

Effects of condensed tannins from *Leucaena leucocephala* hybrid-Rendang (LLR) on methane reduction, rumen fermentation and populations of methanogens and protozoa in vitro

Abstract

Different levels of purified condensed tannins (CT) extracted from *Leucaena leucocephala* hybrid-Rendang (LLR) were investigated for their effects on CH₄ production, rumen fermentation parameters such as pH, dry matter (DM) degradability, N disappearance and volatile fatty acid (VFA) concentrations, as well as on populations of rumen methanogenic archaea and protozoa in vitro. Purified CT concentrations of 0 (control), 10, 15, 20, 25 and 30 mg, and 500 mg of oven dried guinea grass (*Panicum maximum*) with 40 ml of buffered rumen fluid were incubated for 24 h using an in vitro gas production procedure. Total gas (ml/g DM) decreased at a decreasing rate (linear $P < 0.01$; quadratic $P < 0.05$) with increased levels of CT inclusion. CH₄ production (ml/g DM) decreased at a decreasing rate (linear $P < 0.01$; quadratic $P < 0.01$) with increasing levels of CT. Total VFA concentration (mmol/L) decreased at a decreasing rate (linear $P < 0.01$; quadratic $P < 0.01$) with increasing CT inclusions. In vitro DM degradation and N disappearance declined linearly ($P < 0.01$) with increasing levels of CT. Estimates of rumen methanogenic archaea and protozoa populations using microbiological methods and real-time PCR assay showed linear reductions in total methanogens ($P < 0.01$) and total protozoa ($P < 0.01$) with increasing levels of CT. Methanogens in the order Methanobacteriales also declined, but with quadratic and cubic aspects. Results suggest that CT from LLR at a relatively low level of 15 mg of CT/500 mg DM reduce CH₄ production by 47%, with only 7% reduction in degradation of feed DM. However, higher CT inclusions, while further reducing CH₄ emissions, have substantive negative effects on DM digestibility.

Keyword: Condensed tannins; *Leucaena leucocephala* hybrid-Rendang; Methane; Methanogen; Protozoa