

FEED/FODDER

NPARR 2(1), 2011-019, Effect of frequency of supplementation of a soyhulls and corn gluten feed blend on hay intake and performance of growing steers

Feeding supplements less frequently can reduce labor costs and increase profitability. However reducing the frequency of delivery of grain based supplements can negatively affect fiber digestion in the rumen because more grain must be fed per feeding potentially causing decreased ruminal pH and/or an insufficiency of ruminal nitrogen. Using supplements that have a moderate crude protein (CP) level, and that are low in starch, might alleviate negative effects on fiber digestion and therefore decrease negative effects associated with supplementing energy supplements less frequently. Corn gluten feed and soybean hulls are high in metabolizable energy but low in fat and starch, and corn gluten feed is also a good source of ruminally degradable CP. The objective of this study was to determine effects of reducing supplementation frequency during a weekly cycle on steer performance when supplementing medium quality hay with a blend of soybean hulls and corn gluten feed (SH/CGF). The 86 d feeding experiment was replicated over 4 years. Each year, 40 steers (BW = 263 ± 2.5, 281 ± 2.5, 271 ± 2.9, 229 ± 2.9 kg for years 1–4, respectively) were stratified by body weight and assigned to 8 groups which were randomly assigned to treatment. During years 1 and 2, treatments consisted of *ad libitum* medium quality fescue hay (70–100 g/kg CP and 340–410 g/kg acid detergent fiber) that was either not supplemented (HAY), supplemented daily (7X) with 2.73 kg/hd, or supplemented on Monday, Wednesday and Friday (3X) with 6.36 kg/hd. During years 3 and 4, an additional treatment was added in which steers were supplemented on Monday and Thursday with 9.55 kg/hd of SH/CGF (2X). Average daily gain was higher (P<0.01) in supplemented steers compared to non-supplemented steers, but did not differ due to supplementation frequency. Hay intake was reduced (P<0.01) by supplementation and was higher (P<0.05) for 7X compared to both 3X and 2X, but hay intake did not differ between 3X and 2X. The gain to feed ratio was increased by supplementation (P<0.01) and was further increased by less frequent

supplementation (P≤0.02). Results suggest that when supplementing medium quality hay with a blend of soyhulls and corn gluten feed, steers can be supplemented as little as twice a week without reducing performance [M.E. Drewnoski*, M.H. Poore and G.A. Benson (Department of Animal Science, North Carolina State University, Raleigh, NC 27695-7621, United States), *Animal Feed Science and Technology*, 2011, **164**(1-2), 38-44].

NPARR 2(1), 2011-020, Effects of different levels of coconut oil supplementation on performance, digestibility, rumen fermentation and carcass traits of Malpura lambs

The influence of coconut oil (CO) supplementation (0, 25, 50 and 75 g/kg of concentrate) upon performance, nutrient utilization, rumen fermentation, blood biochemistry and carcass characteristics were assessed in lambs (4 males and 4 females in each treatment) between 15 d of age and 6 months. Lambs were allowed to suckle twice daily until 90 d of age. Concentrate and forage (*Ailanthus excelsa* leaves) were provided *ad libitum* for the duration of the experiment. Lambs were weighed at weekly intervals, and a metabolism study was conducted on six representative lambs from each group at 120 d of age to determine nutrient utilization and N balance. Blood samples and rumen liquor samples were drawn at 180 d to determine blood biochemical and rumen fermentation characteristics. At 6 months of age all the male lambs were slaughtered and carcass traits were evaluated. Coconut oil intake was 7.1, 13.8 and 18.8 g/d in three treatment groups compared to zero in control. Pre- and post-weaning gain was similar while dry matter intake was higher in both pre-weaning (L: P<0.001; Q: P<0.001) and post-weaning (L: P=0.001; Q: P=0.001) in control. Digestibilities of organic matter (P=0.013) and neutral detergent fiber (P=0.062) decreased and that of ether extract increased (P=0.001) linearly with increased CO supplementation. The N retention decreased linearly (P=0.001) with increasing CO supplementation. Concentration of total N and trichloroacetic acid precipitable N decreased at a decreasing rate (Q: P=0.051 and P=0.019, respectively) whereas ammonia N in rumen liquor decreased at an increasing rate (Q: P=0.003) with increased CO supplementation. Coconut oil supplementation

linearly ($P=0.006$) reduced rumen protozoa population. Though the concentration of serum glucose was similar, serum cholesterol and non-esterified fatty acids increased linearly ($P<0.05$) with CO supplementation both pre- and post-weaning. Pre-slaughter weight, dressed weight, eye muscle area, and body fat were similar in all the lambs. Coconut oil supplementation up to 50 g/kg is optimum in lamb rations due to improved feed conversion ratio and production of a carcass with acceptable characteristics. Higher levels of CO supplementation depressed growth and feed conversion due to its suppression of rumen protozoa and reduced fiber digestibility [R.S. Bhatt, N.M. Soren*, M.K. Tripathi and S.A. Karim (Division of Animal Nutrition, Central Sheep and Wool Research Institute, Avikanagar, Via-Jaipur, Rajasthan 304501, India), *Animal Feed Science and Technology*, 2011, **164**(2), 29-37].

NPARR 2(1), 2011-021, A herb and legume sward mix increased ewe milk production and ewe and lamb live weight gain to weaning compared to a ryegrass dominant sward

This study investigated the potential of a mixed herb sward to improve production of multiple-bearing ewes and their offspring compared to a ryegrass dominant sward. Forty four twin-bearing (twin) and 42 triplet-bearing (triplet) mixed-aged Romney ewes that were a maximum of 140 days pregnant (P140) were randomly allocated to one of two nutritional treatments being: a mix of chicory, plantain, white and red clover (Herb), or a ryegrass dominant sward (Ryegrass) to form the following groups: twin Ryegrass $n = 22$, triplet Ryegrass $n = 20$, twin Herb $n = 22$ and triplet Herb $n = 22$. Ewes and their lambs remained on these herbage treatments until 66 days after the mid-point of lambing (L66). By L66, ewes grazing the Herb treatment compared to ewes on the Ryegrass treatment were heavier ($P<0.05$; 70.9 ± 1.17 kg *versus* 66.1 ± 1.15 kg) and had higher ($P<0.05$) body condition scores (2.8 ± 0.07 *versus* 2.4 ± 0.07 , respectively). Ewes grazing the Herb treatment produced more milk ($P<0.05$) at each of the three sampling periods (3137 ± 161.3 *versus* 2613 ± 148.1 at day 7, 3280 ± 148.8 *versus* 2483 ± 153.1 at day 14 and 3237 ± 131.8 mL *versus* 2428 ± 136.2 mL at day 21). Lambs from ewes grazing the Herb treatment were heavier ($P<0.05$) at

L22 (10.36 ± 0.274 kg *versus* 9.29 ± 0.272 kg) and L66 (20.67 ± 0.490 kg *versus* 17.55 ± 0.493 kg). The higher live weights (LW) were due to higher ($P<0.05$) LW gains of Herb lambs between birth and L22 (298 ± 10.8 g/day *versus* 245 ± 10.7 g/day) and between L39 and L66 (268 ± 16.2 g/day *versus* 179 ± 15.9 g/day). Herb triplet-bearing ewes produced more ($P<0.05$) total lamb LW by L66 than Ryegrass triplet-bearing ewes (45.70 ± 3.051 kg *versus* 28.26 ± 3.203 kg, respectively). Results demonstrate that a herb sward mix can improve multiple ewe and lamb performance compared to a ryegrass dominant sward [P.G. Hutton, P.R. Kenyon*, M.K. Bedi, P.D. Kemp, K.J. Stafford, D.M. West and S.T. Morris, (Sheep Research Centre, College of Sciences, Massey University, New Zealand), *Animal Feed Science and Technology*, 2011, **164**(1-2), 1-7].

NPARR 2(1), 2011-022, Effects of supplemental levels of hesperetin and naringenin on egg quality, serum traits and antioxidant activity of laying hens

Hesperetin and naringenin phytochemicals are naturally occurring flavanoids in citrus fruits. The purpose of this study was to evaluate the effects of supplementing different levels of extracted hesperetin and naringenin on egg quality, serum traits and antioxidant activity in laying hens. Two experiments were conducted, each for 10 weeks, in a completely randomized experiment design. Each had 100 Leghorn laying hens (26 weeks old) randomly assigned into five groups ($n = 20$) based on dietary categories of hesperetin 0, 0.5, 1, 2, 4 g/kg and naringenin 0, 0.5, 1, 2, 4 g/kg. Experimental results indicated that there was increased ($P<0.05$) egg production in the 1 g/kg naringenin-supplemented group, but lower ($P<0.05$) egg production in the hesperetin- and naringenin-supplemented groups given 4 g/kg. Cholesterol content (per gram yolk) and total cholesterol content (per egg) were lower ($P<0.05$) in the hesperetin- and naringenin-supplemented groups as compared to the control group, and the 2 g/kg hesperetin- and naringenin-supplemented groups showed the most significant difference. Both serum cholesterol and triglyceride concentrations were lower ($P<0.05$) in the 2 g/kg hesperetin- and naringenin-supplemented groups. The SOD and catalase activities, scavenging O_2^- and iron-chelating abilities were higher ($P<0.05$) in the 2 g/kg hesperetin- and naringenin-supplemented groups, and

the trolox equivalent antioxidant capacity was higher ($P < 0.05$) in the 2 g/kg naringenin-supplemented group. The results confirmed that both hesperetin and naringenin could lower serum and egg yolk cholesterol levels, and improve the antioxidant activities, however the measured variables generally showed significant quadratic responses to increasing amounts of the compounds. The recommended supplementation level of hesperetin and naringenin is 2 g/kg of the basal diet for reduced serum and yolk cholesterol contents and increased antioxidant capacity [S.Ting, H.S. Yeh and T.F. Lien*(Department of Animal Science, National Chiayi University, 300 University Road, Luh Liau Li, Chiayi 600, Taiwan, ROC), *Animal Feed Science and Technology*, 2011, **163**(1), 59-66].

NPARR 2(1), 2011-023, Effects of feeding rapeseed oil, soybean oil, or linseed oil on stearoyl-CoA desaturase expression in the mammary gland of dairy cows

Stearoyl-CoA desaturase (SCD) is an important enzyme in the bovine mammary gland, and it introduces a double bond at the Δ^9 location of primarily myristoyl-, palmitoyl-, and stearoyl-CoA. The main objective of this study was to compare the effects of various fatty acids (FA) typically present in dairy cow rations on the expression of SCD1 and SCD5 in the mammary gland of dairy cows. Twenty-eight Holstein-Friesian cows were randomly assigned to 1 of 4 dietary treatments. The dietary treatments were a basal diet supplemented (dry matter basis) with 2.7% rapeseed oil as a source of C18:1 *cis*-9; 2.7% soybean oil as a source of C18:2 *cis*-9,12; 2.7% linseed oil as a source of C18:3 *cis*-9,12,15; or 2.7% of a 1:1:1 mixture of the 3 oils. The oil supplements were included in the concentrate, which was fed together with corn silage and grass silage. In addition, cows were grazing on pasture, consisting mainly of perennial ryegrass, during the day. Biopsies from the mammary gland were taken and analyzed for mRNA expression of SCD1 and SCD5 by using quantitative real-time PCR. Milk yield as well as milk protein and fat contents did not differ among the 4 dietary treatments. Dietary supplementation with rapeseed oil and linseed oil increased proportions of C18:1 *cis*-9 and C18:3 *cis*-9,12,15 in blood plasma, respectively, compared with the other treatments. Supplementation with soybean oil and linseed oil increased milk FA

proportions of C18:2 *cis*-9,12 and C18:3 *cis*-9,12,15, respectively, but supplementation with rapeseed oil did not increase C18:1 *cis*-9 in milk. Mammary SCD1 expression was reduced by supplementation of soybean oil compared with rapeseed oil and linseed oil. In contrast, SCD5 expression did not differ among the 4 treatments. The C16 and C18 desaturation indices, representing proxies for SCD activity, were lower for the soybean oil diet compared with the diet supplemented with a mixture of the 3 oils. In conclusion, our study shows that mammary SCD1 expression is significantly downregulated in dairy cows by feeding unprotected soybean oil compared with rapeseed oil or linseed oil, and this is partially reflected by the lower desaturase indices in the milk. Furthermore, mammary SCD5 expression appears to be differently regulated than expression of SCD1 [A.A.A. Jacobs*, J. van Baal, M.A. Smits, H.Z.H. Taweel, W.H. Hendriks, A.M. van Vuuren and J. Dijkstra (Animal Nutrition Group, Wageningen University, PO Box 338, 6700 AH Wageningen, the Netherlands), *Journal of Dairy Science*, 2011, **94**(2), 874-887].

NPARR 2(1), 2011-024, Replacing corn with glycerol in diets for transition dairy cows

Expansion of the biofuels industry has increased the availability of glycerol as an alternative feed for dairy cows. The objective of this study was to determine the effects of glycerol on feed intake, milk production, rumen volatile fatty acids, and metabolic parameters in transition dairy cows. Multiparous Holstein cows were fed diets containing either high-moisture corn ($n = 11$) or glycerol ($n = 12$) from -28 to +56 d relative to calving. Glycerol was included at 11.5 and 10.8% of the ration dry matter for the pre- and postpartum diets, respectively. Prepartum feed intake was not changed by glycerol feeding (14.9 vs. 14.6 kg/d, control vs. glycerol) nor did postpartum feed intake differ (19.8 vs. 20.7 kg/d, control vs. glycerol). Overall milk yield did not differ (35.8 vs. 37 kg/d, control vs. glycerol) and milk composition, milk urea nitrogen, somatic cells, and energy balance were not different with glycerol feeding. Blood glucose content was decreased in cows fed glycerol during the prepartum period (59.1 vs. 53.4 mg/dL), and β -hydroxybutyrate concentration was increased (0.58 vs. 0.82 mmol/L, control vs. glycerol). Concentrations of blood nonesterified fatty acids did

not differ between the treatment groups, and no response to glycerol for blood metabolites during the postpartum period was observed. Total rumen volatile fatty acid concentrations (mmol/L) did not differ between treatments, but proportions of rumen propionate and butyrate were greater for cows fed glycerol (22.7 vs. 28.6% of propionate, control vs. glycerol; and 11.5 vs. 15.3% of butyrate, control vs.

glycerol) at the expense of acetate (61.4 vs. 51.5%, control vs. glycerol). These data indicate that glycerol is a suitable replacement for corn grain in diets for transition dairy cows [E.R. Carvalho, N.S. Schmelz-Roberts, H.M. White, P.H. Doane and S.S. Donkin*(Department of Animal Sciences, Purdue University, West Lafayette, IN 47907), *Journal of Dairy Science*, 2011, **94**(2), 908-916].