browning reaction. All diets contained (DM basis) 30% alfalfa silage, 30% corn silage, 4% soy hulls, 2.4% mineral–vitamin premix, and 16% CP. The SBM diet contained 25% high-moisture corn (HMC) and 8.6% SBM; the canola diets contained 22% HMC and 11.4% CM or TCM. On the last day of wk 4, 8, and 12, spot urine and fecal samples were collected at 6 and 18 h after feeding. Data were analyzed using the MIXED procedure of SAS. Orthogonal contrasts were used to compare effects of different protein sources (SBM vs. CM + TCM and CM vs. TCM). Partial data are presented in Table 1. Compared with SBM, apparent digestibility of DM, OM, CP, and NDF was greater on both CM and TCM diets and there were trends for improved digestibilities when CM was compared with TCM. There were no differences for N intake, milk yield, and total N excreted in urine and feces; however, both canola diets decreased urinary urea N (% of total urinary N) and fecal N (% of total N intake) and decreased MUN concentration. No differences were observed between CM and TCM with regards to N utilization. Results from this experiment indicate that replacing SBM with CM or TCM in lactation diets improved digestibility and minimized environmental impact but that extrusion did not improve CM utilization.

Key Words: dairy nutrition, digestibility, nitrogen utilization

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1585 **Impact of different diet crude protein levels and ruminally degradable protein:ruminally undegradable protein ratios on midlactation dairy cow performance: II. Dry matter intake, digestibility, and nitrogen balance.**

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This study evaluated the impact of different CP levels and RDP:RUP ratios in the diets of 24 crossbred Holstein–Gir midlactating dairy cows. Animals were allotted for 60 d to 4 treatments on a complete random design ($n = 6$). Experimental diets were formulated using the CNCPS version 6.1 model to meet production requirements and to be isoenergetic and provide the same amount of MP. Crude protein concentrations were 12.4, 13.0, 13.6, and 15.4% on a DM basis. Ruminally degradable protein levels ranged from 5.6 to 9.7% DM and RUP ranged from 6.8 to 5.7 DM in relation to treatments with lower and higher CP levels, respectively. Soypass (Cargill) was used in substitution to soybean meal and urea to adjust RDP:RUP ratios. Parameters evaluated were DMI, CP intake (CPI), DM digestibility, nitrogen balance, microbial protein yield (MPY), and plasma urea nitrogen (PUN). Data were analyzed using PROC MIXED from SAS 9.0 on a split plot design. Dry matter intake did not differ among treatments and ranged from 20.0 to 21.6 kg/d, whereas CPI increased ($P < 0.01$) as diets' CP level increased (2.59–3.46 kg/d). Treatments did not affect DM digestibility (60.2–61.9%) but CP digestibility increased ($P < 0.04$) as RDP levels in the diets increased (58.2–67.2%). Treatments did not affect milk N (119–135 g/d) or N in feces (178–182 g/d). Urine N increased (116–247 g/d) as diets CP level increased ($P < 0.01$). Microbial protein yield was not affected by treatments. Plasma urea nitrogen values raised from 10.2 to 19.6 mg/dL as RDP levels increased ($P < 0.01$). Results show that formulating diets with more RUP sources can be an efficient tool to reduce N excretion and improve N balance. Reducing RDP and CP levels in the diets did not affect DMI and did not impair MPY.

Key Words: ruminally degradable protein, ruminally undegradable protein, nitrogen balance

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1586 **Evaluation of protein supplementation in low- to medium-quality forage diets on intake and ruminal fermentation in steers.**

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Four ruminally and duodenally cannulated steers (469 ± 37 kg initial BW) were arranged in a 4 × 4 Latin square to evaluate the impact of protein supplementation in low- to medium-quality forage diets on intake and ruminal fermentation. Protein supplement treatments included 1) high-fat dried distillers' grains (HDG; 10.8% fat), 2) low-fat dried distillers' grains (LDG; 5.7% fat), and 3) cottonseed meal (CSM; 3.0% fat). The basal diet (CON) consisted of low- to medium-quality chopped grass hay (8.3% CP and 64.9% NDF) fed ad libitum twice daily at h 0 and 12. Treatments were formulated to provide similar CP intake and were supplemented once daily to the basal diet: HDG at 0.8%, LDG at 0.7%, and CSM at 0.4% of BW. Each 21-d experimental period had 16 d of adaptation and 5 d of data collection. Intake data was collected d 17 to 21, and rumen fluid samples were collected on d 20 at h −2, 0, 2, 4, 6, 8, 10, and 12. Hay DMI was lower with supplementation of HDG ($P < 0.01$) verses CON and CSM but similar to LDG. However, hay DMI for LDG was not different ($P > 0.05$) than that for CON but lower ($P \leq 0.01$) than that for CSM. As expected, CP intake was greater ($P \leq 0.0001$) with protein supplementation than CON but not different among protein supplements. Fat intake was greatest to least for HDG, LDG, CSM, and CON, respectively ($P \leq 0.001$). Protein supplementation resulted in lower ($P \leq 0.05$) overall ruminal pH and over 2-fold greater ($P \leq 0.05$) ammonia concentration compared with CON. Overall ruminal pH was lowest for HDG compared with LDG, CSM, and CON (6.88, 6.23, 6.54, and 6.64 ± 0.09, respectively; $P = 0.0001$);

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