



Using NIR spectroscopy for the discrimination between *Eucalyptus Nitens* and *E. Globulus*

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Globulus vs Nitens

Globulus

Nitens

Higher density

Higher quality

Higher pulp yield

More expensive

Faster growth

More resistant to
diseases and low
temperatures

Cheaper

Globulus vs Nitens

E. globulus ✓



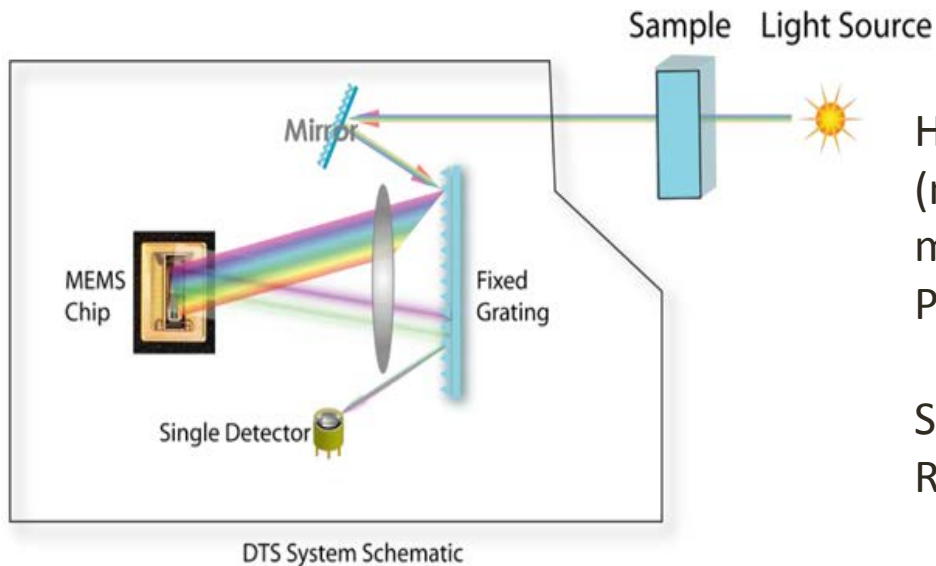
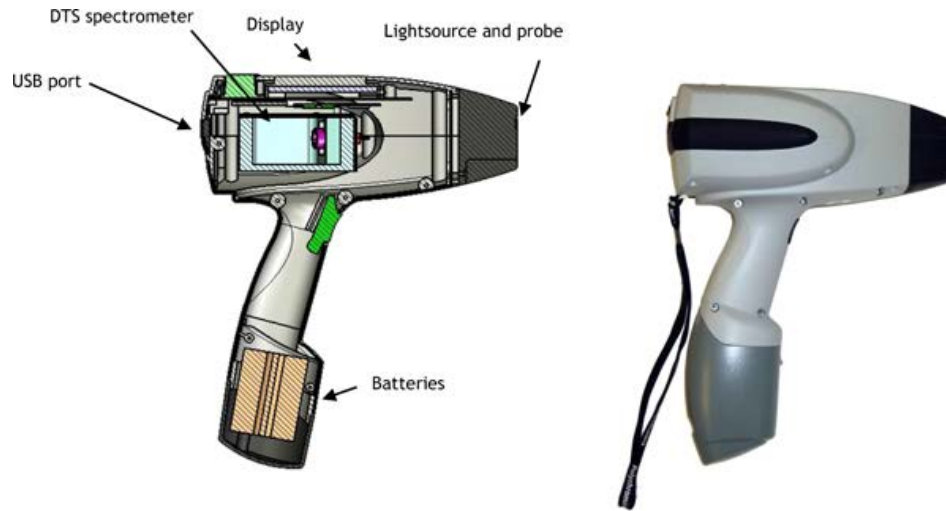
E. nitens X



*Acacia
melanoxyton* X



Instrumentation



Handheld MEMS
(micro-electro-
mechanical system)
Phazir-Polychromix

S.R. 1600-2400nm
Reflectance mode

(Adapted from Geller, 2007)



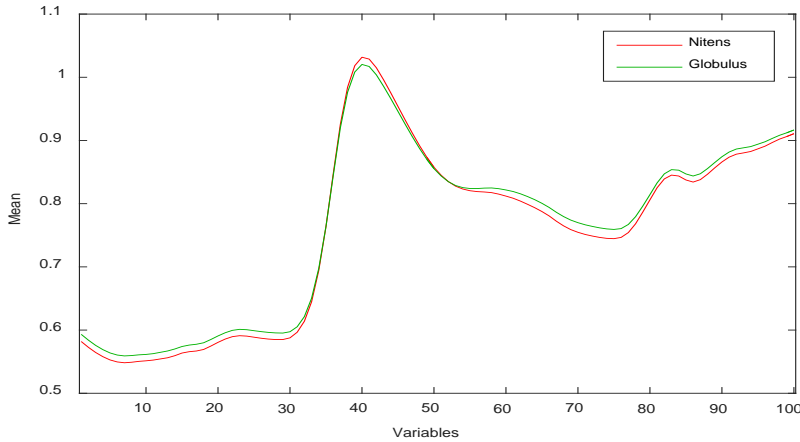
848 samples were analyzed of which 580 belonging to the species *Globulus* and 268 samples to the species *Nitens*



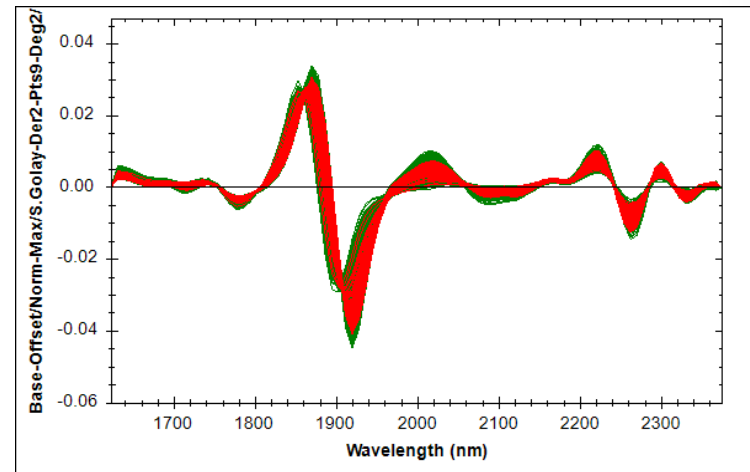
Classification error was calculated through cross-validation, predicting an external group of 124 samples excluded from the calibration set



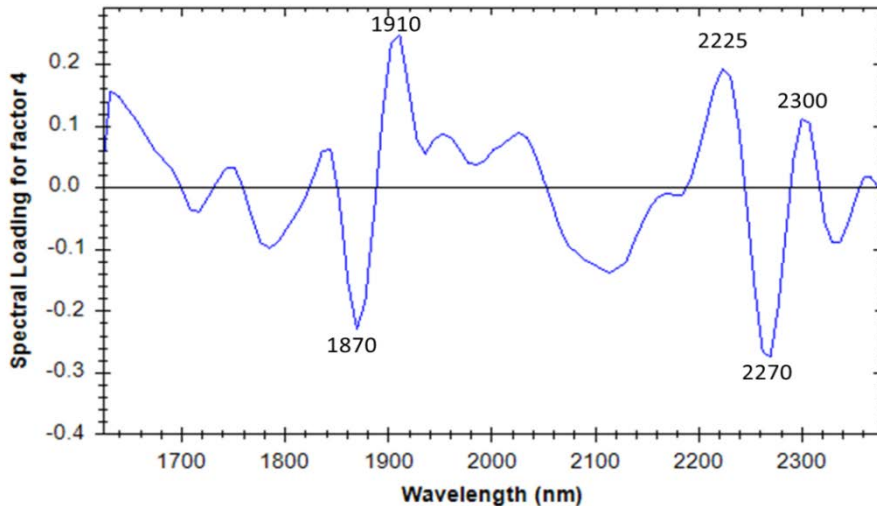
Exploring spectral data



Problems: Porosity, density, roughness
Spectra pre-treatments: Baseline
Offset, Normalize Max and Second
Derivative, Mean Center (S.Golay, 9,2).



Spectral Loading for factor 4 vs Wavelength

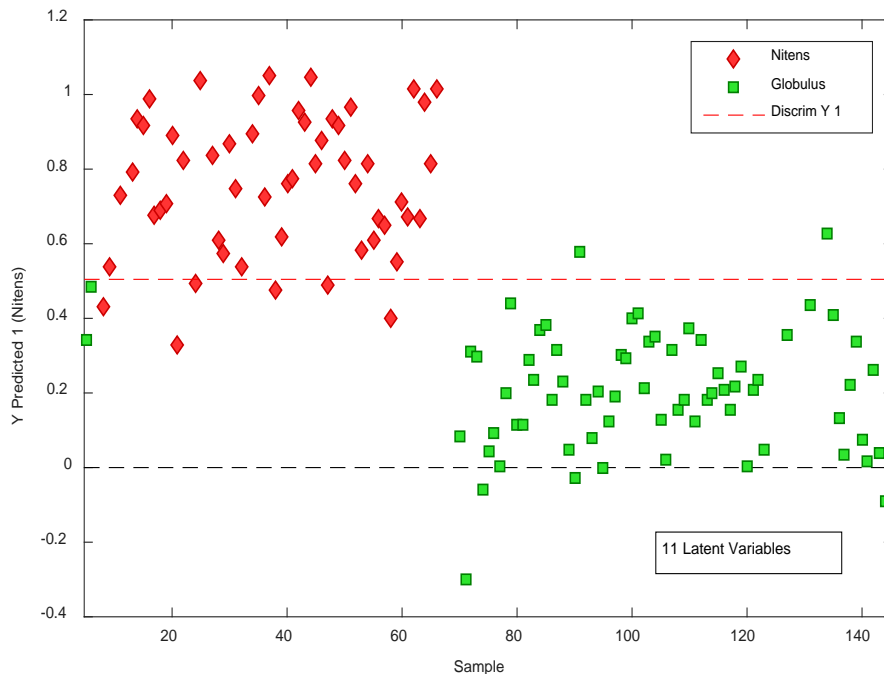


- 1870 nm C-H (second overtone)
- 1930 nm -OH and -C=O
- 2270 nm O-H and C-O
- 2300 nm C-H



From NIR spectra to discriminant model

PLS-DA using 11 latent variables



The average prediction error obtained was 7 %.

Multivariate prediction model was built using the algorithm PLS-DA (Partial Least Square Discriminant Analysis)

Sensitivity (fraction of true positives)
Specificity (fraction of true negative)
Matthew's correlation coefficient
Classification error in cross validation

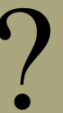
Predicted as *Nitens*
Predicted as *Globulus*

Actual classes:
Nitens *Globulus*
48 2
6 68



Questions

- How to get rid of the humidity?
- How to decrease the prediction error?
- How to find a faster method? (Handheld instrument takes about 5 seconds per spectrum and at least one duplicate is needed)
- Is it possible to integrate NIRS and image analysis in order to enhance the information obtaining spatial information (distribution of cellulose, detection of wood defects...)?
- Could NIRS be suitable for fighting against illegal logging?



Thank you!



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