]
3	S	41.5[c]	24.9[cd]	18.2	46.3[ab]	67.7[a]
4	S	43.8[a]	23.4[de]	12.4	39.6[bc]	55.3[cd]
5	S	41.8[c]	25.4[cd]	8.2	45.0[ab]	58.9[bc]
6	S	43.0[ab]	25.9[c]	14.6	45.9[ab]	60.7[abc]
7	S	39.9[d]	25.4[cd]	9.4	36.7[c]	56.6[cd]
8	S	42.3[bc]	26.9[bc]	16.2	38.1[c]	61.2[abc]
9	S	41.2[c]	29.7[a]	23.8	43.0[abc]	59.7[abc]
10	S	43.7[a]	22.7[e]	8.8	36.6[c]	57.8[bcd]
11	S	41.4[c]	25.2[cd]	9.1	40.7[bc]	59.4[abc]
12	E	36.6[e]	28.7[ab]	15.3	47.4[a]	60.2[abc]
	SEM	0.4	0.7	3.8	2.3	2.9
	P > F	<0.01	<0.01	0.07	<0.01	0.03

[a–e] ($P < 0.05$).
S = solvent process; E = expeller process.

Key Words: canola meal, inhibitor in vitro, rumen-undegraded protein

T305   Influence of different levels of exogenous enzymes preparation at two application methods on in vitro ruminal fermentation of some fibrous feeds in sheep. A. Z. M. Salem*[1], H. Gado[2], N. E. Odongo[3], R. Rojo[4], M. M. Y. Elghandour[1], and A. Olmido[4], [1]*Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma del Estado de México, Toluca, Estado de Mexico, Mexico, [2]Faculty of Agriculture, Ain Shams University, Cairo, Egypt, [3]Animal Production and Health Section, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, International Atomic Energy Agency, Vienna, Austria, [4]CU-UAEM- Temascaltepec, Universidad Autónoma del Estado de México, Estado de México, México.*

The present experiment was aimed at investigating the effect of different levels of exogenous enzymes preparation (ENZ - mixture of cellulase, xylanase, α-amylase and proteases enzymes) on in vitro gas production, some ruminal fermentation parameters (pH, NH3-N and VFA (total and individual acids) and fiber degradability (ADF and NDF) of three fibrous feeds (FF - corn stover, oat straw, sugarcane bagasse) at two methods of application (direct addition or pretreatment for 24h with ENZ) in sheep. The levels of ENZ used were 0, 0.06, 0.12 and 0.24 g/g DM of each FF, and ENZ was dissolved in distilled water to obtain the concentration of each level in 1 mL. Rumen liquor was collected before the morning eating from 4 sheep (40 ± 3.2 kg BW, fed on a total mixed ration of 50% commercial concentrate and 50% alfalfa hay) fitted with permanent rumen cannula. In vitro gas production was recorded at 2, 4, 6, 8, 10, 12, 24, 48 and 72 h of incubation. After 72 h, the incubation was stopped and the inoculant's pH was determined and filtered to determine ADF and NDF degradability, VFA (total and individual acids) and NH3-N concentrations. In vitro organic matter digestibility and metabolizable energy, were estimated. Data were analyzed as 4 (four doses of ENZ) × 3 (three FF) × 2 (two methods of application) factorial experimental

design. Addition of ENZ increased (P<0.05) gas production, NH3-N and VFA concentrations with the FF used. Acetic acid concentration was increased with the addition or pretreatment of FF with ENZ without effect on butyric or propionic acids concentrations. Pretreatment of FF for 24 h with ENZ was increased the ruminal fermentation and fiber degradability (ADF and NDF) of FF. Highest in vitro gas production and ruminal fermentation activities were found in sugarcane bagasse compared with oat straw and corn stover. It is concluded that pretreatment the FF with ENZ for 24 h before the in vitro incubation could improve the ruminal fermentation and fiber degradability in sheep compared to the direct addition in diets. Sugarcane bagasse treated with ENZ could be considered a good roughage for ruminants.

Key Words: exogenous enzymes, fibrous feeds, gas production

T306   Composition of diets fed to different groups of lactating cows on California dairies. A. R. Castillo*[1], N. Silva del Rio[2], N. R. St-Pierre[3], and W. P. Weiss[3], [1]*University of California, Cooperative Extension, Merced, [2]University of California, Cooperative Extension, Tulare, [3]The Ohio State University, Department of Animal Science, Columbus.*

The objective of this survey was to describe TMR dietary groups and TMR nutrient contents in lactating dairy cows. Forty dairies in Merced County, California, were selected based on the number of cows (mean 787 ± 592 from 210 to 2435 lactating cows/farm) and milk yield per cow (mean 31.8 ± 5.19 from 20.6 to 43.5 kg/d 3.5%FCM). Samples of TMR fed to different groups (n = 118) were taken in duplicate on 2 nonconsecutive days and assayed for DM, NDF, ADF, lignin, CP (N*6.25), crude fat, and ash. The grouping systems and nutrient composition of the TMR (means ± SD) are in Table 1. Nine of 40 dairies (22%) fed a single diet to all lactating cows and 31 dairies fed multiple TMR diets to their lactating cow groups. Average milk production per cow for dairies feeding a single diet and multiple diets were 27.5 ± 5.5 and 33.0 ± 4.5 kg/d 3.5% FCM. All dairies with multiple diets had a high and low TMR. Fifty-eight, 32, and 15% of dairies with multiple diets prepared TMR for fresh, first lactation, and mid groups, respectively. Average (Table 1) and ranges of dietary NDF content on dairies with one diet (from 32.9 to 42.2%NDF) were close to the low TMR diets (from 30.6 to 43.5%NDF). Crude Protein contents in multiple diets TMR (fresh, 1st lactation, high, and mid) were similar averaging 17.5%CP. Across farms, CP content for 1st lactation diets were most consistent ranging from 16.7 to 18.0%CP, whereas for the other production groups ranged from 14% to more than 19%. Based on the limited variation in average nutrient concentrations among different diet groups, opportunities may exist to better match cow requirements with TMR composition.

Table 1. TMR dietary groups and nutrient contents

TMR of lactating cows	Dairies (n)	Nutrient content						
		DM%	NDF%	ADF%	Lignin%	CP%	Fat%	Ash%
Multiple diets	31							
Fresh	18	58.0 ± 5.5	34.0 ± 2.3	23.4 ± 1.6	5.4 ± 0.8	17.5 ± 1.3	4.7 ± 1.0	8.3 ± 1.1
1st Lactation	10	59.0 ± 6.3	32.8 ± 2.3	22.6 ± 1.9	5.4 ± 0.9	17.5 ± 0.4	4.7 ± 0.7	8.6 ± 1.5
High	31	58.3 ± 6.1	33.8 ± 1.9	22.8 ± 1.4	5.5 ± 0.8	17.5 ± 1.3	5.0 ± 1.2	8.3 ± 0.9
Mid	15	58.5 ± 7.0	34.6 ± 2.2	23.8 ± 2.1	5.6 ± 1.0	17.5 ± 1.0	4.9 ± 1.2	8.4 ± 1.4
Low	31	54.9 ± 7.3	36.1 ± 3.0	24.5 ± 2.6	6.0 ± 1.3	16.9 ± 1.6	4.0 ± 0.9	8.7 ± 1.3
Single diet	9	56.0 ± 11.4	36.9 ± 3.0	24.3 ± 2.3	5.9 ± 0.6	17.8 ± 1.9	4.1 ± 1.0	8.1 ± 1.0

Key Words: dairy farms, TMR dietary groups, TMR nutrient contents

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T307   Ruminal degradability, duodenal flow, and intestinal digestibility of protein from canola meal or corn and wheat distillers grains in growing beef heifers. C. Li[1,2], J. Q. Li[2], K. A. Beauchemin[1], and W. Z. Yang*[1], [1]*Research Centre, Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada,* [2]*College of Animal Science, Inner Mongolia Agricultural University, Hohhot, Inner Mongolia, China.*

The objective of this study was to evaluate the ruminal degradability, duodenal flows and intestinal digestibility of protein from canola meal or dried corn and wheat distillers grains with solubles (DDGS) in growing beef heifers. Five ruminally and duodenally cannulated Angus heifers (initial BW 386 kg) were assigned to a 5×5 Latin square design. The diets consisted of 60% barley silage and 40% barley grain-based concentrate (DM basis) with differing protein supplements: control (CON; no protein supplement), canola meal (CM), wheat DDGS (wDDGS), corn DDGS (cDDGS) or fractional corn DDGS (fDDGS). Contents of CP were 12.5, 14.6, 14.3, 14.1 and 14.2% (% DM), respectively, for CON, CM, wDDGS, cDDGS and fDDGS diets. DMI (kg/d) was lower ($P < 0.05$) for CON (8.9) than for the other diets (average of 10.0) which were not different. Intake (g/d) of N followed the same pattern of DMI with lower N intake ($P < 0.05$) for CON (177) than the other diets (240). There were no differences in mean ruminal pH (6.22 to 6.30) but total VFA concentration (mM) was the greatest ($P < 0.05$) for wDDGS (127) and fDDGS (124), and lowest ($P < 0.05$) for CON (115) and cDDGS (116). Ruminal NH_3 N (mM) was greatest ($P < 0.05$) for CM (7.4) and lowest ($P < 0.05$) for CON (4.9), while the DDGS diets were intermediate (6.2). Ruminal degradability of protein was not different among diets (53 to 57%). Flows (g/d) of NAN and microbial N to the duodenum were lower ($P < 0.05$) for CON (196 and 117) than for other diets (247 and 142). Digestibility (% intake) of N in the intestine (74%) was not different among diets. The results indicate that the 4 sources of feed protein delivered no differences in the amount of protein at the small intestine when the diets were formulated to be isonitrogenous. Corn and wheat DDGS can be used to replace CM to supply the protein requirements of growing cattle fed backgrounding diets based on barley grain.

Key Words: beef heifer, flow and digestibility of N, protein supplement

T308   Tables of nutritive values for farm animals in tropical and Mediterranean regions: an important asset for improving the use of local feed resources. D. Sauvant*[4,1], G. Tran[1], V. Heuze[1], D. Bastianelli[2], and H. Archimède[3], [1]*Association Française de Zootechnie, Paris, France,* [2]*CIRAD, Systèmes d'élevage et produits animaux, Montpellier, France,* [3]*INRA, UR143 Unité de Recherches Zootechniques, Petit-Bourg, Guadeloupe, France,* [4]*AgroParisTech-INRA, Paris, France.*

The demand for livestock products has been growing steadily in emerging and developing countries and with it the need for information about animal feeds. However, users of these countries often have to resort to feed data that are either obsolete or from temperate countries. The project "Tables of nutritive values for farm animals in tropical and Mediterranean regions" led by INRA, CIRAD and AFZ (and supported by FAO) aims to create an updated and comprehensive set of datasheets for more than 500 fodders and raw materials. Collaborations have begun with research groups in Belgium, Morocco and Spain. A major goal of the project is to better identify and characterize the local feed resources to improve the technical and economic performance of farms. Nutrition modeling, collaborations between research teams and identification of gaps in knowledge are part of the scientific objectives. The datasheets are created by a group of 20 scientists and engineers, who rely on a massive collection of scientific literature and experimental data to write qualitative and quantitative syntheses (via methods such as meta-analysis). A database containing more than 2 million raw data has already been established. Each datasheet provides information such as physical descriptions, pictures, feed availability, forage management, processes and environmental impact, as well as consistent chemical compositions (mean values and variability), feeding recommendations and nutritional values, potential concerns etc. for the main species of farm animals (Ruminant, swine, poultry, rabbit, fish). The publication of the datasheets is due in 2013, first as a FAO website and later in a book form.

Key Words: feed data base, multispecies, nutritive value

T309   Quality evaluation of italian rye grass and whole crop barley with homofermentative and heterofermentative lactic acid bacteria. H. Lee[1], M. Jeong[1], S. Kim[1], L. Mamuad[1], B. Cha[1], E. Kang[1], C. Jeong[1], D. Kim[1], D. Kim[2], and S. Lee*[1], [1]*Sunchon National University, Suncheon, Republic of Korea,* [2]*National Institute of Animal Science, Suwon, Korea.*

This study was conducted to determine the quality of Italian rye grass (IRG) and whole crop barley (WCB) with addition of monoculture and co-culture of homofermentative and heterofermentative LAB on in situ fermentation. Strains of homofermentative LAB (*Lactobacillus casei* KACC 12416) and heterofermentative LAB (*Lactobacillus reuteri* KCTC 3594) were used in this study. *L. casei* and *L. reuteri* had the highest propionic acid production, thus they were used in fermenting the forage. The forages were fermented using monoculture and co-culture of *L. casei* and *L. reuteri* for 60 days ensiling. Microbial analyses, dry matter, NDF and ADF digestibility were determined and evaluated using SAS (2003). Addition of LAB in IRG inhibits the growth of molds. Dry matter digestibility of IRG was significantly higher on co-culture of *L. casei* and *L. reuteri* at 6 and 24 hours of ensiling. On the other hand, dry matter digestibility of WCB was significantly higher in *L. casei* monoculture at 12 hours of incubation and in co-culture at 6 and 12 hours of incubation. ADF digestibility of IRG was significantly higher in L. casei monoculture at 6 hours of ensilage and in co-culture at 6 and 48 hours of ensilage. Furthermore, ADF digestibility of WCB was significantly higher in *L. reuteri* monoculture and in co-culture at 24 hours of ensilage. The result of this experiment suggests the addition of co-culture homofermentative and heterofermentative LAB which improves silage quality as well as inhibits molds.

Key Words: homofermentative and heterofermentative LAB, Italian rye grass, whole crop barley

T310   Sunflower cake in multiple supplements for cattle grazing in the dry season: pH and ruminal ammonia nitrogen. R. P. da Silva*[1], A. C. Mesacasa[1], J. T. Zervoudakis[1], L. K. Hatamoto-Zervoudakis[1], L. da Silva Cabral[1], F. de Paula Leonel[2], R. G. F. da Silva[1], J. Q. Soares[1], L. C. R. P. Silva[1], A. J. Neto[1], A. de Oliveira Zanette[1], and J. F. W. Koscheck[1], [1]*Federal University of Mato Grosso, Cuiaba, Mato Grosso, Brazil,* [2]*University of ST John King Del, Sao Joao Del-Rei, Minas Gerais Brazil.*

The research aimed to evaluate the inclusion levels of sunflower cake as protein source to replace soybean meal in multiple supplements for cattle grazing during dry season on nutritional parameters. Five steers were used, Nellore, uncastrated, with age and average initial weights of 20 months and 354.7 kg, respectively, divided into 5 paddocks of 0.25 ha each, consisting of *Brachiaria brizantha* 'Marandu'. The experiment

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was divided into a 5 × 5 Latin square design, composed of 5 experimental periods of 15 d each and 5 animals. The strategy adopted was the inclusion of sunflower cake in increasing levels of 0, 270, 406, 540 g / kg supplement as well as an mineral mixture ad libitum (MM). Supplements were formulated to be isonitrogenous (25% CP) and provided the amount of 1.5 kg / animal / day of natural matter. The availability of total dry matter and potentially digestible were 3.120 and 2.379 kg/ha respectively. The different levels of protein replacement of soybean meal by sunflower cake protein did not cause major changes in ruminal pH ($P > 0.10$), it remained around 6.72 at time 0 hours, and 6.57 4 h after supplementation, does not impair the growing rumen microbiota. There was a statistically significant difference ($P < 0.10$), for concentrations of NH_3-N among the animals that received only MM and cattle that received protein supplements in 4 h, that can be explained by the increasing concentration of NH_3-N in the rumen, enhancing the degradation of forage and therefore higher intake. Among the animals that received supplementation, was also observed statistically significant difference ($P < 0.10$), in which the increase in the supply of sunflower cake promoted a decrease in the concentration of NH_3-N in time 4 hours after supplementation, that it can be explained by the higher indigestible portion of sunflower cake compared to soybean meal. It is concluded that the inclusion of sunflower cake in the formulation of supplements did not affect the nutritional parameters, in which it can replace soybean meal in up to 100%, at this level of supplementation evaluated.

Key Words: cattle, co-products, pasture

T311   Prediction of carbohydrate fractions in some tropical grasses. R. S. Fukushima,* C. B. Bacha, A. P. Fuzeto, A. C. R. Port, and A. V. Vargas, *Universidade de Sao Paulo, Pirassununga, SP, Brazil.*

Balancing ruminant diets for maximum production requires appropriate levels and types of dietary carbohydrates (CHO). The Cornell Net Carbohydrate and Protein System (CNCPS) has equations based on NDF content that estimate fermentation and passage of feed CHO and protein fractions which can be used to predict ME and protein utilization. In previous versions of the CNCPS, CHO fractions were categorized into 4 fractions: A (sugars, organic acids, and oligosaccharides), B1 (starch and soluble fiber), B2 (available NDF) and C (unavailable NDF). Later, scientists at Cornell University (Lanzas et al., 2007) proposed an expanded CHO scheme. Among some changes, fraction B1 turned out to be only starch, B2 was soluble fiber, B3 was available NDF and C was unavailable NDF. They compared it with the original CNCPS scheme by using a database which involved ingredients commonly used in ruminant rations and mathematical analyses. The present work agrees with the expanded CHO scheme, however, using a different approach: CHO fractions were predicted in 5 tropical forage samples, stalk and leaf tissues, at 3 maturity stages, using the original CNCPS and alternative equations (Queiroz et al., 2008) where NDF was substituted for by another fibrous preparation, crude cell wall (CW) which is obtained after treating the sample with water and organic solvents in a Soxhlet equipment. CW was used because NDF does not provide a complete measure of cell wall components such as pectin, β-glucans and galactans (soluble fiber) that are dissolved by NDF solution. Estimates of CHO fractions were compared by *F* tests from SAS. NDF substitution for CW showed that soluble fiber went to fraction A of CNCPS, the rapidly digestible carbohydrates. Because of its own degradation characteristics it is suggested that the soluble fiber fraction be accommodated in a specific fraction (B2) while the slowly digestible NDF be placed in a new fraction, B3. The fraction B1 would be only starch. Fraction C is still unavailable NDF. The approach used here allowed estimation of soluble fiber by subtracting NDF from CW. Expanded CHO scheme seems to provide better estimation of carbohydrate pools. This work was funded by FAPESP, Brazil.

Key Words: cell wall, CNCPS, NDF

T312   Using the acetyl bromide lignin method to quantify lignin content in forages. M. H. Ramos[1], R. S. Fukushima*[2], and M. S. Kerley[1], [1]*University of Missouri, Columbia, MO,* [2]*Universidade de Sao Paulo, Pirassununga, SP, Brazil.*

Lignin is a phenolic polymer that gives structural rigidity to plants; however, it inhibits cell wall digestion by microbial enzymes in herbivores. As a consequence, energy utilization is reduced. To better understand such inhibition it is important the correct quantification of lignin. The spectroscopic method acetyl bromide lignin (ABL) was used to quantify lignin in 21 grass samples (perennial ryegrass, tall fescue, annual ryegrass, sorghum Sudan and Caucasian bluestem) and 18 legume samples (alfalfa, lespedeza and red clover). Estimates of lignin concentrations were compared by *F* tests. SAS was used to draw linear regressions to measure main lignin effects and to correlate lignin content with in vitro forage dry matter digestibility. Grasses showed higher ABL concentrations than did legumes: 62.5 and 43.7 g/kg, respectively. It is pointed out that ABL, as a spectroscopic method, may possess the sensitivity to detect soluble lignin components that would be lost by conventional gravimetric analyses. Grasses, but not legumes, contain substantial levels of ester-linked low molecular weight phenolic acids which could contribute to the UV absorbance. The importance and magnitude these phenolics may be measured together with condensed lignin require more studies. IVDMD was negatively correlated with ABL method ($P < 0.005$) for both grasses and legumes. Grasses showed slightly higher digestibility, although without statistical difference ($P > 0.16$). Regression equations were, grass: $Y = -4.26X + 906.6$ ($R^2 = 0.81$) and legumes: $Y = -4.11X + 811.5$ ($R^2 = 0.61$). Curves had similar slopes ($P > 0.98$). These parallel lines indicate that the degradability of grasses and legumes had similar pattern as lignin concentration increased. In other words, it seems that grass lignin is no more inhibitory to digestion than legume lignin. These results add strength to the hypothesis that lignin's effect on degradability of forage cell walls is primarily related to concentration. In this context, ABL method may be a good alternative to quantify lignin content and to predict forage digestibility. Other lignin methods were studied and their data are being processed. This work was funded by CAPES, Brazil.

Key Words: digestibility, forages, lignin

T313   Estimates of kinetic degradability parameters and passage of materials originated from intercropping between brachiaria grass and plantations of corn and soybeans. T. S. de Oliveira*[1], V. S. de Oliveira[1], T. M. de Oliveira Alves[1], J. C. Pereira[1], and R. A. M. Vieira[2], [1]*Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil,* [2]*Universidade Estadual Norte Fluminense, Campos dos Goytacazes, Rio de Janeiro, Brazil.*

The study was conducted to determine the kinetic parameters of in situ DM and NDF and the movement of materials from the intercropping of brachiaria grass and crops with corn and soybeans. Three experiments were used, as follows: Experiment 1 – Brachiaria grass and corn consortium at different plant ages. Experiment 2 – Brachiaria grass and corn consortium set in sowing arrangements. Experiment 3 – Brachiaria grass and soybeans consortium. The kinetics of particles transit were determined by the recovery of the indicators in the faces of the animal.

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In the degradation test the samples were incubated in the nylon bags at the times of 0, 3, 6, 9, 12, 24, 48, 72, 96, 120 and 144 h. Kinetics data of rumen degradability and particles passage of silages made from material derived from the intercropping of brachiaria grass and crops of corn and soybeans are scarce, which makes comparisons difficult. However, the kinetics of particles passage from corn and brachiaria grass silage (CBS) was 0.030 and Brachiaria grass (BG) was 0.023 had values close to those found in the literature, for soybean and Brachiaria grass silage (SBS) was 0.018 was lower than the data from literature, which were compared with corn and brachiaria grass silage in exclusive culture. The rate of digestion from corn and brachiaria grass silage (CBS) was 0.018 and Brachiaria grass (BG) was 0.0353 had values close to those found in the literature, for soybean and Brachiaria grass silage (SBS) was 0.021. The materials that come from the intercropping caused ruminal repletion. The degradation rates were lower when correlated with data from literature. The values obtained for the parameters of degradation kinetics and passage of materials obtained from the various forms of intercropping of brachiaria grass and crops of corn and soybeans do not compromise the recommendation of the use of forage to increase the profitability of the system.

Key Words: grasses, kinetics of particles transit, degradability

T314   Utilization of infrared thermography image analysis in ruminant feeding experiments. M. S. V. Salles*[1], S. C. Silva[1], L. C. Roma Junior[1], C. E. L. Oliveira[2], F. A. Salles[1], C. M. M. Bittar[3], and L. El Faro[1], *[1]APTA Centro Leste, Ribeirao Preto, Sao Paulo State, Brazil, [2]FZEA USP, Pirassununga, Sao Paulo State, Brazil, [3]ESALQ USP, Piracicaba, Sao Paulo State, Brazil.*

Infrared thermography (IRT) is an alternative, noninvasive method, which has been studied as a tool in the identification of several physiological and pathological processes related to changes in body temperature. Heat production in ruminants is increased by high intake of forages. This study aimed to detect through IRT, changes in temperature caused by the ingestion of diets with different amounts of forage. For this purpose an experiment was conducted with 24 Jersey heifers (average body weight of 227 kg), in a replicated Latin square design, with repeated measures in time, with the following treatments: 30, 50 and 70% forage (corn silage) in relation to the diet dry matter (DM). Feeding consisted of a total mixture ration offered (3% of body weight) from 08:00 to 14:00. Each collection period (4 d) was preceded by 7 d of diet adaptation. The thermography images (right and left flank and eyes, feet and forehead), heart rate, respiratory rate and rectal temperature were obtained every 2 h, from 06:00 to 18:00h. Temperature values of the thermography images of the right flank in the 30, 50 and 70% treatments were 29.95, 30.11 and 29.89°C, with a significant difference between the last 2 ($P = 0.0339$). The 50% treatment, which showed the highest temperature of the right flank, also had higher DMI (6.50, 7.24 and 5.95 kg for 30, 50 and 70, $P < 0.0001$); while for NDF intake, there was an interaction ($P = 0.0007$) between treatment and time (1.72, 2.31, 2.86 for 30%; 2.36, 3.03, 3.49 for 50%, and 2.02, 2.78, 3.45 for 70%, at 08:00, 10:00 and 12:00h, respectively). Other variables did not differ between treatments. Although the difference between treatments were of small magnitude, the use of thermographic images enabled detection of a temperature increase associated with higher dietary fiber intake. Financial support FAPESP.

Key Words: dry matter intake, NDF intake, ruminant

T315   Evaluating and refining the CNCPS feed library. R. J. Higgs,* L. E. Chase, D. A. Ross, and M. E. Van Amburgh, *Department of Animal Science, Cornell University, Ithaca, NY.*

The Cornell Net Carbohydrate and Protein System (CNCPS) model includes a library of >800 ingredients which is the reference database for describing the chemical composition of a diet. The objective was to evaluate the current feed library against commercial laboratory data, and update the library as required. To conduct the analysis, data sets were provided by 2 commercial laboratories (n > 100,000 analyses; Dairy One, Ithaca, NY and Cumberland Valley Analytical, Hagerstown, MD). The procedure followed 4 sequential steps and bound each feed to the following constraint (Eq 1): (CP + EE + ash + NDF + acetate + propionate + butyrate + lactate + organic acids + sugars + starch + soluble fiber) = 100. In the first step, components used to differentiate farm level characteristics of the same feed were fixed (DM, NDF, CP). Second, linear regression equations were derived from the data provided and used to calculate components from other correlated components within the same feed ($R2 > 0.65$). Third, factors not predicted using standard linear regression and not in Eq. 1 were calculated using a matrix of regression coefficients derived from data generated using a Monte Carlo (MC) simulation. To complete the analysis, probability density functions of each chemical component of each feed were fit and correlated to each other in @Risk (Palisade, Ithaca, NY). A MC simulation was run for 30,000 iterations, which generated a standardized data set of likely feed compositions. These data were then used to calculate the coefficients for the matrix. Lastly, components that were not assigned values in any of the preceding steps were calculated using a genetic algorithm optimizer (RISKOptimzer, Palisade). Minimum and maximum boundaries for each component within a feed were set using the data sets provided to constrain the optimizer to a likely range of values (mean ± SD). The optimizer was also constrained to satisfy the assumptions of Eq 1. The approach provided an efficient and repeatable way of evaluating and refining the composition of a large number of different feeds against commercially generated data similar to that used by CNCPS users on a daily basis.

Key Words: feed chemistry, optimization, library

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