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Effect of supplementation with selected medicinal plants on *in vitro* methane production

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Abstract

Tropical plants are reported to possess anti-methanogenic effect due to their high content of plant secondary metabolites. In this study, anti-methanogenic potential of leaves from three selected medicinal plants native to Nigeria; namely Combretum micranthum (CMI), *Diospyros mespiliformis* (DME), Guiera senegalensis (GSE) were investigated. Four *in vitro* gas production trials were conducted using 120 mL serum bottles, where 500 mg of Timothy hay was incubated at 39°C for 72 hours with rumen liquor collected from the abattoir. Four treatment groups were involved of which three groups were supplemented respectively with leaf meal from the three experimental plants at 300 g kg ^{1} DM, and a control group with no supplementation. Each treatment was replicated three times, with three blanks included per run. A completely randomised design was employed. Observation for total gas production, methane production, digestibility, pH, total volatile fatty acids (TVFA), and ammonia nitrogen concentrations were recorded followed by one-way ANOVA. Treatment significantly ($p < 0.05$) affected total gas production, methane production, digestibility, and pH. Nevertheless, TVFA production and ammonia nitrogen concentrations were not significantly influenced by the treatments. Treatment with DME significantly had the highest methane reduction (20 %) but also significantly reduced total gas production and digestibility while markedly producing less TVFA compared to the control. All three plants displayed a significant reduction for methane emissions per gram of substrate digested relative to the control. Remarkably, only CMI supplementation increased both digestibility and TVFA production. Although GSE significantly reduced digestibility, its ability to generate more TVFA than the control suggests potential as a promising candidate for methane mitigation. It is suggested that CMI and GSE should be tried in an *in vivo* experiment to determine their *in vivo* methane reduction ability.

Keywords: Digestibility, rumen fermentation, volatile fatty acids

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