

wk,  $P < 0.01$ ), primiparous than multiparous cows (0.95 vs. 0.62 kg/wk,  $P < 0.01$ ) and late than mid-lactation dairy cows (0.82 vs. 0.74 kg/wk,  $P = 0.26$ ). Milk protein contents were higher in high producing cows than mid producing cows (3.1% vs. 2.9%,  $P < 0.01$ ). Milk fat content did not differ among treatments. The ruminal fermentation parameters were the same among treatments except the ratio of acetate to propionate (3.26 vs.

2.54,  $P < 0.01$ ) was higher for mid than high milk producing dairy cows. Results from this study suggests that production of high producing and younger dairy cows is affected more than medium producing or older cows when exposed to 79-82 THI and fed similar diets.

**Key Words:** cows, hot weather, performance

## Ruminant Nutrition: Forages

**M335 Efficiency of different chemicals in deactivation of phenolic compounds in Sainfoin (*Onobrychis viciifolia* Scop.).** H. Khalilvand-Behroozyar, M. Dehghan-Banadaki\*, and K. RezaYazdi, *Research Center of Excellence for Improving Sheep Carcass Quality and Quantity, Animal Science Department, University of Tehran, Karaj, Tehran, I.R. Iran.*

Sainfoin (*Onobrychis viciifolia*) is a member of the Fabaceae family (Leguminosae), tannin rich legume. Reports about condensed tannin content of sainfoin have very wide range from 25 to 100g/kg DM. No reports about effects of tannin destructive or binding matter on tannin deactivation of sainfoin were found. This study was conducted to determine (TP), total tannins (TT) and condensed tannins (CT) content of sainfoin. Samples of forage (from effects of different chemicals on total phenolics different regions of 30 bale) were chopped 3-5 cm length, and then treated with solutions of  $KMnO_4$  (0.03 M), NaOH (0.05 M), sodium bicarbonate (0.1 M), wood ash (180 g/L) and water with forage to reagent volume ratio of 1:4 (W/V). 5% solution of PEG (6000 MW) was sprayed to forage with 1:1 ratio. Treatment with urea (20g/ 100 ml/1 kg of DM) was done using adhesive rubber to create anaerobic conditions for 1 week. All of above treatments were carried out in triplicates, in 25°C temperature, for 20 min, with hand shaking. Treated forages were then exposed to 40°C temperature in a forced air oven, for 48 hour. All forage samples were ground to pass 0.5 mm screen size (Wiley mill). Determinations of TP, TT and CT content of treated and control forages were done tenth time, using Folin Ciocalteu reagent, polyvinyl polypyrrolidone (PVPP) and Butanol-HCl reagent, respectively. For preparation of plant extracts 200 mg of dried (0.5 mm ground) plant material is taken in a glass beaker of approximately 25 ml capacity. Ten ml of aqueous acetone (70%) is added and the beaker is suspended in an ultrasonic water bath (Branson 3210) and subjected to ultrasonic treatment for 30 min at room temperature. Data were analyzed using by SAS 9.1, using GLM procedure with complete random design ( $P < 0.05$ ). TP, TT and CTs content of sainfoin was  $39.4 \pm 0.6$ ,  $38.5 \pm 1$  and  $21.3 \pm 0.4$  g/kg of DM. Results (table 1) showed that PEG and water were more effective in CT deactivation. Although all of the chemicals reduced CT levels far from 90%, but TP and TT deactivation ranged from 54.12 to 75.40 and from 55.06 to 76.57 percent, respectively. In both cases, water was the best.

**Table 1. Reduction of TP, TT and CT of treated sainfoin.**

	Reduction of TP (%)	Reduction of TT (%)	Reduction of CT (%)	S.E.M
Water	75.40 <sup>a</sup>	76.57 <sup>a</sup>	92.06 <sup>cd</sup>	0.12
Urea	60.47 <sup>d</sup>	59.46 <sup>d</sup>	92.53 <sup>c</sup>	0.28
$KMnO_4$	71.82 <sup>b</sup>	70.44 <sup>b</sup>	92.41 <sup>c</sup>	0.08
PEG	66.39 <sup>c</sup>	67.09 <sup>c</sup>	98.57 <sup>a</sup>	0.19
Wood ash	57.41 <sup>e</sup>	59.57 <sup>d</sup>	91.61 <sup>d</sup>	0.14
NaOH	54.12 <sup>f</sup>	55.11 <sup>e</sup>	93.79 <sup>b</sup>	0.19
Sodium bicarbonate	54.89 <sup>f</sup>	55.06 <sup>e</sup>	91.84 <sup>d</sup>	0.22

**Key Words:** sainfoin, condensed tannin, PEG

**M336 The effect of high sugar grass on nitrogen and methane output in cattle: A modeling approach.** J. L. Ellis\*<sup>1</sup>, A. Bannink<sup>2</sup>, J. Dijkstra<sup>3</sup>, A. J. Parsons<sup>4</sup>, S. Rasmussen<sup>4</sup>, G. R. Edwards<sup>5</sup>, E. Kebreab<sup>6</sup>, and J. France<sup>1</sup>, <sup>1</sup>Centre for Nutrition Modelling, Department of Animal and Poultry Science, University of Guelph, Guelph, ON, Canada, <sup>2</sup>Animal Sciences Group, Division Animal Production, Wageningen University and Research Centre, Lelystad, The Netherlands, <sup>3</sup>Animal Nutrition Group, Wageningen Institute of Animal Sciences, Wageningen University, Wageningen, The Netherlands, <sup>4</sup>AgResearch, Palmerston North, New Zealand, <sup>5</sup>Lincoln University, Lincoln, New Zealand, <sup>6</sup>Department of Animal Science, University of Manitoba, Winnipeg, MB, Canada.

The potential of high sugar grass varieties to reduce nitrogen (N) excretion of pasture fed cattle has received considerable attention. It is the purpose of this work to (1) evaluate the prediction of N excretion within a dynamic mechanistic dairy cattle model, (2) evaluate the effect of high sugar grasses on N excretion across multiple studies, and (3) evaluate the effect of high sugar grasses on enteric methane production. The database consisted of 4 published studies for which high sugar grasses were being evaluated for their effect on N excretion. Root mean square prediction error (RMSPE, % observed mean) for urine N, fecal N and milk N (all g/d) were 23.7%, 22.3% and 11.4%, respectively, with the majority of error coming from regression slope deviation and random sources. Proc GLM in SAS was used to analyse the results with study as a fixed effect, and showed that total N excretion was negatively related to water soluble carbohydrate (WSC) content of the diet ( $P = 0.006$ ) and the WSC:CP ratio ( $P < 0.001$ ). Predicted methane production (% GE intake) was significantly affected by treatment, and was positively related to WSC content of the diet ( $P < 0.001$ ), negatively related to N content of the diet ( $P < 0.001$ ) and positively related to the WSC:CP ratio ( $P = 0.001$ ). Results show that the model predicts N excretion adequately, that total N excretion, particularly urine N, is reduced with high sugar grasses, but that this mitigation strategy may also increase methane production (% GE intake).

**Key Words:** sugar grass, nitrogen, methane

**M337 Lipolysis and biohydrogenation of forage species at vegetative and reproductive stages of growth.** A. Cabiddu<sup>1</sup>, M. R. F. Lee\*<sup>2</sup>, L. Salis<sup>1</sup>, N. D. Scollan<sup>1</sup>, and M. L. Sullivan<sup>3</sup>, <sup>1</sup>AGRIS, Sardinia, Italy, <sup>2</sup>Aberystwyth University, Wales, UK, <sup>3</sup>USDA-DFRC, Madison, WI.

Fresh forage is known to increase polyunsaturated fatty acids (PUFA) in ruminant products. Besides forage's proportionally high levels of PUFA, other factors such as plant secondary metabolites may play a role. In particular polyphenol oxidase (PPO) production of phenol bound protein (PBP) has been shown to reduce ruminal lipolysis. This study investigated the effect of forage species on ruminal lipolysis and C18:3 biohydrogenation (C18:3-Bio). Common vetch (CV); Crimson clover (CC), red clover (RC+) and PPO1 gene silenced red clover (RC-) were harvested, at reproductive (R) and vegetative (V) growth stages, freeze-

dried and ground. Samples were analysed for PBP (modified Lowry assay) and weighed (1 g DM) into incubation tubes to give triplicates of each forage at each growth stage for two time points (0 and 6 h). Buffer was dispensed into the tubes along with rumen liquor from 4 rumen fistulated dairy cows maintained on permanent pasture. At the allocated time points tubes were destructively harvested by freezing with liquid N<sub>2</sub>. Lipid was extracted using chloroform:methanol (2:1; v/v), fractionated by TLC and bimethylated (5% HCl, 0.5N NaOH in methanol) before analysis on GC. Data was analysed by ANOVA with species × growth stage as the treatment. Lipolysis and C18:3-Bio were calculated as the proportional loss of glycerol-based membrane lipid and total C18:3 between 0 and 6 h, respectively. PBP (mg/g DM): 0.54, 0.60, 2.62 and 1.98 (V) and 1.35, 1.15, 2.92 and 2.41 (R); Lipolysis: 0.78, 0.58, 0.82 and 0.85 (V) and 0.72, 0.61, 0.68, and 0.77 (R); C18:3-Bio: 0.72, 0.41, 0.63 and 0.77 (V) and 0.80, 0.70, 0.52 and 0.62 (R) for CV, CC, RC+ and RC-, respectively. There was a growth stage × species effect (P<0.001) for both lipolysis and C18:3-Bio. PBP was negatively correlated with lipolysis for all species except CC, which had the lowest lipolysis irrespective of growth stage and the lowest C18:3-Bio in V. CC and CV had lower levels of membrane lipid and C18:3 than RC which may have influenced the comparison. Low lipid metabolism of CC compared to CV warrants further investigation.

**Key Words:** lipolysis, forage species, growth stage

**M338 Effects of maturity of alfalfa conserved as silage on intake, productivity, and rumen pools in lactating dairy cows.** K. L. Kammes\*, Y. Ying, and M. S. Allen, *Michigan State University, East Lansing.*

Effects of alfalfa maturity on dry matter intake (DMI), milk production, and ruminal pool sizes and the relationship of these effects with preliminary voluntary DMI (pVDMI) were evaluated using 16 ruminally cannulated Holstein cows in a crossover design experiment with a 14-d preliminary period and two 17-d treatment periods. During the preliminary period, pVDMI of individual cows ranged from 22.8 to 29.8 kg/d (mean = 25.8 kg/d) and 3.5% fat-corrected milk yield ranged from 34.1 to 68.2 kg/d (mean = 43.7 kg/d). The two treatments were diets containing alfalfa silage harvested from one field at either a) earlier maturity (EARLY) or b) later maturity (LATE) as the sole forage. Alfalfa silages contained 42.3 and 53.4% neutral detergent fiber (NDF) for EARLY and LATE, respectively; both diets contained ~20% forage NDF and 27% total NDF. The pVDMI determined during the last 4 d of the preliminary period was used as a covariate. Main effects of alfalfa maturity and their interaction with pVDMI were tested by ANOVA. Yield of milk and milk components were not affected by treatment or its interaction with pVDMI (P>0.15). EARLY increased DMI 2.3 kg/d compared to LATE (29.8 vs. 27.5 kg/d) and ruminal turnover rates of DM, OM (organic matter), and NDF were greater for EARLY compared to LATE (P<0.001) but no interaction of treatment and pVDMI was observed for these variables. Rumen contents wet weight and volume and rumen pool sizes of DM, OM, NDF, and indigestible NDF were all greater for LATE compared to EARLY (P<0.05). Interactions were detected between alfalfa maturity and pVDMI for ruminal pool sizes; DM, OM, NDF, and indigestible NDF pools increased at a slower rate for EARLY compared to LATE as pVDMI increased. The greater turnover rate of rumen pools likely allowed greater DMI for EARLY compared to LATE, but the relative contribution of ruminal distension to satiety likely differed for the two treatments because rumen pool sizes were consistently greater for LATE compared to EARLY.

**Key Words:** alfalfa maturity, intake, milk production

**M339 Alfalfa silage length of cut interacts with feed intake to affect concentration of milk components in Holstein cows.** K. L. Kammes\*, Y. Ying, and M. S. Allen, *Michigan State University, East Lansing.*

Effects of length of cut of alfalfa silage on dry matter intake (DMI), milk production, and ruminal pool sizes and the relationship of these effects with preliminary voluntary DMI (pVDMI) were evaluated using 14 ruminally cannulated Holstein cows in a crossover design with a 14-d preliminary period and two 19-d treatment periods. During the preliminary period, pVDMI of individual cows ranged from 16.8 to 30.8 kg/d (mean = 24.8 kg/d) and 3.5% fat-corrected milk yield ranged from 22.9 to 62.4 kg/d (mean = 34.4 kg/d). Experimental treatments were two diets containing alfalfa silage chopped to either a) 1.0 cm (SHORT) or b) 1.9 cm (LONG) theoretical length of cut as the sole forage. Alfalfa silages contained ~43% neutral detergent fiber (NDF); diets contained 47% forage, 18% forage NDF, and 25% total NDF. The pVDMI determined during the last 4 d of the preliminary period was used as a covariate. Main effects of particle size and their interaction with pVDMI were tested by ANOVA. DMI and milk yield were not affected by treatment or its interaction with pVDMI. However, response of milk fat, protein, and lactose concentrations (means = 4.00, 3.40, and 4.68%, respectively) to particle size depended on pVDMI, as indicated by a significant interaction between particle size and pVDMI. While LONG increased milk fat and lactose concentrations compared to SHORT for cows below 25 kg/d pVDMI and decreased them for cows with higher pVDMI, the reverse was observed for milk protein concentration. Ruminal digesta wet matter, volume, and pool sizes of nutrients were similar for SHORT and LONG. Ruminal turnover time of potentially digestible NDF was numerically lower for SHORT compared to LONG (8.1 vs. 9.5 h). Reducing the theoretical length of cut of alfalfa silage by half did not affect feed intake, milk production, or rumen pool sizes but treatment effect on milk components varied with preliminary feed intake.

**Key Words:** particle size, intake, milk production

**M340 Protein fractionation of various whole crop silages, and effect of silage based TMR on fermentation characteristics and degradability in vitro, and ruminal degradability and whole tract digestibility of TMR by cattle.** J. Shinekhuu\*<sup>1</sup>, G. L. Jin<sup>1</sup>, S. H. Choi<sup>1</sup>, B. J. Ji<sup>1</sup>, X. Z. Li<sup>2</sup>, and M. K. Song<sup>1</sup>, <sup>1</sup>*Department of Animal Science, Chungbuk National University, Cheong-ju, Chungbuk, Korea,* <sup>2</sup>*Department of Animal Science, Yanbian University, Yanji, Jilin, China.*

Protein in silages of rice straw (RSS), and whole crop barley (BS), rye (RS) and Sudan grass (SGS) was partitioned by CNCPS method. Both silages and borate buffer extracted silages (ERSS, EBS, ERS, and ESGS) were mixed with concentrate in 40 to 60 ratio (DM) to prepare TMR. Rumen fluid was collected from four ruminally fistulated cow fed the each silage based TMR and strained through 12 layers of muslin and mixed with artificial saliva in same ratio under CO<sub>2</sub> flushing to prepare culture solution. The four different silages and respecting buffer extracted silage based TMR (5g for each TMR) were added to 500 ml culture solution and incubated at 39 C up to 48h in culture jar with rotator (100rpm/min) placed in water bath. An in vivo study was also conducted in a 4 x 4 Latin square design with four ruminally fistulated cows for 4 silage TMRs to examine rumen fermentation characteristics, rumen degradability or whole tract digestibility. Highest total soluble protein fraction was obtained from the RS with lowest content from rice straw silage. Insoluble protein (B3) was highest in SGS and CC fraction was lowest in RSS. The pH of incubation solution was lowest in RS while was highest in RSS-TMR during 48h incubation. Opposite results to the

pH were found in ammonia-N and total VFA concentration. The DM and NDF degradability in culture solution was higher for TMRs of BS and RS than those for RSS and SGS TMRs ( $P < 0.01$ ). The CP degradability was lowest in SGS TMR ( $P < 0.01$ ). Degradability of DM, CP and NDF was higher for un-extracted silage TMRs than for extracted silage TMRs. The ruminal ammonia-N concentration was lowest in RSS TMR but the total VFA was not affected by silages and extraction. The whole tract digestibility of DM was lowest in RSS while that of NDF was highest in RS TMR. The whole tract digestibility of CP was not different among diets.

**Key Words:** protein fractionation, degradability, in vitro

**M341 Fermentation profiles of brown midrib and non-brown midrib hybrid corn silage.** K. E. Nestor Jr.\*, P. Krueger, J. Anderson, J. Brouillette, and K. Emery, *Mycogen Seeds, Inc., Indianapolis, IN*.

The objective of this study was to determine if brown midrib (bmr) corn silage hybrids have a similar fermentation profile over time of storage to non-bmr corn silage hybrids. The first four months of data are presented. A total of 24 non-bmr hybrids and 20 bmr hybrids were collected at harvest at 14 different locations. At each location, hybrids were selected with similar relative maturities. Samples were chopped and collected into vacuum sealed bags. Multiple samples of each hybrid were collected and stored in an environmentally controlled room. Samples were analyzed monthly for soluble protein, starch, sugar, 7 hr. in vitro starch degradability, pH, lactic acid, acetic acid, total volatile fatty acids (VFA), ammonia and 30 h in vitro neutral detergent fiber (NDF) digestibility. Samples were pooled by month for analysis. Data was analyzed by ANOVA with hybrid and month as main effects. Thirty hour NDF digestibility was higher ( $P < 0.01$ ) in the bmr hybrid class within each month and was unchanged in the non-bmr hybrid class for each month of fermentation but tended to drop in the first four months of fermentation in the non-bmr hybrid class. Within month, there were no differences between hybrid classes in soluble protein, starch, sugar, 7 hr. in vitro starch degradability, lactic acid, acetic acid, and ammonia. Total VFA was higher in the bmr hybrid class ( $p < 0.07$ ) at month 4 but was not different in other months. The pH was lower ( $p < 0.05$ ) in the bmr hybrid class in month 3 but not in other months. Soluble protein increased ( $p < 0.02$ ) and pH decreased ( $p < 0.01$ ) by month of fermentation for each hybrid class. No difference by month of fermentation was observed in 7 hr in vitro starch degradability, starch, or sugar within each hybrid class. There was a trend ( $p < 0.16$ ) for an increase in acetic acid by month of fermentation. Lactic acid, ammonia, and total VFA increased between month one and two and stabilized afterwards. These data suggest that there is no difference in fermentation profiles of bmr and non-bmr hybrids in the first four months of fermentation.

**Key Words:** corn silage, brown midrib, fermentation profile

**M342 Utilization of solid state fermentation of *Pleurotus sapidus* for sugar cane silages.** A. Peláez-Acero<sup>1</sup>, M. Meneses-Mayo<sup>1</sup>, L. A. Miranda-Romero<sup>2</sup>, S. S. González-Muñoz<sup>\*1</sup>, and O. Loera-Corral<sup>3</sup>, <sup>1</sup>*Colegio de Postgraduados, Montecillo, Edo. de México, México*, <sup>2</sup>*Universidad Autónoma de Chapingo, Chapingo, Edo. de México, México*, <sup>3</sup>*UAM Iztapalapa, México D.F., México*.

The objective of this study was to evaluate production of cellulases, xylanases and laccases by *Pleurotus sapidus* using sugar cane (SC)

as substrate after 15 days of solid state fermentation. Two trials were performed; in both the experimental design was completely randomized, data was analyzed using PROC GLM (SAS) and means were compared using the Tukey test ( $P \leq 0.05$ ). In trial I, sugar cane was fermented 48 hours (SCF), then inoculated with 5% *P. sapidus* and fermented for 15 days (SCF-15). Results showed significant differences ( $P \leq 0.05$ ) for: a) 1.96 IU/g DM cellulases, 2.08 IU/g DM xylanases, 5.25 IU/g DM laccases for SCF-15; b) CP was 7.43% for SCF-15 and 5.53% for SCF; c) NDF, ADF and *in vitro* DMD were 72.42, 41.48 and 64.80% for SCF-15, and 44.81, 29.08 and 63.71% for SCF; d) calculated metabolizable energy was 1.80 Mcal for SCF-15, and 2.28 Mcal for SCF. In trial II sugar cane was ensiled 24 days with 0, 10 and 20% SCF-15. There were significant differences ( $P \leq 0.05$ ) between day 0 and 24 for: a) pH, 5.16 and 3.90; b) DM, 35.47 and 33.64%; c) soluble carbohydrates, 9.14 and 4.05%; d)  $\text{NH}_3\text{-N}$ , 3.80 and 9.26%; e) lactic acid, 10.32 and 19.44%; f) *in vitro* DMD, 64.28 and 70.13%. Besides, at day 24, significant differences ( $P \leq 0.05$ ) were found between 0 and 20% SCF-15 for: a)  $\text{NH}_3\text{-N}$ , 9.89 and 5.65%; b) lactic acid, 12.40 and 18.52%; c) *in vitro* DMD, 66.65 and 71.53%. It may be concluded that fermented sugar cane may be used as substrate for producing fibrolytic enzymes, which then could be utilized to increase quality of sugar cane silages.

**Key Words:** solid state fermentation, fibrolytic enzymes, sugar cane

**M343 As corn plants mature, NDF mass decreases.** P. M. Walker<sup>1</sup>, J. M. Carmack<sup>\*1</sup>, L. H. Brown<sup>2</sup>, and F. N. Owens<sup>2</sup>, <sup>1</sup>*Department of Agriculture, Illinois State University, Normal*, <sup>2</sup>*Pioneer Hi-Bred International, a DuPont Business, Johnston, IA*.

Determining corn silage value of the corn plant can be difficult. Nine Pioneer ® corn hybrids (107 to 116 day CRM) grown in 2008 near Normal, IL were harvested 15 cm above ground level weekly starting 102 days after seeding until plant DM content reached 50%. One thousandth of an acre was harvested on each date with ten plants from each hybrid being divided into two sections, the bottom 46 cm and the remaining top section. Top sections and total plants (recombined) were assayed commercially for nutrient composition (CP, starch, NDF, ADF, ash) and at the Pioneer Livestock Center for in situ NDF disappearance. Based on regression against harvest date, as harvest date advanced, NDF, ADF, sugars, and ash as a percentage of plant DM all decreased ( $P < 0.05$ ) largely due to dilution by starch. As harvest date advanced, weight per plant of dry matter, protein, and starch per plant increased ( $P < 0.01$ ) as expected. However, weight per plant of NDF, ADF, sugars, and ash all decreased ( $P < 0.01$ ). Transformation to starch (increasing 3.6 g/d) can explain the decrease in sugar (0.8 g/d) mass of plants, but the decrease in weights of NDF and ADF (0.70 and 0.52 g/d per plant or 0.8 and 1.0% of total mass/d) indicates that some portion of these fiber fractions were mobilized. NDF digestibility typically is expressed as a fraction of total NDF. If the mass of NDF decreases as corn plants mature due to mobilization of digestible NDF, then digestibility expressed as a fraction of the remaining NDF is incomplete as an index of the relative energy availability for plants that are harvested at different stages of maturity. Whether the extent of NDF mobilization is altered by environmental conditions, hybrid, or the “stay-green” trait is not yet certain. For estimating energy availability of corn plants at harvest, both NDF content and NDF digestibility must be considered.

**Key Words:** NDF, corn silage, maturity

**M344 Effects of moisture content and storage time on quality of baled TMR.** J. Wang, J. Q. Wang\*, W. J. Guo, Z. T. Song, J. Y. Zhang, and D. P. Bu, *The State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, Beijing, China.*

Influence of moisture content and time of storage of baled TMR was evaluated. The TMR were baled using stretch film in order to give support for the storage and delivery of TMR to small farms. TMR feed (F/C, 50:50; CP, 15.4%) containing 40%, 50%, and 60% moisture were wrapped and baled using YK-50 wrapping and baling machine. Three replicate bales were prepared for each sampling spot. After 0, 3, 7, 15, 30, and 60 d storage, the bales were opened and the sensory characteristics were evaluated. At the same time, core samples were taken using a modified boring device for nutrients and fermentation analysis. Data were analyzed statistically by using PROC MIXED of SAS. Results showed that there were no molds in baled TMR before 15 d storage, while some inequality of size molds appeared at the outer surface in part of the bales at 30 and 60 d. Along with the storage, DM content kept decreasing throughout the whole storage time ( $P > 0.05$ ). The CP, EE, ash, and lignin contents increased over storage time while NDF and ADF fluctuated. The pH of each treatment decreased significantly ( $P < 0.01$ ) along with the storage, and different moisture content TMR embodied pH was 4.67, 4.60 and 4.73 for 40%, 50%, and 60% moisture contents respectively at 60 d.  $\text{NH}_3\text{-N}/\text{total-N}$  of the baled TMR exhibited significantly increase ( $P < 0.01$ ) after storage, and the ratio were more in higher moisture content TMR (2.83, 3.24, and 4.05% for 40%, 50%, and 60% moisture content; respectively). The concentration of lactic acid, acetic acid and propionic acid were also increased along with the storage time ( $P < 0.01$ ), but butyric acid was not detected in the whole course. Lactic acid and volatile acid concentration were high in higher moisture content TMR. These results showed that there was no negative impact on nutrient content and quality after 15 d storage of TMR and baling technology could be used to achieve the effective storage and delivery of TMR.

**Key Words:** total mixed ration, baling technology, storage

**M345 Chemical composition and nutritive value of total mixed ration (TMR) stored as wrapped round bales.** J. Wang, J. Q. Wang\*, W. J. Guo, Z. T. Song, J. Y. Zhang, and D. P. Bu, *The State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences, Beijing, China.*

This experiment was conducted to evaluate the storage effect of TMR baled by stretch film and its nutritive value on milk production of lactating dairy cows in order to give support for the storage and delivery of TMR to small farms and make them also can use TMR diets. The TMR feed was produced based on forage to concentrate of 60:40 (DM basis) (DM, 50%; CP, 13.9%;  $\text{NE}_L$ , 1.38 Mcal/kg of DM) and then wrapped and baled using YK-50 wrapping and baling machine. Three bales were prepared for each sampling spot. After 0, 3, 7, 15, and 30 days storage, the bales were opened and core samples were taken using a modified boring device for nutrients analyses. Results showed that no mold was found in baled TMR before 15 days storage, while some inequality of size molds appeared at the outer surface on 30 d. Along with storage,

CP, EE, ash, and lignin contents showed increasing over storage time compared with 0 d storage while NDF and ADF were manifested as a fluctuation. The pH of baled TMR was significantly decreased ( $P < 0.01$ ) from 5.17 at 0d to 4.44 at 30d. The proportion of  $\text{NH}_3\text{-N}/\text{total-N}$  of baled TMR significantly increased ( $P < 0.01$ ) after storage and reached 3.43% of total-N at 30 d of storage. The concentration of lactic acid and volatile acid also increased ( $P < 0.05$ ) along with the storage. Twenty-four late lactation cows average  $182 \pm 25$  DIM and average milk production of 15.9 kg/d were also selected to evaluate the effect of this baled TMR (stored 5-15d) on DMI, milk yield, and milk composition compared with traditional separate feeding of forage and concentrate. Experiment lasted 8 weeks. Cows fed baled TMR produced significantly more milk (14.4 vs. 12.4 kg/d) and more milk CP (0.55 vs. 0.48 kg/d), 3.5% FCM (14.7 vs. 12.9 kg/d) compared with separate feeding ( $P < 0.05$ ). It would be concluded that baled TMR may be a good selection for small-scale farmers to use TMR technique to improve their efficiency and income of dairy production.

**Key Words:** total mixed ration, baling technology, milk production

**M346 Effect of supplementing sodium diacetate in baled-TMR on the performance of middle lactation dairy cows.** W. J. Guo, J. Q. Wang\*, J. Wang, Z. T. Song, J. Y. Zhang, and D. P. Bu, *State Key Laboratory of Animal Nutrition, Institute of Animal Science, Beijing, China.*

This experiment was conducted with thirty Holstein cows in mid-lactation ( $124 \pm 23$  DIM,  $16.4 \pm 6.1$  kg of milk/d) to examine the effects of supplementing sodium diacetate in baled total mixed ration (BTMR) on dry matter intake (DMI), milk yield, milk composition, body condition score (BCS), and some serum biochemistry parameters. Treatments were: 1) the forage and concentrate feeding separately (FS); 2) feeding in the form of BTMR; 3) BTMR supplemented with sodium diacetate (SDA). Animals were housed and individually fed 3 times daily to allow 5 to 10% orts (as-fed basis) in a tie-stall barn. Feeding intake and orts were recorded daily. Cows were milked twice daily at 0200 and 1400 h. Blood samples were collected monthly via venipuncture from coccygeal vein 3 h after morning feeding. The data were analyzed using the MIXED model of SAS 9.0 with a repeated measure. The results indicated that the DMI of the BTMR and SDA were significantly ( $P < 0.01$ ) higher than FS (18.9, 18.7 and 17.7 kg/d). The treatments of BTMR and SDA increased milk yield by 6.2% and 7.2% compared with FS. The milk protein, milk lactose, and solid non-fat (SNF) showed no significant differences among three treatments. However, the SDA treatment significantly ( $P < 0.01$ ) increased the milk fat compared with BTMR and FS (3.86, 3.27 and 3.4%). The BCS values of cows fed BTMR, SDA and FS diets were not significantly different. Serum urea nitrogen concentrations of the BTMR and SDA groups were significantly ( $P < 0.01$ ) lower than that of FS group (21.8, 20.9, and 26.4 mg/dL), and no significant differences existed among three treatments on serum protein, serum glucose and serum lipid concentrations. These results suggested that BTMR and SDA had positive effect on feed intake and milk production of lactating dairy cows compared with FS, while the addition of SDA increased milk fat significantly.

**Key Words:** dairy cow, sodium diacetate, total mixed ration