369 Effect of drought stress on fiber digestibility of corn for silage. G. Ferreira* and C. L. Teets, Department of Dairy Science, Virginia Tech, Blacksburg, VA.

The objective of this study was to determine the effect of drought stress on ruminal in situ neutral detergent fiber digestibility (NDFD). Five corn varieties were seeded in pots (6 replicates) and grown in a greenhouse. After seeding (5/13/19), replicates were allocated to a water-sufficient treatment (W) or a water-insufficient treatment (D). From seedling to harvesting, W and D pots were watered with 598 and 273 mm of water, respectively. Silking date (date at which 50% of the plants showed silks) occurred on 8/12/19, and harvested occurring on 9/4/19. At harvesting, 3 internodes and 3 leaf-blades from the bottom of the plant and from the phytomers above the insertion of the ear were dissected and composted by tissue. After drying, tissues were ground to pass through a 2-mm screen (cyclone mill), and 0.25 g was put into Ankom F57 porous bags previously rinsed with acetone to perform in situ digestibility in 3 cows. All tissues of each of the 3 replicates per treatment and variety were incubated within a same cow, so cow was considered a blocking factor. All bags were placed simultaneously into the rumen and incubated for 0, 3, 6, 9, 12, 18, 24, 48, 96, and 240 h. In situ disappearance parameters were determined using Proc NLIN of SAS according to the model ISNDFD = B × [1-e^(-k × T)], where B is the potentially digestible NDF and k is the fractional digestion rate of B. We also measured fraction C at 240 h (i.e., uNDF240). Kinetic parameters were contrasted using a mixed model that included the effects of cow (random), treatment (fixed), hybrid (fixed), disease × hybrid (fixed), and the residual error. For the lower stems, drought stress did not affect fractions B (65.0%; P = 0.22) and C (35.0%; P = 0.22) and did not affect k (5.3%; P = 0.34). For the upper stems, drought stress did not affect fractions B (76.3%; P = 0.30) and C (23.8%; P = 0.30) but tended to increase k (4.5 vs. 5.2%/h; P = 0.09). For the upper blades, drought stress increased fraction B (82.5 vs. 84.3%; P = 0.02) and reduced fraction C (17.5 vs. 15.7%; P = 0.09). For the upper stems, drought stress did not affect fractions B (82.5% vs. 84.3%; P = 0.34) and C (23.8% vs. 21.7%; P = 0.30) but tended to increase k (4.5 vs. 5.2%/h; P = 0.09). For the upper blades, drought stress increased fraction B (82.5 vs. 84.3%; P = 0.02) and reduced fraction C (17.5 vs. 15.7%; P = 0.09) but did not affect k (3.9%/h; P = 0.42). In conclusion, under the conditions of this study, drought stress had minimal effects on NDFD.

Key Words: drought, corn silage, fiber digestibility

370 Effect of forage processor roll-gap settings and storage length on the fermentation profile, nitrogen fractions, and kernel processing score of whole-plant corn silage harvested at different maturities. B. A. Saylor*1, E. C. Diepersloot1, L. G. Ghizzi1,2, J. O. Gusmao1,3, C. J. Ominski1, N. McLean2, C. Lafreniere3, S. Bittman4, and J. C. Plaizier1, 1Department of Dairy Science, Virginia Tech, Blacksburg, VA, 2Department of Animal Sciences, University of Florida, Gainesville, FL, 3Department of Animal Nutrition and Animal Production, University of São Paulo, Pirassununga, São Paulo, Brazil, 4Department of Animal Science, Federal University of Lavras, Lavras, Minas Gerais, Brazil.

The objective of this study was to assess the effect of forage processor roll-gap settings and storage length on the fermentation profile, N, fractions, and kernel processing score of whole-plant corn silage harvested at different maturities. Samples from a single corn silage hybrid at 3 harvest maturities [1/4, 1/2, and 3/4 kernel milk line (early, intermediate, and late, respectively)] with 2 roll-gap settings (1 and 3 mm) on a forage harvester were collected at harvest and stored in quadruplicate vacuum pouches for 0, 30, 120, or 240 d. Data were analyzed as a split-split-plot design using the MIXED procedure of SAS. Concentrations of DM tended to differ (P = 0.09) among maturities and averaged 30.4, 31.8, and 37.4% for early, intermediate, and late maturity silages, respectively. There was a maturity × storage length interaction for pH (P = 0.02) and lactic acid concentrations (P = 0.05). Silage pH was similar among maturities at 30 and 120 d, but was greater in late maturity silage at 240 d. Concentrations of lactic acid were similar among maturities at 30 and 120 d, but were greater in intermediate maturity silage compared with late maturity silage at 240 d. Concentrations of acetic, propionic, and total acids were unaffected (P > 0.05) by treatments. Concentrations of soluble CP increased (P < 0.001) from 20.4 to 44.5% of CP as storage increased from 0 to 240 d. A maturity × storage length interaction was observed (P = 0.01) for ammonia-N (% of N) concentrations; with no differences observed at 0, 30, and 120 d, but with greater concentrations in intermediate maturity silage at 240 d. Concentrations of WSC decreased (P < 0.001) from 13.3 to 1.9% of DM as storage increased from 0 to 240 d. Kernel processing score increased (P = 0.01) from 62.4 to 67.7% of starch passing through a 4.75-mm screen as storage increased from 0 to 240 d. These results reaffirm the effects of prolonged fermentation on silage nitrogen fractions and suggest that prolonged fermentation may increase kernel processing score.

Key Words: corn silage, maturity, roll-gap

371 Fiber digestion kinetics of summer annual grasses with or without brown midrib genotype. G. Ferreira*, A. I. Silva-Reis1, A. A. Peryera1,3, and C. L. Teets1, 1Department of Dairy Science, Virginia Tech, Blacksburg, VA, 2Department of Animal Agrarias, Universidad Nacional del Nordeste, Corrientes, Corrientes, Argentina, 3Facultad de Agronomía y Veterinaria, Universidad Nacional de Río Cuarto, Río Cuarto, Córdoba, Argentina.

The objective of this study was to determine fiber digestion kinetics of summer annual grasses containing (BMR) or not (CONV) the brown midrib genotype. Four varieties (2 CONV and 2 BMR) of corn (CN), sorghum (SG), and pearl millet (PM) were planted in 1 × 3 m plots (3 plots/variety). All plots were planted and harvested on 5/30/19 and 9/18/19, respectively. Samples of leaf-blades, stems, and whole plants were collected, dried, and ground to pass a 2-mm screen, and 0.25 g was put into Ankom F57 porous bags previously rinsed with acetone to perform in situ digestibility in 3 cows. All samples from 1 of the 3 replicates per species and variety were incubated within the same cow, so cow was considered a blocking factor. All bags were placed simultaneously into the rumen and incubated for 0, 3, 6, 9, 12, 18, 24, 48, 96, and 240 h. In situ disappearance parameters were determined using Proc NLIN of SAS according to the model ISNDFD = B × [1-e^(-k × T)], where B is the potentially digestible NDF and k is the fractional digestion rate of B. Kinetic parameters were contrasted using a mixed model that included the effects of cow (random), species (fixed), hybrid (fixed), species × genotype (fixed), and the residual error. For the whole plants, fraction B was 82.1, 79.5%, and 71.2% for CONV and BMR, respectively (P < 0.01). The fraction - 

Key Words: summer annuals, fiber digestibility, brown midrib (BMR)
To assess how the fiber contents of silages of perennial forages are related to their in vitro dry matter digestibility (IVTDMD), 270 samples of first cut alfalfa, grass, and alfalfa/grass silages were collected from dairy farms throughout Canada. Samples were analyzed for NDF and ADF by wet chemistry and for IVTDMD using 48 h incubation the ANKOM Daisy II system with an NDF ending. Summary statistics (Table 1) show that the ADF and NDF contents of the samples collected had a wide range in composition and were representative of first-cut alfalfa and alfalfa/grass silages (NRC, 2001. National Research Council, 2001 Nutrient Requirements of Dairy Cows). Pearson correlations between the ADF, NDF, and IVTDMD contents of the samples were determined using the SAS software, as the NDF and ADF contents of forages are routinely used to determine feed intake, energy content and digestibility of ruminant feeds. The correlation coefficients of the regression of ADF on IVTDMD and of NDF on IVTDMD, were −0.41 (P < 0.01) and −0.55 (P < 0.01), respectively. A reason for the low correlation coefficients may be that a NDF ending, rather than a pepin ending for the Daisy II method was used, as the former method results in higher dry matter digestibility estimates. Differences in the alfalfa to grass ratio among samples may also have contributed to the low correlations. Our data does not indicate how the IVTDMD data can best be used for quality assessment and diet formulation when AFD and NDF analyses are available. More research may also be needed to modify the Daisy II method to provide a more accurate estimate of total-trace dry matter digestibility in cattle.

Key Words: alternative feedstuff, feedstuff scarcity, ruminants

374 Effects of pre-cutting round hay bales during baling on forage quality and processing time. W. E. Brown*1, E. Harms2, J. Heinssohn3, J. McGinnis2, C. I. Vahl1, B. J. Bradford1, and M. J. Brouk3, 1Kansas State University, Manhattan, KS, 2John Deere Corporation, Olathe, KS, 3Agassiz, BC, Canada.

Innovative round hay balers with knives that cut the hay as it enters the baling chamber reduce the particle size upon baling and eliminating the need for a tub-grinder. The objective of this study was to evaluate the effects of a round hay baler with knives on forage quality at baling and after storage, and the processing time to reduce particle size before feeding. Alfalfa hay was baled (560 M Megawide HC2, John Deere, Moline, IL) with knives every 15.25 cm (CUT) or without knives (NORM). At baling and after 6 mo storage uncovered, bales were weighed, measured and 10 core samples obtained for nutrient analysis. Cores were separated into outer 15 cm and inner 15 to 46 cm segments to determine depth of spoilage. After storage, particle size was reduced to approximately 4 inches using a mixer wagon for CUT or a tub grinder for NORM. Grinding time and hay loss were analyzed as a completely randomized design. Bale dimensions, weight and density were analyzed as a split-plot design, while nutrient analysis was analyzed as a split-split plot design with treatment as the whole plot, storage period as the sub-plot, and core depth as the sub-sub-plot. Compared with NORM, CUT increased bale weight (513 vs. 581 ± 19.8 kg DM; P < 0.001) and density (154 vs. 170 ± 5.9 kg DM/m2; P < 0.001). Core depth increased with storage time point whereby ADF concentration increased more for outer than inner cores from baling to storage (2.6 vs. 1.1 ± 0.48%; P < 0.01), with similar effects for lignin (0.7 vs. 0.2 ± 0.1%; P < 0.01) and 240-h UNDF (1.9 vs. 0.8 ± 0.52%; P = 0.01). Compared with NORM, CUT increased concentrations of ADF and aNDFom by 0.6% (P = 0.01) and decreased RFQ (117 vs 112 ± 3.2 points; P = 0.02). The CUT treatment increased time to reduce particle size (11.0 vs 3.6 ± 1.53 min; P < 0.001), but decreased grinding DM loss by (24.1 ± 2.83 kg; P < 0.001). In summary, CUT produced larger, more dense bales and increased fiber content slightly; however, the increase may be negligible in ration formulation when hay is fed as part of a TMR. In view of DM loss advantages for CUT during grinding, post-grinding nutrient analysis should be considered.

Key Words: processing, harvest, shrink

Table 1 (Abstr. 372).

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Key Words: fiber, in vitro dry matter digestibility, silages

373 The content of lignin and hemicellulose of silages from different genotypes of sorghum biomass. F. J. Ferreira1, D. E. P. Oliveri1, G. M. Dallago2, C. S. Bonfá1, and M. A. Magalhães1, 1Universidade Federal do Vale do Jequitinhonha e Mucuri, Diamantina, MG, Brazil, 2McGill University, Sainte-Anne-de-Bellevue, QC, Canada.

In countries with a tropical climate, seasonal productivity of forage is one of the most important factors limiting animal performance under grazing systems, which prevents animals from expressing their maximum genetic potential. Therefore, it is important to search for alternative feedstuff that would meet the demand for roughages during periods of scarce, such as the sorghum biomass. The objective of this study was to analyze the content of lignin and hemicellulose of silages of different genotypes of sorghum biomass. We evaluated 8 new genotypes of sorghum biomass (B004, B005, B009, B010, B011, B013, B015, and B020), one commercial genotype of sorghum biomass (K1009), and 2 non-biomass commercial genotypes of sorghum that are commonly used for silage (BRS655 and Volumax). The experiment was conducted using a randomized design with different genotypes as treatment and with 4 repetitions of each treatment. The material was ensiled using PVC silos that were kept closed for 45 d. Then, the silos were opened and we measured the content of hemicellulose and lignin. The data were analyzed using one-way ANOVA followed by the Tukey test (α < 0.05). Statistically significant differences (P < 0.05) and great variability were found between the genotypes for both cell wall components. The average hemicellulose content ranged from 23.6% to 28.6% and the average lignin content varied between 4.5% and 6.5%. Among the biomass genotypes, the genotype B020 had one of the lowest contents of hemicellulose (mean ± standard deviation = 25.0 ± 0.44) and lignin (4.5 ± 0.47), with the latter being lower than the commercial biomass genotype (P < 0.05). In conclusion, the biomass genotype B020 is a possible candidate for usage in the feeding of ruminant animals because its low hemicellulose and lignin content would not limit its intake and digestibility.

Key Words: alternative feedstuff, feedstuff scarcity, ruminants