

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

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Introduction:

- Nigeria has very large ruminant pop
- Recently, it signed the Global Methane Pledge
- Needs to ↓ ruminant CH₄ emissions
- Current mitigation strategies are too expensive or not applicable to local ruminant production systems
- There is need to develop strategies appropriate for local prod systems
- Phytochemicals like tannins, saponins & flavonoids have been reported to have anti-methanogenic properties.

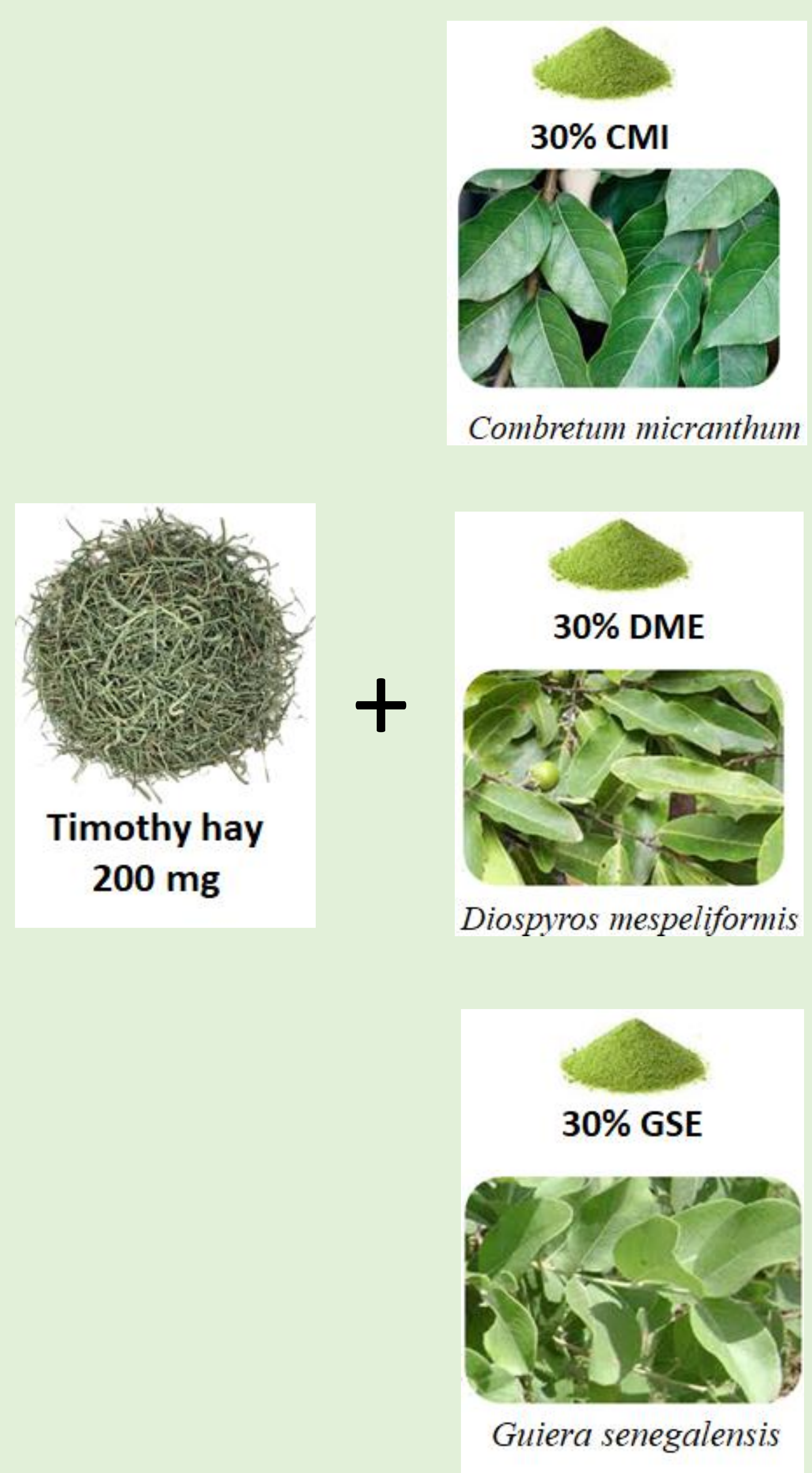


Fig 1. Incubation substrate & treatments

Introduction:

- Phytochemicals represent a cheap strategy for Nigeria
- Numerous plants used as medicinal plants contain phytochemicals

Aim:

- To investigate the *in vitro* methane reduction potential of some selected medicinal plants common in the area

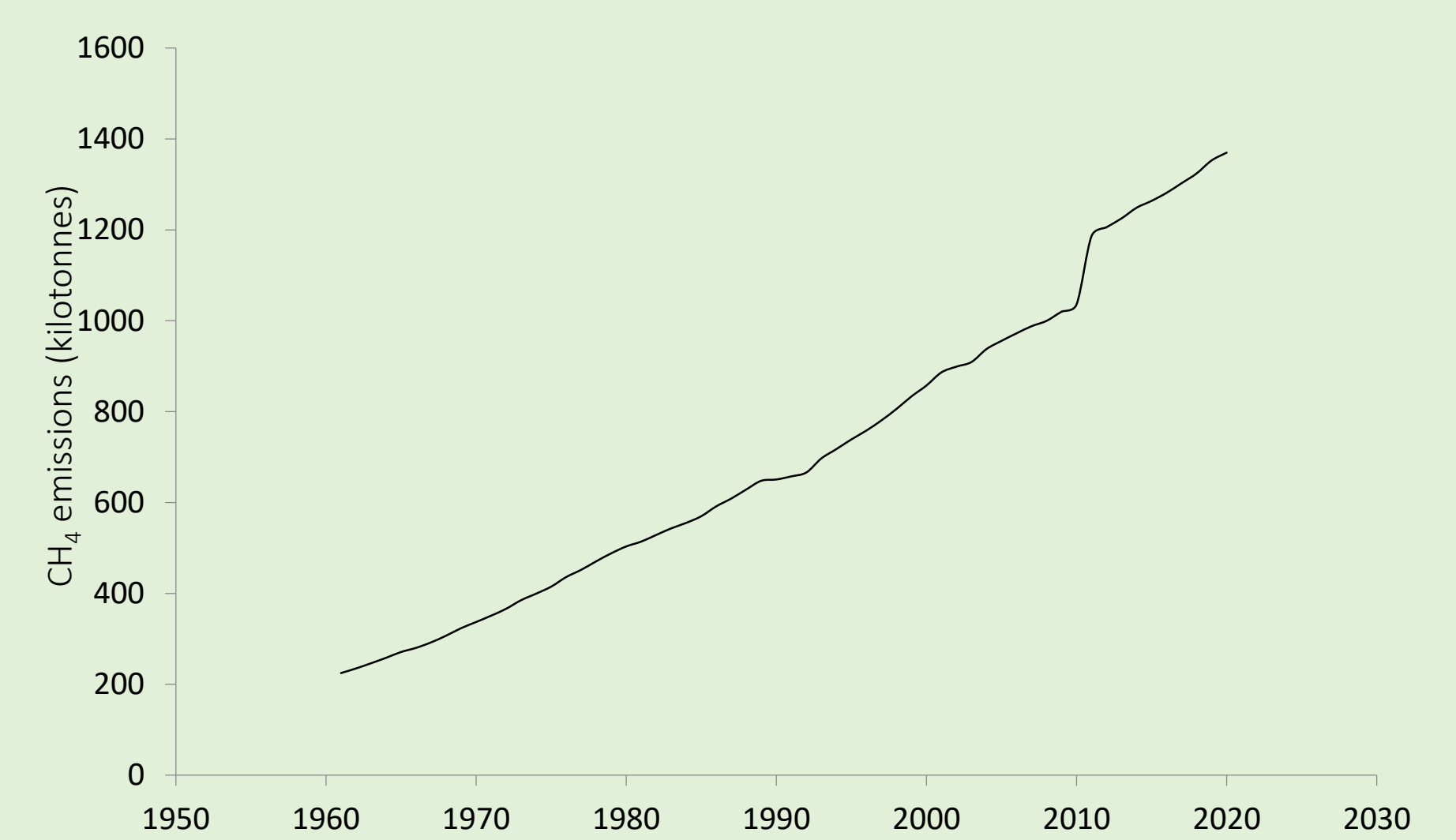


Fig 2. Enteric methane emissions in Nigeria 1960-2020 (FAO, 2023)

Methods:

- In vitro gas production technique for 48 hours – Theodorou
- Innoculation media: McDougal buffer + rumen fluid (2:1)
- Pepsin HCl two-step digestion for 48 hours – Tilley & Terry
- CRBD: (CON + 3 TRTs + BLANK)
3 reps x 4 runs
- Parameters: Gas prod = ?
CH₄ prod = ?
VFA = ?
NH₃-N = ?
IVDMD = ?
pH = ?
- Two-way ANOVA: 95% CI, POST HOC: Tukey's HSD.



Fig 3. Setup of experiment

Results:

Table 1: Effect of supplementing leaf meals of medicinal plants on methane production and fermentation properties

Parameter	Treatments					p-values
	CON	CMI	DME	GSE	SEM	
Total Gas Prod (ml)	65.43 ^a	64.25 ^{ab}	51.32 ^b	57.30 ^{ab}	3.502	0.026
TGP/substrate incubated (ml/g)	327.13 ^a	247.10 ^b	197.38 ^b	224.03 ^b	13.928	0.000
Total CH ₄ Prod (ml)	10.37 ^a	9.69 ^{ab}	7.05 ^b	9.35 ^{ab}	0.696	0.012
CH ₄ /TGP (%)	15.97 ^a	15.06 ^{ab}	13.89 ^b	15.06 ^{ab}	0.507	0.056
CH ₄ /substrate incubated (ml/g)	21.92 ^a	15.78 ^b	11.65 ^c	14.47 ^{bc}	1.018	0.000
CH ₄ /substrate digested (ml/g)	36.23 ^a	25.59 ^b	21.17 ^b	26.01 ^b	1.681	0.000
Digestibility (%)	60.45 ^b	61.74 ^a	55.27 ^c	54.62 ^c	0.292	0.000
pH	6.66 ^{ab}	6.63 ^b	6.68 ^a	6.65 ^{ab}	0.010	0.009
TVFA (mmol)	44.50	46.11	41.95	45.59	2.812	0.731
TVFA/substrate incubated (mmol/g)	222.49 ^a	177.36 ^{ab}	161.36 ^b	175.36 ^b	12.059	0.007
NH ₃ -N (mg/dl)	8.60 ^a	7.51 ^b	6.63 ^c	8.43 ^a	0.149	0.000

- The 3 med plants ↓ fermentation & CH₄ prod
- DME had the highest CH₄ ↓ but also ↓ digestibility and VFA production

Conclusions:

- Medicinal plants ↓ Total CH₄ & CH₄ yield (ml/g)
- But also ↓ fermentation and IVDMD
- Total VFA not reduced by CMI & GSE
- CMI and GSE could be tried *in vivo*.