Discrimination of botanical families using NIR Hyperspectral Imaging

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Introduction

NIR Hyperspectral Imaging system (NIR-HSI) can be successfully used in grassland studies at a large scale, but this system is not yet developed for species discrimination on dried and milled samples. The NIR-HSI can be used for discrimination of botanical families, plant species and detection of toxic or/and invasive plants from mixed meadows.

Aim of the study

To discriminate at laboratory scale, using a NIR Hyperspectral imaging (HSI), different botanical families (Poaceae and Fabaceae families).

Material and Methods

POA
• *Agrostis capillaries* L
• *Anthoxanthum odoratum* L
• *Briza media* L
• *Cynosurus cristatus* L
• *Festuca pratensis* L
• *Festuca rubra* L
• *Trisetum flavescens* L
• *Nardus stricta* L
• *Deschampsia flexuosa* L

Gârda de Sus

FABA
• *Lathyrus pratensis* L
• *Lotus corniculatus* L
• *Trifolium montanum* L
• *Trifolium pratense* L
• *Trifolium repens* L

NIR-HSI System
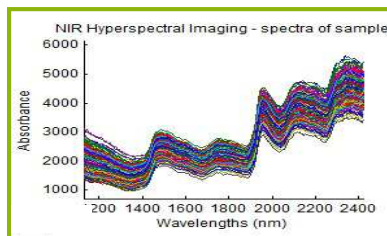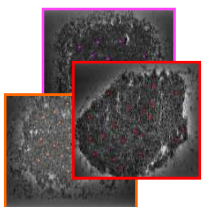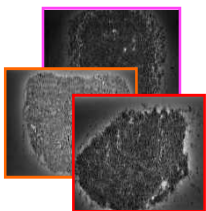Wavelength range:1100-2400 nm
Image acquisition and analysis
HyperSee program was used for images acquisition.

NIR Hyperspectral Imaging - spectra of sample

Preliminary results

### Calibration model
500 spectra (1st and 3rd repetition images)

Independent validation set
250 spectra (2nd repetition images)

After first derivative (window=11, polynomial=2) preprocessing the PLS-DA algorithm was used. With 10 latent variables, a high correlation **R^2=0.88** and a low error **RSECV=0.135** were obtained and significantly assessed ($P < 0.05$).
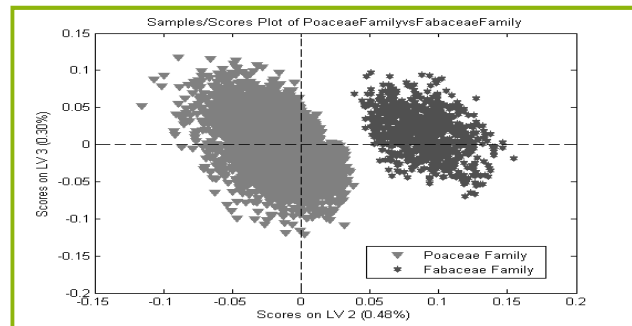
After loading exploration the components which made the difference are:
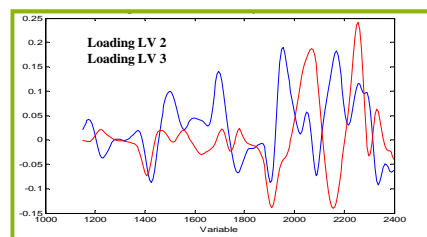
POA
• Protein (-)
• Cellulose (+)
• Starch (+)

FABA
• Protein (+)
• Cellulose (-)

Conclusions

This preliminary study indicated that this technique can be very useful for determining the floristic composition of hays harvested from grazing lands and it could probably be extended to the detection of invasive and toxic plants. This technique is original regarding the plants discrimination and sample preparation. The method has been applied to hay meadows but could be extended to any other kind of forages.

Acknowledgements

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