

IN VITRO EFFECTS OF *Tribulus terrestris* SEED POWDER AS FEED ADDITIVE ON METHANE EMISSION AND DIGESTIBILITY IN LOCAL CATTLE BREED OF SRI LANKA

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Methane (CH₄) emissions from ruminant livestock contribute significantly to global greenhouse gas accumulation and represent a loss of dietary energy. The use of plant-based feed additives rich in secondary metabolites has gained attention as a sustainable strategy for methane mitigation. This study evaluated the in vitro effect of *Tribulus terrestris* seed powder, a saponin-rich natural additive, on methane production, protozoal population, and feed digestibility using rumen fluid collected from local cattle breeds of Sri Lanka. A basal substrate composed of rice bran and paddy straw was supplemented with *T. terrestris* seed powder at graded inclusion levels (10%, 30%, and 50%), alongside an unsupplemented control. In vitro fermentation was conducted under anaerobic conditions, and methane production was measured at 6-hour intervals for 24 hours, while in vitro dry matter digestibility (IVDMD) and protozoa counts were determined after incubation. Results demonstrated a significant ($p < 0.05$) reduction in methane production with increasing levels of *T. terrestris* supplementation compared to the control. The methane-reducing effect was accompanied by a marked decline in rumen protozoa populations, indicating a possible saponin-mediated inhibition of protozoa-associated methanogenesis. Moderate inclusion levels of *T. terrestris* maintained acceptable digestibility, whereas higher levels tended to reduce IVDMD. Overall, the findings suggest that *T. terrestris* seed powder has strong potential as a natural methane-mitigating feed additive for climate-smart livestock systems, provided that optimal inclusion levels are used to balance methane reduction and nutrient utilization in local cattle production systems of Sri Lanka.

Keywords: Digestibility, *In vitro* fermentation, Local cattle, Methane mitigation, *Tribulus terrestris*, Saponins