PRODUCTION, MANAGEMENT, AND THE ENVIRONMENT: NUTRITION AND MANAGEMENT

0559 Zilpaterol hydrochloride repartitions chemical components of the empty body of Holstein steers.

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A serial harvest from 254 to 534 d on feed (DOF) was conducted to quantify changes in growth and composition of calf-fed Holstein steers (n = 110, initial BW = 449.2 ± 19.9 kg). One-half were supplemented with the β-2 adrenergic agonist zilpaterol hydrochloride (ZH; 8.33 mg/kg 100% DM basis) with the remainder fed a control (CON) ration during the final 20 d followed by a 3 d withdrawal before harvest. Cattle were randomly allocated to dietary treatment and harvest endpoint (254, 282, 310, 338, 366, 394, 422, 450, 478, 506, and 534 DOF) in a 2 × 11 factorial randomized complete block experimental design conducted in the years 2012 and 2013. Cattle fed ZH had increased ($P \leq 0.03$) empty body weight (EBW; 17.8 kg), HCW (20.7 kg), dressed yield as a percentage of shrunk BW (DYSBW; 2.1%), dressed yield as a percentage of EBW (DYEBW; 1.3%), and empty body moisture (EBM; 1.3%) compared to CON steers regardless of DOF. Concurrently, cattle fed ZH had less ($P \leq 0.02$) digesta fill (6.1 kg) and empty body fat (EBF; 1.7%) compared to CON steers. Absolute weights of the empty body components including blood, hide, internal cavity components (ICC), and bone were not different ($P > 0.20$) for steers fed ZH or the CON diet. However, cattle fed ZH had increased ($P < 0.01$) carcass soft tissue (CST; 20.2 kg) compared to CON cattle. When comparing ZH and CON empty body components as a percentage of EBW, cattle fed ZH had less ($P \leq 0.02$) hide (0.3%), ICC (1.0%), and bone (0.5%). Furthermore, cattle fed ZH had more ($P < 0.01$) CST (1.7%) compared to CON steers with no difference ($P = 0.81$) in blood as a percentage of EBW. Comparing the chemical composition of the ICC, ZH steers had less ($P = 0.05$) protein (0.7%) with more ($P = 0.02$) ash (0.1%) compared to CON steers. Comparing the chemical composition of CST, cattle fed ZH had increased ($P = 0.02$) moisture (1.4%) with a concurrent reduction ($P < 0.01$) in fat content (2.0%) compared to CON cattle. This investigation proposes that the increase in dressed carcass yield observed in ZH supplemented cattle may best be explained by reductions in hide, fill, and ICC.

Key Words: beef, zilpaterol hydrochloride, composition

0560 Effect of organic grain supplementation on activity and rumination time of organic dairy cows.

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Organic cows (n = 57) were used to evaluate activity and rumination time of cows fed three grain supplementation strategies during the grazing season. Cows were assigned to one of three replicate supplementation groups: 1) no corn grain supplementation (100% pasture, GRS, n = 19), 2) low corn grain (2.72 kg/head/day, LOW, n = 19), and 3) high corn grain (5.44 kg/head/day, HI, n = 19), and calved during two seasons at the University of Minnesota West Central Research and Outreach Center, Morris, from October to December 2012 and March to May 2013. Supplement (organic corn grain and minerals) was fed with a TMR of corn silage and alfalfa haylage, and at least 30% of diet DMI for LOW and HI cows consisted of organic pasture. Pasture and TMR intake were measured on a group basis, because cows were group fed. Activity and rumination time (daily and 2-h periods) were monitored electronically using HR-LD Tags (SCR Engineers Ltd., Netanya, Israel) for 125 d. Activity is reported in "activity units" from SCR DataFlow II software. The PROC HPMIXED of SAS was used for statistical analysis, and independent variables were season of calving (fall or spring), month of grazing (June to September), parity (1, 2, 3+), breed group, supplementation group and the interactions of month of grazing and supplementation group, breed group and supplementation group, and parity and supplementation group. Cow and replicate were random effects with repeated measures. The GRS (1138) cows had greater ($P < 0.05$) daily activity than HI (1001) cows but were similar to LOW (1019) cows. Daily activity was the greatest ($P < 0.05$) during July (1258) and least during September (819). Rumination was not different for the GRS (397 min/d), LOW (384), and HI (370) cows. Daily rumination was greater ($P < 0.05$) during September (402 min/d) compared to July (361). Daily activity increased rapidly from h 6:00 and 8:00 to h 16:00 and 18:00. From h 18:00 to 20:00, cows had a rapid decline in activity until h 6:00 the next day. All supplementation groups had the greatest rumination during h 2:00 and 4:00 and the least during h 10:00 and 12:00. In summary, GRS cows had greater activity but not greater daily rumination compared to LOW and HI supplemented cows. Monthly activity and rumination patterns of grazing organic cows may have been influenced by the weather and fly populations.

Key Words: activity, rumination, organic

0561 Effect of feeding kelp on growth and profitability of group-fed dairy calves in an organic production system. B. J. Heins*[1] and H. Chester-Jones[2], *[1]University of Minnesota West Central Research and Outreach Center, Morris, [2]University of Minnesota Southern Research and Outreach Center, Waseca.*

Heifer calves (n = 113) were used to evaluate the effect of feeding kelp on growth and economics of calves in an organic group management system. Calves were assigned to replicate feeding groups of 10 in super hutches by birth order during two seasons from September to December 2012 and March to May 2013 at the University of Minnesota West Central Research and Outreach Center, Morris. Calves in groups were the experimental unit. Breed groups of calves were: Holsteins (HO, n = 16) selected for high production; HO (n = 17) maintained at 1964 breed average level; crossbreds (n = 51) including combinations HO, Montbéliarde, and Swedish Red selected for high production; and crossbreds (n = 29) including combinations of HO, Jersey, Normande, and Swedish Red selected for robustness. Treatment groups were 1) control calf starter (CS; 18% CP as-fed; CON), 2) CS plus 56.7 g kelp/calf daily (Kelp2), and 3) CS plus 113.4 g kelp/calf daily (Kelp4). Calf groups were fed 1.5% DM solids of 13% total solids organic milk of birth weight once daily and then weaned at 60 d when the group consumption averaged 0.91 kg starter/calf daily. Body weight and hip height were recorded at birth, once/wk, at weaning, and at 90 d of age. Data were analyzed using PROC MIXED of SAS. Independent variables for analyses were the fixed effects of birth weight (co-variable), season of birth, breed group, treatment group, along with replicate as a random effect. Calf group ADG to weaning and weaning BW were 0.67, 82.9; 0.63, 79.4, and 0.61; 78.4 kg for CON, Kelp2, and Kelp4, respectively ($P < 0.10$). Hip heights at weaning were 93.8, 91.2, and 91.8 cm for CON, Kelp2, and Kelp4, respectively ($P < 0.05$). Daily gain to 90 d were 0.78, 0.74, and 0.68 kg for CON, Kelp2, and Kelp4 respectively, ($P < 0.05$). Total costs (grain, health, and organic milk) to 90 d of age for calf groups were $2,660.20 for CON, $2,711.39 for Kelp2, and $2,718.42 for Kelp4; however, the cost per kilogram of gain was significantly higher ($P < 0.05$) for the Kelp4 ($4.16) group compared to the CON ($3.69) group. In summary, calves fed a control calf starter had higher daily gains than calves fed high kelp calf starter rations. Feeding kelp in calf starter rations for organic dairy calves may not be economically justified.

Key Words: calf starters, organic production, kelp

0562 Reproductive performance of Barki ewes in Siwa Oasis as affected by including date seeds in the concentrate ration. E. B. Abdalla*, *Faculty of Agriculture, Ain Shams University, Cairo, Egypt.*

The present study investigated the effect of feeding date seeds on productive efficiency of Barki ewes in Siwa Oasis. Seventy-five adult Barki ewes (37.8 ± 0.63 kg) were divided into three equal groups: (G1) was kept as control (0.0% date seed), while the other two groups were fed on date seeds as a partial (50%, G2) or complete replacement (100%, G3) of the yellow corn in the concentrate diet. Animals were offered berseem *(Trifolium alexandrinum)* hay ad libitum and had access to fresh water twice a day. Estrus cyclicity and hormonal profiles during estrous cycle and pregnancy were determined. Reproductive parameters (number of services/conception, conception rate, lambing rate, average litter size, and mortality rate) were also recorded. Results indicated that date seeds contain estrogen-like compounds (β-sitosterol, stigmasterol and estradiol) with values of 0.01, 0.31, and 0.10 mg/kg, respectively. These levels did not affect estrus activity, since 90 and 80% of the ewes exhibited regular estrous cycle lengths with an overall mean of 17.3 ± 1.09 and 17.1 ± 0.86 d, respectively. Estradiol-17β (E_2) and progesterone (P_4) profiles either during estrous cycle or pregnancy were found to follow the normal pattern reported in the literature. Plasma (P_4) levels increased during pregnancy, especially during late pregnancy and decreased to the basal values during lactation, while plasma (E_2) levels were not significantly different among experimental groups. Date seeds, on the other hand, had improved all reproductive parameters studied as compared to the control group. Conception rate and lambing rate were found to be higher in both G2 (92 and 92%) and G3 (88 and 80%) as compared to the control group (76 and 72%), respectively. No abortions or stillbirths were found in the three groups. These results may confirm that date seeds have no estrogenic effects and could be used safely as a partial (50%) or complete replacer (100%) for the concentrate ration of ruminants, which in turn positively reflect on the Bedouins' income and animal health under desert conditions.

Key Words: date seeds, Barki ewes, estrus activity

0563 Impact of heifer development system on subsequent ADG and reproduction in two different breeding seasons. H. R. Nielson*[1], J. D. Harms[1], A. F. Summers[2], R. A. Vraspir[1], and R. N. Funston[1], *[1]University of Nebraska, West Central Research and Extension Center, North Platte, [2]University of Nebraska, Lincoln.*

The objective of this study was to determine the impact of heifer development system on subsequent growth and reproductive performance in two breeding seasons. In Exp. 1, over a 3-yr period, 196 May-born crossbred (5/8 Red Angus, 3/8 Continental) heifers were stratified by BW and randomly assigned to one of two post-weaning nutritional treatments (2 pastures·treatment^{-1}·yr^{-1}) beginning mid-January to mid-April. Heifers were offered ad libitum meadow hay (HAY) and 1.81 kg/d (29% CP, DM basis) supplement or allowed to graze meadow (MDW) and 0.45 kg/d supplement. Heifers were managed as a single herd before and following treatment. Heifers were synchronized with a single $PGF_{2\alpha}$ injection 5 d after

being placed with bulls for 45 d. Heifers on HAY treatment had greater ($P < 0.01$) ADG during the treatment period compared with MDW heifers (0.63 ± 0.01 kg/d vs. 0.33 ± 0.01 kg/d, respectively). However, heifers grazing meadow experienced a compensatory gain resulting in similar ($P \geq 0.12$) BW in June, July, and at pregnancy diagnosis. There was no difference ($P = 0.65$) in the proportion of heifers attaining puberty before the breeding season for HAY (62 ± 18%) and MDW (49 ± 18%) heifers. Pregnancy rates were similar ($P = 0.79$) between HAY vs. MDW treatments (69 ± 6% vs. 67 ± 6% respectively). In Exp. 2, 100 spring-born, crossbred (5/8 Red Angus, 3/8 Continental) heifers were, over 2 yr, stratified by BW and randomly assigned to HAY or MDW treatments. Similar to Exp. 1, HAY heifers had greater ($P < 0.01$) ADG during the treatment period than MDW heifers (0.80 ± 0.02 vs. 0.47 ± 0.02 kg/d). During the spring, HAY and MDW heifers had similar ($P = 0.14$) ADG, and BW was similar ($P \geq 0.17$) in May and September. Pubertal status before breeding was not affected by treatment ($P = 0.55$). Pregnancy rates were similar for HAY (88 ± 5%) and MDW (86 ± 5%, $P = 0.78$) heifers. Although ADG during the winter feeding period was greater for HAY heifers, BW was similar in the spring, summer, and at pregnancy diagnosis between treatments, suggesting a compensatory growth effect for MDW heifers. Similarly, there was no difference in pubertal status or pregnancy rate, indicating that a lower input winter management system is viable to maintain heifer pubertal status and pregnancy rates in two breeding seasons.

Key Words: beef heifers, development system, reproduction

0564 A comparison of serum metabolic profiles of dairy cows that maintained or lost body condition score 15 d before calving. M. R. Sheehy[*1,2], F. J. Mulligan[1], and A. G. Fahey[3], [1]*School of Veterinary Medicine, University College Dublin, Dublin, Ireland,* [2]*Devenish Nutrition Ltd, Belfast, Northern Ireland,* [3]*School of Agriculture and Food Science, University College Dublin, Ireland.*

Body condition score is an indirect measure of energy balance. Energy balance before calving may affect production and health in the following lactation. Energy restriction before calving has recently been advocated as a nutritional strategy that may result in BCS loss before calving. The objective of this study was to determine if loss of BCS 15 d before calving had an impact on the NEFA and calcium at wk -1 and wk 0 relative to calving and β-hydroxy butyrate (BHBA) and haptoglobin at wk 0 and wk +1 relative to calving from 93 Holstein-Friesian cows. On d -15 to d 0 relative to calving, BCS was assessed (1 = emaciated, 5 = obese). Cows were divided into two groups: those that did not lose BCS between d -15 and d 0 (MAINT, $n = 50$) and those that lost BCS from d -15 to d 0 (LOSS, $n = 43$). The fixed effects of BCS group, parity, wk and their interactions and a random effect of cow were analyzed for using PROC MIXED of SAS. Before calving LOSS cows tended to have higher NEFA concentrations than MAINT cows (0.88 ± 0.05 v 0.78 ± 0.04 mmol/L, $P = 0.10$) and a group by wk interaction was also found ($P < 0.01$), with an increase of 0.69 ± 0.09 mmol/L for LOSS and an increase of 0.59 ± 0.07 mmol/L for MAINT from wk -1 to 0. There was no difference in calcium concentrations between the LOSS and MAINT cows (2.21 ± 0.02 v 2.23 ± 0.02 mmol/L); however, a group by wk effect ($P < 0.01$) was found with a decrease from wk -1 to wk 0 of 0.32 ± 0.04 and 0.25 ± 0.03 mmol/L for LOSS and MAINT, respectively. After calving, LOSS cows were found to have higher concentrations of BHBA than MAINT cows (0.72 ± 0.04 v 0.57 ± 0.04 μmol/L, $P < 0.05$). A group by wk interaction ($P < 0.05$) was found for BHBA with an increase of 0.19 ± 0.07 μmol/L for LOSS and an increase of 0.02 ± 0.07 μmol/L for MAINT cows from wk 0 to 1. There was no difference found for haptoglobin between the LOSS and MAINT cows (115.41 ± 1.45 v. 114.71 ± 1.29 ng/mL, $P > 0.05$. In conclusion, LOSS cows tended to have significantly higher NEFA before calving and had a higher BHBA after calving with little effect on serum concentrations of calcium or haptoglobin.

Key Words: haptoglobin, NEFA, β-hydroxy butyrate

0565 Comparison of methods for isolation of miRNA from bovine milk whey. X. L. Jin[*1], H. Y. Liu[1], L. Liu[1], Z. H. Wei[1], and J. X. Liu[2], [1]*Institute of Dairy Science, Zhejiang University, Hangzhou, China,* [2]*Zhejiang University, Hangzhou, China.*

Milk miRNAs have great potential to utilize as noninvasive biomarkers for diagnosis or prognosis of diseases due to their high stability in the whey. More than 400 different miRNAs have been found in the mammalian milk. Some protocols have been established for isolation and quantification of miRNAs in whey, but the efficiency and effectiveness of these protocols are variable. The objective of the present study was to compare the methods for isolation of miRNAs from whey. Bovine milk samples were centrifuged and filtered to obtain the whey, 250 μL of which was lysed by Trizol LS. Total RNA was isolated from the whey RNA homogenate by two methods: 1) modified phenol based technique (alcohol precipitation with the addition of glycogen as carriers), and 2) column-based clean-up by miRNeasy Mini Kit. Yield and quality of total RNA isolated by these two methods were measured by NanoDrop ND-1000 spectrophotometer. Bioanalyzer 2100 instrument analysis using RNA6000 PicoKit was employed for precise detection of the RNA distribution-electropherogram of the microchip gel electrophoresis. The cycle thresholds of several endogenous miRNAs (bta-miR-141, bta-miR-148a, bta-miR-200c, and bta-miR-375) and a spike-in synthetic miRNA (cel-miR-39) were tested by RT-qPCR to compare their recovery efficiency between these two methods. Both methods could successfully isolate similar amount of small RNA (< 200nt)

from whey. Results of cycle thresholds of the endogenous miRNAs and spike-in cel-miR-39 indicated that the column-based cleanup method yielded approximately 10-fold miRNA than the alcohol precipitation. Nanodrop and bioanalyzer2100 based on RNA6000 PicoKit analysis could not reflect the real miRNA recovery efficiency of the whey. Whereas, spike-in control cel-miR-39 could be utilized as reliable and stable reference due to its perfect performance during the RT-qPCR. In summary, it is preferable to isolate miRNA from whey by combined phenol and column based approach.

Key Words: Isolation, miRNA, whey