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Biochemical characterization of the genetic resources of wild coffee trees collection using near infrared spectroscopy

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Davrieux Fabrice, Lallemand Laura, Minier Jérôme, Hoarau Mathilde, Soria Christian, Joët Thierry, Boulanger Renaud, Durand Noël

Introduction

This study aims to enrich the CIRAD infrared spectral database (1) for coffee beans (>2200 references, mainly *C. arabica* and *C. canephora* samples) and improve the predictive models for the major seed constituents (2) using the chemical diversity of wild coffee species present at the *Coffea* Biological Resources Centre (3) (maintained by IRD and CIRAD in Reunion Island).

Materials/Methods

462 coffee samples from 32 species were dried ground and analyzed for their NIR spectrum. Based on spectra diversity, 90 representative samples were selected using Mahalanobis distances (fig.1) and analyzed for their caffeine, trigonelline, fat and chlorogenic acids (CGA) contents. New models were developed.

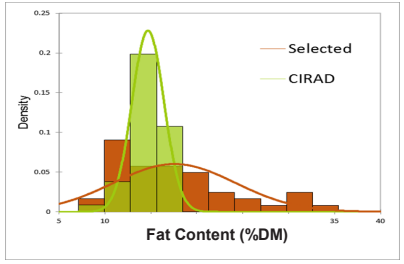

Figure 2: Fat content distribution for CIRAD database and new selected samples

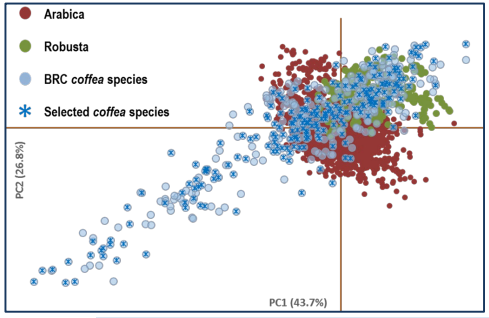

Figure 1: Spectral repartition on PC1 and PC2.

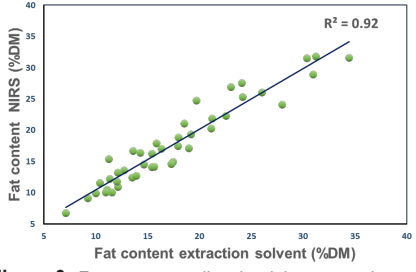

Figure 3: Fat content predicted vs laboratory values

Results/Discussion

The 90 samples originated from 22 coffee species.

The caffeine content ranged from 0 to 3.3%, trigonelline from 0.25 to 1.52%, CGA from 0,22% to 10,53% and fat from 7.12% to 34,45% (DMb). The predicted models present standard errors of 0.08%, 0.07%, 0.58% and 0.48% for respectively caffeine, trigonelline, CGA and fat. These performances are close to original models with an increase of the content ranges (e.g. Fat, fig.2 & 3).

Conclusion/Perspectives

This study demonstrated the efficiency of the use of genetic diversity present in the *Coffea* genus to enhance the robustness of the database. The resulting calibrations cover a larger range of values. Mahalanobis distances permitted an efficient improvement of the representativeness with a limited number of samples. New calibrations will be applied to the whole database (400 samples) in order to describe biochemical diversity in wild coffee species.

References:

1. Davrieux, F., et al. "Determination of the content of six major biochemical compounds of green coffee using NIR. Proceedings of the 11th International Conference. Vol. 441. Chichester: NIR Publications, 2004.
2. dos Santos Scholz, Maria Brigida, et al. "Application of near infrared spectroscopy for green coffee biochemical phenotyping." Journal of Near Infrared Spectroscopy 22.6 (2014): 411-421.
3. http://florilege.arcad-project.org/fr/crb/coffea/

davrieux@cirad.fr
crb-coffea@ird.fr