Addition of Red Clover or Birdsfoot Trefoil in Alfalfa-based Mixtures to Improve the Forage Energy to Protein Balance

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Abstract

The low ratio of sugars (S) to crude proteins (CP) in alfalfa (AL, *Medicago sativa* L.) leads to inefficient use of nitrogen by ruminants. The objective was to determine if adding red clover (RC, *Trifolium pratense* L.) or birdsfoot trefoil (BT, *Lotus corniculatus* L.) with or without a grass species to AL improved the forage S/CP ratio. Treatments were 100% AL (control) or AL-based mixtures with RC or BT in three proportions (75, 50, or 25% of seeded legumes) with either no grass or with timothy (*Phleum pratense* L.) or tall fescue (*Schedonorus arundinaceus* Schreb. Dumort.), resulting in 21 treatments assigned to a randomized complete block design with four replications at three sites in Canada (Agassiz, BC; St-Anne-de-Bellevue, QC; St-Augustin-de-Desmaures, QC). Species contribution and nutritive attributes measured at each harvest were weighted for yield as a proportion of the seasonal yield and expressed yearly for the first two post-seeding years. Regression analyses showed that forage S concentration increased, CP concentration tended to decrease, and the S/CP ratio increased from 0.3 to 0.5 ($y = 0.002 x + 0.3$; $P = 0.003$, $R^2 = 0.53$) with the addition of up to 92% RC or up to 66% BT to AL-based mixtures. The addition of up to 61% TI or 55% TF did not impact the S/CP ratio of AL-based mixtures. Further studies are needed to determine if the improved forage S/CP ratio following the addition of RC or BT to AL-based mixtures leads to an improved N-use efficiency in ruminants.