medium diets. Cows had similar (P > 0.05) DMI from week -7 through week -4 before calving; conversely, DMI from week -3 through calving was higher for cows on the high diet. Pospartum cows fed high and medium diets were heavier than those fed low diets, whereas no treatment effect (P > 0.05) was observed for ADG. Cows on the high level diet had higher DMI than the medium and low diet cows. A interaction treatment x week (P < 0.05) indicates differences in MY among treatments; on average, MY of cows fed the high diet was 7.0 and 15.3 kg higher than those fed on the medium or low diets, respectively. In contrast, calves BW at birth, days to first estrous, days open and service per conception were similar among treatments groups. In conclusion, increasing dietary levels of ENL and CP during the dry period increased DMI, BW, and ADG. Likewise, in pospartum period, increasing the levels of ENL and CP were associated with increased DMI, BW changes, and MY.

Key Words: Energy, Protein, Transition cow

Ruminant Nutrition: Non-fibrous Carbohydrate and By-Product Feedstuffs

M235 Altering structural to non-structural carbohydrate ratio in the diet of transition dairy cows grazing pasture did not affect subsequent health or production. J. R. Roche*, *Dexcel*, *Hamilton, New Zealand*.

Due to increasing glucose requirements precalving, it was hypothesized that altering the dietary structural to non-structural carbohydrate content to increase gluconeogenesis would reduce precalving mobilization of body tissue and improve subsequent milk production. Sixty-eight multiparous dairy cows were randomly allocated to one of two diets for 36 ± 8.7 d precalving. All cows were fed pasture and pasture-silage precalving, with one group also receiving 3kg DM/d of a barley-maize concentrate (30% DMI). Precalving diets were iso-energetic (114 MJ ME/cow/d). At calving, cows in both precalving feeding treatments were allocated in a completely randomized design to two dietary treatments for 35 d in a 2x2 factorial arrangement. Postcalving, all cows received pasture and pasture silage with one group also receiving 5.0 kg DM/d of a barley-maize concentrate (35% DMI). Postcalving diets were also iso-energetic (179 MJ ME/cow/d). Daily FCM (26.0 kg/cow/d) was not affected by either pre- or postcalving concentrate supplementation, although protein to fat ratio was higher in cows supplemented postcalving. Similarly, concentrate supplementation pre- or postcalving did not affect either BW or BCS change before or after calving. Cows receiving concentrates precalving had slightly higher (P<0.001) plasma NEFA concentrations, but otherwise were not different to those receiving an equivalent energy intake from pasture and pasture silage. Postcalving concentrate supplementation increased (P<0.01)plasma glucose and NEFA, decreased (P<0.001) plasma BHBA. Results suggest little effect on milk production by replacing energy from structural carbohydrates in high quality pasture with energy from non-structural carbohydrate during the transition period.

Table 1.

Variable	Precalving Past	Precalving Conc	Postcalving Past	Postcalving Conc	SED	P- value Pre	P- value Post
FCM, kg/d	26.2	25.8	26.3	25.6	0.75	0.68	0.39
Fat,%	4.67	4.72	4.99	4.40	0.091	0.57	<0.001
Protein, %	3.48	3.53	3.48	3.53	0.048	0.31	0.30
BCS change precalving	0.02	0.06			0.043	0.39	
BCS change postcalving	-0.11	-0.11	-0.09	-0.13	0.029	0.99	0.20

Key Words: Structural to nonstructural carbohydrate ratio, Pasture, Transition dairy cow

M236 The feeding value of corn distillers solubles for lactating dairy cows. A. K. Sasikala-Appukuttan*[1], D. J. Schingoethe[1], A. R. Hippen[1], K. F. Kalscheur[1], K. Karges[2], and M. L. Gibson[2], [1]*South Dakota State University*, *Brookings*, [2]*Dakota Gold Research Association*, *Sioux Falls, SD*.

Fifteen Holstein cows (10 multiparous and 5 primiparous) in midlactation (79.3 ± 9.2, DIM) were used in a replicated 5 x 5 Latin square design with 4-wk periods to evaluate and compare the use of condensed corn distillers solubles (CCDS) and dried distillers grains with solubles (DDGS) in the total mixed ration. The forage portion of the diets was kept constant at 27.5% corn silage and 27.5% alfalfa hay (DM basis). Diets were: 1) 0% distillers grains products (control), 2) 18.5% DDGS, 3) 10% CCDS, and 4) 20% CCDS, and 5) 18.5% DDGS with 10% CCDS. Diets 2 and 3 contained 2% added fat while diet 4 and 5 contained 4% added fat from the distillers byproducts. The diets were balanced to provide 17% CP. Mixed model procedure of SAS was performed and the statistical model was y = treatment + parity + period with cow (parity) being random. Milk yield tended (P < 0.10) to be greater for diets 2 to 5 than for diet 1. Fat and protein concentration and yields were similar (P > 0.10) for all diets. Dry matter intake, energy-corrected milk and feed efficiency, defined as ECM/DMI, were similar (P > 0.10) across diets. Milk urea nitrogen was greatest (P < 0.01) for cows fed diet 1. Ruminal acetate decreased (P < 0.01) and propionate increased (P < 0.01) when fed CCDS and DDGS. The results showed that CCDS is as effective as DDGS in replacing soybean meal and corn grain in the total mixed ration.

Table 1.

Item	Diet 1	2	3	4	5	SEM
DMI, kg/d	21.4	22.0	20.9	21.3	21.9	1.53
Milk, kg/d	33.8	36.2	35.5	36.0	36.0	1.86
ECM, kg/d	31.0	32.4	32.3	32.8	32.7	1.67
Fat, %	2.96	2.84	2.93	2.93	2.86	0.09
Fat, kg/d	1.00	1.01	1.03	1.05	1.04	0.06
TP, %	2.92	2.88	2.87	2.88	2.90	0.05
TP, kg/d	0.99	1.03	1.01	1.03	1.04	0.05
FE	1.55	1.60	1.62	1.59	1.55	0.12
MUN, mg/dL	15.0	10.9	11.1	11.0	11.4	1.31
Ruminal VFA						
-Acetic, %	65.6	64.6	62.6	61.1	61.4	0.97
-Propionate, %	19.9	22.0	22.1	22.3	22.6	0.95

Key Words: Condensed corn distillers solubles, Dried distillers grains with solubles, Dairy cattle

M237 Effect of feeding wet pressed beet pulp on milk yield of dairy cows. J. C. Dalton*[1], N. Rimbey[1], B. Shafii[2], W. J. Price[2], M. A. McGuire[2], D. Costesso[3], and J. Stewart[4], [1]*University of Idaho*, *Caldwell*, [2]*University of Idaho*, *Moscow*, [3]*Amalgamated Sugar, LLC*, *Ogden, UT*, [4]*Stewart Farms, Inc.*, *Nampa, ID*.

Beet pulp is the solid residue remaining after sugar is extracted from sugar beets. Typically, the pulp is mechanically pressed to 25% DM content and then artificially dried for storage and feeding. Wet pressed beet pulp (WBP) is an inexpensive alternative that would expend less fossil fuel during processing. The objective of this study was to determine the effect of feeding WBP (24.3% DM, 11.1% crude protein, 28.4% ADF, 46% NDF) on milk yield of dairy cows. Dairy cows (n = 379) greater than 30 days in milk were randomly allotted to receive a diet that contained WBP or a control diet (CON) for 11 weeks. On a dry basis, the WBP ration contained 1.35 kg of wet pressed beet pulp, 6.2 kg earlage, and .95 kg corn silage, whereas the CON ration contained 7.2 kg earlage and 1.2 kg corn silage. All other feedstuffs and amounts fed (dry basis) were the same for the treatment and control groups. Samples of the WBP TMR averaged 54.8% DM; 16.2% crude protein; 21.4% ADF; 32.8% NDF. Samples of the CON TMR averaged 58.3% DM; 16.9% crude protein; 20.3% ADF; 30.9% NDF. All cows were milked 3x, and milk yield data was collected electronically at each milking. Seven day average milk yield was analyzed as repeated measures ANOVA, using the Mixed Procedures of SAS. Separate analyses were carried out for cows between 30 to 135 days in milk (DIM) and 136 to 305 DIM. Milk yield did not differ between the WBP and CON groups (48.2 ± .71 kg/d vs. 48.7 ± .78 kg/d, mean ± SEM, respectively) for cows between 30 to 135 DIM. For cows between 136 and 305 DIM, milk yield differed (P<.05) between the WBP and CON groups (45.7 ± .87 kg/d vs. 41.7 ± 1.07 kg/d, mean ± SEM, respectively). Results from this study suggest that the inclusion of WBP in the diet of lactating dairy cows increased the milk yield of cows between 136 and 305 DIM, but not cows between 30 to 135 DIM.

Key Words: Dairy cows, Milk yield, Beet pulp

M238 The interaction of barley composition, processing method, and exogenous enzyme addition on dry matter and neutral detergent fiber disappearance. T. L. Benson*, J. J. Michal, R. L. Kincaid, C. T. Gaskins, and K. A. Johnson, *Washington State University*, *Pullman*.

To examine the interaction of the chemical composition of barley, processing method and exogenous enzyme addition, 8 varieties of barley of differing chemical composition (hulless, malt, feed, 2-row and 6-row) were processed using 4 methods; whole (W), steam-rolled (SR), dry rolled (DR), and temper-rolled (TR) and incubated in the rumen for 24h. Processed barleys were treated with water (H_20), b-glucanase (5.4 U/mg, BG), or one of two xylanases (0.64 U/mg, X1; and 32.1 U/mg, X2) Enzymes were applied at the rate of 1U/gm to the processed barleys 2h prior to incubation in nylon bags in the rumens of two fistulated steers fed at maintenance a diet consisting of bluegrass straw and corn silage. After incubation, bags were removed, rinsed, and analyzed for dry matter (DMD) and neutral detergent fiber disappearance (NDFD). There was no effect of steer on DMD or NDFD. Barley variety impacted DMD disappearance (P<.001). DMD ranged from 65.1± 0.42 to 53.9± 0.42 with the hulless barley having the greatest DMD and the barley variety with the highest fiber content having the lowest. Processing method significantly (P<0.001) affected DMD (W 4.2± 0.3, DR 80.4± 0.3, SR 64.5± 0.3, TR 79.8± 0.3) and NDFD (W 14.1± 0.60, DR 36.1± 0.60, SR 21.0±0.60, TR 34.1±0.60). Enzyme addition impacted DMD and NDFD (p<0.001) with H_2O having no effect and X1 having the greatest effect on NDFD (H_20 24.3± 0.6, BG 27.3± 0.6, X1 28.1± 0.6, X2 25.5± 0.6). There was no interaction of enzyme with barley variety or enzyme with processing method but there was a significant interaction (P<0.001) of barley variety by processing method on DMD and NDFD. The hulless variety had the greatest DM and NDFD with all processing methods. TR was the method of processing of barley that is high in fiber, that yielded the highest DM and NDF disappearance.

Key Words: Barley, Processing, Enzymes

M239 Effect of extent of barley grain processing on productivity of lactating dairy cows varying in milk yield and days in milk. G. McGregor[1], M. Dehghan-banadaky[1], R. Corbett[2], and M. Oba*[1], [1]*University of Alberta*, *Edmonton, Alberta, Canada*, [2]*Alberta Agriculture Food and Rural Development*, *Edmonton, Alberta, Canada*.

The objectives were to evaluate the effect of finely (FN) or coarsely (CR) steam-rolled barley on productivity of lactating dairy cows, and how the response to FN relative to CR differs for cows varying in physiological state. Sixty Holstein cows (191 ± 82.1 DIM; 643 ± 83.2kg BW), 20 primiparous and 40 multiparous, were used in a cross-over design with 14d per period. The volume-weight of barley grain was 68.3 kg/hL before processing. The experimental diets contained either FN or CR (density after processing expressed as a percentage of density before processing = 68.7 ± 0.69% and 82.5 ± 1.51% respectively) at 38.4% of dietary DM. Both diets were formulated for dietary concentrations of NDF, CP and starch of 37.3, 18.4 and 32.4% respectively. All cows were fed a common diet for 14d immediately prior to the experiment to collect pre-trial production data independent of treatment. Neither dry matter intake, milk yield nor 4% fat corrected milk yield differed between the two treatments. Milk fat yield tended to be greater for FN compared to CR (1.14 vs. 1.11 kg/d; P < 0.10), although milk fat concentration was not affected by treatment. Milk urea nitrogen concentration was higher (14.0 vs. 13.6 mg/dL; P < 0.005), and lactose concentration was lower (4.55 vs. 4.58%; P < 0.001) for cows fed FN compared to CR. The response to FN relative to CR in milk fat concentration was not related to pre-trial milk yield, body weight, or body condition score, but positively related to days in milk (linear effect, P < 0.01), indicating that FN treatment decreased milk fat concentration for cows at early stages of lactation but increased for cows at later stages of lactation. Although significant statistical differences were observed for some response variables, the differences were too small to provide practical implications. The extent of processing did not have remarkable effects on productivity of lactating dairy cows for the barley grain used in this study.

Key Words: Barley processing, Production level, Dairy cows

M240 Effect of dietary wheat on dairy cow performance is not influenced by the addition of rumen buffers. L. Doepel* and A. Cox, *University of Alberta*, *Edmonton, Alberta, Canada*.

In a previous study, we demonstrated that wheat grain fed to lactating dairy cows at up to 20% of diet DM in conjunction with sodium bicarbonate at 0.5% of diet DM had no adverse effects on rumen pH or milk and milk component yields relative to that obtained on a barley-based diet. The current study was conducted to determine if a diet containing 20% wheat could safely be fed to dairy cows without the addition of rumen buffers. Twelve 2nd lactation Holstein cows averaging 165 DIM at the beginning of the study were utilized in a

replicated crossover with 21 d periods, the last 7 d being used for sample collection. Cows were fed a TMR twice daily consisting of 35% barley silage, 15% alfalfa hay and 50% concentrate on a DM basis. The concentrate contained 40% rolled hard red spring wheat with (SB) or without (Ctl) sodium bicarbonate at 0.5% of total diet DM. Dry matter intake, cow body weight, and milk and milk component yields were unaffected by treatment. Milk composition also was not influenced by treatment. Rumen pH, measured in 6 cows, was not different between the Ctl and SB treated cows. These results suggest that up to 20% wheat can be included in the diet of lactating cows without a need for rumen buffers.

Table 1.

	Ctl	SB	SEM	*P*
Rumen pH	6.26	6.22	0.03	0.5
DMI, kg/d	21.3	20.7	0.4	0.3
Milk, kg/d	31.4	30.2	1.9	0.6
FCM, kg/d[1]	30.2	29.1	1.7	0.7
Fat, %	3.76	3.78	0.11	0.9
Fat, g/d	1175	1134	70	0.7
Protein, %	3.31	3.30	0.07	0.9
Protein, g/d	1031	983	48	0.5
Lactose, %	4.53	4.52	0.06	0.9
Lactose, g/d	1430	1372	97	0.7
BW, kg	612	608	4	0.4
BCS	2.40	2.58	0.08	0.13

[1]FCM = fat-corrected milk yield (4% FCM, kg = 0.4 x milk yield, kg + 15 X (milk yield, kg x fat, %)

Key Words: Wheat supplementation, Rumen buffers, Dairy cow performance

M241 Effect of wheat supplementation on rumen pH and lactation performance in dairy cows. L. Doepel*, A. Cox, and A. Hayirli, *University of Alberta*, *Edmonton, Alberta, Canada*.

Wheat grain is seldom fed to dairy cows because of the concern that it will contribute to the development of subacute rumen acidosis, with subsequent negative effects on cow productivity. The objective of this experiment was to examine the effect of increasing levels of dietary wheat supplementation on rumen pH and lactation performance. Twelve 2nd lactation Holstein cows averaging 96 DIM at the beginning of the study were utilized in a replicated 3 x 3 Latin square design with 21 d periods. Six of the cows were ruminally cannulated. Cows were fed a TMR twice daily consisting of barley silage (35%), alfalfa hay (15%) and concentrate (50%) containing 0, 20, and 40% rolled hard red spring wheat, so that the final diets contained 0, 10, and 20% wheat on a DM basis. All diets contained sodium bicarbonate at 0.5% of diet DM. In the two wheat diets, wheat directly replaced rolled barley. Data collection took place over the last 7 d of each period except for rumen pH. Rumen fluid was obtained from the cannulated cows by a suction strainer 18 times over the last 24 h of each period. Data were reduced to means before being analyzed by the mixed procedure of SAS using a model that contained square, period and treatment as fixed effects and cow(sq) as a random effect. Rumen pH was reduced by wheat inclusion in the diet (P=.001). Milk and milk component yields were not different between the treatments, but milk protein content was lower in the wheat-fed cows than in the barley-fed cows (P=0.03). Our results indicate that replacing rolled barley with readily fermentable carbohydrate in the form of rolled wheat has minimal effects on lactation performance and that up to 20% wheat can be included in the diet without causing milk fat depression.

Table 1.

	Wheat, % diet		DM		*P*[1]		
	0	10	20	SEM	W	L	Q
Rumen pH	6.44	6.34	6.37	0.02	0.001	0.004	0.002
DMI, kg/d	21.4	20.5	20.8	0.7	0.2	0.4	0.2
Milk, kg/d	35.9	36.0	36.4	1.5	0.8	0.7	0.9
FCM, kg/d	33.3	32.9	33.3	1.4	0.8	0.9	0.6
Fat, %	3.51	3.44	3.43	0.10	0.3	0.4	0.6
Fat, g/d	1261	1231	1246	60	0.5	0.7	0.5
Protein, %	3.09	2.98	3.06	0.06	0.03	0.3	0.01
Protein, g/d	1106	1074	1110	46	0.7	0.9	0.3
Lactose, %	4.56	4.61	4.65	0.06	0.1	0.08	0.8
Lactose, g/d	1645	1668	1695	79	0.6	0.5	0.9
BW, kg	599	597	598	4	0.3	0.5	0.4
BCS	2.61	2.62	2.56	0.04	0.6	0.3	0.4

[1]W = contrast 0 vs. mean of 10 & 20% wheat; L & Q = linear and quadratic treatment effects

Key Words: Wheat supplementation, Milk production, Rumen buffer

M242 Performance and blood metabolites of growing hairy sheep fed sorghum diets with urea and dried citrus pulp. H. Morales-Treviño, J. González-Rodríguez, E. Gutiérrez-Ornelas*, H. Bernal-Barragán, and J. Colín-Negrete, *Facultad de Agronomía, Universidad Autónoma de Nuevo León*, *Carretera Zuazua-Marín Km 17.5, Marín, Nuevo León, México*.

Twenty-eight weaned hairy sheep lambs, initial body weight of 14.9 ± 2.2 kg, were fed sorghum diets with two urea (0.5 and 1%) and two dried citrus pulp (DCP, 0 and 10%) levels throughout a 56 d trial in order to evaluate their growth performance and changes in blood urea N (BUN), glucose and phosphorus. Body weight was recorded and blood samples were taken from the jugular vein every 14 d. Seven lambs were used as replicates in a randomized complete block design experiment with a factorial 2X2 arrangement of treatments. There was no treatment effect (P>0.05) on overall dry matter intake (DMI) and ADG; however, lambs that did not receive DCP the last 14 d of the trial reduced (P< 0.05) their ADG by 11.5% when urea was increased from 0.5 to 1%. An interaction (P<0.05) DCP X urea was found for feed conversion rate (FCR=DMI/ADG). Lambs fed diets containing either 0% DCP + 0.5% urea (FCR=3.28) or 10% DCP + 1% urea (FCR=3.33) had better FCR (P<0.05) than those fed diets containing either 0% DCP + 1% urea (FCR=3.47) or 10% DCP + 0.5% urea (FCR=3.58). BUN increased from 13.0 and 10.3 mg/dL on day 14th to 22.5 and 25.3 mg/dL on day 56th in lambs fed with 0.5 and 1% of urea, respectively. Blood glucose and phosphorous were not affected (P>0.05) by treatments. It is concluded that it is possible to substitute sorghum grain up to 10% with DCP on weaned hairy sheep diets if they are supplemented with 1% urea. Increased levels of BUN can be used for monitoring either excess of urea or crude protein content in hairy sheep diets.

Key Words: Dried citrus pulp, Blood metabolites, Hairy sheep

M243 Effect of partial replacement of forage NDF with byproduct NDF in close-up diets of dairy cattle on periparturient metabolism and performance. H. M. Dann*[1], R. J. Grant[1], C. S. Ballard[1], M. P. Carter[1], K. W. Cotanch[1], H. M. Wolford[1], J. W. Darrah[1], S. A. Flis[1], C. T. Hill[1], and T. Takano[2], [1]*William H. Miner Agricultural Research Institute*, *Chazy, NY*, [2]*Zen-Noh National Federation of Agricultural Co-operative Associations*, *Tokyo, Japan*.

The objective of the study was to determine the effect of partial replacement of forage NDF with byproduct NDF in close-up diets of dairy cattle on periparturient metabolism and performance. Holstein cows (n = 45) and heifers (n = 19) were fed diets containing either 1) 30% oat hay (1.6 Mcal NE_L/kg, 12.8% CP, 42.4% NDF) or 2) 15% oat hay and 15% beet pulp (1.6 Mcal NE_L/kg, 13.2% CP, 40.5% NDF) from –21 d relative to expected parturition until parturition. After parturition, animals received a lactation diet (1.7 Mcal NE_L/kg, 17.1% CP, 35.0% NDF). Animals were group-fed from –21 to –10 d relative to expected parturition and individually fed from –10 d relative to expected parturition until 14 DIM. Animals were required to have at least 5 d of prepartum intake data to remain on the study. Body weight and BCS were determined weekly. Blood was collected and serum from the start of study and –5, –3, –1, 1, 3, 5, 7, 9, 11, and 13 d relative to actual parturition was analyzed for content of NEFA and BHBA. Milk yield was measured. Data were analyzed as a randomized design and subjected to analysis of variance using the MIXED procedure of SAS. Close-up diet did not affect ($P > 0.10$) DMI (1.48% BW), energy balance (116%), or serum content of NEFA (381 µEq/L) and BHBA (6.0 mg/dL) during the last 5 d prepartum. Prepartum BW (776 kg) and BCS (3.56) were similar ($P > 0.10$) between treatments. There was no carryover effect ($P > 0.10$) of close-up diet on DMI (2.20% BW), energy balance (69%), milk yield (34.7 kg), BW (691 kg), BCS (3.32), or serum content of NEFA (723 µEq/L) and BHBA (12.6 mg/dL) during the first 14 DIM. Partial replacement of forage NDF (oat hay) with byproduct NDF (beet pulp) did not affect periparturient metabolism or performance. Further investigation of replacement level is needed.

Key Words: Transition cow, NDF, Beet pulp

M244 Effect of soybean hull supplementation frequency on the performance of steers grazing fall cool-season pastures with clover. R. L. Mills*[1], J. C. Waller[1], and C. J. Richards[2], [1]*The University of Tennessee*, *Knoxville*, [2]*Oklahoma State University*, *Stillwater*.

In two years, eighty Angus and Gelbvieh steers (313±32 kg) were used in a randomized block design to examine performance when supplemented with digestible fiber at three frequencies while grazing fall growth of cool-season pastures, predominantly endophyte-infected tall fescue with clover. Steers were randomly allotted to sixteen 2-ha paddocks which were randomly assigned to four treatments: 1) unsupplemented control; 2) supplemented with soybean hulls (0.5% BW; DM basis) daily; 3) supplemented with soybean hulls (1.0% BW; DM basis) every second day; 4) supplemented with soybean hulls (1.5% BW; DM basis) every third day. Steers had free choice access to water and a loose vitamin/mineral mix. Steers were weighed on d 0, 1, 28, 55, and 56. Initial and final weights were an average of the two beginning and ending weights, respectively. Data were analyzed using the MIXED procedure of SAS. Variables analyzed were initial, d 28, and final weights, and ADG (period 1 = d 1 to 28; period 2 = d 29 to 56; total = d 1 to 56). Contrasts were performed to compare control to supplemented and linear and quadratic effects of supplementation frequency. There were no differences in initial, d 28, and final body weights ($P > 0.10$). No difference ($P > 0.10$) was detected in period 1 ADG. Period 2 ADG was 29.4% greater ($P < 0.01$) for supplemented than control with frequency resulting in a linear response with daily being the greatest at 0.87 kg/d and every second day and every third day reducing ADG by 3.7 and 15.9%, respectively. Total ADG was 14.3% greater ($P < 0.01$) for supplemented than control with frequency resulting in a linear ($P < 0.01$) response with daily being the greatest at 0.90 kg/d and every second and every third day reducing ADG by 6.6 and 2.0%, respectively. This research shows that digestible fiber supplementation increases weight gain of calves grazing fall cool-season pastures with clover and less frequent feeding slightly reduces performance compared to daily supplementation.

Key Words: Cattle, Supplementation, Soybean hulls

M245 Application of advanced Synchrotron-based analytical technique (SR-FTIR) to feed science and ruminant nutrition. P. Yu*, *University of Saskatchewan*, *Saskatoon, Canada*.

Traditional wet chemical analysis methods cannot detect intrinsic structural chemistry of a biological tissue. This is because the chemical structures and molecular characteristics of intrinsic structures of a tissue are destructed during the processing for analysis. Synchrotron-based Fourier transform infrared microspectroscopy (SR-FTIR), taking advantages of synchrotron light brightness (which is 100-1,000 brighter than sunlight), can explore molecular chemical features of the microstructure of biological samples. However, the applications of this synchrotron-based analytical technique to feed science and animal nutrition are rare. This presentation shows several applications of the SR-FTIR technique as a novel approach in feed science and ruminant nutrition research. Application 1 showed that using SR-FTIR technique, intensities and distribution of the biological components in the micro-structure of feed tissue within cellular dimension could be imaged. Application 2 showed with SR_FTIR technique, chemical differences in the ultrastructural matrix of endosperm tissue between Harrington (malting-type) and Valier (feed-type) barley in relation to rumen degradation characteristics were identified. The results indicated that the greater association of the protein matrix with the starch granules in the endosperm tissue of Valier barley may limit access of ruminal microorganisms to the starch granules and thus reduce the rate and extent of ruminal degradation relative to that of Harrington barley. It is the first time that micro-structural matrix in endosperm of barley could be revealed by using SR-FTIR technique, which makes it possible to link feed intrinsic structures to nutrient utilization and digestive behavior in ruminants. Application 3 showed with SR-FTIR technique, feed protein amide I molecular structural-chemical features affected by processing could be quantified with multi-component fitting program (Lorentzian and Gaussian function).

Key Words: Synchrotron infrared microspectroscopy, Feed molecular chemistry, Ruminant nutrition