CITES Tree Species Programme

Project CITES S544:

"Rapid-Field Identification of Dalbergia Woods and Rosewood Oil by NIRS Technology."

Kuala Lumpur, October 05 2022

2. General objectives

A) Build NIRS models using portable devices for identification/classification of 20 *Dalbergia* species.

B) Develop a method of direct analysis by NIRS to authenticate the purity of *Aniba rosiodora* essential oil.

A2. Materials and methods – Dalbergia wood

3.1 Locations for collecting spectra:

5 Brazilian and 6 International wood Xylaria

3.2 Sample surface preparation:

The core of the *Dalbergia* specimens without visual defects.

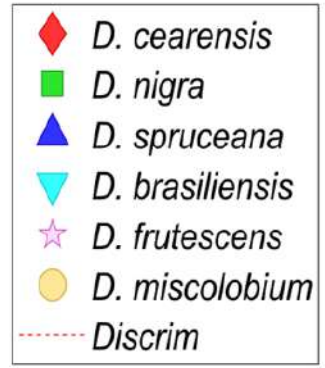
3.3 Equipment:

MicroPhazir RX Analyzer handheld device

3.4 Spectral processing and data analysis:

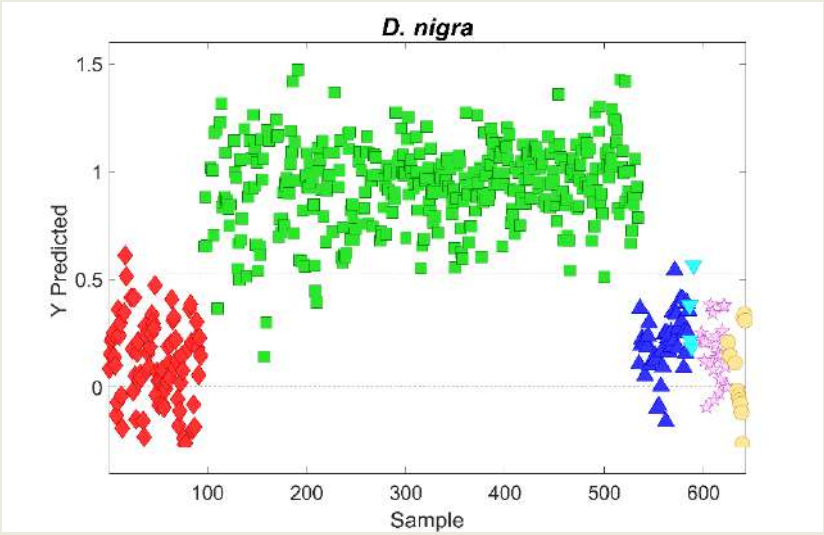
PLS-DA

A3. Results – Dalbergia wood

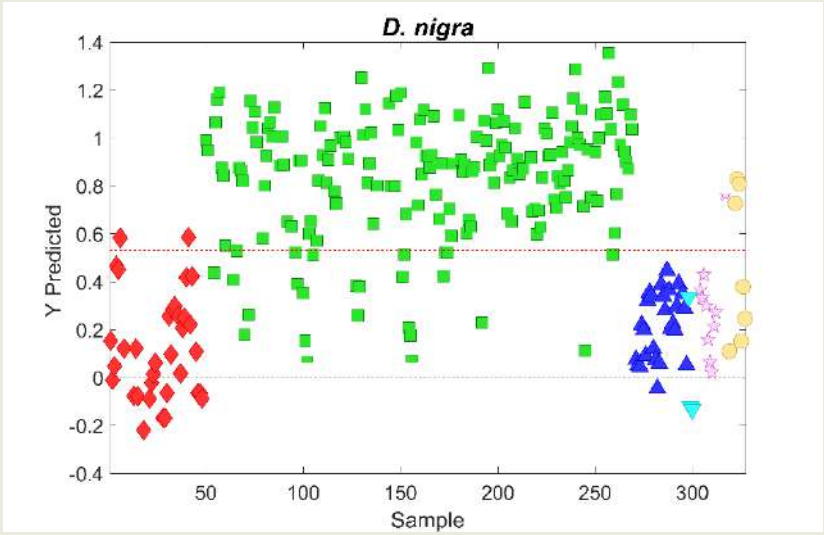


PLS-2DA

Training – 441 spectra



Validation – 222 spectra



Number of samples = 221
Number of spectra = 663
Efficiency rate = 94.6%

A3. Results – Dalbergia wood

NIR spectra of 29 *Dalbergia* wood species are collected.

Most demanded *Dalbergia* species exported from Brazil

Figures of merit obtained for the set of validation

Species	Nº of samples	Nº of spectra	False positive rate	False negative rate	Efficiency rate
D. cearensis	47	141	4,5%	0%	97,7%
D. nigra	221	663	0%	10,5%	94,6%
D. spruceana	26	78	3,0%	0%	98,5%
D. brasiliensis	3	9	0%	--	--
D. frutescens	17	51	2,7%	100%	0%
D. miscolobium	10	30	0%	0%	100%

A4. Future Scenarios

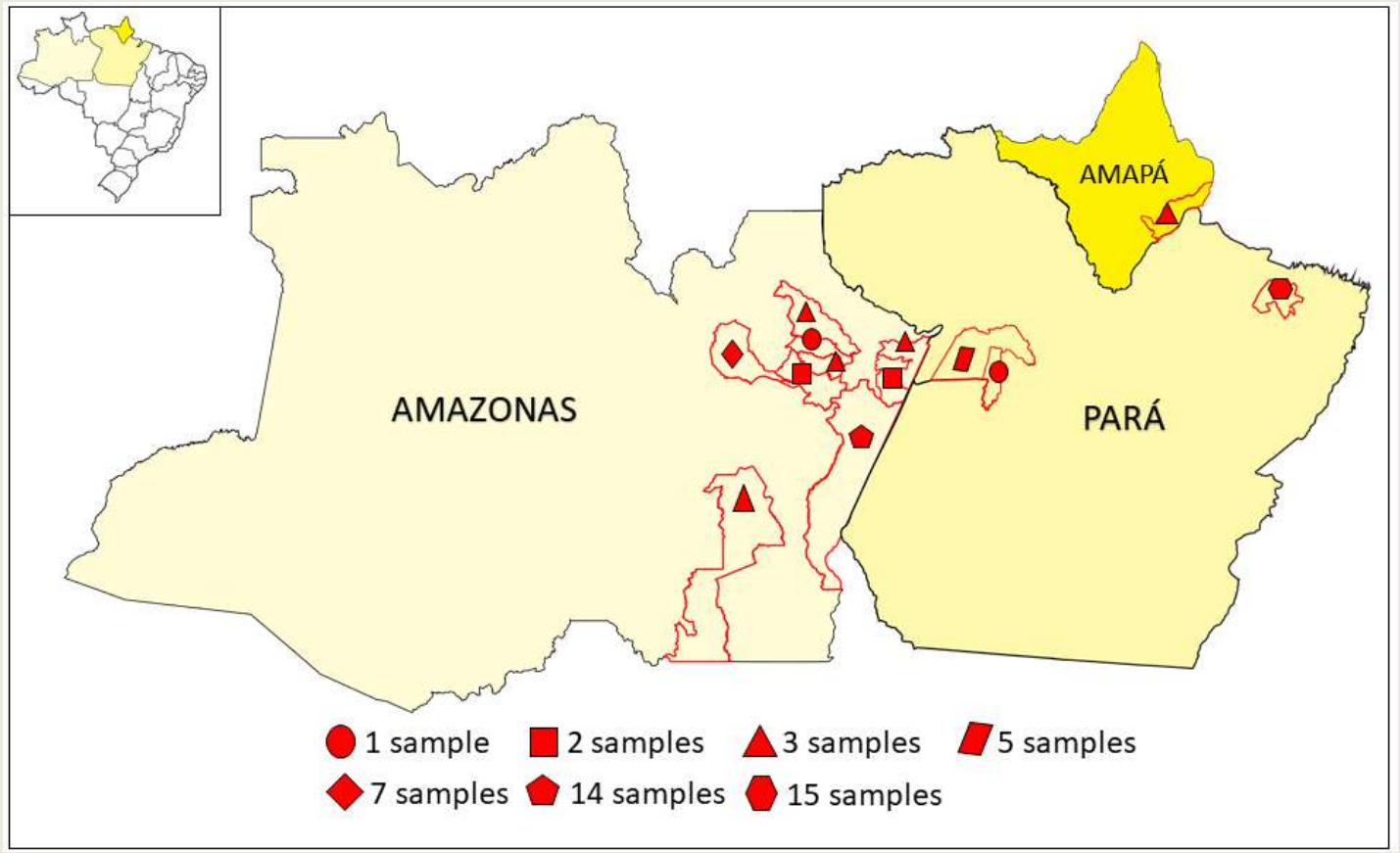
1. Build models for the genus:

   Cedrela (S. America),

   Handroanthus and *Paubrasilia* (Brazil);

2. Make app of the Matlab Program more user-friendly;

B2. Materials and methods – rosewood oil

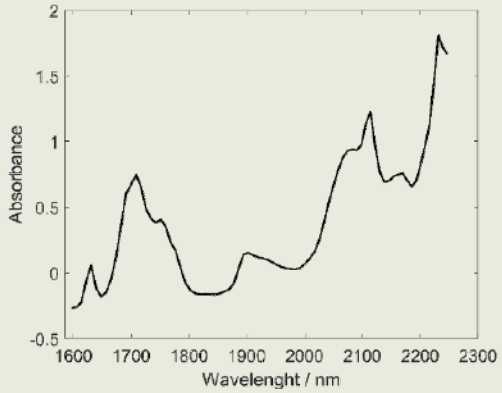


Direct collection: 59 batches - 13 different origins
Online purchase: 9 batches - 9 different suppliers
Total samples: **68 batches - 130 samples**

B2. Materials and methods – rosewood oil

(A) NIRS - MicroPhazir RX Analyzer.

(B) GC-MS - Agilent Technologies

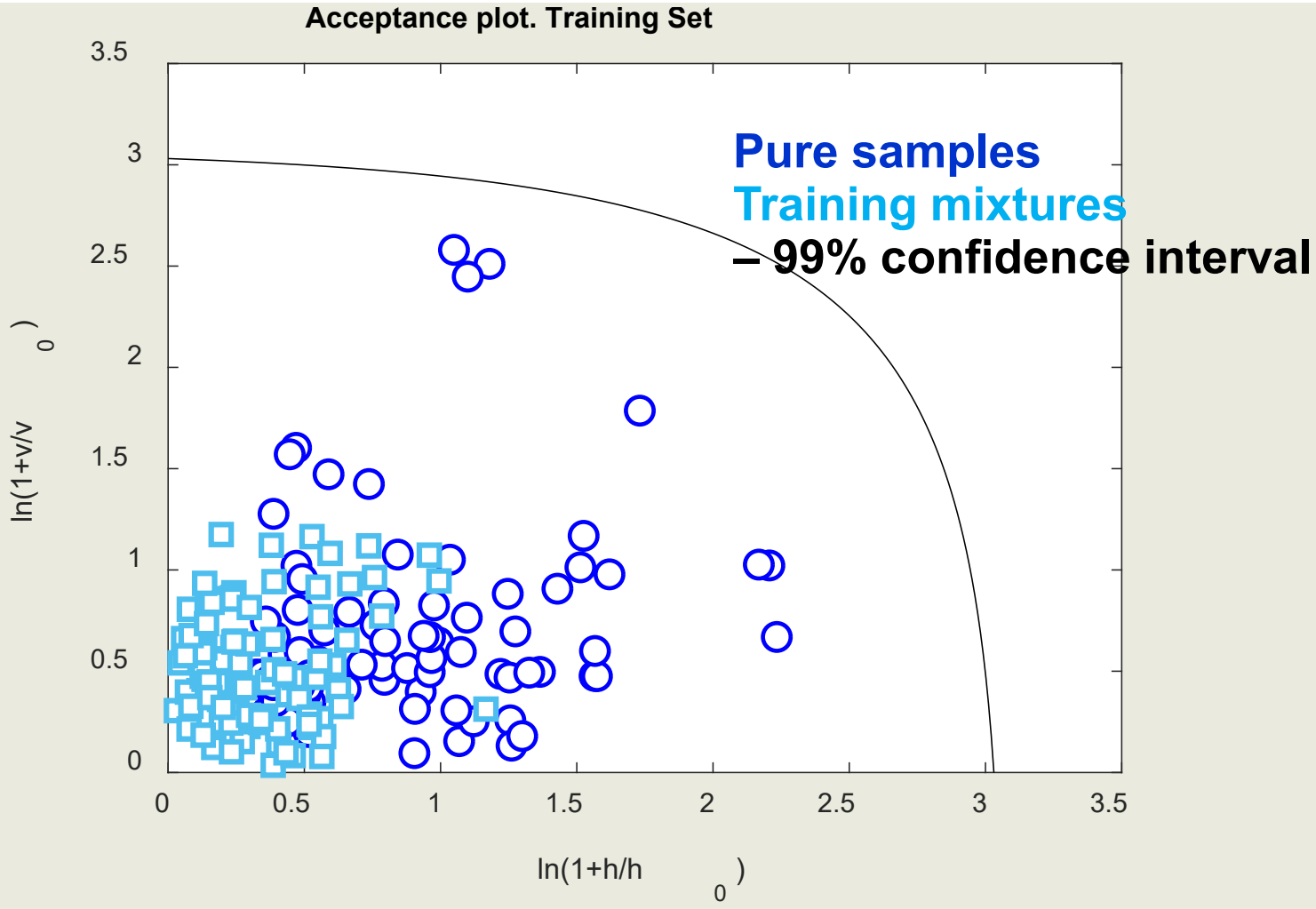


Spectral processing & data analysis:

DDSIMCA

The error and efficiency rates are evaluated

B3. Results– rosewood oil



Model with 3 main components
Low occurrence of anomalous samples
All samples were in the 99% confidence interval.

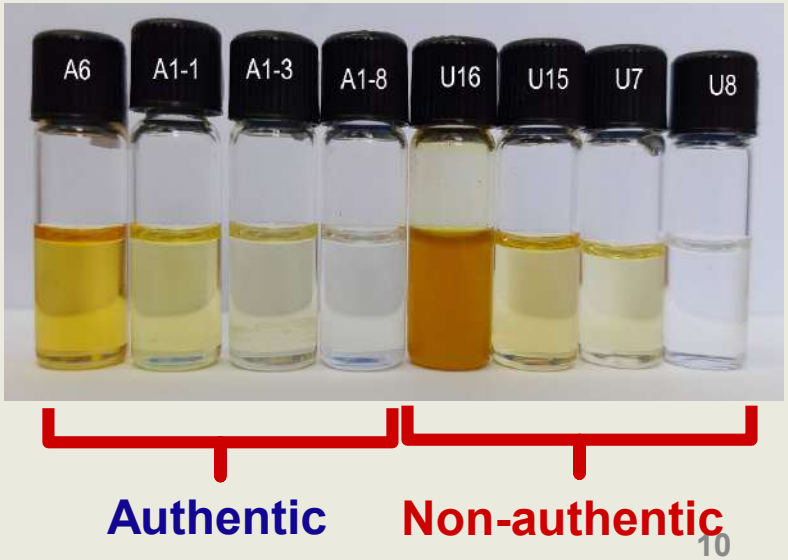
B4. Conclusions

1. The method is fast, shows low cost, and is very efficient (98.9%) for *A. rosiodora* oil authenticity;

2. Is non-destructive, needs no pre-treatment, produces no chemical residues, and requires 0.2 mL of the sample.

3. GC-MS corroborates with the NIRS analyses;

4. 95.4% of commercial samples purchased in Brazil were considered **non-authentic .**



B5. Future Scenarios

1. Physicochemical characterization of the Rosewood oil.
2. Expand NIRS Technology to other CITES oils:
   a. Palo Santo (*Bulnesia sarmientoi*) from Argentina
   b. East African Sandalwood *(Osyris lanceolata)* from Kenia,Tanzania, and Uganda

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A green and direct method for authentication of rosewood essential oil by handheld near infrared spectrometer and one-class classification modeling

Tereza C.M. Pastore [a], Lilian R. Braga [b], Daniele C.G. da C. Kunze [b], Liz F. Soares [b], Floriano Pastore Jr [b], Alessandro C. de O. Moreira [a], Priscila V. dos Anjos [b], Caroline S. Lara [c], Vera T.R. Coradin [a], Jez W. B. Braga [b,d,*]

7. Lessons learned

1. Team must be passionately involved with the research topic and with the work;
2. Weekly meetings; quick communication via WhatsApp were made;
3. Materials and instruments are always available;
4. A local consultant to collect forest products must be part of the team;
5. The team to assist in administrative procedures must exist;
6. The lack of clear administrative procedures created unnecessary delays.

Team

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Thank you for your attention!

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