Assessing the mitigation potential of nutrient blocks made of tropical trees and legumes

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Introduction

- Livestock is an important source of livelihood for more than 900 million smallholders in low and middle-income countries. Currently, demand for livestock products is increasing around the world by population growth, urbanization, and rising incomes (Balehegn et al., 2020).
- Fruits and leaves of tropical trees and legumes are highly nutritious and serve as a valuable source of essential nutrients for animal feed.
- Nutrient blocks are important for providing supplemental nutrition to ruminants when grazing on low-quality forage or during feed scarcity, promoting growth, and maintaining rumen health (Takawale et al., 2016).

Objective

Evaluate the in-vitro gas production and methane (CH_4) concentration emitted from grass-based diets and nutrient blocks made from tropical tree fruits, legume leaves and pods.

Methodology

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The blocks were prepared using fruits from *Enterolobium cyclocarpum* (Ec), leaves of *Tithonia diversifolia* (Td), and leaves (Ll) and pods (Lp) of *Leucaena leucophela*. A total of nine treatments were evaluated, measuring fermentation parameters at two-time intervals (24h and 48h) using a grass diet (75%) and nutrient blocks (25%), with *Urochola brizantha* cv. Toledo (Ub) serving as the basal pasture.

Treatments were:

- **T1:** Ub+BC (commercial nutritional block used as control).
- **T2:** Ub+BM (mixed block with equal proportions of all tropical tree fruits, legume leaves and pods tested).
- **T3:** Ub+Ll.
- **T4:** Ub+Lp.
- **T5:** B.Control (100% commercial nutritional block).
- **T6:** B.Mixed (100% mixed block).
- **T7:** B.Ll (100% block made from Ll).
- **T8:** B.Lp (block made of 100% Lp).
- **T9:** GT (100% Ub used as comparator).

The methodology of Theodorou et al. (1994) was employed for in vitro gas production. Methane concentration was quantified using a gas chromatograph (Shimadzu, Kyoto, Japan).

Results

Gas production increases with incubation time from 24 to 48 hours in all treatments. The maximum value of gas production at 48 h of fermentation was presented in T1 (257ml/g). Treatment T3 obtained the lowest value (232ml/g) between the treatments grass with block. Treatment T7 was the lowest value (171 ml/g) among the treatments without forage and T5 was highest.

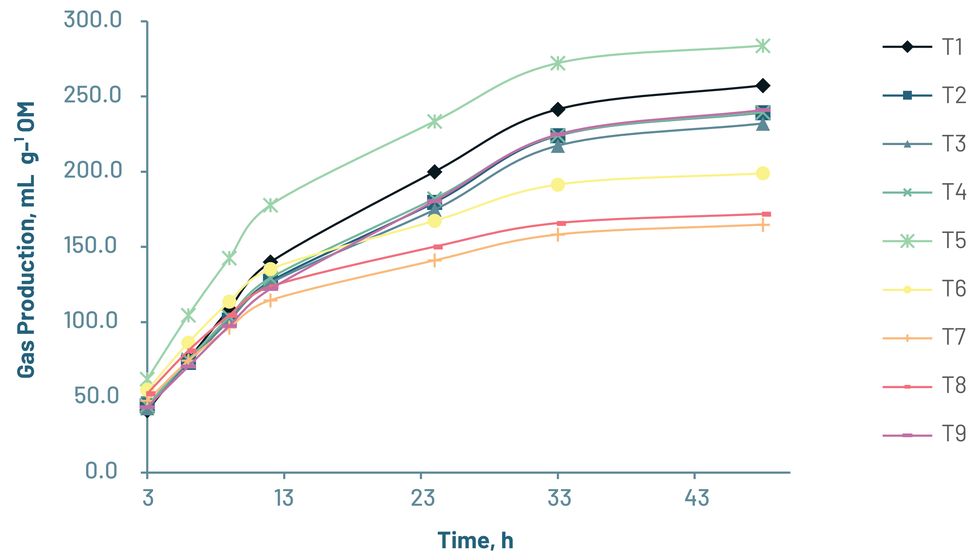

Figure 1. Modeled mean accumulated gas production (mL g–1 OM)

Table 1. Methane concentration at 24 h and 48 h of incubation

	CH_4 mg/ g DM	
	24h	**48h**
T1	15.97 [a]	22.42 [ab]
T2	13.64 [ab]	21.13 [b]
T3	13.03 [ab]	21.07 [b]
T4	13.08 [ab]	21.18 [b]
T5	16.38 [a]	19.69 [b]
T6	10.23 [b]	15.95 [c]
T7	10.66 [b]	16.82 [c]
T8	10.80 [b]	16.05 [c]
T9	14.80 [a]	26.91 [a]
SEM	02.52	03.602
P-value	0.0004	0.0001

[a,b,c:] Mean values in a column with a different letter are statistically different ($P < 0.05$). **SEM:** standard error of the mean; DM : Dry Matter.

The in vitro gas production of the experiment showed that the treatments had a significant effect on methane concentration when the pasture was incubated with the blocks at 48 h respectively.

Conclusions

The results of the experiment revealed that the treatments had a significant impact on ruminal degradation and gas production when the pasture was incubated with the nutrient blocks. Specifically, the inclusion of tree and forage products in the blocks led to an average reduction in net CH_4 concentration of 13 and 21% per degraded dry matter at 24h and 48h of fermentation, respectively.

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