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105547, Poster # 501

Alfalfa and timothy nutritive value in contrasted climatic regions

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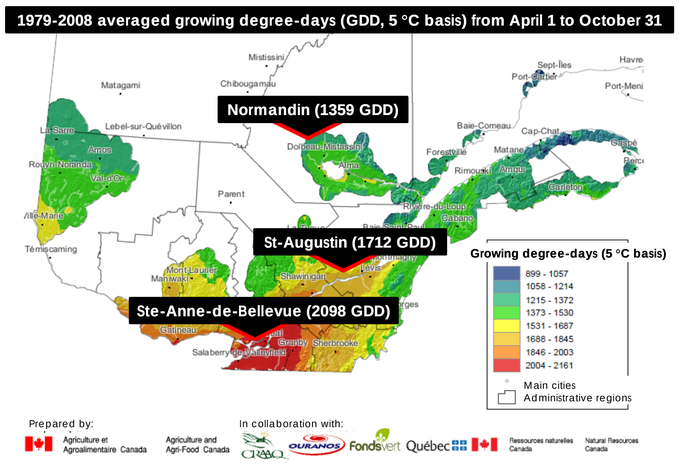
Introduction

- Studies conducted under controlled conditions revealed that forage nutritive value is affected by growth temperature (Thorvaldsson, 1992; Thorvaldsson et al., 2007). However, studies on the effects of regions with different air temperatures on forage nutritive value remain scarce.
- Our **objective** was to compare the forage nutritive value of alfalfa (*Medicago sativa* L.) and timothy (*Phleum pratense* L.) grown at three climatically contrasted sites in the province of Québec, Canada.

Materials & methods

✓ 3 sites in the province of Québec, Canada:



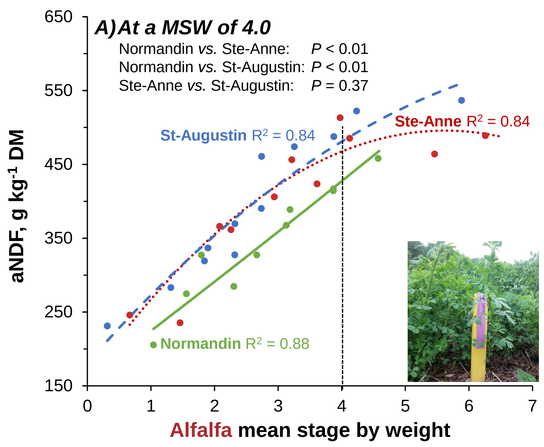
✓ 24-36 plots / site:
- 2 forage species: - alfalfa cv Calypso
  - timothy cv AC Alliance.
- Sampling once a week for 4-6 weeks during the primary growth in 2015 and 2016.
- 3 replications / sampling.

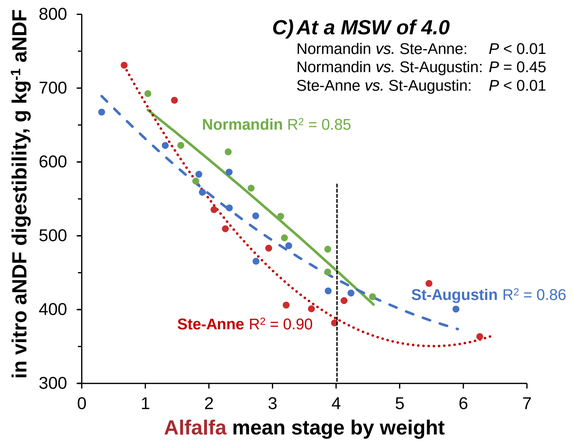
✓ Measurements at each sampling:
- Dry matter (**DM**) yield.
- Mean stage by weight (**MSW**) for alfalfa (Mueller and Teuber, 2007) and timothy (Moore et al., 1991).
- Neutral detergent fibre assayed using α-amylase (**aNDF**) and *in vitro* aNDF digestibility according to Tremblay et al. (2015).

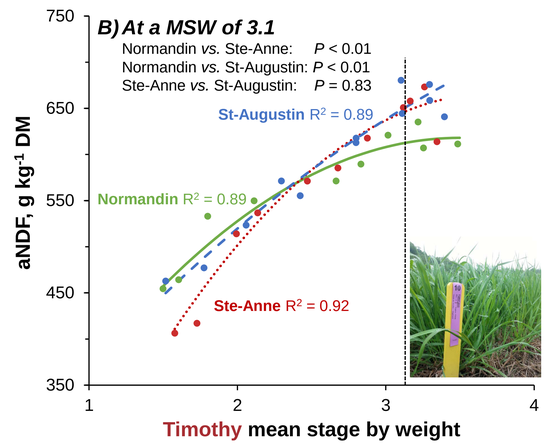
✓ Regression slopes were compared at a given forage stage of development using the TUKEY adjustment. Nutritive value attributes were then compared at a given forage DM yield using inverse regression (Draper and Smith, 1998).

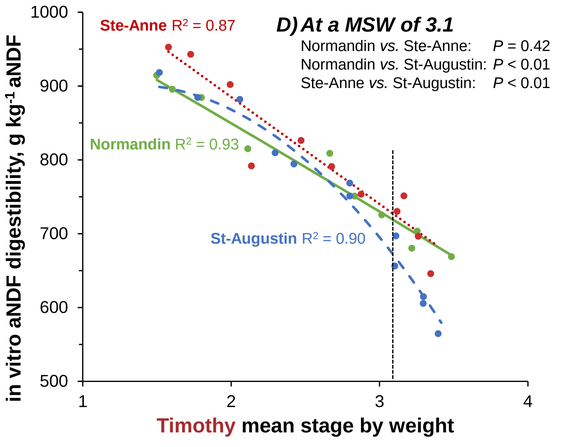
Results & discussion

At a given forage stage of development









At the late bud stage of development for alfalfa (MSW = 4.0) and at the early heading stage for timothy (MSW = 3.1):

- aNDF concentrations of alfalfa (A) and timothy (B) were respectively lower at Normandin (427 and 612 g kg^{-1} DM) than at St-Augustin (481 and 647 g kg^{-1} DM) and Ste-Anne (467 and 645 g kg^{-1} DM);
- *in vitro* NDF digestibilities of alfalfa (C) and timothy (D) were respectively greater or similar at Normandin (453 and 718 g kg^{-1} aNDF) than at St-Augustin (442 and 670 g kg^{-1} aNDF) and Ste-Anne (338 and 726 g kg^{-1} aNDF);
- forage DM yields of alfalfa and timothy were respectively lower at Normandin (4.12 and 4.17 Mg ha^{-1}) than at St-Augustin (6.22 and 6.17 Mg ha^{-1}) and Ste-Anne (5.85 and 5.25 Mg ha^{-1}).

At a given forage DM yield

Two nutritive value attributes at a DM yield of 4 Mg ha^{-1}† at each site for

	Alfalfa				Timothy			
	Normandin	St-Augustin	Ste-Anne	SEM	Normandin	St-Augustin	Ste-Anne	SEM
Neutral Detergent Fiber (aNDF), g kg^{-1} DM	427^{a}	389^{ab}	368^{b}	9.5	612^{a}	587^{b}	613^{a}	6.5
***In vitro* aNDF digestibility, g kg^{-1} aNDF**	453^{a}	524^{b}	531^{b}	10.7	718^{a}	795^{b}	778^{b}	9.3

†This yield is the averaged yield observed at the MSW of 4.0 for alfalfa and of 3.1 for timothy at Normandin. SEM = Standard Error of the Mean.
^{ab}Within a row and a species, means followed by a different letter are significantly different ($P \leq 0.05$).

- At a DM yield of 4 Mg ha^{-1} for both species, the forage aNDF concentration was similar or greater and the *in vitro* NDF digestibility was lower at the northernmost site (Normandin); to reach this DM yield, the development of alfalfa and timothy was more advanced at Normandin (MSW = 4.0 and 3.1) than at St-Augustin (MSW = 2.5 and 2.5) and Ste-Anne (MSW = 2.2 and 2.7).

Conclusions

❖ When reaching the recommended stage of development for harvest, alfalfa and timothy have a superior nutritive value but a lower dry matter yield at the northernmost site than at the other two sites.

❖ The greater nutritive value of timothy and alfalfa grown at the northernmost site (Normandin) was mainly explained by the well-established negative relationship between nutritive value and DM yield.

References

Draper & Smith. 1998. Applied regression analysis, 3rd ed. John Wiley & Sons Inc.; Moore et al. 1991. Agron. J. 83:1073; Mueller & Teuber. 2007. Univ. of California Publication 8289; Thorvaldsson. 1992. Grass Forage Sci. 47:306; Thorvaldsson et al. 2007. Acta Agr. Scand. B-S P, 57:322; Tremblay et al. 2015. Agron. J. 107:211.

Acknowledgements

This study was funded by the “Fonds de recherche axé sur l’agriculture nordique (FRAN-02)”. Thanks to D. Mongrain, G. Bégin, A.-D. Baillargeon, C. Lambert-Beaudet, and L. Lévesque for technical assistance.

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