

# Effect of tannins in *Calliandra calothyrsus* and supplemental molasses on ruminal fermentation *in vitro*

H.D. Hess<sup>1</sup>, F.L. Valencia<sup>2,3</sup>, L.M. Monsalve<sup>2,4</sup>, C.E. Lascano<sup>2</sup> and M. Kreuzer<sup>1</sup>

<sup>1</sup>Institute of Animal Science, Animal Nutrition, ETH-Centre/LFW, CH-8092 Zurich, Switzerland

<sup>2</sup>Tropical Grass and Legume Project, Centro Internacional de Agricultura Tropical (CIAT), Cali Colombia

<sup>3</sup>Universidad Nacional de Colombia, Palmira, Colombia

<sup>4</sup>Universidad de Santa Rosa de Cabal, Pereira, Colombia

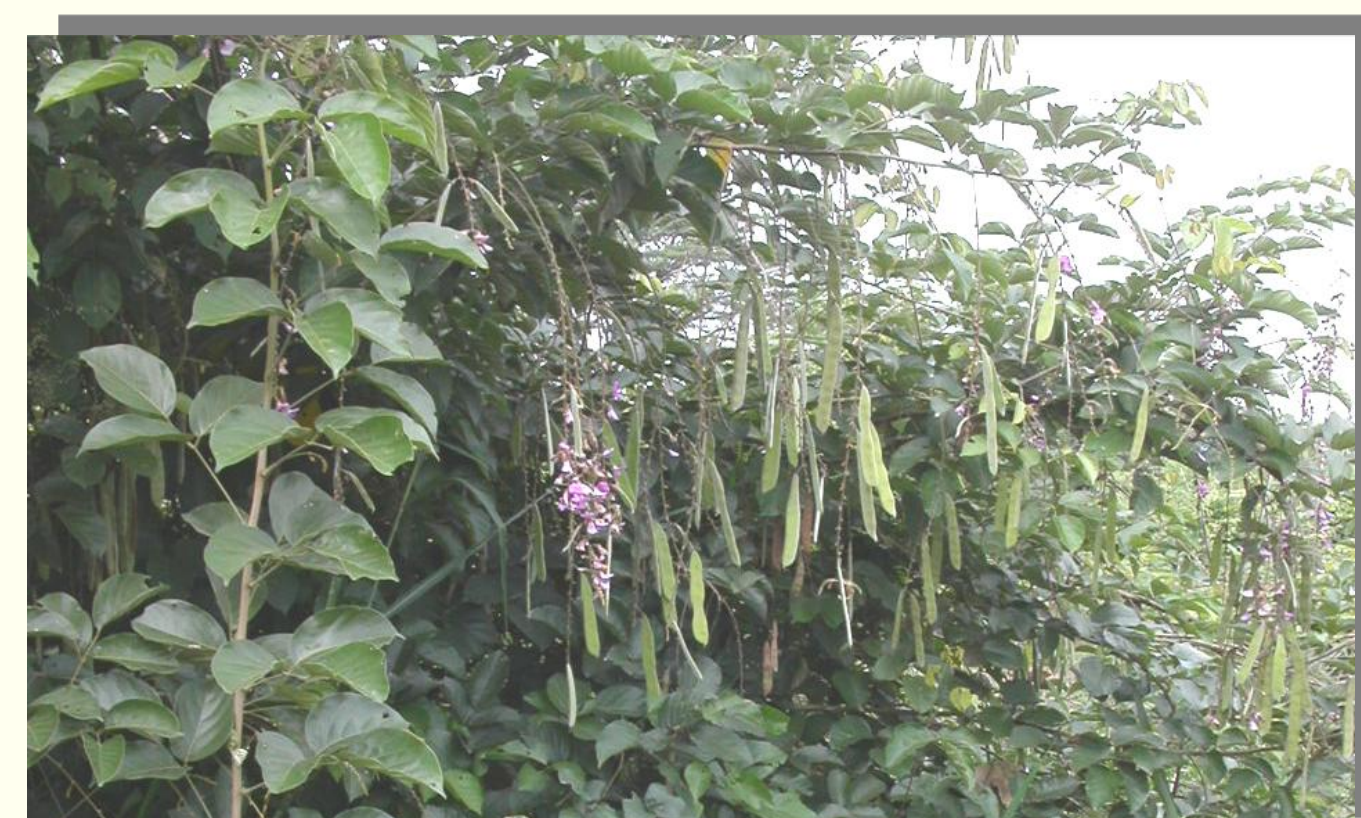
## Introduction

Tropical grass and straw based diets are often limited in feeding value because of their low protein content. The supplementation with the protein-rich *Cratylia argentea* (a legume low in tannins) improves ruminal fermentation, which is not the case with *C. calothyrsus*. On the other hand, supplementation with *C. calothyrsus* was shown to suppress methanogenesis per unit of organic matter fermented. However, it is unclear whether this was the effect of the tannins in this legume or due to a lack of readily-fermentable nutrients.

The objective of the present study was to separate the effect of tannins from the effect of degradable nutrients on ruminal fermentation in order to develop recommendations for the use of *C. calothyrsus* as a potential component of mixed diets for ruminants.



Low forage quality is one of the first limiting factors for ruminant production in the tropics



*Cratylia argentea*, a promising multipurpose legume with low tannin content



*Calliandra calothyrsus*, a multipurpose legume with high tannin content

## Methods

Two *in vitro* experiments were carried out using a rumen simulation technique (8-fermenter RUSITEC):

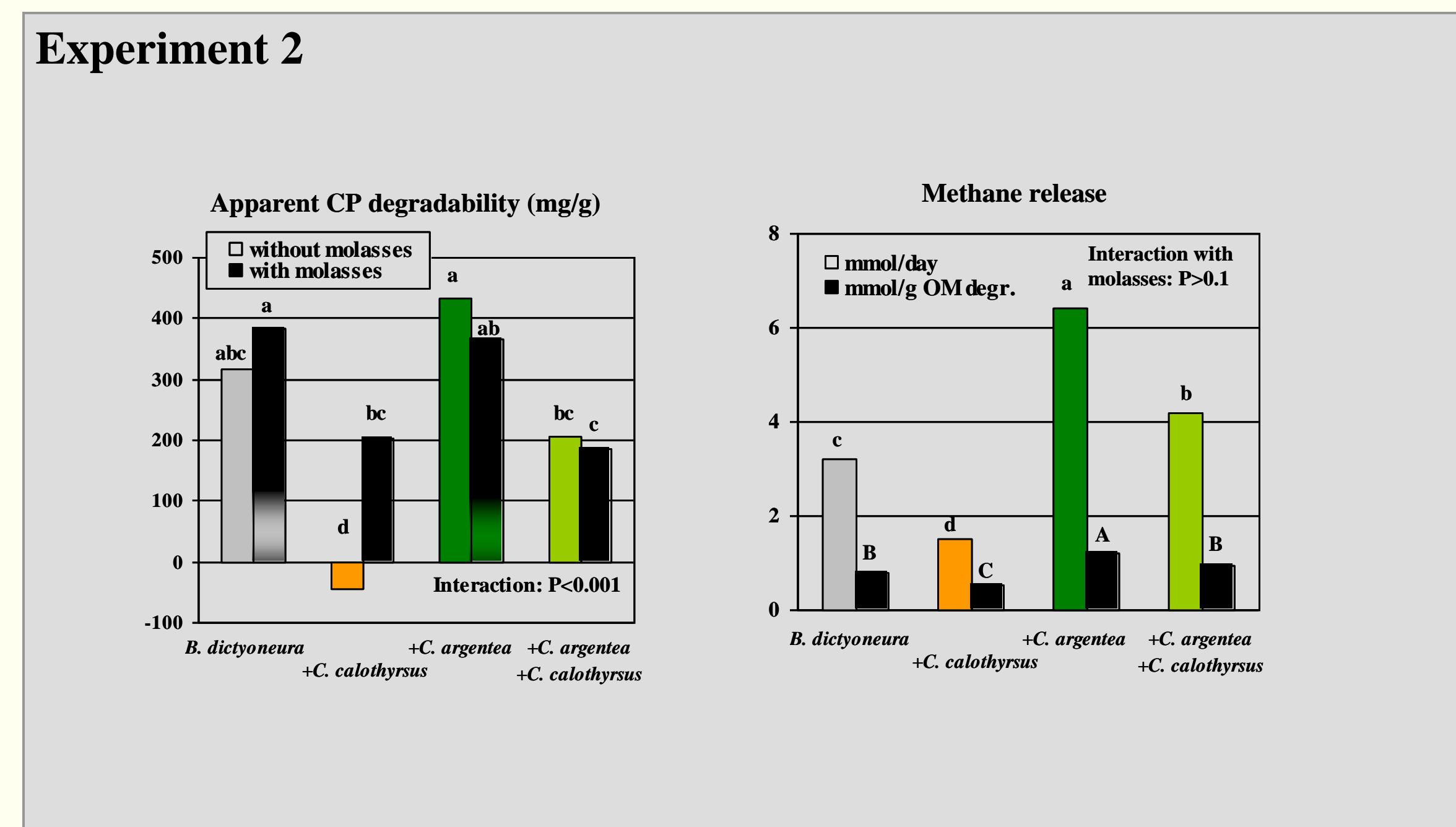
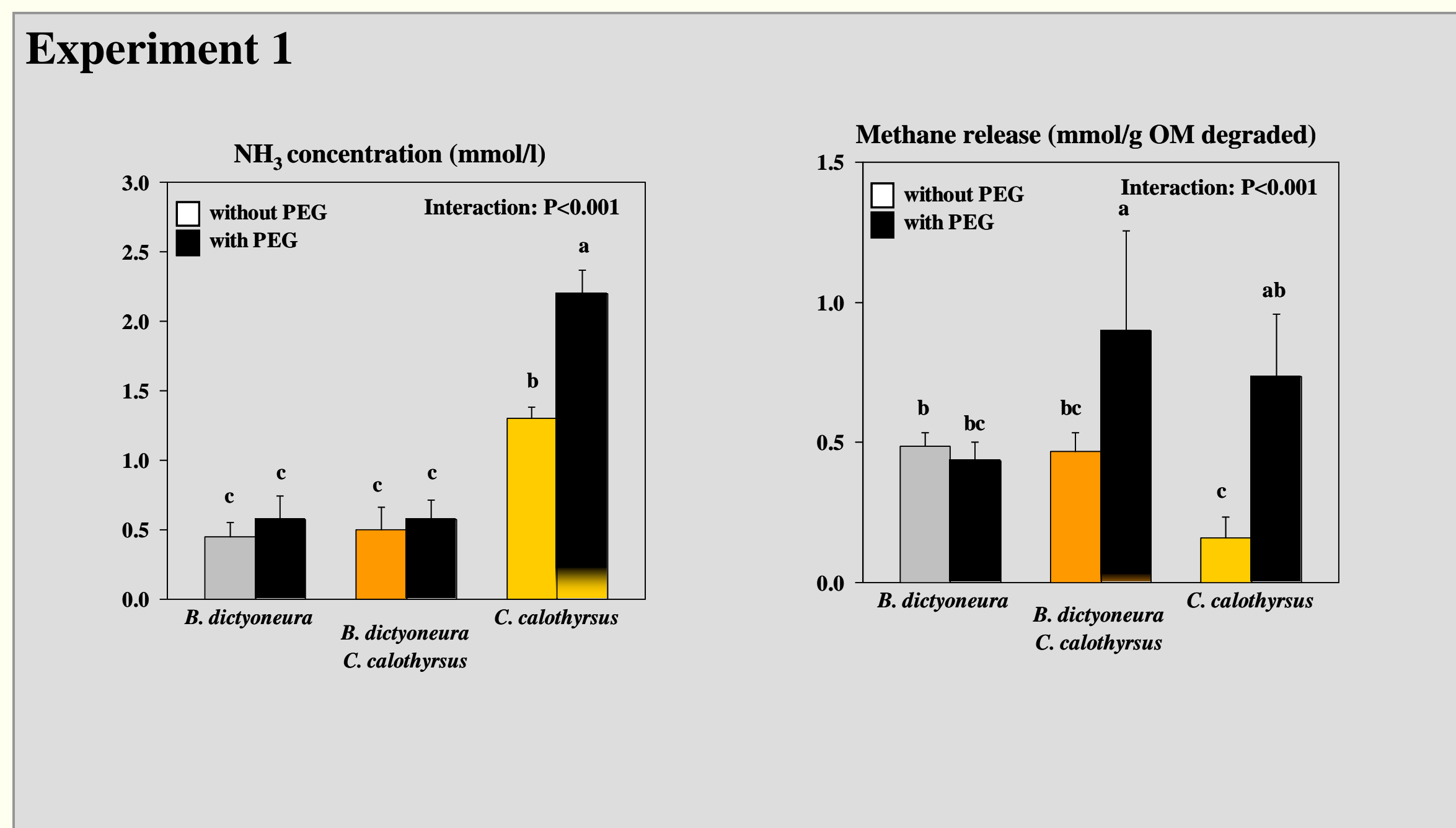
**Exp. 1:** -Control diet: *Brachiaria dictyoneura* (tropical grass) alone  
 -1/3 replaced by *C. calothyrsus*  
 -*C. calothyrsus* alone  
 Incubation of the three diets with or without the addition of PEG (3.5% of DM) to inactivate tannins  
 molasses (10% of DM)

**Exp. 2:** -Control diet: *B. dictyoneura* alone  
 -1/2 replaced by *C. calothyrsus*  
 -1/2 replaced by *C. argentea*  
 -1/4 replaced by *C. calothyrsus* and 1/4 by *C. argentea*  
 Incubation of the four diets with or without the addition of

### Composition of the experimental diets (g/kg DM)

	Experiment 1			Experiment 2			
<i>Brachiaria dictyoneura</i>	1000	667	0	1000	500	500	500
<i>Calliandra calothyrsus</i>	0	333	1000	0	500	0	250
<i>Cratylia argentea</i>	0	0	0	0	0	500	250
Organic matter (OM)	883	905	958	896	925	894	909
Crude protein (CP)	35	73	150	48	88	109	99
Neutral detergent fiber	748	655	492	682	491	647	558
Acid detergent fiber	438	440	419	363	304	361	340

## Results



## Conclusions

The present experiments demonstrated that the tannins present in *C. calothyrsus* are involved in the inhibition of methane release caused by this legume. However, at higher doses, *C. calothyrsus* results in depression of the feeding value of the complete forage-based diet. The combination with a legume low in tannins partially neutralized this negative effect of the high tannins in *Calliandra* and represents an effective way to improve the protein nutrition of ruminants in the tropics without simultaneously enhancing methane release per unit of organic matter fermented. These results further point to the potential of molasses supplementation as a way to suppress the negative nutritional effects of high-tannin legumes, while allowing their methane-suppressing trait to be exploited.