Tracking in situ ruminal degradation of grasses and legumes using δ^{13}C

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Introduction

- ✓ Stable isotopes can be an important research tool to track C and N in grazing experiments
- ✓ The C4 plants are enriched in ^{13}C (range of -12 to -15 ‰) compared with C3 plants, that are depleted in ^{13}C (range of -28 to -32‰)
- ✓ Warm-season C4 grasses and legumes are different in their C isotopic composition and that might help to track the C sources during ruminal degradation.

Objectives

- ✓ The objective of this study was to evaluate forage ruminal decomposition by monitoring the disappearance of different carbon sources (C3 or C4) using C stable isotope (δ^{13}C)

Methods

- ✓ **Alfalfa** (*Medicago sativa*) and **Tifton-85** (*Cynodon spp.*) hay

Treatments :

1) **100%** Alfalfa
2) **75%** Alfalfa + **25%**Tifton-85
3) **50%** Alfalfa + **50%** Tifton-85
4) **25%** Alfalfa + **75%** Tifton-85
5) **100%** Tifton-85

- ✓ The in situ degradability was performed to obtain the degradation curve of each diet
- ✓ Samples of the experimental diets were weighed and placed into nylon bags into a rumen fistulated cow
- ✓ Incubation times were 3, 6, 12, 24, 48, 72, 96, 144, and 288 hours
- ✓ All collected samples were subjected to indigestible NDF (NDFi) analysis.
- ✓ Samples were analyzed for δ^{13}C and performed using the dry combustion (Dumas method) in Vario Micro Cube interfaced with a mass spectrometer IRMS Isoprime 100

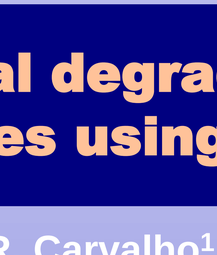
Fistulated Animal

Cannula

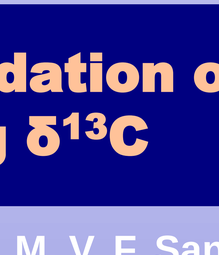
Table 1. Dietary δ^{13}C (‰) based on total sample C (before in situ trial)

Alfalfa:Tifton 85	δ^{13}C
100:0	-30.64
75:25	-25.99
50:50	-23.85
25:75	-18.22
0:100	-14.98

Vario Micro Cube and IRMS



Tifton-85



Alfalfa

Results

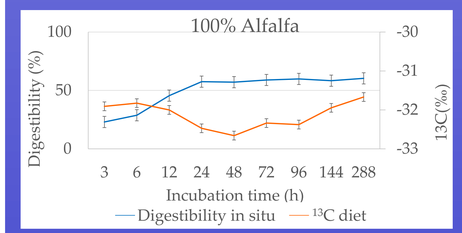


Figure 1. Incubation time (h), alfalfa digestibility and ^{13}C of diet (‰).

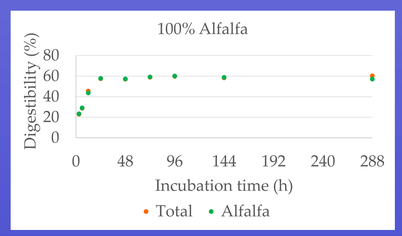


Figure 2. Incubation time (h) and alfalfa digestibility (%).

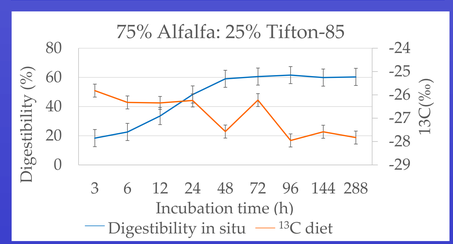


Figure 3. Incubation time (h), total diet digestibility and ^{13}C of diet (‰).

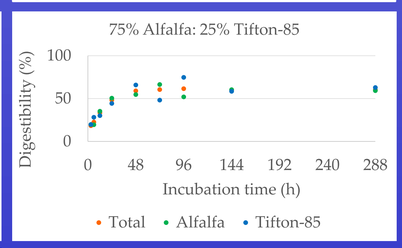


Figure 4. Incubation time (h) total diet, alfalfa and Tifton- 85 digestibility (%)

Results

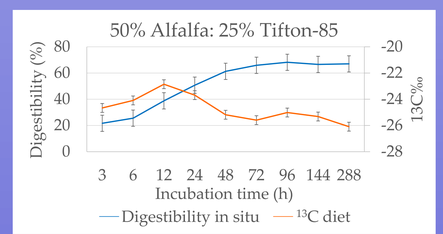


Figure 5. Incubation time (h), total diet digestibility and ^{13}C of Diet (‰).

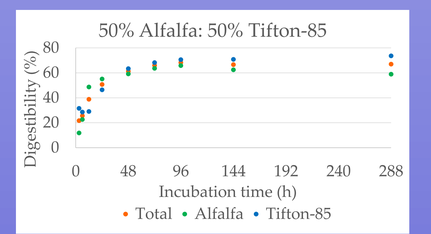


Figure 6. Incubation time (h) total diet, alfalfa and Tifton- 85 (%).

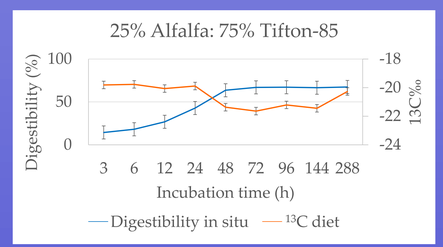


Figure 7. Incubation time (h), total diet digestibility and ^{13}C of Diet (‰).

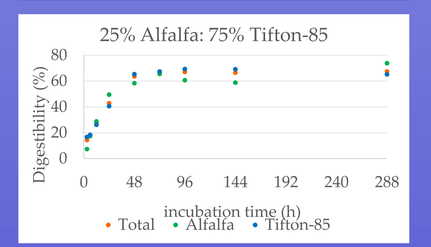


Figure 8. Incubation time (h), total diet, alfalfa and Tifton- 85 (%).

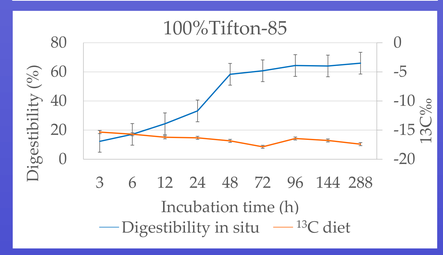


Figure 9. Incubation time (h), total diet digestibility and ^{13}C of diet (‰).

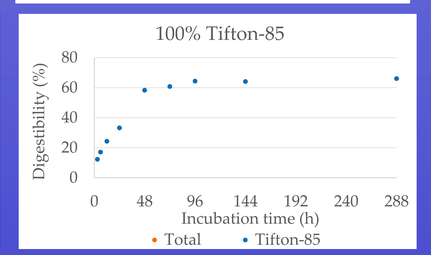


Figure 10. Incubation time (h) total diet, alfalfa and Tifton- 85 digestibility (%).

Conclusions

It is possible to evaluate the forage ruminal decomposition of individual components of the diet (C4 and C3 plants) by monitoring their disappearance using C stable isotope (δ^{13}C) technique.

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