

**EFFECT OF SUPPLEMENTATION OF HERBAL EXTRACTS
ON METHANOGENESIS IN RUMINANTS**

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ABSTRACT

Introduction

Methanogenesis from ruminants is one of the major causes of global warming and methanogenesis reduces the efficiency of nutrient utilization hence manipulation of the rumen microbial ecosystem for reducing methane emission is very vital.

Objective

A study was designed, to evaluate the anti-methanogenic activity of herbs / herbal extracts in ruminants. The herbs tested were *Acacia concinna* pods, *Emblica officinalis* seeds, *Allium sativum* bulbs, *Zingiber officinale* rhizomes, *Ferula assafoetida* resin, *Psidium guajava* leaves, *Terminalia chebula* seeds and *Azadirachta indica* seed kernels.

Materials and Methods

In vitro gas production studies were carried out using Hohenheim *in vitro* gas production test to rank the herbal extracts/residues according to their capacity to lower the percent methane production.

Results and Discussion

Acacia concinna pods methanol extract ranked one (13.3 %) followed by *Acacia concinna* pods methanol residue (13.34 %), *Allium sativum* bulbs water residue (15 %), *Zingiber officinale* rhizomes water residue (15.02 %) and *Psidium guajava* leaves methanol residue (15.1 %). In a second *in vitro* trial the first five ranked treatments were studied at graded inclusion levels of 30, 40, 50, 60 and 70 mg per 500 mg substrate. *Acacia concinna* pods methanol extract, *Acacia concinna* pods methanol residue, *Allium sativum* bulbs water residue, *Zingiber officinale* rhizome water residue and *Psidium guajava* leaves methanol residue inclusion at 50, 30, 30, 50 and 50 mg respectively exhibited maximum inhibition of methanogenesis. These selected herbs in their selected levels were validated through an *in vitro* rumen fermentation experiment (RUSITEC) using complete feed having roughage concentrate ratio of 60: 40. All the selected herbal extracts/residues studied in this experiment significantly ($P < 0.05$) lowered methane production. Maximum reduction was brought about by *Acacia concinna* pods methanol residue. The percent *in vitro* dry matter degradability (IVDMD) remained unaltered.

Conclusion

This study therefore establishes the scope of use of plant extracts in ruminant rations to reduce methane production without adversely affecting IVDMD.

Keywords

Antimethanogenic activity, Hohenheim in vitro gas production test, IVDMD, plant extracts, rumen fermentation, RUSITEC

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Illustration

In vitro rumen fermentation characters (24 hours incubation) on supplementation of selected herbal extracts/residues at selected levels in dairy cattle complete feed using RUSITEC. (Mean* ± SE)

Herb/extract/ residue	Inclusion level, mg	Rumen fermentation characters					
		pH	Total gas, ml	Methane, ml	Carbon dioxide, ml	Methane, %	IVDMD, % NS
Acacia concinna pods methanol extract	50	6.84 ± 0.01 ^b	1205 ± 4.47 ^c	214 ± 1.24 ^{cd}	991 ± 3.23 ^c	17.5 ± 1.12 ^{ab}	46.5 ± 1.42
Acacia concinna pods methanol residue	30	6.85 ± 0.02 ^b	792 ± 4.43 ^{ab}	129 ± 2.29 ^a	663 ± 2.14 ^{ab}	16.7 ± 1.05 ^a	50.6 ± 2.13
Psidium guajava leaves methanol residue	50	6.83 ± 0.01 ^b	1020 ± 4.48 ^{bc}	191 ± 1.64 ^{bcd}	829 ± 2.84 ^{bc}	18.7 ± 0.56 ^{ab}	49.8 ± 2.54
Control (substrate alone)	0	6.83 ± 0.02 ^b	760 ± 2.02 ^{ab}	224 ± 0.97 ^d	536 ± 1.05 ^a	29.2 ± 0.83 ^c	48.7 ± 2.72