

Modulatory effects of condensed tannin fractions of different molecular weights from a *Leucaena leucocephala* hybrid on the bovine rumen bacterial community in vitro

ABSTRACT

BACKGROUND: Condensed tannin (CT) fractions of different molecular weights (MWs) may affect rumen microbial metabolism by altering bacterial diversity. In this study the effects of unfractionated CTs (F0) and five CT fractions (F1-F5) of different MWs (F1, 1265.8 Da; F2, 1028.6 Da; F3, 652.2 Da; F4, 562.2 Da; F5, 469.6 Da) from *Leucaena leucocephala* hybrid-Rendang (LLR) on the structure and diversity of the rumen bacterial community were investigated in vitro.

RESULTS: Real-time polymerase chain reaction assay showed that the total bacterial population was not significantly ($P > 0.05$) different among the dietary treatments. Inclusion of higher-MW CT fractions F1 and F2 significantly ($P < 0.05$) increased the *Fibrobacter succinogenes* population compared with F0 and CT fractions F3-F5. Although inclusion of F0 and CT fractions (F1-F5) significantly ($P < 0.05$) decreased the *Ruminococcus flavefaciens* population, there was no effect on the *Ruminococcus albus* population when compared with the control (without CTs). High-throughput sequencing of the V3 region of 16S rRNA showed that the relative abundance of genera *Prevotella* and unclassified *Clostridiales* was significantly ($P < 0.05$) decreased, corresponding with increasing MW of CT fractions, whereas cellulolytic bacteria of the genus *Fibrobacter* were significantly ($P < 0.05$) increased. Inclusion of higher-MW CT fractions F1 and/or F2 decreased the relative abundance of minor genera such as *Ruminococcus*, *Streptococcus*, *Clostridium* XIVa and *Anaeroplasma* but increased the relative abundance of *Acinetobacter*, *Treponema*, *Selenomonas*, *Succiniclasticum* and unclassified *Spirochaetales* compared with the control and lower-MW CT fractions.

CONCLUSION: This study indicates that CT fractions of different MWs may play an important role in altering the structure and diversity of the rumen bacterial community in vitro, and the impact was more pronounced for CT fractions with higher MW.

Keyword: Condensed tannin; Diversity; Illumina MiSeq; *Leucaena*; Molecular weight; Rumen bacteria