

Effects of forage:concentrate ratio and forage type on apparent digestibility, ruminal fermentation, and microbial growth in goats

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Abstract :

The effects of forage type and forage:concentrate ratio (F:C) on apparent nutrient digestibility, ruminal fermentation, and microbial growth were investigated in goats. A comparison between liquid (LAB) and solid (SAB)-associated bacteria to estimate microbial N flow (MNF) from urinary purine derivative excretion was also examined. Treatments were a 2 x 2 factorial arrangement of forage type (grass hay vs. alfalfa hay) and high vs. low F:C (70:30 and 30:70, respectively). Four ruminally cannulated goats were fed, at maintenance intake, 4 experimental diets according to a 4 x 4 Latin square design. High-concentrate diets resulted in greater ($P < 0.001$) nutrient digestibility except for ADF. However, CP digestibility increased ($P < 0.001$) only for the high-concentrate diets including grass hay. Likewise, N retention, ruminal $\text{NH}_3\text{-N}$ concentration, and urinary excretion of purine derivatives increased ($P < 0.05$) with increasing concentrate in animals fed diets based on grass hay (0.23 vs. 0.13 g of retained N/g of digested N, 30.1 vs. 12.9 mg of $\text{NH}_3\text{-N}/100\text{mL}$, and 11.5 vs. 8.40 mmol/d, respectively), but not ($P > 0.05$) when diets included alfalfa hay. Total protozoa numbers and holotricha proportion were greater and less ($P < 0.001$), respectively, in high- than in low-concentrate diets. The F:C affected ($P < 0.001$) ruminal pH but not total VFA concentration ($P = 0.12$). Ammonia-N concentration was similar ($P = 0.13$) overtime, whereas pH, VFA concentration, and protozoa numbers differed ($P < 0.001$) among diets. Estimated MNF was strongly influenced by using either the purine bases:N ratio obtained in our experimental conditions or values reported in the literature for small ruminants. There was a F:C effect ($P = 0.006$) on MNF estimated from LAB but not from SAB. The effect of F:C shifting from 70:30 to 30:70 in goat diets depends on the type of forage used. The MNF measured in goats fed different diets was influenced by the bacterial pellet (LAB or SAB). In addition, the purine bases:N ratio values found were different from those reported in the literature, which underlines the need for these variables to be analyzed directly in pellets isolated from specific animals and experimental conditions.

Key Word :

bacterial pellet, goat, microbial growth, purine derivative, rumen fermentation

Volume 87, Number 2, February 2009