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Effects of Mixtures of Tropical Legumes with Contrasting Tannin Contents as Supplements to Low-Quality Grass Diets on Ruminal Fermentation *in Vitro*

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Abstract

The use of legume trees and shrubs could be a useful means to overcome protein deficiencies prevalent in tropical ruminant production systems. However, many of the tropical legume species are rich in tannins limiting their utilisation by livestock. It has been postulated that the combination of these legumes with tannin-free legumes could contribute to an improved animal nutrition while contributing to plant diversity at the farm level. Two *in vitro* experiments were carried out with the gas transducer technique to evaluate the effects on ruminal fermentation of mixtures of legumes with contrasting tannin contents as supplements to the tropical grass *Brachiaria humidicola*. Both experiments showed that *B. humidicola* had a high potential in vitro dry matter degradability (IVDMD; >65%) but the extremely low crude protein content (<5%) prevents its use as a good source of fermentable energy, unless it is adequately supplemented with a source of degradable protein. The tannin-free herbaceous legume *Vigna unguiculata* improved protein supply without negatively affecting IVDMD. Supplementation with the tannin-free *Cratylia argentea* (CIAT 18516) resulted in similar or even slightly better fermentation characteristics of the complete diet than supplementation with *V. unguiculata*. Supplementation with the tanniniferous *Calliandra calothyrsus* (CIAT 22310) or *Flemingia macrophylla* (CIAT 17403) did not increase the amount of degraded protein but significantly suppressed IVDMD compared to the grass-alone diet. However, when supplemented in a mixture with *V. unguiculata*, *C. calothyrsus* or *F. macrophylla* could be included in the diet by up to 10% without negative effects on fermentation. For *L. leucocephala*, which also contains tannins, this maximal proportion was around 20%. At higher proportions of inclusion of tanniniferous legumes, crude protein degradation was drastically decreased. It is likely that such a decrease in protein degradation would result in a greater flow of non-ammonia N to the lower digestive tract of ruminants fed these mixtures. Provided a certain amount of the protein-tannin complexes actually gets dissolved and is available for digestion and absorption in the lower digestive tract, a higher proportion of these tanniniferous legumes in mixed diets could enhance animal performance. This hypothesis is currently tested in animal feeding trials.

Keywords: *In vitro* fermentation, legumes, protein, ruminants, tannins, tropical forages