

serotypes (*E. coli* O15:H⁻ [a nonmotile isolate], O127:H19, O136:HUT [an untypeable H antigen], OUT [an untypeable O antigen]:H⁻, and OUT:HUT). Of these STEC serotypes, one (*E. coli* OUT:H⁻) is known to cause HUS and two (*E. coli* O15:H⁻ and OUT:HUT) are known to cause other human illnesses. The *E. coli* O127:H19 serotype detected in this study has not been reported in cattle. Interestingly, *E. coli*

O157:H7 isolates were not found in the cattle tested. The results of this study emphasize the importance of testing dairy cattle for STEC, in general, and suggest the need for developing pre-harvest control methods to decrease carriage and fecal shedding of these foodborne pathogens.

Key Words: Food safety, Dairy cattle, *Escherichia coli*

Forages and Pastures: Silages and Dairy

T93 Dynamics of early fermentation of *Albizia lebbbeck* silage. T. Clavero* and R. Razz, *Centro de Transferencia de Tecnología en Pastos y Forrejes. Facultad de Agronomía. Universidad del Zulia, Maracaibo, Zulia, Venezuela.*

The dynamics of fermentation were studied with *Albizia lebbbeck* ensiled in the western part of Venezuela. Chopped fresh plant materials were ensiled into a laboratory silo, with a relationship 1:2 (w:v) of legumes:molasses, and stored at 25°C, and then were opened on 0.5, 1, 3, 5, 7, 14 and 30 days after ensiling, respectively. The samples were taken from three silos at each sampling time and the fermentation qualities and nitrogenous components were analyzed. The fermentation dynamics showed a fast pH reduction ($P < 0.05$) within the initial three days of ensiling, decrease to 4.11 at day 5 and then remained almost constant until the end of ensiling (30 day). LA content showed a significant ($P < 0.05$) increase after the first day of ensiling, reaching the peak (8.19 g/kg) on day 7, followed by an insignificant decrease ($P > 0.05$). AA content increased significantly ($P < 0.05$) after 3 days of ensiling and reached a highest concentration (1.63 g/kg) on day 7. PA and BA were detected in no or only small amount over the ensiling period. This was attributed to a fast reduction in pH because of the rapid production of LA which restricted growth of clostridia. TN and PN showed a slight decrease within the initial 3 days of ensiling, followed by an insignificant decrease ($P > 0.05$). SN increased gradually and reached the highest value on day 3 ($P < 0.05$) and then tended to decrease. AN was not detected over the ensiling period. Some of the changes in nitrogenous components could be attributed to the action of plant enzymes within initial days of ensiling. This study showed that the silage made from *Albizia lebbbeck* with molasses addition had good fermentation characteristics where active LA fermentation took place in the initial stage of ensilage, resulting in a decrease pH with early stabilization of the medium.

Key Words: *Albizia lebbbeck*, Silage, Fermentation quality

T94 Effect of storage time on ruminal starch degradability in corn silage. J. R. Newbold*¹, E. A. Lewis¹, J. Lavrijssen¹, H. J. Brand¹, H. Vedder², and J. Bakker², ¹Provimi Research and Technology Centre, Brussels, Belgium, ²BLGG, Oosterbeek, The Netherlands.

Fifteen corn silages, covering a wide range in dry matter (DM) and starch content, were stored in bunker silos on commercial farms in the Netherlands. Each silo, filled with one harvest of one cultivar, was sampled at two-monthly intervals from approximately two to ten months after ensiling. Samples were frozen until evaluation of ruminal degradability. Three lactating Holstein cows were used to determine degradability of DM, starch and crude protein (CP) by *in sacco* incubation for 0, 3 and 24h, followed by machine washing. At ensiling, mean DM was 332g/kg (SD=55.0, range=171-476) and mean starch was 312g/kg DM (SD=59.7, range=126-426). Data were analysed by analysis of variance with repeated measures within each

subject (silo) and cultivar as covariate. The proportion of starch degraded after 3h incubation increased with storage time (mean = 0.532, 0.535, 0.589, 0.639, 0.690 when stored for 2, 4, 6, 8 and 10 months, respectively, SE=0.014, $P < 0.001$). Similar effects, of smaller magnitude, were observed for degradability of starch after 0h and 24h. Although the proportion of CP degraded also varied with time of storage (for example, 3h degradability = 0.392, 0.361, 0.335, 0.429 and 0.470 for 2, 4, 6, 8 and 10 month storage, respectively, $P < 0.001$), degradabilities of starch and CP were not correlated ($P > 0.1$). There was an interaction between effect of storage time and DM concentration at ensiling ($P < 0.001$): the increase in 3h starch degradability between 2 and 10 months of ensiling was 0.007 for silages < 300 g DM/kg at ensiling and 0.251 for silages > 375 g DM/kg at ensiling. The rate of increase in 3h starch degradability during storage was correlated positively with DM at ensiling ($r = 0.77$, $P = 0.006$) but not with starch concentration at ensiling ($r = 0.26$, $P = 0.35$). The effect of time since ensiling on starch degradability should be considered when formulating ruminant rations containing corn silage.

Key Words: Degradability, Starch, Corn silage

T95 Corn hybrid forage quality differences as influenced by ensiling. D. J. R. Cherney*, J. H. Cherney, and W. J. Cox, *Cornell University, Ithaca, NY.*

Hybrid selection is one of the most important management practices that affect the feeding quality of corn silage. Our objective was to determine the impact of ensiling on forage quality of 54 corn hybrids. Four field replicates of each hybrid were planted at each of two locations in NY in 2003 (Groveland Station, NY and Aurora, NY). Five plants from each hybrid were harvested, chopped through a chipper shredder, mixed and sub-sampled for fresh and ensiled samples. Silage samples were vacuum bagged within one hour of chopping. There were differences among hybrids in pH ($P < 0.01$) at both sites. pH of ensiled samples was positively correlated with silage dry matter (DM; $r = 0.82$) and increased 0.016 pH units for each 10 g/kg increase in DM. All samples were well ensiled, with an average pH of 3.6, and an individual sample total range of 3.43 to 3.91. Dry matter of fresh and ensiled samples were highly correlated ($r = 0.98$), with ensiled samples averaging 10 g/kg lower than their fresh counterpart. Crude protein (CP) of ensiled samples was highly correlated ($r = 0.95$) with CP of fresh samples. The slope of ensiled sample CP to fresh CP was not different from unity, but there was a 4.1 g/kg bias in CP in favor of the ensiled samples, due to loss of dry matter from oven drying of silage. Sugar of fresh samples averaged 99 g/kg while that of corresponding ensiled samples averaged 36 g/kg. Ranking of hybrids for sugar changed from fresh to ensiled, but was not consistent between sites. Non fibrous carbohydrate of ensiled samples was 52 g/kg lower than fresh samples. There were hybrid x ensiling/fresh interactions for neutral detergent fiber (NDF) and *in vitro* true digestibility

IVTD at one site, this interaction was not significant at either site for fiber digestibility. Correlations between fresh and ensiled were $r=0.47$, $r=0.60$ and $r=0.74$ for NDF and IVTD and fiber digestibility, respectively. Inconsistencies for hybrid x ensiling/fresh interactions indicated that more research is needed to fully assess the relative benefits of ensiling prior to quality comparisons of corn hybrids.

Key Words: Corn silage, Forage quality

T96 Polymerase chain reaction for identification and quantification of *Lactobacillus buchneri* in silage. R. J. Schmidt*, S. Kim, M. G. Emara, and L. Kung, Jr., *University of Delaware, Newark.*

Lactobacillus buchneri is a gram-positive, heterofermentative bacterium that has been used as a silage additive for the past 5 years in the USA. This organism has been implicated to enhance the aerobic stability of silages; however the dynamics of this microbe in the process are not well understood. Traditional methods for species-specific quantification of bacteria are labor intensive and time-consuming, thus the aim of this study was to develop a PCR-based assay for identification and quantification of *L. buchneri* in silage. The assay is based on the amplification of a 134-bp 16S rDNA fragment. Species-specific primers were designed by alignment of the bacterial 16S rDNA sequences from known bacteria and selection of sequences specific at their 3' ends. The specificity of the primers was evaluated in a PCR using DNA from 10 lactic acid bacteria as templates and no cross reactivity was detected. Different methods to isolate the bacterial DNA from silage samples were evaluated before quantification: (1) phenol/chloroform (1x); (2) phenol/chloroform, followed by chloroform (3x each); (3) Ultraclean™ soil DNA kit; and (4) GenElute™ Bacterial Genomic DNA kit. Based on the DNA yield and purity, and the amplification curves, method (1) showed the best results (202 ng DNA/μL and $A_{260}/A_{280}=1.60$). To test our assay, corn silage was inoculated with *L. buchneri* 40788 (Lallemand Animal Nutrition, Milwaukee, WI) in the range of 10^3 to 10^8 colony-forming units (cfu)/g and then the isolated DNA from these treated samples was used as a standard for determining the log cfu of *L. buchneri* per gram of silage by real-time qPCR. The results demonstrated that real-time qPCR was highly correlated ($r^2 = 0.98$) with the different cfu of *L. buchneri* in the spiked silage samples. The PCR-based method proved to be faster and more sensitive for identifying and quantifying *L. buchneri* than classical methods. In addition, the assay will be an important tool for understanding the late effects of this bacterium during the ensiling process.

Key Words: *Lactobacillus buchneri*, qPCR, 16S rDNA

T97 The effect of staygreen ranking, maturity and moisture concentration of corn hybrids on the performance of dairy cows. K. G. Arriola*, A. T. Adesogan, C. R. Staples, D. B. Dean, S. C. Kim, N. A. Krueger, J. L. Foster, S. Chikagwa-Malunga, and M. C. Huysden, *University of Florida, Gainesville.*

This study aimed to determine the effects of hybrid staygreen ranking, maturity at harvest and added moisture to simulate rainfall at harvest on the performance of dairy cows. Two corn hybrids with high (Croplan Genetics 691, HSG) and low (Croplan Genetics 737, LSG) staygreen ranking were grown on separate halves of a 10-ha field, harvested at 26

(Cut 1) or 35% DM (Cut 2) and ensiled in 32-ton plastic bags for 84 and 77 d respectively. A further treatment involved addition of water (15 l/t) to the HSG, Cut 1 hybrid as it was being packed to simulate rainfall during ensiling. Each of the resulting silages was fed as part of a TMR consisting of 35, 55 and 10% (DM basis) of corn silage, concentrate and alfalfa hay, respectively. The TMR was fed ad libitum twice daily to 30 Holstein cows (92 average DIM). The experiment was a completely randomized design and consisted of two 28-d periods, with 14 d for adaptation and 14 d for sample collection. Body weight change (0.6 ± 0.1 kg/d), ruminal contraction rate (2.28 ± 0.14 contractions/min), milk production (36.02 ± 1.5 kg/d), milk fat (3.5 ± 0.1 kg/d) and milk protein (2.3 ± 0.05 kg/d) were not affected ($P>0.05$) by treatment. Intakes of DM (30 vs. 28 kg/d), CP (4.4 vs. 4.03 g/kgDM), NDF (9.3 vs. 8.3 g/kgDM) and ADF (6.2 vs. 5.5 g/kgDM) were greater in cows fed Cut 1 versus Cut 2 hybrids. Rectal temperatures were higher ($P<0.05$) in cows fed HSG (38.1°C) than those fed LSG (37.9°C). Staygreen x maturity interactions were not detected. Therefore, harvesting corn silage at 26% instead of 35% DM increased feed intake but did not affect milk yield or milk composition. Staygreen ranking of these corn hybrids or moisture concentration at ensiling had no differential effect on the performance of lactating dairy cows.

Key Words: Corn silage, Staygreen, Dairy cows

T98 High temperatures have detrimental effects on the stability of silage inoculants that have been rehydrated in water. C. N. Mulrooney*, W. Hu, and L. Kung, Jr., *University of Delaware, Newark.*

Microbial inoculants used to improve the fermentation of silages are often mixed in water and stored in containers that may be exposed to heat from high ambient temperatures and mechanical equipment. The objective of this research was to determine if exposure to high temperatures affects the viability of various inoculants. Inoculants (A-F) were enumerated on Mann Rogosa Sharpe agar to standardize a final count of colony forming units (CFU) in water such that about 473 ml added to a tonne of wet forage would achieve the recommended application rates of lactic acid bacteria (LAB) for each inoculant. Testing was done in four sequences (SEQ). For each SEQ, inoculants were rehydrated in deionized water for 45 min at 30°C followed by incubation for 6 h at 30°C (SEQ 1), 35°C (SEQ 2), 40°C (SEQ 3) or 45°C (SEQ 4) in duplicate 125 ml flasks rotating at 125 rpm. Rotation was stopped and the incubator temperature was lowered to 30°C for the next 18 h. Numbers of LAB were enumerated at 0, 3, 6, and 24 h. Each sequence was repeated twice. Data were analyzed using the MIXED procedure of SAS with repeated measures (time). Data after the first 3 h of incubation for each SEQ is shown below (LAB, log cfu/ml). Incubation at a moderate temperature (SEQ 1) did not affect the viability of the microbial inoculants. However, as temperature of incubation increased, the stability of some inoculants declined varying by inoculant, especially in SEQ 4. Only inoculant A was unaffected by any high temperature after 3 h of incubation. Precautions should be taken to ensure that rehydrated microbial inoculants do not reach elevated temperatures during use and storage.

Table 1.

Inoculant	SEQ 1	SEQ 1	SEQ 2	SEQ 2	SEQ 3	SEQ 3	SEQ 4	SEQ 4
	0 h	3 h	0 h	3 h	0 h	3 h	0 h	3 h
A	8.22	8.20	8.20	8.12	8.07	8.08	8.01	7.68
B	8.63	8.61	8.44	8.41	8.68 ^a	8.15 ^b	8.71 ^a	8.04 ^b
C	8.23	8.20	8.10	7.96	8.29 ^a	7.28 ^b	8.30 ^a	7.17 ^b
D	8.45 ^a	7.97 ^b	8.42 ^a	7.95 ^b	8.09 ^a	7.46 ^b	8.00 ^a	6.07 ^b
E	8.06	8.03	7.96	8.00	7.99	8.00	8.07 ^a	7.52 ^b
F	8.44	8.26	8.46 ^a	8.20 ^b	8.16 ^a	7.67 ^b	8.26 ^a	4.82 ^b

^{ab}Means in rows within a sequence with different superscript differ $P < 0.05$.

Key Words: Silage, Inoculant, Lactic acid bacteria

T99 Effect of corn silage maturity and mechanical processing on nutrient digestibility by lactating dairy cows of different lactation stages. G. Ferreira¹ and D. R. Mertens², ¹University of Wisconsin, Madison, ²USDA-ARS, US Dairy Forage Research Center, Madison, WI.

Starch digestibility (StarchD) can decrease when corn silage is harvested at advanced stages of maturity. Processing corn silage through rollers during chopping typically increases StarchD. We hypothesized that corn silage processing increases StarchD in lactating dairy cows to a greater extent when corn silage is harvested at a late (L) than at an early (E) maturity stage. Corn silages were harvested at 34 or 42% DM (E and L, respectively) and with (P) or without (U) kernel processors. Twenty-four cows in mid lactation and 24 cows in late lactation (73±23 and 455±113 DIM, respectively) were used in a replicated 4×4 Latin square design with 28-d periods to determine nutrient digestibility. Diets contained ~70% corn silage (DM basis). Total tract nutrient digestibilities were measured using LaCl₃ as an external marker. Maturity ($P < 0.06$) and processing ($P < 0.01$) affected dry matter digestibility (69.6, 73.6, 68.7, 72.5% for EU, EP, LU and LP, respectively; SEM=1.0), but the interaction was not significant ($P > 0.20$). Fiber digestibility (NDFD) was greater for cows in late lactation than for cows in mid lactation (48.7 vs. 44.6%, $P < 0.01$). Maturity ($P < 0.01$) and processing ($P < 0.02$) affected NDFD (49.6, 51.3, 41.0, 44.7% for EU, EP, LU and LP, respectively; SEM=2.4), but the interaction was not significant ($P > 0.20$). Lactation stage did not affect StarchD ($P > 0.20$). In agreement with our hypothesis, we observed a significant maturity by processing interaction ($P < 0.04$) for StarchD (92.7, 98.0, 91.4, 98.5% for EU, EP, LU and LP, respectively; SEM=0.7), although the difference in StarchD between EU and LU was less than expected. The corn silage fragmentation index (JDS 88:4414-4425) for EU and LU corn silages was 41 and 58%, respectively, suggesting that a greater fragmentation of the kernels occurred during harvesting of the LU corn silage. This increased fragmentation may have attenuated the negative effect of maturity on StarchD. We concluded that the increase of StarchD due to processing is greatest when corn silages are harvested at advanced stages of maturity.

Key Words: Corn silage maturity, Corn silage processing, Corn silage fragmentation index

T100 Conjugated linoleic acid and omega-3 fatty acids in milk of grazing dairy cows fed fish oil and linseed oil. W. Brown¹, A. AbuGhazaleh¹, and S. Ibrahim², ¹Southern Illinois University, Carbondale, ²North Carolina A&T State University, Greensboro.

The objective of this experiment was to determine the effect fish oil (FO) and linseed oil (LSO) on milk conjugated linoleic acid (CLA) and omega-3 fatty acids when fed to grazing dairy cows. Sixteen Holstein cows (180 ± 20 DIM) were fed a TMR (50:50) diet for 1 wk then divided into 2 groups (n=8 per treatment) and offered oil supplements for 6 wk. Cows in group one were fed a basal diet (8.2 kg/d; DM basis) consisting of corn, soybean meal, molasses, vitamin/mineral premix plus 800 g animal fat (CONT). Cows in the second group were fed the basal diet plus 200 g of FO and 600 g of LSO (FOLSO). Cows were milked twice a day and milk samples were collected weekly. Cows grazed together on Sudan grass pasture for ad libitum and fed treatment diets after the morning and afternoon milking. Analysis of variance was conducted using the MIXED procedure of SAS for a completely randomized design with repeated measures. Treatments had no effect ($P > 0.05$) on milk production (24.4 and 22.8 kg/d for treatments 1 and 2, respectively), milk protein percentages (2.80 and 2.90%), and milk protein yield (0.67 and 0.67 kg/day). Milk fat percentages (3.8 and 3.0%) and yield (0.91 and 0.69) were higher ($P < 0.05$) for cows fed the control diet. The concentrations of cis-9 trans-11 CLA (0.63 and 2.48g/100g of fatty acids) and vaccenic acid (2.1 and 7.3 g/100g of fatty acids) in milk fat were higher ($P < 0.01$) in cows fed FOLSO diet compared with control diet. The concentration of cis-9 trans-11 CLA in milk fat reached maximum (0.58 and 2.9 g/100g fatty acid for diets 1 and 2, respectively) on wk 1 with concentrations for both diets remaining relatively constant thereafter. Concentrations of C18:3 (0.41 and 1.10 g/100g of fatty acids), C20:5 (0.03 and 0.07g/100g of fatty acids), and C22:6 (0.005 and 0.05 g/100g of fatty acids) in milk fat were higher ($P < 0.05$) in cows fed the FOLSO diet. In conclusion supplementing grazing cow diets with FOLSO enhances milk cis-9 trans-11 CLA and omega-3 fatty acids content and could be used as a practical approach to increase CLA and omega-3 fatty acids as functional ingredients in milk.

Key Words: Grazing, CLA, Oil supplements

T101 Economic and environmental impacts of corn silage maturity management. C. S. Ballard*, M. P. Carter, K. W. Cotanch, H. M. Dann, H. M. Wolford, J. W. Darrah, E. D. Thomas, and R. J. Grant, *W. H. Miner Agricultural Research Institute, Chazy, NY.*

The objectives of this study were to evaluate yield and forage quality changes with increasing maturity for one corn hybrid and to determine the effect of maturity on silage effluent production. One field of NK3030 (RM93d) was harvested following a completely randomized design with four replicates at each of three levels of maturity with target dry matters (DM) of: 25% (Mature 1), 30% (Mature 2), and 35% (Mature 3). Concrete silos (91-cm diameter, 109-cm length), equipped with an effluent collection system, were filled with 497 ± 20 kg of fresh corn forage. A temperature data logger was buried midway through the silo to record silage temperature throughout fermentation. Effluent was collected one week after silo filling and analyzed for 5-day biochemical oxygen demand (BOD5) and nutrient content. After 70-100 days of ensiling, silos were opened and emptied. The top 15 cm of silage was weighed and discarded. The remaining silage was removed and analyzed for chemical composition, DM digestibility (DMd) determined by 48 h in vitro dry matter disappearance, and economic value as determined by estimating milk yield using Milk2000

(University of Wisconsin v 7.54). Data were analyzed as a one-way analysis of variance with Tukey Test used for mean separation of treatment differences. The harvested forage was less mature than anticipated with DM of 23%, 25% and 31% for the three levels of maturity. Forage ensiled at Mature 2 resulted in 8.8 L of effluent and 3000 kg less milk compared to corn forage ensiled at Mature 3.

Table 1. Effect of corn maturity at harvest on yield, nutrients, effluent, and estimated milk yield of corn silage

	Mature 1		Mature 2		Mature 3		P
	Mean	sd	Mean	sd	Mean	sd	
DM Yield (T/Ha)	15.33 ^b	0.99	15.53 ^b	0.20	16.90 ^a	0.58	0.02
CP (g/kg DM)	82 ^a	4	86 ^a	3	76 ^b	6	<0.01
NDF (g/kgDM)	498 ^a	10	445 ^b	9	425 ^c	15	<0.01
DMD (g/kg DM)	786 ^b	8	808 ^a	14	812 ^a	13	<0.01
Effluent (L)	2.68 ^b	2.4	8.83 ^a	0.5	0 ^c	0	<0.01
Effluent BOD5 (g/L)	28.5	13.6	36.3	0.9	-	-	0.30
Milk Yield (kg/Ha)	25,120 ^c	888	26,505 ^b	994	29,563 ^a	1123	<0.01

a,b,c Means within a row with different superscript differ ($P < 0.05$).

Key Words: Corn silage, Maturity, Effluent

T102 An evaluation of various nitrogenous additives or a microbial inoculant on the fermentation and aerobic stability of corn silage. R. J. Schmidt^{*1}, P. G. Summer², and L. Kung, Jr.¹, ¹University of Delaware, Newark, ²Ajinomoto USA, Inc., Eddyville, IA.

Various N-based compounds or a microbial inoculant were added to freshly chopped whole-plant corn to determine their effects on silage fermentation and aerobic stability. Treatments were: 1) nothing, control (C), 2) 0.75% (wet forage weight) urea (about 7% added CP/t DM), 3) 2.5% Silaferm (A1) (an amino acid fermentation liquor byproduct, Ajinomoto, USA, Inc, Eddyville, IA, about 3.5% added CP/t DM), 4) 5% Silaferm (A2) (about 7% added CP/t DM), 5) 2.35% Silaferm and urea combination (AU) (about 7% added CP, 60% of CP from urea and 40% from Silaferm), or 6) *L. buchneri* and *P. pentosaceus* (LBC) (400,000 and 100,000 cfu/g of wet forage, respectively, Lallemand Animal Nutrition, Milwaukee, WI). Forages were packed into quadruplet 20-l mini silos for each treatment and ensiled for 120 d. Relative to C and LBC silages, addition of the various N-based treatments had minimal effects on the acid end products of silage but they increased ($P < 0.05$) the concentrations of ammonia-N and CP and decreased ($P < 0.05$) the concentration of ethanol in silage. Silage A1 had higher ($P < 0.05$) in vitro DM digestibility compared with control (52.25 vs. 46.73%), while A2, AU, U and LBC were all intermediate in DMD; 50.25, 50.89, 48.88 and 48.89%, respectively. Silage A2 had a higher level ($P < 0.05$) of true protein, measured as tungstic acid insoluble N (6.96 % of DM) compared with all other treatments (average of 5.85%). Silage AU had a higher ($P < 0.05$) concentration of tungstic acid insoluble N (6.30%) compared with C and LBC silages (5.58 and 5.51%, respectively). Silage LBC had more ($P < 0.05$) acetic (1.63 vs. 1.07%) acid and 1,2 propanediol (0.94 vs. 0.0%) than did silage C. Treatment with LBC (66.5 h) and AU (44.0 h) improved ($P < 0.05$) the aerobic stability of silage compared to C (28.5 h). Dry matter recovery was not different among treatments. Treatment with amino acid fermentation byproducts and urea has potential for improving the nutritive value and aerobic stability of corn silage.

Key Words: Silage, Inoculant, Amino acids

T103 Corn silage genotype effects on intake, digestion, and milk production by dairy cows. J. P. Goesser*, R. D. Shaver, and J. G. Coors, University of Wisconsin, Madison.

The Wisconsin Quality Synthetic (WQS C3) is a corn breeding population under selection at the University of Wisconsin for improved NDF digestion and silage yield. A recessive allele, *floury2*, increases floury endosperm in corn grain, and its starch has been found to be more ruminally degradable than dent corn. Population WQS C3, and two near-isogenic hybrids, W64AXOH43 (ISO) and W64AXOH43 *fl2* (*fl2*), were harvested from isolated 0.5 ha plots as whole-plant corn silage at approximately 35% DM. Treatment silages were fed in TMR to six cows assigned randomly to a replicated 3x3 Latin Square design with 21-d periods. However, only two periods were completed due to unforeseen silage shortages. Data were analyzed using a mixed models procedure. The ISO, *fl2*, and WQS C3 corn silages averaged 35.9, 35.7, and 35.7 % NDF, respectively. Diets were formulated to meet or exceed NRC (2001) protein, mineral, and vitamin requirements and averaged 30.8% NDF. Diets were comprised of 54% corn silage, 36% concentrate, and 10% alfalfa hay (DM basis). Lactation performance and digestion data are presented in Table 1. Intake and milk production did not differ among treatments. Ruminant 48-h in situ DM and NDF disappearance were greater for WQS C3, but total tract NDF digestibilities were not in agreement with our in situ results or prior in vitro measurements. Reduced total tract NDF digestibility for ISO relative to *fl2* was unexpected based on previous in vitro measurements and our in situ measurements, and cannot be explained. Starch in situ disappearance and total tract digestibility will be determined.

Table 1

Item		W64A	<i>fl2</i>	WQS	SE	P
Dietary DM	%	50.3	47.7	50.9	1.0	NS
DMI	kg/d	22.6	23.2	24.4	1.0	NS
Milk Yield	kg/d	36.0	37.3	37.3	2.7	NS
24-h ruminal DM disappearance	%	64.0	62.0	66.5	1.2	0.07
24-h ruminal NDF disappearance	%	31.3	30.1	38.0	2.5	0.12
48-h ruminal DM disappearance	%	75.4 ^b	74.5 ^b	79.5 ^a	0.9	0.03
48-h ruminal NDF disappearance	%	52.9 ^b	54.6 ^b	62.2 ^a	1.9	0.04
Total tract DM digestibility	%	56.4	63.1	63.1	2.2	NS
Total tract NDF digestibility	%	32.1 ^b	46.1 ^a	48.6 ^a	2.8	0.03

Key Words: Corn silage, NDF digestibility, DM digestibility

T104 The nutritive value of normal- or high-cut normal corn silage versus normal-cut BMR corn silage for lactating dairy cows. B. M. Moulder*, L. Kung, Jr., R. S. Teller, C. N. Mulrooney, and R. J. Schmidt, University of Delaware, Newark.

A normal corn silage hybrid (Mycogen FQ7511) was cut at a normal height (leaving 10-15 cm of stalk) or a high height (leaving 46-51 cm of stalk) and a BMR hybrid (F2F797) was harvested at a normal-cut height (leaving 10-15 cm of stalk). High cutting of FQ7511 increased the concentrations of DM (+4%), CP (+5%), NEL (+3%) and starch (+7%) but decreased the concentrations of ADF (-9%), NDF (-8%) and ADL (-13%) compared to normal-cut FQ7511. The 30 h NDF-D of normal-cut FQ7511, high-cut FQ7511 and normal-cut BMR corn silage was 51.7, 51.4, and 63.5%, respectively. Corn silages were fed to cows and comprised 45% of the TMR ration DM. Diets were isonitrogenous and isocaloric. Thirty Holstein cows (average 81 ± 48 DIM) were blocked by production and DIM and randomly assigned

to ten simultaneous 3 × 3 Latin squares. Each period consisted of a 3-wk period and the data from last 10 d of each period was used for statistical analysis. Mean separation was performed using the Least Significant Difference procedure when the treatment effect was significant. Milk production, milk protein production and milk lactose % were greater ($P < 0.05$) for cows fed normal-cut BMR (48.8 kg/d, 1.40 kg/d, 4.88%) than for those fed normal-cut FQ7511 (46.8 kg/d, 1.34 kg/d, 4.82%) or high cut 7511 (47.7 kg/d, 1.36 kg/d, 4.83%). Cows fed high-cut FQ7511 had milk with less fat (3.48%) than cows fed high-cut silage (3.60%). Cows fed BMR corn silage tended to produce more ($P < 0.12$) 3.5% FCM than cows fed the other silages. Dry matter intake was not affected by treatment. Feed efficiency (kg of 3.5% FCM milk/kg of DMI) was greater (1.83, $P < 0.05$) for cows fed normal-cut BMR than those fed normal-cut 7511 (1.77) or high cut 7511 (1.75) corn silages. Cows fed normal-cut BMR had milk with a lower ($P < 0.05$) MUN (14.8 mg/dl) than did other treatments (average of 16.2 ml/dl). Harvesting a normal corn hybrid at a high-cut height improved its nutritive value but the improvement in feeding value to lactating cows was not equivalent to that found when cows were fed BMR corn silage harvested at a normal-cut height.

Key Words: BMR, Corn silage, Cutting height

T105 Fermentation characteristics of sugarcane silage mixing with *Gliricidia sepium* and cassava tops. T. Clavero*¹, R. Razz¹, and J. Urdaneta², ¹Centro de Transferencia de Tecnología en Pastos y Forrajes. Facultad de Agronomía. Universidad del Zulia, Maracaibo, Zulia, Venezuela, ²INIA, San Felipe, Yaracuy, Venezuela.

In order to increase the concentration of CP and improve fermentation quality of sugarcane silage, we tested ensiling with *Gliricidia sepium* and/ or cassava tops. Sugarcane was cultivated in a tropical dry forest in north central Venezuela. *Gliricidia sepium* tops (GS) were harvested at 2 month's regrowth. Cassava tops (leaves and stems) were collected right after root harvesting. The treatments for silage making were: 100% sugarcane (SC), 98% SC + 2% GS, 96% SC + 4% GS, 92% SC + 8% GS and 92% SC + 4% GS + 4% of cassava tops. Fresh plant materials were chopped to 1 cm length, mixed according to treatment, ensiled in laboratory silos and stored at 25°C for 60 d. After opening the silos, DM, pH, total nitrogen content (TN), volatile basic nitrogen (VBN), NDF and ADF were determined. The data were analyzed according to a completely randomized design with three replications. Across all mixed silages, NDF concentrations were reduced by 5.4%. Dry matter and ADF concentrations were not affected by treatment. All mixed silages had decreased ($P < 0.01$) pH when compared with SC silage. Addition of GS or cassava increased ($P < 0.05$) TN in silages, with a tendency ($P < 0.10$) of increased TN with increased GS in the silage mixture. Also, TN concentrations did not differ between 8% GS and 4% GS + 4% cassava treatments. Sugarcane silage had extremely high VBN (21.3%) whereas mean VBN for mixed silages was 12.8%. Tannin concentrations in the mixed silages may have limited proteolytic activities thus reducing the loss of silage nitrogen. In the present experiment, mixing GS and/or cassava tops with sugarcane during silage making improved silage quality parameters.

Key Words: Mixing, Sugarcane, Silage quality

T106 Use of effective microorganisms (EM) as additive for grass silage. E. González*^{1,2}, R. Casals², and E. Albanell², ¹Estación Experimental Pastos y Forrajes IH, Central España, Matanzas, Cuba, ²Grup de Recerca en Remugants; Facultat Veterinaria, Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain.

Mixtures of selected species of microorganisms including predominant populations of lactic acid bacteria, photosynthetic bacteria, yeasts, actinomycetes and molds, have been effectively used recently and have gained attention worldwide for sustainable agriculture (improving soil quality, soil health, and the growth, yield, and quality of crops), and to a lesser extent, in animal production systems. Two effective microorganisms (EM) solutions, control fermented solution (EM-U) or fermented solution with added sugarcane molasses, (EM-A) were evaluated as additives for ensiling sorghum (*Sorghum bicolor*) harvested during the end of summer season in Catalonia, Spain. The inoculant (EM) was mixed (% of fresh wt) with the chopped grass (≈2 cm particle size) to form four treatments: 1) Control (No EM); 2) EM-A2 (EM-A inoculant applied at 2%); and 3) EM-A5 (EM-A at 5%); and 4) EM-U2 (EM-U at 2%). For each treatment, duplicate plastic bags were filled with 20 kg of fresh chopped sorghum, adequately compacted and stored at ambient temperature in the dark. After 2.5 months incubation, the two bags per treatment were emptied and sampled in order to determine effluent pH, DM, and volatile fatty acids (VFA) and ammonia nitrogen (NH₃-N) concentrations. Statistical analysis of data was performed with PROC GLM of SAS. Effective microorganisms improved ($P < 0.05$) fermentation characteristics of silages, decreasing pH and NH₃-N, and increasing VFA concentrations. There were significant differences ($P < 0.05$) between the doses for the evaluated parameters; lowest pH (4.05) was obtained with EM-A2, while no differences were detected for NH₃-N and VFA between the two extended treatments (EM-A2 and EM-A5). Control and EM-U2 treatments did not differ in DM (18.36 vs. 18.12%) or VFA (107.04 vs. 127.60 mmol/l) concentrations; however, pH and NH₃-N were decreased with EM-U2, which was considered the optimal treatment in this study.

Table 1. Effects of 'EM' on the conservation of *Sorghum bicolor*. Data are the average of treatments by duplicates

Item	Control	EM-A2	EM-A5	EM-U2	S.E.M	P value
DM content, %	18.36 ^a	16.82 ^b	16.55 ^b	18.12 ^a	0.31	0.003
pH	4.27 ^a	4.05 ^c	4.14 ^b	4.11 ^b	0.02	0.001
N-NH ₃ , mg/l	91.90 ^a	88.14 ^{ab}	84.51 ^{ab}	83.93 ^b	2.64	0.003
VFA, mmol/l	107.04 ^a	237.72 ^b	232.37 ^b	127.60 ^a	18.02	0.005

a,b,c: Within rows, for each parameter, means with different letters differ at $P < 0.05$

Key Words: Effective microorganisms, Silage, Conservation

T107 Fermentation characteristics of hairy indigo (*Indigofera hirsuta*) and guinea grass (*Panicum maximum*) ensiled alone or in combination. O. Araujo-Febres* and R. Razz, Facultad de Agronomía. La Universidad del Zulia, Maracaibo, Venezuela.

Characteristics of the forage legume hairy indigo (*Indigofera hirsuta*) ensiled as a sole crop or mixed with guinea grass (*Panicum maximum*) were evaluated. Tropical legumes are characterized as forages with high protein and lignin concentrations, and with relatively high concentrations of cell wall components. Thus, tropical legumes are difficult to ensile because of their low concentrations of water-soluble

carbohydrates which are required for lactic acid fermentation. In addition, tropical legumes contain high concentrations of buffering substances which counteract the desired quick pH drop for optimal conservation. This experiment was designed as a completely randomized design with four replications of three silages made either from guinea grass, hairy indigo or a 50:50 mixture of both forages on a w/w basis. Silages were stored in 20-L plastic containers, without additives, for 56 days. Cell wall components and N concentrations were assayed. Volatile fatty acid analysis was performed using gas chromatography. Results are shown in Table 1. Ensiling a 50:50 mixture of hairy indigo and guinea grass resulted in intermediate values for lactic acid, CP, NDF and lignin concentrations compared to the legume or grass alone. The pH and the concentrations of ADF of the mixture were similar to the grass but lower than for the legume. Acetic acid concentrations did not increase with addition of the grass to the legume. Butyric acid was not detected. These data indicate that guinea grass added to hairy indigo in equal proportions increased NDF and decreased CP concentrations, enhanced silage fermentation and quality, and decreased the pH to values needed for adequate forage preservation.

Table 1. Fermentation characteristics of hairy indigo and guinea grass, or ensiled in combination

Treatment	DM	pH	Lactate	Acetate	Butyrate	CP	NDF	ADF	Lignin	
						% DM				
Legume	24.90a	6.03a	6.9c	1.1b	0.00	17.75a	45.77c	46.20a	12.63a	
50:50	23.61a	4.79b	8.1b	1.6b	0.00	15.42b	54.52b	41.39b	7.75b	
Grass	17.79b	4.60b	9.9a	2.1a	0.00	11.52c	67.74a	38.79b	4.59c	

a, b, c means within column with different superscripts differ ($P \leq 0.05$).

Key Words: Indigofera hirsuta, Panicum maximum, Silage

T108 An evaluation of extended lactation as a strategy to alleviate reproductive loss in a seasonal pasture-based system. S. T. Butler*, L. Shalloo, and J. J. Murphy, *Teagasc Moorepark DPRC, Co. Cork, Ireland.*

This study was carried out to examine whether extending the calving interval to 24 months would be a viable alternative to culling and replacing cows that had failed to become pregnant during the breeding season. 46 non-pregnant lactating cows were assembled in late Nov 2004, paired on the basis of parity, days in milk, and previous milk production, and assigned to receive either 3 or 6 kg ('low' or 'high') concentrate and ad libitum grass and maize silage (50:50 mix) over the winter period (13 weeks). Cows were turned out to pasture in late March, and received 1 kg concentrate/day until dry-off (milk yield <5 kg/day). Cumulative milk production was calculated from calving to the end of Nov 2004 (normal period), and from the start of Dec 2004 until dry off in 2005 (extended period). Data were analysed using the MIXED procedure of SAS, with indoor feeding treatment and block in the model statement. High winter feeding resulted in greater ($P < 0.01$) milk production over the winter indoor period (20.0 ± 0.3 vs. 17.8 ± 0.3 kg/day), and had a carryover effect of increased milk production through the end of lactation (5177 vs. 4686 kg during the extended period, $P < 0.05$). At the end of the study period, cows (regardless of previous feeding) were ranked on the basis of cumulative milk solids, and separated into 3 groups (R1, R2, and R3). R1 produced 7287 (549) and 5738 (476) kg, R2 produced 6267 (466) and 4836 (393) kg, and R3 produced 5273 (391) and 4266 (350) kg milk in the normal and extended periods, respectively (milk solids in parentheses). Average lactation length was 593 days (range 475-677), was not affected by winter feeding, but was longer ($P < 0.05$) in R1 and R2 than R3 ($615 \pm 10, 609 \pm 13$, and 558 ± 13 , respectively). 85% of the cows became pregnant during the breeding season of year 2, with a first service conception rate of 52%, and was not affected by either feeding treatment or rank. The results indicate that extended lactation may be a viable alternative to culling non-pregnant cows, and seems more suited to high producing cows.

Key Words: Extended lactation

Graduate Student Paper Competition: National ADSA Production Division Poster Competition

T109 Predictors of stillbirth for cows moved to calving pens when calving is imminent. J. Carrier*, S. Godden, J. Fetrow, S. Stewart, and P. Rapnicki, *University of Minnesota, St. Paul.*

The objective of this study was to identify predictors for stillbirth (SB) in cows moved from freestalls to a calving pen when calving is imminent (therefore interrupting the parturition process). The herd was a 2500-cow dairy where pre-fresh heifers and cows were kept in two separate freestall pens and moved to individual pens for calving. Cows fresh from 11/2003 to 2/2004 were included in the cohort, excluding twin births. Stillbirth was defined as death of a calf at calving or within 24 hours of calving. The advance of parturition immediately prior to moving was scored as (a) presence of only mucus or blood at the vulva, (b) presence of a "water bag" (allantochorion or amnion) or (c) presence of feet or head. The other predictors were parity (1 vs. 2+), total serum calcium concentration of the dam after calving (totCa), calf weight (CW, expressed as % of the dam's weight) and body condition score (BCS). Calving ease score (CE) was reported on a 5-point scale, later contracted to 3 levels of assistance (1: none, 2: light and 3+:

required). A total of 495 parturitions could be videotaped (277 heifers, 218 cows). There were 15% SB in the cohort. The risk of SB was modeled using multivariate logistic regression. Odds ratios (OR) adjusted for the other predictors are shown with 95% C.I. Stillbirth was not associated with BCS. Compared to unassisted calvings (CE1), the odds of SB were 2.9x higher for CE2 (1.4 to 6.0) and 46x higher for CE3+ (17 to 120). Stillbirth odds were reduced by 36% per 1% unit increase of CW relative to the dam (OR = 0.64, 0.47 to 0.89). Similarly, the odds of SB tended to be reduced by 22% per 1-mg/dL increase in totCa (OR=0.78, 0.57 to 1.06). The odds of SB were 5.2x higher for heifers vs. cows (2.2 to 12). Cows moved to a calving pen earlier (mucus only) were 2.5x more at risk of SB than those moved later with a "water bag" (1.0 to 6.0), but presence of feet was not different from the "water bag" stage. The fact that advance of parturition, parity and totCa remained in the model even after adjustment for CE could be due to a potential association with duration of calving, to be analyzed in another part of the study.

Key Words: Stillbirth, Parturition, Epidemiology