Graduate Student Competition: ADSA Production Division Poster Competition, PhD Division

M111   Effects of energy supplementation for pasture forages on in vitro ruminal fermentation in continuous cultures. C. T. Noviandi*[1], M. N. McDonald[1], D. R. ZoBell[1], J.-S. Eun[1], M. D. Peel[2], and B. L. Waldron[2], *[1]Department of Animal, Dairy, and Veterinary Sciences, Utah State University, Logan, [2]Forage and Range Research Laboratory, USDA-ARS, Logan, UT.*

Eight dual-flow continuous culture fermentors (700 mL) were used to assess effects of energy supplementation [no concentrate, 30% ground corn, or 30% dried distilled grains with solubles (DDGS)] with 4 pasture forages [tall fescue (TF) without N fertilizer (TF-NF), TF with N fertilizer (TF+NF), TF-alfalfa mixture, and TF-birdsfoot trefoil mixture (TF+BFT)] on in vitro ruminal fermentation and N utilization. Twelve dietary treatments were tested in a completely randomized design with a 3 (energy supplements) × 4 (pasture forages) factorial arrangement. Each culture fermentor was offered a total of 15 g DM/d. Forages were supplied in 4 equal portions at 0600, 1200, 1800, and 2400 h, while energy supplements were fed in 2 equal portions at 1200 and 2400 h. Three replicated runs lasted 10 d each, with the first 7 d allowed for microbial adaptation to the diets, and 3 d for sampling. Average daily culture pH was affected by energy supplementation ($P < 0.05$), but not by forage, ranging from 5.94 to 6.44. Energy supplementation increased total VFA concentration ($P < 0.01$). Corn supplementation resulted in greater VFA concentration in the TF+NF compared with DDGS supplementation, whereas the DDGS supplementation increased VFA concentration in the TF+BFT compared with corn supplementation ($P < 0.05$), leading to an interaction between energy supplements and pasture forages ($P < 0.01$). However, corn supplementation resulted in greater total VFA concentration than DDGS (43.4 vs. 41.5 mM). Decreases in ruminal ammonia-N concentration, methane production, and acetate-to-propionate ratio were observed when corn or DDGS was added into diets ($P < 0.01$). These results indicate that supplementing pasture forages with corn or DDGS enhanced microbial assimilation of ammonia-N and shifted metabolic pathways of microbial fermentation. Supplementation of corn in the TF+BFT elicited a similar ammonia-N concentration as the corn supplemented in the TF+NF. Therefore, grass-legume mixtures would be a sustainable component in grass grazing systems to improve N utilization efficiency with appropriate energy supplementation.

Key Words: continuous cultures, energy supplementation, pasture forage

M112   Evaluation of feed delivery methods for prepubertal dairy heifers during the growing period. T. S. Dennis,* J. E. Tower, and T. D. Nennich, *Purdue University, West Lafayette, IN.*

The objective of this study was to evaluate effects of feed delivery method on growth, dry matter intake (DMI), feed efficiency, and rumen fermentation characteristics of prepubertal dairy heifers during the growing period. Ninety Holstein heifers (179.1 ± 29.9 kg, 171 ± 26 d of age) were randomly assigned to 1 of 15 pens by body weight (BW). Treatment diets contained 56% forage and 44% grain mix (DM basis) and were delivered using a hay feeder and grain bunk (HF), forage and grain fed side-by-side in a bunk (SBS), or a total mixed ration (TMR) for 98 d. Heifers were weighed every 2 wk, and hip and withers heights and heart girth circumference (HGC) were measured monthly. Blood and rumen fluid were collected at the beginning, middle, and end of the study to measure plasma urea N, plasma glucose, and rumen NH_3 and volatile fatty acids (VFA). Data were analyzed as repeated measures using PROC MIXED of SAS with pen as the experimental unit. Feed delivery method affected final BW, as HF heifers were 11.1 kg and 9.7 kg heavier than SBS and TMR heifers ($P < 0.01$ and $P < 0.01$), respectively. Average daily gains were lower for SBS ($P < 0.05$) and tended to be lower for TMR ($P < 0.10$) compared with HF, averaging 0.75, 0.78, and 0.87 kg/d, respectively. Average DMI was greater for HF compared with SBS and TMR (8.2, 7.7, and 7.7 kg/d, respectively; $P < 0.01$), resulting in similar gain:feed between delivery methods overall ($P > 0.10$). Heifers fed using HF had greater HGC than SBS ($P < 0.05$) and tended to have greater HGC than TMR ($P < 0.10$); however, hip and withers heights were not affected by delivery method ($P > 0.10$). Heifers fed using SBS had increased acetate and butyrate concentrations on d 42 ($P < 0.05$), resulting in increased total VFA concentrations on d 42 ($P < 0.05$). Acetate and butyrate concentrations were similar for HF and TMR throughout the study ($P > 0.10$). Blood metabolites, rumen pH, and rumen NH_3 were not affected by delivery method ($P > 0.10$). Results from this study showed that component feeding using a hay feeder increased ADG; however, the manner of feed delivery did not affect feed efficiency or growth in prepubertal dairy heifers.

Key Words: dairy, heifer, feed delivery

M113   Prediction of pregnancy outcome using machine learning algorithms. S. Shahinfar*[1], K. Weigel[1], D. Page[2], J. Gunter[1], V. Cabrera[1], and P. Fricke[1], *[1]Department of Dairy Science, University of Wisconsin-Madison, Madison, [2]Department of Biostatistics and Medical Informatics, and Department of Computer Science, University of Wisconsin-Madison, Madison.*

On a daily basis making decisions about whether or not to breed a given cow and knowledge about expected outcome outcome of the breeding would have an economic impact on profitability of breeding program and net income of the farm. The outcome of each breeding can be affected by many management and physiological factors that vary between farms. Machine learning algorithms offer a great opportunity with regard to problems of multi co-linearity, missing values, or complex interactions among variables (Caravielo et al., 2006). The objective of this study was to develop a user friendly and intuitive on-farm tool to help farmers making decisions about breeding cows. To achieve our goal, we applied several different machine learning algorithms to predict the pregnancy status of each cow after breeding based on phenotypic and genotypic data. Data from 26 dairy farms in Alta Genetics Advantage progeny testing program were used, representing a 10-year period from 2000 to 2010. Reproduction, production, health events, and breeding values of cows and sires were extracted from an on-farm dairy management software and USDA-AIPL databases. The edited data set consisted of 195128 breeding records for multiparous lactation dairy cows, and each of record had 38 potential explanatory variables. Naïve Bayes classifier, Bayesian network, and bagging with RepTree were applied to the data. Among all of these methods, bagging had the best performance with 0.697, area under the ROC curve and 0.665 precision. Naïve Bayes and Bayesian network had 0.599 and 0.615 area under ROC curve respectively. An Information base variable selection procedure identified Mean conception rate in last 3 mo in herd, period, DIM at breeding, past times