

134. Protein digestibility of tannin-containing forages in the rumen and the abomasum as determined *in vitro* (*In vitro*-Schätzung der Proteinverdaulichkeit von tanninhaltigem Raufutter im Pansen und im Abomasum). H. D. Hess*, J. Cortés, J. E. Carulla, Martha L. Pabón, T. T. Tiemann, C. E. Lascano and M. Kreuzer – Posieux/Bogotá/Cali/Zürich

The International Centre for Tropical Agriculture (CIAT) has identified a range of shrub legume species with excellent growth characteristics under tropical conditions and high crude protein (CP) content. However, the feeding value of certain species may be limited by high concentrations of tannins which decrease the ruminal degradation of crude protein. We hypothesized that a significant proportion of this rumen-protected protein is degraded under conditions simulating the abomasum.

Methods: This hypothesis was tested by applying an *in vitro* digestibility technique (1) modified to determine ruminal and abomasal degradability of crude protein. One grass-alone and 13 legume supplemented diets were incubated *in vitro* for 48 h in ruminal fluid and McDougall buffer (1:4). *Brachiaria humidicola* 6133 (CIAT accession number) was used as grass species. The legume supplement (1/3 of dietary dry matter [DM]) consisted either of a single non-tanniniferous (*Cratylia argentea* 18516) or tanniniferous legume, (*Calliandra calothyrsus* 22310 and 22316, *Flemingia macrophylla* 17403 and *Leucaena leucocephala* 734) or combinations of *Cratylia* with the tanniniferous legumes in proportions of 2:1 and 1:2. A total of nine samples were incubated per treatment. Subsequent to incubation in ruminal fluid, three samples of every treatment were filtered, and the solid residue was analyzed for dry matter (DM) and organic matter (OM) to estimate apparent ruminal DM and OM degradabilities. Three samples were filtered, and the solid residue treated with NDF solution and analyzed for DM and N to determine true ruminal DM and N degradability. The remaining three samples were further incubated for 24 h with HCl-pepsin to simulate abomasal digestion. After incubation, samples were filtered and the solid residues analyzed for DM and N. Ammonium concentration in the fermentation fluid was measured at 0, 6, 12, 24 and 48 h of incubation using the Kjeldahl method.

Results: The rate of ammonium production during incubation in ruminal fluid was affected by the type of legume supplement and was decreased with increasing proportion of tanniniferous legume in the diet as expected. Overall, diets with high proportion of *Calliandra* resulted in the lowest ammonia production. Apparent and true ruminal degradation of DM and total DM degradation (ruminal + acid-pepsin) as well as ruminal degradation of nitrogen were inversely related to the proportion of tanniniferous legume in the mixture. This effect varied with species and was less pronounced than the relationship between ammonium concentration and legume proportion. Nitrogen degradation was notably improved by incubation with acid-pepsin solution, and the proportion of acid-pepsin digested N (difference between true ruminal and total N degradability) was lowest with *Cratylia* alone and increased with the proportion of tanniniferous legume in the mixture.

Conclusions: These results indicate that the supplementation with tanniniferous legumes clearly increases the proportion of acid-pepsin digestible protein of dietary origin. Thus, the replacement of *Cratylia* by tanniniferous legumes decreased apparent ruminal crude protein degradation and increased the proportion of dietary crude protein degraded during acid-pepsin incubation. This indicates that a major part of the tannin-bound protein, which is protected from microbial degradation in the rumen, is available for acid-pepsin digestion in the abomasum and suggests that the use of mixtures of legumes with and without tannins could effectively improve the supply of metabolically available protein to the animal.

1) TILLEY, J. M. A and TERRY, R. A. (1963): J. Br. Grassl. Soc. 18:104-111.

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