M2 internship proposal 2024-2025

Genetic profiling of Guianese Rose wood, *Aniba rosodora*, from plantations and natural populations.

Supervision:

Niklas Tysklind (UMR Ecofog), Myriam Heuertz (UMR Biogeco), Valérie Troispoux (UMR EcoFoG, Daniela Florez (CIRAD), Margaux Llamas (CIRAD), Olivier Brunaux (ONF).

niklas.tysklind@ecofog.gf; myriam.heuertz@inrae.fr; valerie.troispoux@ecofog.gf; daniela_carolina.florez_parra@cirad.fr; margaux.llamas@cirad.fr; olivier.brunaux@onf.fr;

Location of the internship:

UMR EcoFoG, Campus Agronomique de Kourou, 97310 Kourou, French Guiana

Summary:

During the Anib@rosa2 (FEDER) project we studied the population structure of known provenances of rosewood, *Aniba rosodora*, in French Guiana. We used 12 microsatellites (SSRs, simple sequence repeats) on 120 individuals and identified significant population structure among the different provenances. We also generated an annotated reference genome (1560 contigs; 1.07Gb long; 97.8% BUSCO completeness) and analysed the transcriptomes of 24 individuals from four provenances varying in the oil yield after 10 years of growth in the plantation.

The M2 internship is part of the GEYSER project recently funded through CRB IBISA 2023 call "Réseaux Nationaux des Centres de Ressources Biologiques". In this project, we aim to develop an high-throughput microsatellite genotyping approach, SSRseq (Lepais et al. 2020), from the *Aniba rosodora* reference genome to genotype all the individuals from the Risquetout Experimental plantation established in 2002, so that the plantation can be incorporated into the *Centre de Ressources Biologiques de Guyane*, managed by the CIRAD. Samples from other plantations (COMBI and BAFOG Experimental plantations, other Commercial plantations) and from natural populations will also be incorporated into the genotyping effort. Furthermore, GEYSER will allow us to resequence the genome of rosewood so that we can obtain a chromosome level genome assembly.

The M2 internship candidate will contribute to 1) sampling of the plantation trees and sampling of natural populations; 2) extraction of DNA from the collected samples; 3) analysis of the resulting SSRseq data; 4) do comparative genomics on the newly assembled genome with other published Lauraceae genomes (optional task if time permits).

Background information:

Aniba rosodora, also known as rosewood (En.) and *Bois de rose* (Fr.), is a hardwood tree from northern South America from the Lauraceae family. The whole tree is fragrant, producing a highly demanded essential oil (EO) containing monoterpene alcohol linalool. The EO extraction process is destructive, as the tree is felled. The EO is used in the luxury **perfume industry**, **aromatherapy**, and the cosmetic sector, and has sedative, antibiotic, antioxidant, cytotoxic, and antimutagenic properties (Giordani and Kaloustian 2006; de

Almeida et al. 2009). Rosewood is part of the history of French Guiana, as the tree sustained a **lucrative industry** during the early 20th century. However, the destructive method of oil extraction has led to sharp declines in rosewood populations across the entire species' range. Rosewood is considered an **endangered species** cited in Appendix II of CITES, banning international trade of the wood and its derivatives since the 1970s. To supply the demand of the EO and relieve wild populations, plantations have been put in place (Amusant et al. 2015, 2016) combining seeds from several provenances.

Profile of the candidate:

We seek a biologist or bioinformatician with an interest in population genetics, conservation genetics, the analysis of genotyping data, and potentially comparative genomics. The position includes some field work, mainly the collection of samples from plantations and potentially wild populations of rosewood; lab work is expected, and training in DNA extraction will be provided; candidates with good analytical skills and adequate written English will be preferred.

Funding of the M2 internship:

GEYSER project (CRB IBISA funding)

Almeida, Reinaldo Nóbrega de, Demétrius Antonio Machado Araújo, Juan Carlos Ramos Gonçalves, Fabrícia Costa Montenegro, Damião Pergentino de Sousa, José Roberto Leite, Rita Mattei, et al. 2009. "Rosewood Oil Induces Sedation and Inhibits Compound Action Potential in Rodents." *Journal of Ethnopharmacology* 124 (3): 440–43.

Amusant, Nadine, Jacques Beauchène, Alexis Digeon, and Gilles Chaix. 2016. "Essential Oil Yield in Rosewood (Aniba Rosaeodora Ducke): Initial Application of Rapid Prediction by Near Infrared Spectroscopy Based on Wood Spectra." *Journal of Near Infrared Spectroscopy* 24 (6): 507–15.

Amusant, Nadine, Alexis Digeon, Laurent Descroix, Olivier Bruneau, Vincent Bezard, and Jacques Beauchène. 2015. "Planting Rosewood for Sustainable Essential Oil Production: Influence of Surrounding Forest and Seed Provenance on Tree Growth and Essential Oil Yields." *Bois et Forets Des Tropiques* 6 (326): 57–65.

Giordani, R., and J. Kaloustian. 2006. "Action Anticandidosique Des Huiles Essentielles: Leur Utilisation Concomitante Avec Des Médicaments Antifongiques." *Phytotherapie* 4 (3): 121–24.