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# Is the Methane Mitigating Potential of Tropical Woody Forage Species Reduced after Adapting the Ruminants to Tanniniferous Forage?

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## Abstract

Forages obtained from woody plants are important for tropical livestock feeding, especially during the dry season. A special feature is their often high content of plant secondary compounds (PSC) which are, although being potentially adverse with respect to forage intake and digestion, of great interest because some of them are able to mitigate the greenhouse gas methane. One persistent concern in that respect is that methanogens might rapidly adapt to PSC thus making this effect short-lived. Therefore, the present study investigated the *in vitro* fermentation of woody plants in ruminal fluid obtained either from PSC-adapted sheep (n=3), or from non-adapted control sheep (n=4). Adapted sheep received tanniniferous *Leucaena leucocephala* and concentrate with 15 % $^{\text{Mimosa caesalpiniaefolia}}$ besides grass hay during 6 weeks before ruminal fluid sampling while control sheep grazed on cultivated *Brachiaria* pastures and were supplemented with concentrate without *M. caesalpiniaefolia*. Experimental plants included four rarely studied woody species (*Caesalpinia* spp., *Sida cordifolia*, *Astronian urundeuva*, and *Desmanthus virgatus*; harvested at three sites of the semi-arid Caatinga region, NE-Brazil) and *L. leucocephala*. Ruminal fermentation traits were determined *in vitro* using the gas pressure transducer technique. The crude protein contents ranged from 206±33 g/kg dry matter (DM) (*L. leucocephala*) to 110± 2 g kg$^{-1}$ DM (*Caesalpinia* spp.). The highest total phenol and total tannin contents were found in *A. urundeuva*, with 243±77 and 201± 64 g kg$^{-1}$ DM, respectively, while values were lowest with *D. virgatus* (45±13 and 29±9 g/kg DM). Overall, ruminal fluid from control sheep showed higher ($p < 0.05$) ammonia concentration, net gas production and net methane yield (% of total gas) than that of PSC-adapted sheep. In contrast, there was no significant difference between the two treatments in *in vitro* organic matter degradability. Overall, the plant species effect was significant for all fermentation traits mentioned, with the plant-treatment interaction being not significant. The lowest percentage of net methane yield found with *A. urundeuva* was consistent with the prevalence of phenolic compounds. The present results indicate that a 6-week adaptation to tanniniferous plants did not result in a noticeable adaptation of ruminal methanogens which otherwise would make these plants' methane mitigating ability useless.

**Keywords:** Agroforestry, Brazil, greenhouse gas, livestock, nutrition, rumen

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