M103 Effect of feeding distillers dried grains to lactating cows on farms in the southern dairy region of Chile. R. Shaver*[1], R. Ehrenfeld[2], M. Olivares[2], J. Cuellar[3], and F. Inostroza[1], [1]*University of Wisconsin*, *Madison,* [2]*Cooprinsem*, *Osorno, Chile*, [3]*US Grains Council*, *Bogota, Columbia*.

A field trial was conducted on 5 farms to determine the effect of feeding distillers dried grains (DDGS) on milk production in the southern dairy region of Chile. The trial was repeated on each farm during winter (July and August; primarily silage-based rations) and spring (November and December; pasture-based rations). Only for one farm could the treatments be applied concurrently by feeding different isonitrogenous concentrate mixes to randomly assigned cows in the milking parlor with data analyzed as a randomized complete block design. Milk yield tended ($P < 0.07$) to be greater for cows fed DDGS (2.0 kg/cow per d) by 1.9 kg/d in winter and 1.8 kg/d in spring. In winter, milk protein yield was ($P < 0.02$) greater for cows fed DDGS by 73 g/d. Milk fat content was ($P < 0.01$) lower for cows fed DDGS by 0.26%-units in the spring, however, milk fat yield was unaffected by treatment. The 4 farms that could not apply the treatments concurrently were randomly assigned to either a control to DDGS or a DDGS to control isonitrogenous concentrate treatment sequence in a crossover design with monthly feeding periods during the winter and spring. Data were analyzed as a crossover design with farm as the experimental unit. Milk yield was ($P < 0.05$) greater for farms fed DDGS (2.5 kg/cow per d) by 0.9 kg/d in winter. We conclude that DDGS was an effective dairy concentrate ingredient in the southern dairy region of Chile.

Key Words: pasture, dairy cows, distillers grains

M104 Yield and quality of grasses and legumes for dairy cattle feeding. E. E. Corea Guillén*[1], J. M. Flores Tensos[1], F. M. Salinas Munguia[1], E. A. Crespin Payés[1], and J. A. Elizondo-Salazar[2], [1]*Departamento de Zootecnia, Facultad de Ciencias Agronómicas, Universidad de El Salvador, El Salvador,* [2]*Estación Experimental Alfredo Volio Mata, Facultad de Ciencias Agroalimentarias, Universidad de Costa Rica, Costa Rica.*

Forages used in a cut-and-carry system are a very important feed resource for dairy cattle in El Salvador and many areas of Central America. However, forages are extremely variable in terms of yield and quality and they are usually low in CP content. Planting legumes mixed with grasses is a management practice to take advantage of their unique ability to bind atmospheric N and to improve the quality of the forage when harvested. This study was conducted to determine yield and quality of 2 forages, 2 legumes and a 1:1 sward mixture between them. Two varieties of Sorghum (*Sorghum bicolor* var. CENTA S-2 and *Sorghum bicolor* var. RCV) and the legumes Canavalia (*Canavalia ensiformis*) and Vigna (*Vigna sinensis*) were used in the study. Forages were established in 12 × 12-m plots with 3 replications in a randomized block design. Seeding rate was 250000, 250000, 50000, and 75000 plants/ha for S-2, RCV, Canavalia and Vigna, respectively. They were planted in different days so that they would be harvested at maturity age (75, 70, 80, and 60 d for S-2, RCV, Canavalia and Vigna, respectively). Samples were taken at maturity age to estimate yield and for determination of DM yield, DM, CP, NDF, and ADF concentration. Variables were analyzed using GLM procedure of SAS 9.1. Separation of means was done using the Duncan's multiple comparison procedure. There were differences ($P < 0.01$) between treatments for all variables studied. Grasses produced more available DM (kg/ha) than legumes. Legumes had higher CP content than grasses as expected. The findings of the study corroborate that grasses (S-2 and RCV) produced more biomass than legumes and that a mixture of both is a way to improve the yield of the legume alone and the quality of the grass alone.

Table 1. Yield and quality of grasses and legumes

Forage	Available DM, kg/ha	DM, %	CP, %	NDF, %	ADF, %
Sorghum					
S-2	15970.8[a]	17.9[a]	10.2[d]	67.3[c]	44.0[bc]
RCV	8941.1[c]	16.3[ab]	11.5[cd]	71.5[a]	42.4[e]
Legume					
Canavalia	6133.5[d]	16.2[ab]	17.4[a]	56.3[f]	45.2[a]
Vigna	3146.8[e]	10.0[c]	16.9[a]	52.7[g]	39.3[f]
Mixture					
S2_Canavalia	12938.9[b]	18.1[a]	11.7[cd]	67.8[c]	42.9[de]
S2_Vigna	12102.6[b]	15.4[b]	14.6[b]	68.7[b]	44.6[ab]
RCV_Canavalia	9500.8[c]	17.0[ab]	14.6[b]	66.0[d]	43.5[cd]
RCV_Vigna	8978.2[c]	15.1[b]	13.7[bc]	63.4[e]	39.4[f]

[a-g] $P < 0.01$, comparing least squares means within column.

Key Words: grasses, legumes, forages

M105 Quality of ensiled grasses and legumes for dairy cattle feeding. E. E. Corea Guillén*[1], J. M. Flores Tensos[1], F. M. Salinas Munguia[1], E. A. Crespin Payés[1], and J. A. Elizondo-Salazar[2], [1]*Departamento de Zootecnia. Facultad de Ciencias Agronómicas*, *Universidad de El Salvador, El Salvador*, [2]*Estación Experimental Alfredo Volio Mata. Facultad de Ciencias Agroalimentarias*, *Universidad de Costa Rica, Costa Rica*.

Silage is an excellent way to preserve forages at the optimum stage of growth for use during a time when it is unavailable. This is very important in all Central American countries in which there is a very marked dry season. However, it is well known that nutritional quality of grasses is not high and studies have demonstrated the superiority of grass-legume silages in comparison with grass silages. There is also a growing interest in organic and low-input production systems. A study was conducted to assess the nutritional value and quality of microsilages prepared from different combinations of grasses and legumes. A completely randomized design was used with 2 varieties of Sorghum (*Sorghum bicolor* var. CENTA S-2 and *Sorghum bicolor* var. RCV) and 2 legumes Canavalia (*Canavalia ensiformis*) and Vigna (*Vigna sinensis*). Forages were harvested at maturity age (75, 70, 80, and 60 d for S-2, RCV, Canavalia and Vigna, respectively). Seven kg of fresh-chopped forages in the proportions of 100:0, 70:30, and 50:50% w/w for grass and legume respectively, were placed in plastic bags in triplicate. Air was extracted by compacting the forage mass and bags were tightly sealed. Microsilages were open after a 21 d period and a sample was taken to determine pH, and for DM, CP, NDF, and ADF concentration. Variables were analyzed using GLM procedure of SAS 9.1. Separation of means was done using the Duncan's multiple comparison procedure. There were significant differences ($P < 0.01$) for the variables studied among the different mixtures. pH was among accepted values. Dry matter content was highest when grasses were ensiled alone. CP values were higher when a 50:50 proportion was used. Differences in the chemical composition of these silages reflect variations in the proportion of each forage type.

Table 1. pH and quality of ensiled forages

Proportion	pH	DM, %	CP, %	NDF, %	ADF, %
100:0					
S2_Canavalia	3.7[a]	23.1[a]	8.4[a]	61.7[a]	38.6[a]
RCV_Canavalia	3.6[b]	24.0[a]	8.0[a]	52.1[b]	33.5[b]
70:30					
S2_Canavalia	3.8[ab]	23.1[ab]	10.9[a]	57.1[b]	37.8[b]
S2_Vigna	3.9[a]	21.0[b]	9.7[b]	61.1[a]	40.4[a]
RCV_Canavalia	3.8[ab]	23.4[a]	10.8[a]	56.1[bc]	37.6[b]
RCV_Vigna	3.7[b]	21.7[ab]	9.9[b]	55.9[c]	35.3[c]
50:50					
S2_Canavalia	4.1[a]	21.5[a]	12.7[ab]	62.6[a]	42.3[a]
S2_Vigna	4.0[b]	18.5[b]	11.6[b]	60.9[b]	42.4[a]
RCV_Canavalia	4.0[b]	21.3[a]	13.3[a]	57.9[c]	40.3[b]
RCV_Vigna	4.1[a]	19.0[b]	13.8[a]	54.3[d]	34.7[c]

[a-c]$P < 0.01$, comparing LSM.

Key Words: microsilage, grasses, legumes

M106 Chewing and ruminating with various forage qualities in non-lactating dairy cows. M. Fustini*[1], A. Palmonari[1], A. J. Heinrichs[2], and A. Formigoni[1], [1]*Università di Bologna*, *Bologna, Italy*, [2]*Department of Dairy and Animal Science*, *The Pennsylvania State University, University Park*.

In Parmigiano Reggiano cheese area use of silages is not allowed. Thus, hay is the sole source of fiber in these diets. Forage quality strongly affects eating behavior, in particular if hay is represented by alfalfa. This study investigated typical dry forage diets used in the Parmigiano Reggiano area. Six multiparous, non-lactating Holstein cows were used in a replicated 3 × 3 Latin square to evaluate 3 different cuts of alfalfa hay fed as the sole forage source. First diet contained a first cut forage, while a second cut (poorly digestible) and a fifth cut (highly digestible) were used in the second and third diet. Eating and ruminating behavior were studied to investigate forage properties related to chewing activity. Digestibility was evaluated in vitro using the Tilley and Terry technique. Statistical analysis was conducted using PROC MIXED of SAS. No differences were found in eating time (average value 220.5, 261.7, 235.5 min/d for 1st, 2nd and 3rd diet respectively, $P > 0.05$); however, ruminating time per kilogram of physically effective neutral detergent fiber was greater when cows were fed first cut alfalfa than second or fifth cut (average value 136.1, 111.2, 107.1 min/d for 1st, 2nd and 3rd diet respectively, $P < 0.05$), despite not different digestibility and diet particle size of first and third diet (% dNDF 24h average values 50.44, 48.38 for 1st and 3rd diet respectively, $P > 0.05$). In summary, this study found no differences in eating time for the 3 hays fed. Ruminating time was not related to overall nutrient composition or digestibility of the hay, but varied by cutting with first cutting hay promoting more rumination.

Key Words: eating behavior, ruminating, forage quality

M107 The effect of management on corn silage quality. L. O. Abdelhadi*[1], C. A. Malaspina[2], W. R. Barneix[2], P. A. Saravia[2], and C. de Elia[3], [1]*Est. El Encuentro, Research & Extension in Ruminant Nutrition*, *Cnel. Brandsen, Bs.As., Argentina*, [2]*CACF*, *Argentina*, [3]*Alltech Biotechnology*, *Argentina*.

When formulating diets, corn silage quality is usually evaluated from samples taken before feedout and exposure to air, underestimating the losses related to exposure, extraction, mixing and feeding. A completely randomized design with a 3x2 factorial arrangement of treatments was used to evaluate the effects of silo type and sample location on CS nutrient composition in 12 commercial dairy and beef farms. Corn silage was manufactured in either bunker (n = 6) or bag (n = 6) silos, was inoculated with 5g/ton of Sil-All and sealed with plastic for 45d before feed out. The feed out rate was 0.2 to 0.3m twice daily for all bags and bunkers. Composite samples for analysis were collected from 3 locations: Depth = sample taken at 1m depth from the exposed face; Face = sample taken from the surface of the exposed face; and Feed bunk (FB) = sample taken from the FB after exposure to air for 3 to 4 h. Samples from the center of the silo were collected using a forage sampler at 0.5, 1.0 and 1.5 m from the floor. Sub samples were hand-mixed, divided into equal quarters, with 2 opposite quarters selected to obtain the composite sample including the fines. Samples were analyzed for DM, OM, NDF, WSC, CP, Starch, pH and in vitro DM digestibility (IVDMD). Although no effects of sampling location were detected for most variables, IVDMD tended ($P = 0.07$) to be reduced from Depth to FB, independently of silo type. This reduction seemed to be associated with a higher pH ($P = 0.09$) from depth to FB. These results suggest that CS extraction and distribution negatively affect the nutritional quality and this change should be considered for a more accurate diet formulation.

Table 1. Corn silage quality by sampling site or type of silo

	Sampling site (n=12)				Type of silo (n=18)		
Variable	Depth	Face	FB	SE	Bunker	Bag	SE
DM, %	31.9	30.7	32.3	2.32	33.1	30.1	1.89
% on DM basis							
OM	93.5	93.1	92.5	0.66	92.7	93.4	0.54
NDF	44.2	46.6	48.2	2.21	48.4a	44.3b	1.81
WSC	6.7	5.6	5.6	0.86	5.8	6.1	0.70
CP	5.9	5.9	6.2	0.41	5.9	6.2	0.34
Starch	16.9	13.2	13.5	3.51	15.0	14.0	2.87
IVDMD	70.9a	68.4b	67.5c	1.49	69.5	68.5	1.21
pH	3.88b	3.87b	4.03a	0.08	3.98	3.88	0.06

[abc]Means within a row with unlike letters differ ($P < 0.09$). SE= standard error (diff. of 2 means).

Key Words: corn silage, management, quality

M108 Whole-plant corn quality parameters for ensiled and unensiled samples: Effects of hybrid and length of fermentation. C. M. Fish*[1,2], R. D. Shaver[1], D. C. Weakley[2], J. G. Lauer[1], and T. E. Piper[2], [1]*University of Wisconsin*, *Madison,* [2]*Land O' Lakes Inc.*, *Shoreview, MN*.

Most corn hybrid trials use unensiled samples for laboratory analysis of forage quality parameters. The purpose of this study was to determine the effect of ensiling on ranking hybrids for silage quality. Twenty-nine corn hybrids of differing genetic backgrounds from early, mid, and late relative maturity groups were planted in replicated field test plots using a randomized complete block design at Lancaster, Plymouth and West Salem, WI. During harvest at 30–35% whole-plant DM content, 3 400-g samples were obtained from each field test plot; one sample was immediately refrigerated (0 d fermentation) for no more than 48 h before drying and 2 were ensiled in 25 cm by 33 cm vacuum-sealed bags stored at room temperature at the Land O'Lakes warehouse in Vincent, IA for 30 d or 120 d fermentation times. Refrigerated and ensiled samples were dried in a forced-air oven at 43–46°C for 48 h, ground on a Wiley mill to pass a 6mm screen, and analyzed using the Perten Diode Array 7200 NIR Analyzer. Parameters analyzed were starch, NDF, ivNDFD (30 h; % of NDF), and an index of in vitro starch digestibility (GPN).

Quality data were used to calculate milk per ton (MPT; kg per US ton; MILK2006). Data were analyzed using Proc Mixed in SAS with fixed effects of fermentation, hybrid and their interaction, and random effects of location, replication, and location interactions. Maturity trial averages and P-values for quality parameters are presented in the Table. Hybrid differences were detected for most parameters. There was a significant effect of fermentation on NDF, ivNDFD, GPN and MPT. However, interactions between hybrid and fermentation were not detected. Unensiled sample data may be used in quality evaluation trials for ranking corn silage hybrids, but fermentation influences silage quality parameter results.

Table 1. Maturity trial averages and P values for main effects and interaction

	NDF%	ivNDFD%	Starch%	GPN	MPT, kg/ton
Early Trial Avg	39.5	45.6	35.9	8.13	1502
Hybrid	0.159	0.029	0.122	0.785	0.073
Ferm	0.120	<.0001	0.349	0.014	0.024
Ferm*Hybrid	0.999	0.998	0.993	0.432	0.999
Mid Trial Avg	38.6	48.4	37.0	8.01	1540
Hybrid	<.0001	<.0001	0.0002	0.070	0.006
Ferm	0.059	0.011	0.476	0.007	0.009
Ferm*Hybrid	0.701	0.582	0.926	0.010	0.641
Late Trial Avg	38.4	46.9	38.7	8.09	1537
Hybrid	0.015	0.046	0.001	0.226	0.169
Ferm	<.0001	0.032	0.157	0.052	0.011
Ferm*Hybrid	0.985	0.994	0.967	0.253	0.995

Key Words: corn silage, starch, NDF

M109 Fermentation characteristics of corn-lablab bean silage mixtures. F. E. Contreras-Govea*[1], M. A. Marsalis[2], S. V. Angadi[3], G. R. Smith[4], and L. M. Lauriault[5], [1]*New Mexico State University, Plant and Environmental Sciences Department*, *Artesia,* [2]*New Mexico State University, Extension Plant Sciences Department*, *Clovis,* [3]*New Mexico State University, Plant and Environmental Sciences Department*, *Clovis,* [4]*Texas AgriLife Research, Texas A&M University System*, *Overton,* [5]*New Mexico State University, Plant and Environmental Sciences Department*, *Tucumcari.*

The objective of this study was to assess the fermentation characteristics of corn (*Zea mays* L.) when in mixture with different proportions of lablab bean (*Lablab purpureus* (L.) Sweet) for silage. Corn and lablab bean cv Rio Verde were grown in separate fields at 2 locations in 2009. Corn was harvested between 1/3 and 1/2 milk line and lablab between 5% and 15% bloom. Corn and lablab bean were chopped to a theoretical length of 25-mm. Chopped samples of both crops were hand mixed on per cent fresh weight basis to obtain 6 corn-lablab composite mixtures, 1) 100–0, 2) 90–10, 3) 75–25, 4) 50–50, 5) 25–75, and 6) 0–100. Mixtures were ensiled in 1-L glass jars at a density of 500-g of fresh material per jar. Four replications per treatment were included at each location. Mini-silos were fermented for 60 d at room temperature (25°C). At opening 250-g of fresh silage was vacuum sealed in plastic bags, frozen, for later analysis of fiber and fermentation characteristics. Data analysis was conducted as a randomized complete design for each location. Crude protein ($P < 0.01$) increased from 8.0% to 20.0% as the proportion of lablab bean increased in the mixture at both locations. At Location 1 NDF ($P < 0.003$) decreased and at Location 2 ($P < 0.01$) increased as lablab increased in mixture. At location 2, 48 h in vitro DM digestibility decreased from 87.3% to 81.3% as lablab increased in mixture, with no differences at the Location 1 ($P > 0.634$). Silage pH ($P < 0.0001$) and lactic acid concentration ($P < 0.01$) increased as well as the proportion of lablab increased in the mixture at both locations. Mixing lablab bean with corn for silage can potentially reduce protein supplementation requirements in dairy cow rations.

Key Words: corn, lablab bean, silage fermentation

M110 Fermentation characteristics of forage sorghum-lablab bean silage mixtures. F. E. Contreras-Govea*[1], M. A. Marsalis[2], S. V. Angadi[3], G. R. Smith[4], and L. M. Lauriault[5], [1]*New Mexico State University, Plant and Environmental Sciences Department*, *Artesia,* [2]*New Mexico State University, Extension Plant Sciences Department*, *Clovis,* [3]*New Mexico State University, Plant and Environmental Sciences Department*, *Clovis,* [4]*Texas AgriLife Research, Texas A&M University System*, *Overton,* [5]*New Mexico State University, Plant and Environmental Sciences Department*, *Tucumcari.*

The objective of this study was to assess the fermentation characteristics of forage sorghum (FS) [*Sorghum bicolor* (L.) Moench] for silage when in mixture with different proportions of lablab bean (*Lablab purpureus* (L.) Sweet) cv Rio Verde. Forage sorghum and lablab were grown in separate fields at 2 locations in 2009. Forage sorghum was harvested between soft and late dough stage of the kernel and lablab bean between 5% and 15% bloom. Forage sorghum and lablab were chopped to a theoretical length of 25 mm. Chopped crops were hand mixed on per cent fresh weight to obtain 6 FS-lablab composite mixtures, 1) 100–0, 2) 90–10, 3) 75–25, 4) 50–50, 5) 25–75, and 6) 0–100. Mixtures were ensiled in 1-L glass jars at a density of 500-g of fresh material per jar. Four replications per treatment were included at each location. Mini-silos were fermented for 60 d at room temperature (25°C). At opening, 250-g of fresh silage was vacuum sealed in plastic bags, and frozen for later analysis of fiber and fermentation characteristics. Data analysis was conducted as a randomized complete design for each location. Over both locations CP ($P < 0.0001$) and IVTD ($P < 0.01$) increased from 9.0% to 20.6% and from 79% to 85% respectively, as the proportion of lablab bean increased in the mixture. However, ADF ($P < 0.0001$) also increased with the addition of lablab bean in the mixture. Lactic ($P < 0.0001$) and Acetic ($P < 0.0001$) acids, and pH ($P < 0.0001$) also increased with the addition of lablab in the mixture. Mixing lablab bean with FS for silage can potentially reduce protein supplementation in rations for dairy or beef cattle and improves digestibility of the silage.

Key Words: forage sorghum, lablab bean, silage fermentation

M111 Growing degree-days as corn silage harvest indicator. J. S. Oliveira*[1], E. J. D. de Almeida[2], F. C. F. Lopes[1], and E. C. M. de Lanes[3], [1]*Embrapa Gado de Leite*, *Juiz de Fora, MG, Brazil*, [2]*Universidade Federal de Juiz de Fora*, *Juiz de Fora, MG, Brazil*, [3]*Centro de Ensino Superior de Juiz de Fora*, *Juiz de Fora, MG, Brazil*.

Dry matter content (DM%) at harvesting is important to have high quality corn silage. Ideal DM% ranges from 31 to 35 for bunker silos. Methods used by farmers to estimate DM% of corn crop are laborious or not reliable. This research studied the relation between growing degree-days (GDD) and DM% in different corn hybrids and its use as a tool to predict DM% in a corn crop. The field work was done at National Dairy Center Research, EMBRAPA, Coronel Pacheco, MG, Brazil. Six hybrids were planted in 4 dates (12/15/2004, 01/14/2005, 10/26/2005, 11/24/2005) using a casual block design and 3 replications. The experimental unit was a line 20 m long with 90 plants. After the eightieth day, 5 plants were sequentially harvested every 3 d from each line for dry matter content determination (DM%). Starting at seedling, maximum and minimum daily temperatures were recorded and used to calculate GDD using the formula GDD = [(Tmax - Tmin) / 2] - TB,

where TB is the base temperature, considered 8 for that region. Pairs of DM% and GDD originated a linear regression equation to estimate the required GDD for plants of each experimental unit reach 33% dry matter (GDD33). From the 72 equations, only 5 presented *P* value higher than 0.01 for parameter b. The GDD33 of only one of the 6 hybrids was affected ($P < 0.05$) by planting date. Also, GDD33 average was different ($P < 0.05$) between hybrids. Considering 80% precision, the error when using GDD33 to estimate 33% of DM varied from ± 2 (one hybrid) to ± 3 (5 hybrids) DM% units. Because DM content for ensiling must be in a range and not a fixed value, GDD seems to be a reliable tool to predict the proper time for corn silage harvest. This information should be included by seed companies when recommending a corn hybrid for silage.

Funded by FAPEMIG.

Key Words: growing degree units, dry matter, hybrids

M112 Production and quality of alfalfa harvested at different stages of maturity. R. Copado[1], C. Arzola*[1], J. A. Payan[2], J. Salinas[3], O. Ruiz[1], C. Rodriguez-Muela[1], E. Rodriguez[1], J. A. Ortega[1], and O. Serna[2], [1]*Universidad Autonoma de Chihuahua*, *Chihuahua, Chih., Mexico*, [2]*INIFAP*, *Chihuahua, Chih., Mexico*, [3]*Universidad Autonoma de Tamaulipas*, *Cd. Victoria, Tams., Mexico*.

To evaluate the effect of maturity upon the nutritional quality of 2 varieties of alfalfa ("Cuff-101" and "Excellent multileaf") harvested on 2 seasons (summer and fall), the production (kg/ha) and quality of forage was characterized. There were determined the leaf/stem ratio of biomass and its content of dry matter, crude protein, neutral detergent fiber, acid detergent fiber and lignin over a range of maturity following an initial phenologic stage characterized by an average stem length of about 0.3 m, (but not visible buds, flowers, or seedpods) within the 2 seasons. Within each season, plots were clipped initially (d 0) and then additional sampling dates were scheduled at 5-d intervals for the next 20 d, resulting in a total of 5 clipping dates (0, 5, 10, 15, and 20 d). Data were analyzed as a split-plot experiment, the plots arranged factorially in a randomized complete block design, being the alfalfa varieties and season the main effects, and maturity the subplot term. Season influenced both production and forage quality, so during the fall the production of dry matter was lower ($P < 0.01$). On d 20 in summer a yield of 5.8 ton MS/ha was registered and in fall only 4.9 ton MS/ha, without differences among varieties ($P > 0.05$). Dry matter crude protein (CP) content of leaves in fall in growing stage was 35.0% on d 0, whereas stem's was 25.3% and whole plant was 31.8%. In summer, CP was 32.7% in leaves, 22.6% in stems and 29.3% in the whole plant. On the 20 d (flowering stage) of fall the leaves had 25.4% CP, stems 20.2% and whole plant 23.7%, compared with 23.5%, 19.1% y 21.6% CP in summer, respectively. Contents of FDN and FDA diminished ($P < 0.01$) in fall, due to a dilution effect or an observed diminution of fiber for a rapid accumulation of biomass. In summer, the accumulation of biomass on both varieties was larger than 4 ton/ha of DM. It was concluded that the best quality of forage is obtained during fall regardless of variety, but yield is lower. With the advancement of maturity, nutritional quality of alfalfa diminished, whereas production increased.

Key Words: alfalfa, stage of maturity, nutritional quality

M113 Gas production profiles of two varieties of alfalfa harvested on different stages of maturity. O. Serna-Beltran[1,2], C. Arzola*[1], E. Santellano-Estrada[1], J. A. Payan-Garcia[2], A. Corral-Luna3,1, O. Ruiz[1], C. Rodriguez-Muela[1], and J. Salinas[4], [1]*Universidad Autonoma de Chihuahua*, *Chihuahua, Mexico*, [2]*Instituto Nacional de Investigaciones Forestales, Agricolas y Pecuarias*, *Delicias, Chihuahua, Mexico*, [3]*Department of Animal Sciences-University of Illinois at Urbana-Champaign*, *Illinois*, [4]*Universidad Autonoma de Tamaulipas*, *Reynosa, Tams. Mexico*.

Alfalfa (*Medicago sativa*) dry matter is readily fermented in the rumen. Even though this phenomenon has been extensively studied in relation to the effects of the conservation method, there are not many studies regarding the effect of maturity upon the rumen degradability of alfalfa hay. The objective of this study was to assess the effect of maturity, expressed as time of harvest over a range of sampling periods (0, 5, 10, 15, and 20 d following Stage 2, (when stem length was > 0.40 m, but no buds, flowers, or seedpods were visible) of 2 varieties ("Excellent 9HQ and "Excelent multifoliar 9HQ ML," AgriBioTech) on 4 seasons (spring, early and late summer, and fall). An exclosure was sub-divided on 5 stripes on each of 8 locations of Delicias, Chih., Mexico, and sampled within 5 d intervals after an initial cut. Data were analyzed with a sub-plot design, with variety and period as main effects and day of cutting as sub-plot term. Statistical analysis used the GLM procedure of SAS. Gas production data were adjusted with the monophasic model of Groot, using proc NLIN of SAS. Linear, quadratic, cubic and quartic effects tests were performed for forage composition traits and gas production kinetics parameters within each maturity stage. There were not differences among varieties ($P > 0.05$) in the content of crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL). As maturity advanced, CP decreased linearly ($P < 0.001$), yet NDF, ADF, and ADL increased ($P < 0.001$) linearly. Maturity had also a strong effect upon the ruminal degradability of alfalfa as assessed with gas production profiles. A significant linear tendency ($P < 0.01$) was found for both A (gas production asymptote) and B (time after incubation at which half of the asymptotic amount of gas has been formed) parameters increasing as maturity advanced. Parameter C (a constant determining the sharpness of the switching characteristic of the profile) declined, showing linear ($P < 0.01$) effects.

Key Words: alfalfa, degradability, maturity

M114 Can different ME estimation methods give different values for tanniferous forages? H. Khalilvandi-Behroozyar*[1,2], M. Dehghan-Banadaky[1], and K. Reza Yazdi[1], [1]*Department of Animal Science, University of Tehran*, *Karaj, Tehran, I.R. Iran*, [2]*Department of Animal Science, University of Urmia*, *Urmia, West Azerbaijan, I.R. Iran*.

Condensed tannins (CT) are antinutritional factors, reduced nutrient digestibility by binding them and probably can disrupt digestibility estimation methods. To determine any possible effects, experiments carried out with different methods for estimating metabolizable energy of sainfoin. Forages were taken from farms in Isfahan and representative dry samples were analyzed for DM, OM and CT. For gas production test, 2 mm sieved samples, were used in Triplicates and 2 separated runs. Rumen fluid was obtained from 2 maintenance level fed, rumen fistulated Taleshi cows. 24h gas production data were used for calculation of ME content by follow equations: 1) $ME = 2.2 + 0.1357GP_{24} + 0.0057CP + 0.0002859CP^2$, 2) $ME = 2.2 + 0.136GP_{24} + 0.057CP + 0.0029CF^2$ & 3)%OMD = $14.88 + 0.8893GP_{24} + 0.0448CP + 0.0651$ash. For in vitro digestion trial, samples milled through a 1 mm sieve. Two separated runs, each in triplicates and 3 jars as blank, applied. ME estimated using ME = 0.0157 × DOMD. Also, an in vivo digestibility trial (17 d, with7

d for fecal collection) was done using 3 ruminally fistulated Holstein cows. Forages were fed as sole diet at 10% above maintenance energy requirements. Total fecal collection and marker assay including AIA and Cr_2O_3 (5 gr infused from ruminal fistula, d 8 to 14) were done for determining OM digestibility. Data were analyzed by GLM procedure of SAS 9.1 with CRD design and Duncan test ($P \leq 0.05$). CT content was 21.3 g/kg DM. Estimated ME from in vitro digestion trial was 10.11 and mean estimations from gas production and in vivo trial was 7.19 and 8.75 MJ kg^{-1} DM. No significant differences were exist between different ME estimates of gas production or between in vivo methods. Also, OM digestibility in in vitro was higher than values determined by in vivo and gas production profiles. Higher OM digestibility values for filtration based methods can be explained by rapid passing of phenols throughout filter paper that take part in digestible fraction. It seems that in vitro digestibility trial overestimate OM digestibility of tanniferous forages and cannot be used efficaciously and precisely for estimation of ME in high tannin forages.

Key Words: sainfoin, tannin, ME

M115 Ruminal degradability of nutrients in Sainfoin, a tanniferous legume forage. H. Khalilvandi-Behroozyar*[1,2], K. Reza Yazdi[1], and M. Dehghan-Banadaki[1], [1]*Department of animal Science, University of Tehran*, *Karaj, Tehran, I. R. Iran*, [2]*Department of animal Science, University of Urmia*, *Urmia, West Azerbaijan, I.R. Iran*.

Sainfoin (*Onobrychis viciifolia* Scop.), a nonbloating member of the Fabaceae family. Information regarding nutritive value of sainfoin is scarce, that limit its use in balanced rations. This experiment was done using second cut, mid bloom forage samples taken from farms in Isfahan, Iran for determining degradability of sainfoin nutrients. Representative samples obtained from at least 30 bales. An In situ experiment designed for evaluating sainfoin hay for DM, OM, CP, NDF and NDF_{OM} degradability, by 3 ruminally fistulated Holstein cows (multiparous, 680 ± 20kg of BW), fed 2 equal meals (0800 and 1800) of a balanced ration with CNCPS V5 for 10% above maintenance requirements with forage:concentrate ratio of 60:40.Samples were ground to pass 2 mm screen size (Wiley mill) and then sieved to remove particles less than 50µ. Five gram samples were weighed into nylon bags (10 × 20 cm) with 50µ pore size, to create sample size: surface area of 12.5 mg/cm^2. Duplicate samples were incubated for 4, 8, 12, 24, 48, 72 and 96h in ventral rumen, just before morning meal. After incubation, bags were removed and rinsed with cold tap water, until the rinsed water remained clear. To obtain the 0 h values triplicates were rinsed by 39°C water for 20 min. bags were dried at 60°C for 48 h in a forced air oven and then weighed. Aliquots were used for ash, CP, NDF and NDFom determination. Degradation profiles were calculated by the nonlinear model. The effective degradability (ED) in the rumen with digesta passage rate of 0.05 h^{-1} was calculated using NEWAY computer package. Total tannin and Condensed tannin contents were 38.5 and 21.3 g/kg DM. Low CP degradability can be explained by formation of tannin-protein complexes that are not available for microbial degradation. Tannins extracted from sainfoin can inhibit proteolysis by rumen major proteolitic bacteria. Lower cell wall degradability can be explained by formation of unbearable tannin complexes with plant cell wall that can recovered as ADL (during digestion) and preventing microbial attachment, condensed tannins can prevent microbial cellulase activity and deactivation of β endoglucanases.

Table 1. In situ degradation parameters of sainfoin (g/g)

	a	b	c(h^{-1})	ED
DM	0.334±0	0.363±0.01	0.07±0.02	0.540±0.02
OM	0.316±0	0.387±0.01	0.09±0.02	0.548±0.02
CP	0.171±0	0.459±0.05	0.04±0.01	0.379±0.02
NDF	0.014±0	0.518±0.01	0.05±0.01	0.271±0.03
NDF_{OM}	0.042±0	0.505±0.02	0.05±0.01	0.265±0.02

Reported values are means ± standard deviations.

Key Words: sainfoin, tannin, degradability

M116 A survey of molds and yeasts in Canadian corn silage. H. V. L. N. Swamy*, A. M. A. Heeg, and A. B. Rae, *Alltech Canada*, *Guelph, ON, Canada*.

Penicillium mycotoxins from silage have been implicated in various disorders in ruminant animals, especially dairy cows. Commercial facilities to analyze silage *Penicillium* mycotoxins, except PR toxin, are currently not available in North America. Mold count and identification in silage have been used to indirectly assess the potential toxicity of *Penicillium* mycotoxins. Such information, however, is not available for Canadian silage. A survey, therefore, was conducted in the summer of 2008 wherein 34 corn silage bunks in Ontario were sampled for mold and yeast counts. Samples with mold count exceeding 1000 col/gm were further subjected to mold identification. All the samples were analyzed at Dairyland Laboratories, Inc., WI, USA. The samples were frozen immediately after collection and were shifted to USA in dry ice. The average mold count was 65,000 col/gm and the average yeast count was 3.2 million col/g. Twenty 4 samples were above 1000 col/gm and they were subsequently subjected to mold identification. *Penicillium* mold represented 50% of mold spectrum while *Mucor* and *Fusarium* were at 15 and 14%, respectively. *Penicillium* mold was the dominant species among all in contrast to the conventional thinking. Given the temperate climate in Canada, *Fusarium* molds were thought to be the primary molds in Canadian feedstuffs. This survey for the first time indicated that Canadian silages should be tested for *Penicillium* molds and/or mycotoxins along with *Fusarium* mycotoxins to assess the total animal toxicity.

Key Words: silage, *Penicillium*, mycotoxins

M117 A survey of mold count and identification in Pennsylvanian dairy feed ingredients. H. V. L. N. Swamy*[1], J. M. Lawrence[2], and N. J. Adams[2], [1]*Alltech Canada*, *Guelph, ON, Canada*, [2]*Alltech California*, *Fresno, CA*.

Penicillium mycotoxins from silage have been implicated in various disorders in ruminant animals, especially dairy cows. Commercial facilities to analyze silage *Penicillium* mycotoxins, except PR toxin, are currently not available in North America. Mold count and identification in feed ingredients have been used to indirectly assess the potential toxicity of *Penicillium* mycotoxins. Such information, however, is not published specific to Pennsylvania region in USA. A survey, therefore, was conducted in 2009 wherein 278 feed ingredients, collected from commercial dairy farms in PA, were sampled for mold and yeast counts. Samples with mold count exceeding 1000 col/gm were further subjected to mold identification. The major ingredients tested included corn silage (n = 107), haylage (n = 45), high moisture corn (n = 40), TMR (n = 30) and hay (n = 8). All the samples were analyzed at Dairyland Laboratories, Inc., WI, USA. The samples were frozen immediately after collection and were shifted to lab in dry ice. The samples with mold count more

than 1000 col/gm were considered positive and this was amounted to 74.5%. Among these 39.6, 40.6, 11.1, and 8.7% samples had mold counts between 1001 and 10,000, 10,001 and 100,000, 100,001 and 1 million, and more than 1 million col/gm, respectively. Mold count more than 10,000 col/gm has potential to cause production losses and this was amounted to 60.4% of positive samples. Mold identification revealed that *Penicillium* mold represented 62.3% of mold spectrum while *Mucor*, *Aspergillus*, *Fusarium* and *Cladosporium* were at 46.4, 7.7, 7.7 and 6.3%, respectively. It is important to note that mold identification percentages need not have to add up to 100% as some samples can be contaminated with more than one mold type. *Penicillium* mold was the dominant species among all in contrast to the conventional thinking. Given the temperate climate in Pennsylvania, *Fusarium* molds were thought to be the primary molds in dairy feedstuffs. This survey indicated that silages should be tested for *Penicillium* molds and/or mycotoxins along with *Fusarium* mycotoxins to assess the total animal toxicity.

Key Words: silage, *Penicillium*, mycotoxins