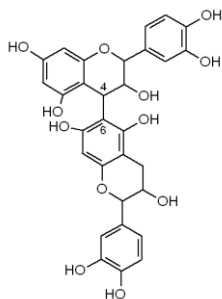


The condensed tannins in sainfoin cause digestive synergy on *in vitro* rumen fermentation of cocksfoot

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Introduction

- **Forage from multi-species or permanent grasslands can contain secondary metabolites potentially bioactive on rumen digestive processes**

Ex: condensed tannins, saponins, polyphenol oxidase



- **Digestive interactions between grasses and legumes when the digestive profile of a combination of forages differs from the balanced average values of its components** (Niderkorn and Baumont, 2009)

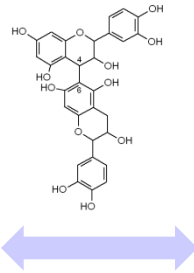
Could synergistic effects be useful for reconciling animal production and its environmental footprint ?

Decreasing N losses and methane emissions without affecting nutrient use by animals



Objective of the study

- To describe the digestive synergy between cocksfoot and sainfoin on rumen fermentation parameters
- To clarify the role of condensed tannins from sainfoin in these interactions



Sainfoin

Perennial forage legume, palatable, non bloating, anthelmintic properties, melliferous flowers

Condensed tannins (CTs)

- Proanthocyanidins located in plant vacuoles
- Form stable complexes with protein reducing the degradation of dietary protein in the rumen (Waghorn , 2008) and decreasing N losses in urine (Aufrère et al., 2008)



Experimental design

Cocksfoot

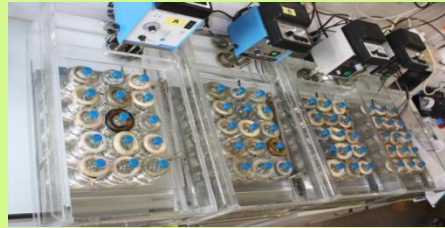
(g/kg DM) NDF=542 ; CP=144

Sainfoin

(g/kg DM) NDF=346 ; CP=157

Protein binding activity CTs = 15.2 g eq-tannic acid/kg DM

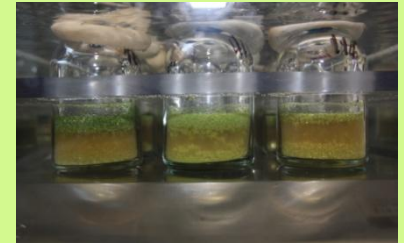
- Sampling at a vegetative stage
- Freeze-drying



BATCH FERMENTATION *in vitro*

- Forages alone
- Mixtures cocksfoot/sainfoin (25:75, 50:50, 75:25)

- ❖ Incubation in buffered rumen juice from sheep
- ❖ Anaerobic conditions at 39°C, in triplicate



In presence or absence of polyethylene glycol (PEG, binding/inactivation of CTs)

Role of CTs

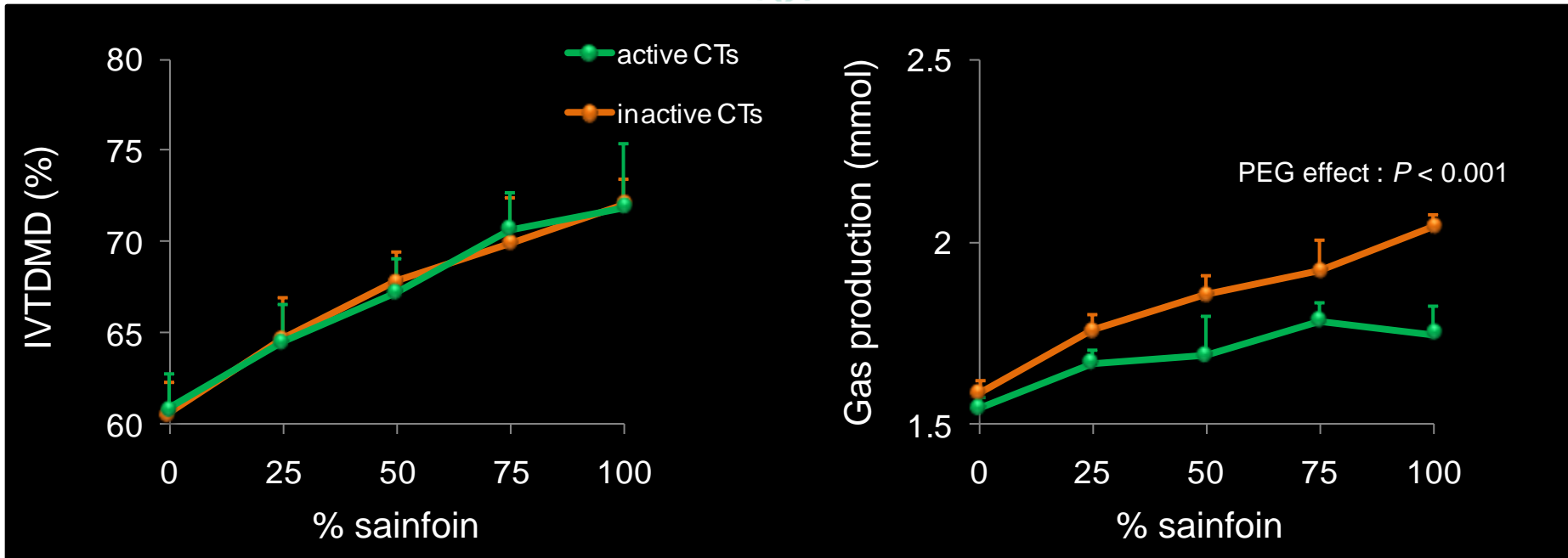
MEASUREMENTS at 3.5 h (soluble fraction) and 24 h (whole plant)

- *In vitro* true dry matter digestibility (IVTDMD)
- Total gas production
- NH₃ in the fermentation medium



RESULTS

● At 3.5h of incubation



IVTDMD

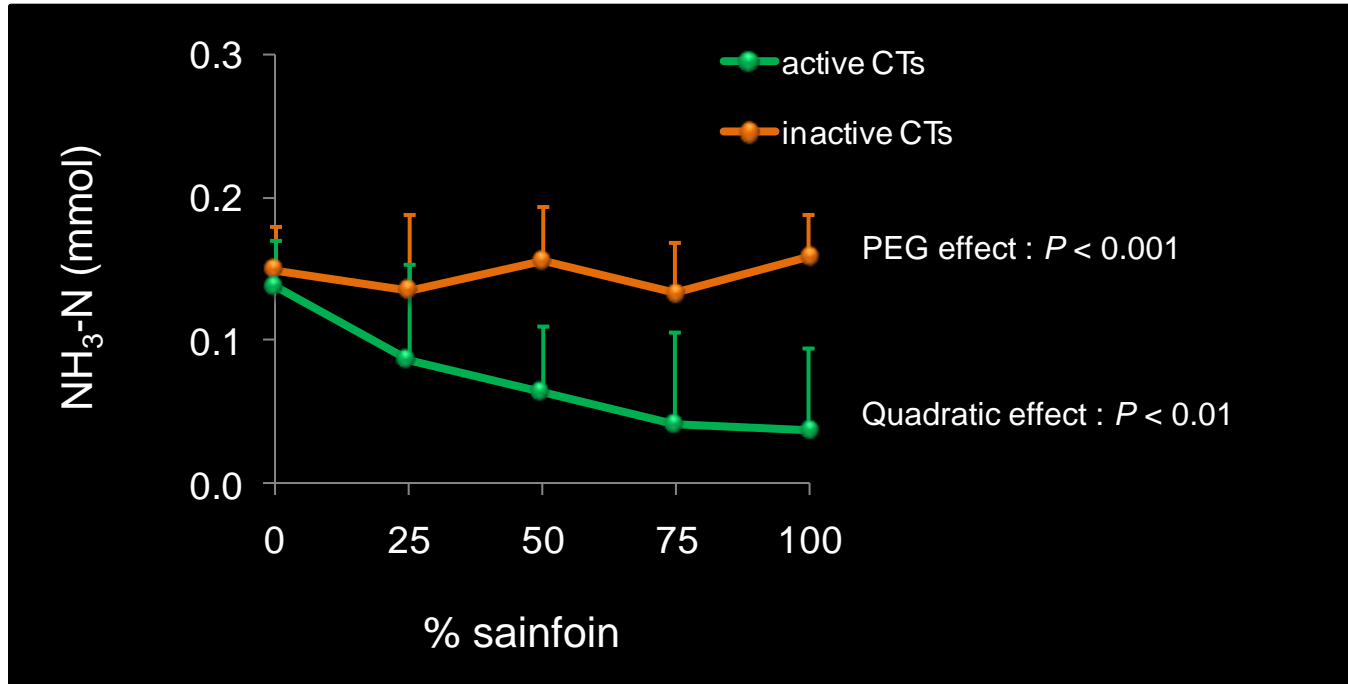
- Linear increase when % sainfoin increases
- No effect of CTs

CTs decrease the gas production per unit of DM degraded



RESULTS

● At 3.5h of incubation

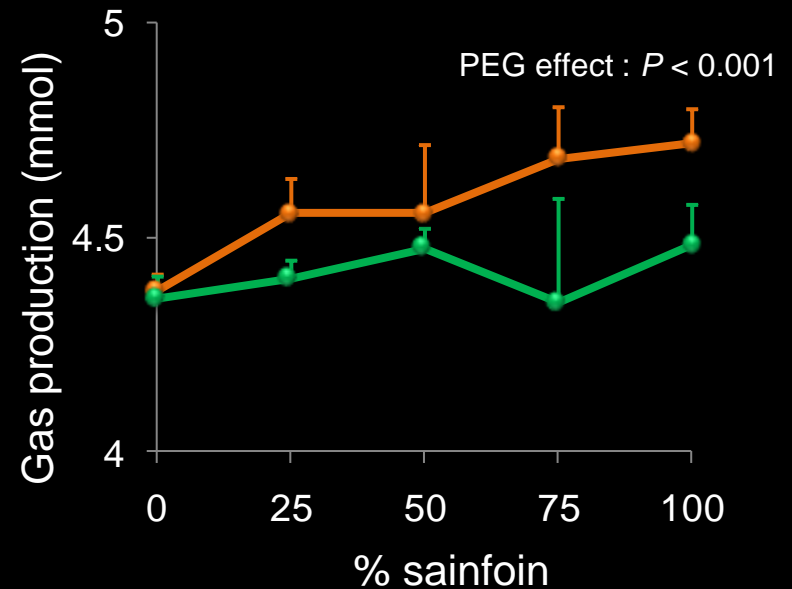
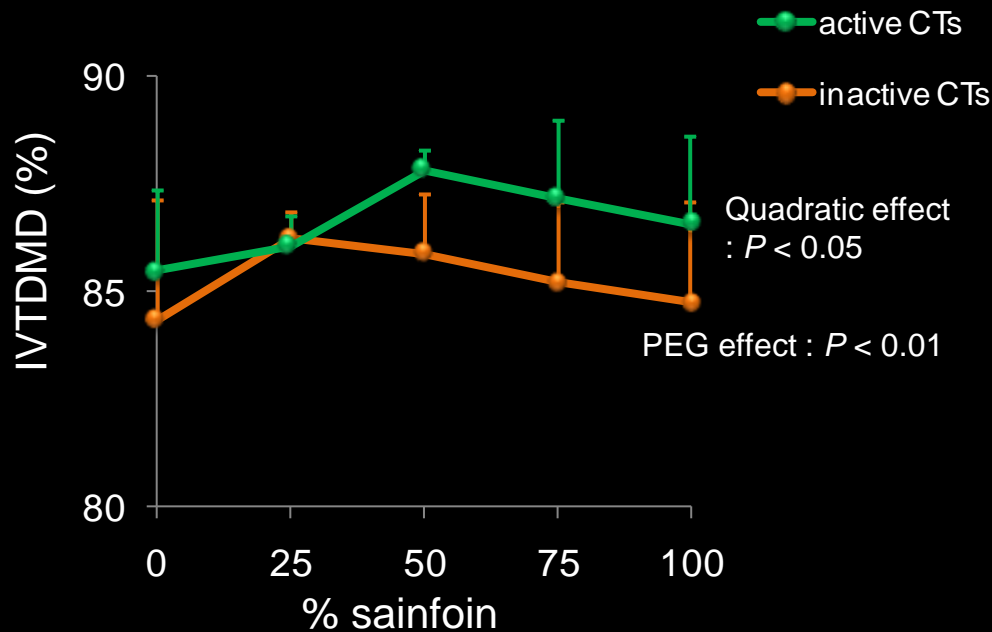


- Lesser degradation of cocksfoot proteins in mixtures containing sainfoin
- CTs in sainfoin also bind cocksfoot proteins



RESULTS

At 24h of incubation



IVTDMD

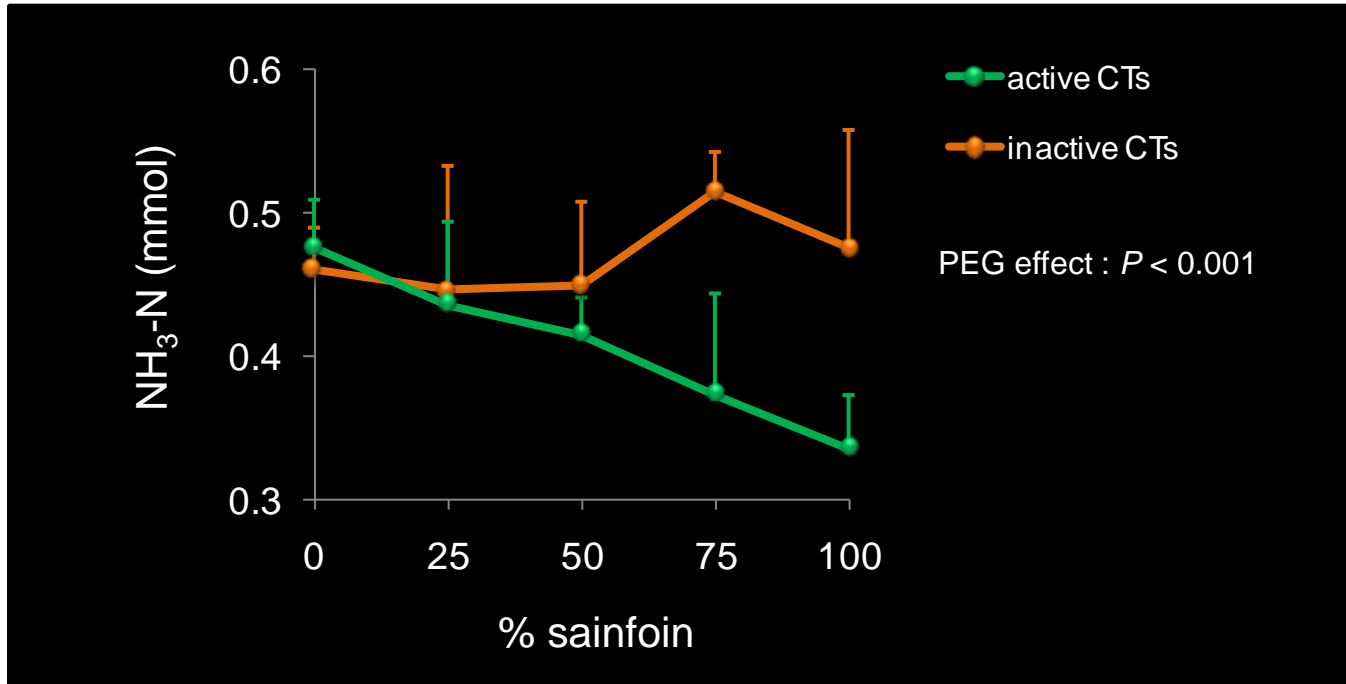
- Synergistic action on substrate degradation (optimal: 50:50)
- with a beneficial effect of CTs

- CTs decrease the gas production
- More DM degraded and less gas produced → high microbial biomass production (Blummel *et al.*, 1997)



RESULTS

● At 24h of incubation



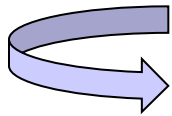
CTs are active on the protein degradation throughout the fermentation process



Conclusion

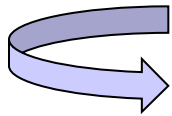
When mixing cocksfoot and sainfoin, CTs produce:

- a synergistic action on the DM digestibility *in vitro*
- a decrease of the gas losses while maintaining the nutritive value



Better utilization of plant substrates by the rumen ecosystem likely due to a high microbial biomass production

- a decrease of the protein degradation of the whole mixture



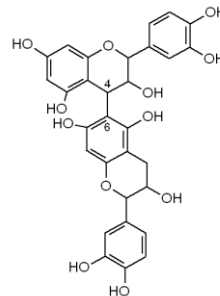
Due to the role of CTs, introducing sainfoin in an association of forage species could interact favourably on N metabolism in the rumen

Synergy relevant in terms of nutritive value and environmental footprint

Optimal: 50-75% of sainfoin



Thank you for your attention



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August 29th - September 2nd

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