



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:

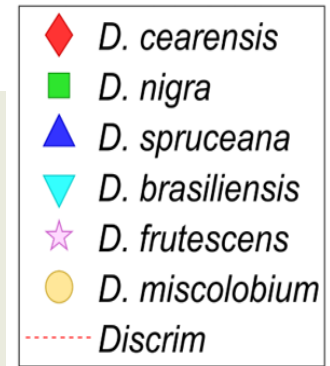
MicroPhazir RX Analyzer handheld device

3.4 Spectral processing and data analysis:

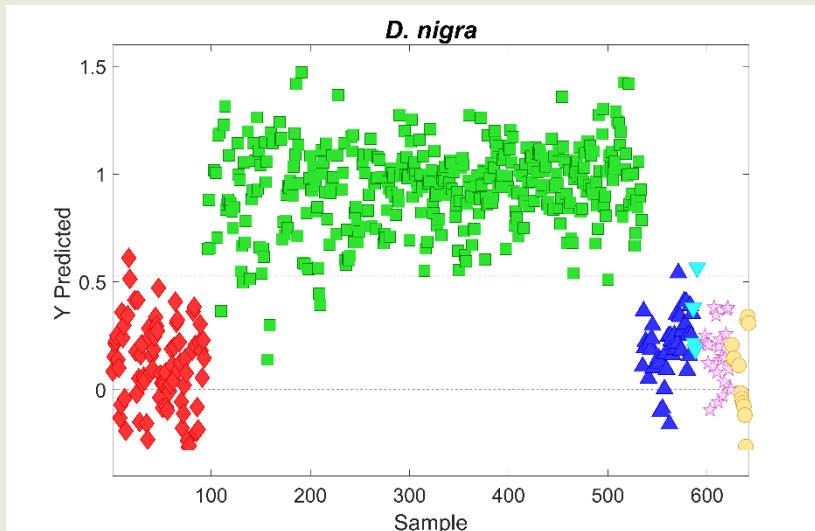
PLS-DA

A3. Results – *Dalbergia* wood

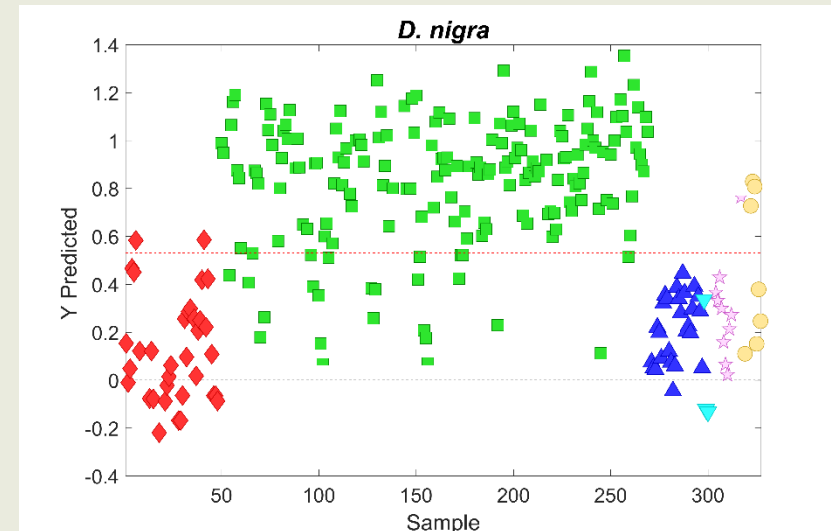
PLS-2DA



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
<i>D. cearensis</i>	47	141	4,5%	0%	97,7%
<i>D. nigra</i>	221	663	0%	10,5%	94,6%
<i>D. spruceana</i>	26	78	3,0%	0%	98,5%
<i>D. brasiliensis</i>	3	9	0%	--	--
<i>D. frutescens</i>	17	51	2,7%	100%	0%
<i>D. miscolobium</i>	10	30	0%	0%	100%

A4. Future Scenarios

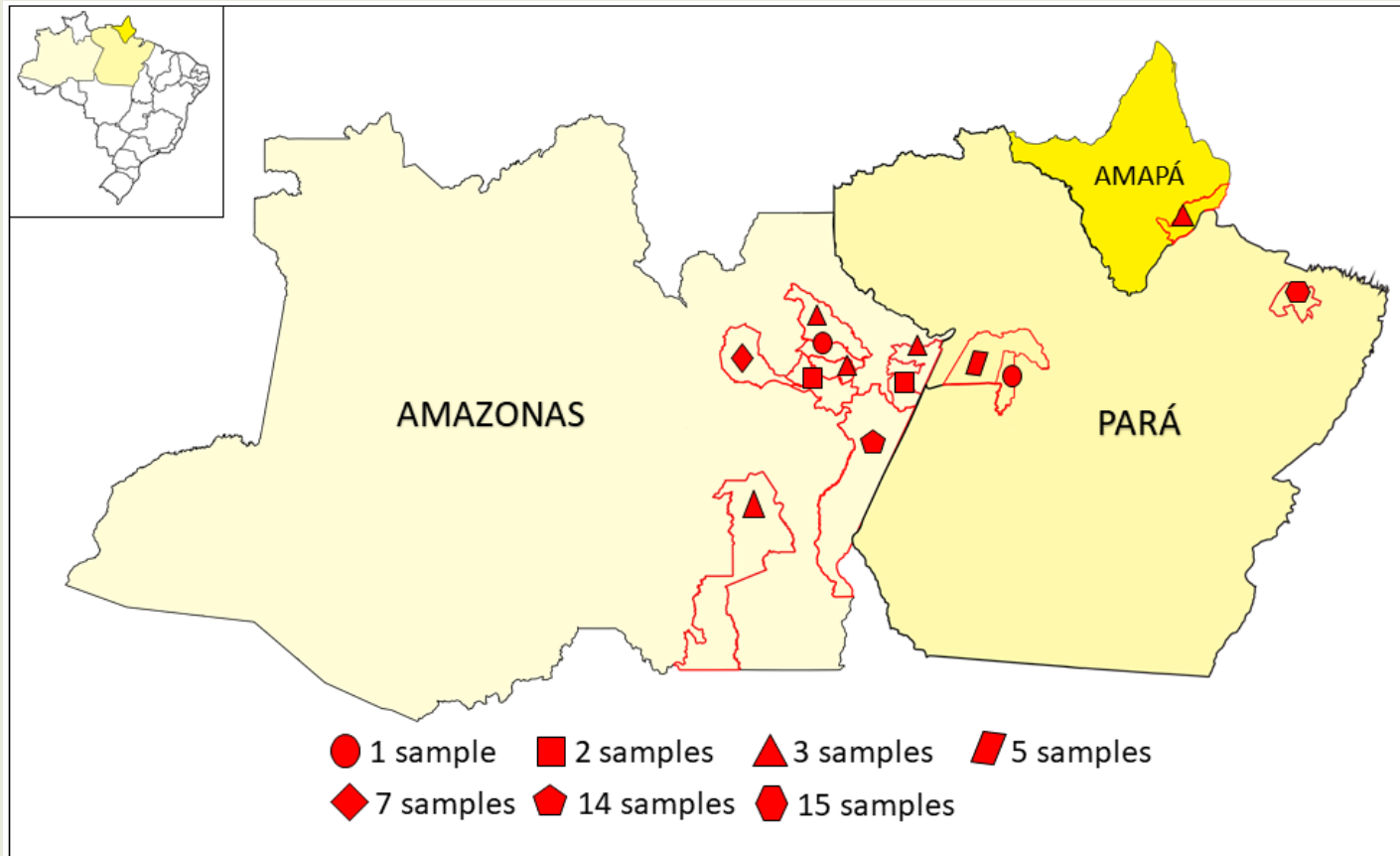
1. Build models for the genus:

Cedrela (S. America),

Handroanthus and *Paubrasilia* (Brazil);

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

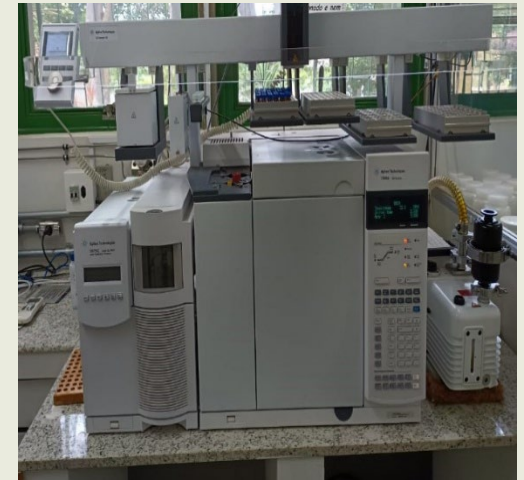
B2. Materials and methods – rosewood oil



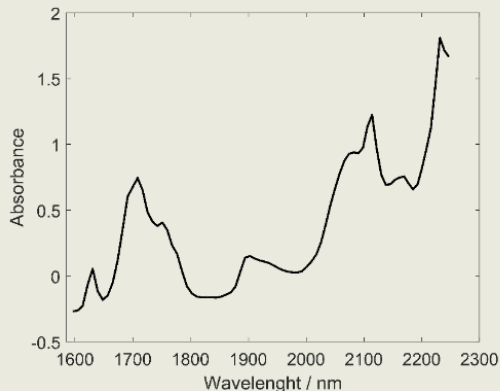
Direct collection: 59 batches - 13 different origins
Online purchase: 9 batches - 9 different suppliers
Total samples: **68 batches - 130 samples**

B2. Materials and methods – rosewood oil

(A) NIRS - MicroPhazir RX Analyzer.



(B) GC-MS - Agilent Technologies

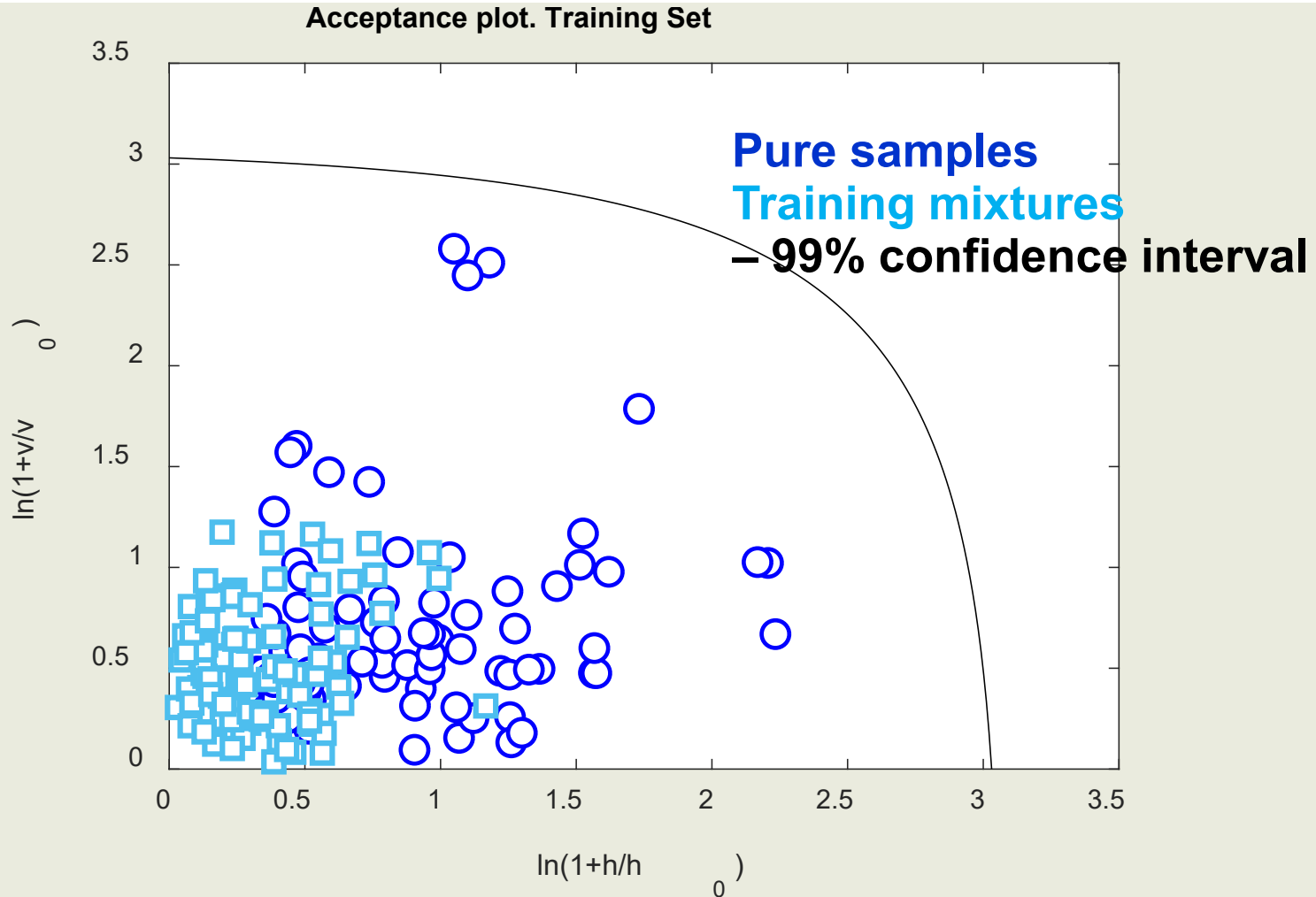


Spectral processing & data analysis:

DDSIMCA

The error and efficiency rates are evaluated

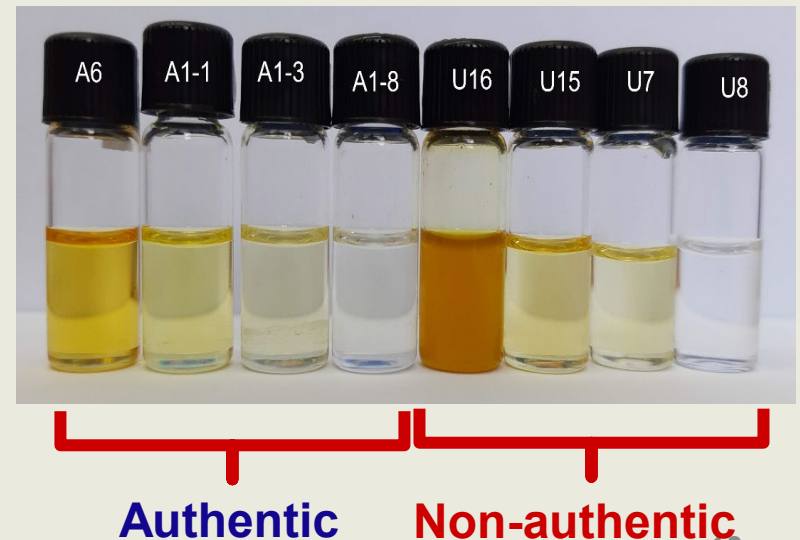
B3. Results— rosewood oil



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



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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

Researchers:

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[Thank you for your attention!](#)

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KFW

