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Integrating anti-methanogenic plants into silvopastoral mosaics: Lessons from the tropics

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Abstract

Ruminant production contributes to climate change by its enteric methane emissions (Idrissou et al., 2019), leading to some mitigating strategies (Gbénou et al., 2024). In tropical regions, incusing anti-methanogenic plants within silvopastoral mosaics is gradually gaining place, and offers a promising, ecologically grounded strategy to reduce enteric methane emissions thank to their metabolite compounds (Ku-Vera et al., 2020). The aim of this review is to explores the current evidence of the inclusion of anti-methanogenic plants into silvopastoral systems; underlying the main species, biochemical mechanisms, and environmental outcomes. We hypothesised that these plants in ruminant diets can hamper methane synthesis during the digestion process thank to their metabolite compounds particularly phenols.

The PRISMA method has been used to look for pertinent papers, obtained from tree academic databases (Google Scholar, Scopus, Research Gate), using a combination of keywords, without any publication year restrictions. Then, documents have been filtered and screened for information extraction.

Several researches have focused on anti-methanogenic plants, global tropical regions; Latin America and East Africa being the areas with more researches. Species like *Acacia nilotica* (503 g kg^{-1} DM), *Dichrostachys cinera* (386.5 g kg^{-1} DM), *Monechma incanum* (307 g kg^{-1} DM), *Grewia flava* (233.7 g kg*−1* DM) and *Rhus lancea* (226.6 g kg*−1* DM) have demonstrated a high mitigating effect on methane emissions, thanks to their high phenol contents. Phenolic compounds are catabolized by rumen microorganisms using hydrogen or formate to form volatile fatty acids, inhibit methane production within ruminant, thus highlighting their potential in reducing methane emissions from livestock. More the plant phenolic compound (hydroxyl groups) amount is, less the methane is produced. However, the concentration, bioactivity, and the seasonal variability of phenol compounds are highly dependent on species, edaphoclimatic zone, and plant maturity.

The use of trees and shrubs in feeding tropics seems appropriate for reducing methane production in tropical areas. Further studies will allow to determine the trade-offs between methane mitigation and animal performance when using these plants.

Keywords: Ligneous, metabolite compounds, methane, phenol, ruminants, tree-livestock integration, tropics

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