Potential of condensed tannins from Leucaena leucocephala hybrid on methane mitigation in ruminants

ABSTRACT

Methane is the second most important greenhouse gas that contributes to global warming and climate change. It has a heat trapping potential 23 times that of carbon dioxide. Globally, ruminant livestock produce about 80 million metric tonnes of enteric methane annually, accounting to about 30% of global anthropogenic methane production. Methane produced during enteric fermentation also contributes to a loss of energy of up to 15% for the animal. Thus, mitigation of methane production by ruminants not only reduces greenhouse gas emission but also improves feed efficiency and reduces production cost. There has been considerable interest in use of plant extracts to mitigate enteric ruminal methane emissions. Condensed tannins are secondary plant metabolites that have been considered for mitigating methane production in ruminants, but they may also decrease digestibility of feed in ruminants. Leucaena leucocephala is a tree legume that has been used as a feed supplement for ruminants because of its high protein content. However, it also contains condensed tannins. The L. leucocephala hybrids in Malaysia have been found to have higher condensed tannin contents than the parent L. leucocephala. The effectiveness of condensed tannins from these L. leucocephala hybrids on reduction of methane has not been studied. Thus, this study was conducted to investigate the effects of pure condensed tannins, extracted from young leaves and shoots of L. leucocephala hybrid-Rendang on methane mitigation, rumen fermentation parameters such as pH, dry matter (DM) digestibility, nitrogen degradability and volatile fatty acids production, as well as populations of methanogens and protozoa. The ñin vitro gas production testò was used in the investigation as it provides data on fermentation parameters of feed with a high correlation to its in vivo base. The results showed that the condensed tannin extract, at a low level of 30 mg/g DM could reduce methane production by 39% as compared to the control, without negatively affecting DM digestibility, nitrogen degradability, rumen pH and total volatile fatty acids production. Total populations of methanogens and protozoa were also reduced by about 55 and 38%, respectively. Populations of methanogens in the orders Methanomicrobiales and Methanobacteriales were reduced by 22 and 7%, respectively. The findings of the study indicated that condensed tannins at 30 mg/g DM has the potential to be used as a feed supplement to reduce methane production in ruminants, without adversely affecting rumen fermentation parameters.

Keyword: Methane mitigation; Ruminal methane production; Condensed tannins; Leucaena leucocephala hybrid