ADSA-SAD (Student Affiliate Division) Undergraduate Competition: Original Research

227 Use of green vegetative index maps to predict nutritional quality variation of corn silage. Eleonor L. Cayford*[1], Leyang Feng[2], Shao Yang[2], and Gonzalo Ferreira[1], *[1]Department of Dairy Science, Virginia Polytechnic Institute and State University, Blacksburg, VA, [2]Geography Department, Virginia Polytechnic Institute and State University, Blacksburg, VA.*

The objective of this study was to evaluate the use of remote sensing techniques to anticipate the nutritional variation of corn silage. Cornfields (i.e., fields) from 3 commercial dairy farms located in Pittsylvania, Montgomery, and Washington counties in Virginia were used. Fields had an approximate surface of 25, 10, and 54 ha, respectively. Landsat images were obtained from the US Geological Survey online EarthExplorer system for the months Apr to Sep from 2000 to 2014. The spatial resolution of the images is 30 m. Visual assessment of cloud contamination in and around the 3 fields was made using red band (R_{red}) and near infrared band (R_{nir}) imagery. Images were then made into subsets using the field boundaries to calculate the normalized difference vegetation index (NDVI). Normalized difference vegetation index maps were derived for all images as follows: $NDVI = (R_{nir} - R_{red})/(R_{nir} + R_{red})$. This NDVI equation produces values in the range from −1 to 1, where positive values indicate vegetated areas and negative values represent non-vegetated areas, such as water, clouds, or snow. The NDVI values for each pixel of all images were calculated under ArcGIS/Arcpy environment. Low, mid, and high NDVI values within a field were represented by red, yellow, and green pixels, respectively. Coordinates for a single red, yellow, and green area within each field were obtained. At harvesting time, each of the 3 selected areas within each field was reached using a GPS, and 3 samples composed of 8 plants were cut 15 cm above ground (3 areas × 3 samples = 9 samples per field). Whole-plants were weighed, chopped, mixed, and ensiled in bags for 60 d. Nutritional composition of corn silage was performed by wet chemistry. Data was analyzed as a randomized complete block design, where field and NDVI were blocks and treatments, respectively. Dry plant biomass was similar among NDVI areas (270 g/plant; $P > 0.39$). Concentrations of DM (28.3%; $P > 0.25$), ash (4.55; $P > 0.38$), CP (10.5%; $P > 0.29$), NDF (41.3%; $P > 0.49$), and ADF (25.3%; $P > 0.89$) did not differ among NDVI areas. In conclusion, differences in NDVI in cornfields did not correspond with differences in nutritional composition of corn silage.

Key Words: corn silage, nutritional variation, normalized difference vegetation index

228 Processed water and its effect on daily intake and growth in dairy calves. Patrick J. Neff*[1], Matt C. Claeys[1], and Tamilee D. Nennich[1,2], *[1]Purdue University, West Lafayette, IN, [2]Famo Feeds, Freeport, MN.*

There are potentially bacteria and minerals in well water that could reduce the growth and health of preweaned calves. The objective of this study was to determine the effects of providing dairy calves processed drinking water on calf growth, starter intake, and water intake, as well as determine the efficacy of a novel water processing system on water mineral levels. Sixteen Holstein heifers (49.9 ± 7.7 kg of BW) were assigned to 1 of 2 drinking water treatments in a randomized complete block design and blocked by birth date. Treatments were either conventional well water (CONV) or processed water using a novel processing system (PRO). Water was sampled 1×/mo for analysis of minerals. Calves were fed 1.9 L of a 22:20 milk replacer with 0.70 kg/d of powder being fed 2×/d and a 20% CP texturized calf starter. Body weights, hip width (HW), hip height (HH), and heart girth (HG) were measured every 2 wk. Calves began treatments at 2 wk, were weaned at 8 wk, and ended the study at 10 wk of age. Starter and water intake were determined daily. Data were analyzed as repeated measures using PROC MIXED in SAS with calf as the experimental unit. Water mineral content was similar between treatments with sulfates averaging 45.3 ppm in CONV and 35.0 ppm in PRO, chlorides averaging 14.0 and 11.7 ppm in CONV and PRO, respectively, total dissolved solids of 330.3 ppm in CONV and 259.3 ppm in PRO, and sodium levels of 6.3 for CONV and 5.0 ppm for PRO, respectively. In this study, growth results were similar for calves regardless of treatment. The average BW for calves over the study was 155.2 kg for CONV and 156.8 kg for PRO ($P = 0.63$) and ADG was 0.79 and 0.83 kg/d for CONV and PRO ($P = 0.43$), respectively. Starter intake for CONV averaged 1.2 kg/d and 1.3 kg/d for PRO ($P = 0.74$) with feed efficiencies averaging 1.01 kg starter intake/kg gain overall ($P = 0.86$). Average water intakes were 2.0 and 2.2 kg/d for CONV and PRO ($P = 0.50$), respectively. The HH averaged 89.9 cm ($P = 0.80$), HW averaged 20.9 cm ($P = 0.43$), and HGC averaged 96.5 cm ($P = 0.67$). In this study, both treatments showed similar results for water mineral levels, water intake, starter intake, and growth.

Key Words: dairy calves, water, growth

229 Calving detection in dairy cattle using a novel vaginal temperature device. Megan C. Hardy*, Denise L. Ray, Joey D. Clark, and Jeffrey M. Bewley, *University of Kentucky, Lexington, KY.*

Parturition detection and dystocia prevention represent major challenges to dairy farmers. A potential solution is a vaginal thermometer used to detect calving. The objective of this study was to assess the Vel'Phone vaginal thermometer (Vel'Phone, Medria, Chateaubourg, France) for calving prediction accuracy and to characterize temperature and behavior before calving time. Primiparous (n = 40) and multiparous (n = 55) Holstein cows were enrolled in the study, conducted at the University of Kentucky Coldstream Dairy from May 2013 to August 2014. The Vel'Phone thermometer was vaginally inserted into each animal before the expected calving date. Vel'Phone service provided text messages displaying daily temperature reports, as well as impending calving and thermometer expulsion alerts. The Vel'Phone collected temperature data to investigate precalving temperature decreases. Alert timing data were collected to assess the Vel'Phone's calving prediction ability. Video monitoring recorded calving time and behavior (Barn Cams, Oconomowoc, WI). The MEANS procedure of SAS 9.3 (SAS Institute, Inc., Cary, NC) was used to calculate the average time between impending calving alerts, expulsion alerts, and calving time. The FREQ procedure of SAS created alert-frequency distributions. The GLM procedure of SAS was used to assess the effects of calf weight, calf sex, parity, calving ease, and season on precalving temperature decreases. A gradual temperature decrease of 0.6°C was seen at 48 h before parturition. Calf weight, calf sex, parity, calving ease, and season did not have a significant ($P < 0.05$) effect on precalving temperature decreases. Results indicate temperature

decreases 48 h before parturition and thermometer expulsion alerts could be useful in calving detection technology.

Key Words: vaginal temperature, calving detection, precision dairy technology

230 Consideration of *DGAT1* interactions with DNA markers improved genetic predictions . Amber N. Gabel* and Chad D. Dechow, *The Pennsylvania State University, University Park, PA.*

DGAT1 is a major gene influencing yield in cattle with effect magnitudes that vary by breed, implying that *DGAT1* interacts with other parts of the genome. This study aims to determine whether consideration of interactions between *DGAT1* and single nucleotide polymorphisms (SNP) could improve the accuracy of genomic predictions for fat yield in Holsteins. The initial data set included 1,143 305-d fat yield records from 358 Holstein cows in 11 herds that were genotyped for *DGAT1* and 45,187 SNPs. A series of analyses included a random animal effect, a fixed *DGAT1* effect, a single fixed SNP effect, and a fixed interaction of *DGAT1* with the same SNP. This analysis was repeated for each SNP, 191 of which significantly interacted with *DGAT1* ($P < 0.05$). The significant SNP were then included in a single analysis and backward eliminated until a group of 41 significant *DGAT1* × SNP interactions remained. To evaluate whether consideration of the interactions improved genetic prediction, 5 data sets were created where all data from 2 to 3 herds was eliminated. Breeding values were subsequently estimated for those cows whose data were excluded. A sixth validation data set was created where data from the youngest cows was excluded. Four breeding values were estimated for each validation data set: EBVBASE (random animal effect only), EBVDGAT1 (EBVBASE plus DGAT1 effects), EBVSNP (EBVDGAT1 plus SNP effects), and EBVI (EBVSNP plus *DGAT1* × SNP effects). Validation models were more significant when 305-d yield was regressed on EBVI ($F = 37.41$) than on EBVSNP ($F = 14.03$), EBVDGAT1 ($F = 14.51$), or EBVBASE ($F = 0.84$) for the young cow validation data. Validation models were also most significant when 305-d fat yield was regressed on EBVI in 4 of the 5 validation groups where data were excluded from specific herds. Similarly, the correlation between EBVI and EBV from a full model with all data included was highest in 4 of the 5 herd validation analyses (mean = 0.48, range = 0.29 to 0.64) and for the young cow evaluation (0.54), whereas the lowest was always EBVBASE (range = −0.10 to 0.27). Consideration of SNP interactions with *DGAT1* may yield more accurate genomic predictions for fat yield.

Key Words: *DGAT1*, fat

231 Effectiveness of treating subclinical ketosis in dairy cows. Albert J. Brown*[1], Maurice L. Eastridge[1], Leon D. Weaver[2], and K. J. Chapman[2], *[1]The Ohio State University, Columbus, OH, [2]Bridgewater Dairy, Montpelier, OH.*

Ketosis is a major metabolic disorder of dairy cattle in the United States. There are various viewpoints on whether it is cost effective to treat subclinical cases of ketosis (SCK) with propylene glycol (PPG) and dextrose in comparison to treating animals that become clinically ketotic. For this trial, there was a control group and 2 treatment groups. Control cows had <1.2 m*M*/L β-hydroxybutarate (BHBA) and did not receive treatment. Treatment 1 cows were deemed SCK, defined by a blood BHBA of 1.2 to 2.9 m*M*/L and received 250 mL 50% dextrose solution intravenously and 300 mL PPG orally for 3 d. Treatment 2 cows also were SCK (same criteria as Trt 1) but did not receive the PPG and dextrose. Cows with > 2.9 m*M*/L BHBA were not enrolled in the trial. To determine treatment, blood was drawn from the tail vein/artery at 4 d in milk (DIM) and tested for BHBA using a Precision Xtra Meter (Abbott Laboratories, Abbott Park, IL). NEFA and BCS (1 = thin, 5 = fat) were recorded −14 to −3 d prepartum. Data were analyzed using the PROC GLM procedure with repeated measures of SAS (2012), with significance at $P < 0.05$ and trends at $P < 0.10$. Prepartum NEFA were similar between Trt 1 and 2 but lower for control (316, 300, and 240 μEq/mL, respectively). BHBA at 4 DIM was similar for Trt 1 and 2 but lower for control (1.66, 1.69, and 0.70 m*M*/L, respectively), with a similar pattern at 11 DIM (1.34, 1.46, and 0.69 m*M*/L, respectively). BCS at 11 DIM was higher for Trt 1 cows (3.45) than control (3.33) and Trt 2 cows (3.31). Milk yield during the first 90 DIM was similar for control and Trt 1 cows (42.7 vs. 42.1 kg/d, respectively), but milk yield was lower for Trt 2 cows (41.2 kg/d) compared with control cows and tended ($P = 0.06$) to be lower than for Trt 1 cows. Cows with SCK postpartum were showing signs of altered energy metabolism prepartum. Treatment for SCK had minimal effect on BHBA, appeared to increase BCS, and tended to increase milk yield. Additional data on health events and cost of treatments will provide further evidence to the effectiveness of treatment of SCK.

Key Words: ketosis, subclinical ketosis, propylene glycol

232 Assessing the impact of bovine fecal contamination in water on health and management practices. Sarah J. Thomsen*[1], Jillian F. Bohlen[1], and J. Brooks Crozier[2], *[1]University of Georgia, Athens, GA, [2]Roanoke College, Salem, VA.*

The objective of the experiment was to determine the survival and then relationship between *E. coli* O157:H7 and a bovine fecal marker in river water in a set of sequential experiments. Microcosms of river water and sediment were created in 500-mL sampling bottles. In the first module, *E. coli* O157:H7 was inoculated into water samples (125 mL sediment, 400 mL water); in another experimental setup, 1 g of dairy cattle manure was inoculated into the microcosms (150 mL sediment, 300 mL water). Both setups had control groups. Throughout a period of one week, samples were collected; on d 7, an initial sample was collected and all were shaken to represent a disturbance in the water and sampled again. All samples underwent DNA extraction and polymerase chain reaction, utilizing the specific markers *eae* gene in *E. coli* and bovine *Bacteroides* in the manure to indicate presence or absence. In both experiments, data supported presence of the desired markers after inoculation 24 h, but were absent by the end of the week. However, both experimental setups were also positive for the markers 2 out of 3 times in the samples when shaken after one week. This data supports the theory that markers remain present in the sediment even after one week. These data were then used to consider different management practices to better human and herd health, in addition to farm efficiency, with the hope to reduce fecal contamination into water sources. The goal of the experiment was to examine the survival of a harmful strain of *E. coli* and a bovine fecal marker. The bovine fecal marker was used as pathogenic fecal coliforms like *E. coli* can be transferred through bovine feces. This makes bovine feces not only a home but a mobile mechanism by which harmful and zoonotic pathogens may contaminate water supplies. These contaminations may be direct or by indirect sources such as runoff. These realities generate health concerns for both humans and animals with a need to minimize fecal deposition and access to water sources through best dairy management practices.

Key Words: *E. coli*, water, fecal contamination