Changes in rumen protozoal community by condensed tannin fractions of different molecular weights from a Leucaena leucocephala hybrid in vitro

ABSTRACT

Aims: To evaluate the effects of condensed tannins (CTs) fractions of differing molecular weights (MWs) from a Leucaena leucocephala hybrid-Rendang on the rumen protozoal community in vitro.

Methods and Results: The effects of unfractionated CTs (F0) and CT fractions of different MWs (F1 > F2 > F3 > F4 > F5) on protozoal population and community were evaluated in vitro using rumen microbes and ground guinea grass as the substrate. Higher-MW CT fractions F1 and F2 significantly ($P < 0{\cdot}05$) decrease the number of ciliate protozoa. The real-time PCR analysis showed that the total protozoa was significantly ($P < 0{\cdot}05$) lower in F0 and all CTs with fractions F1 and F2 having the lowest value. High-throughput sequencing of the partial 18S rRNA gene showed that the genus Entodinium significantly ($P < 0{\cdot}05$) decreased with increasing MWs of CT, whereas Anoplodinium-Diplodinium were significantly ($P < 0{\cdot}05$) increased. Inclusion of the highest MW CT fraction F1 decreased the relative abundance of the minor genera such as Eudiplodinium and Polyplastron compared to the control and CT fractions F2ï F5.

Conclusion: CTs of differing MWs could reduce and alter the rumen protozoa population in vitro. This effect was more pronounced for higher-MW CTs.

Significance and Impact of the Study: The high MW CTs should be considered as a feed supplement in the ruminant diet to reduce the protozoal population which are known to be associated with methanogens as a means to mitigate methane production in the rumen.

Keyword: 18S rRNA gene sequence; Condensed tannin fractions; Illumina Miseq; Leucaena leucocephala; Molecular weight; Protozoa diversity