Adapt-in-wild

Study of the climate adaptation of wild coffee (Coffea canephora)

ABSTRACT

Coffee is the second largest trade commodity exported by Southern countries. Brazil is the first coffee producer worldwide and is also an important consumer. Coffea canephora (Robusta) provides 33% of global, and 22% of Brazilian coffee production. Climate change (warming and irregular rainfall patterns) however would have strong negative impacts in coffee production. On our knowledge, adaptive strategies mitigating these effects largely depend (1) on how crops respond to climate variability and (2) on the availability of genetic resources within wild populations, as a basis for drought- and heat tolerance traits.

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Project type : AAP MOBILITE
Research units in the network : IPME-PHIM
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Flagship project : no

Project leader : PONCET Valérie
Project leader's institution : IRD
Project leader's RU : DIADE

Budget allocated : 6804 €
Total budget allocated (including co-financing) : 6804 €
Funding : Labex

GOAL

We propose to conduct a detailed analysis of the relationship between climate change and C. canephora genetic variation at the level of both genome and drought-tolerance candidate genes, using the geographic distribution of wild C. canephora African populations with contrasted habitats.
The aim of this project is to training a Brazilian Ph.D. student in bioinformatics and landscape genomics in a collaborative network.

ACTION

The objectives are to better understand the genetic and biological basis of coffee drought tolerance in C. canephora and to characterize the underlying diversity both in cultivated and natural germplasm (wild populations).
We will conduct a detailed analysis of the relationship between climate change and C. canephora genetic variation in its wild and natural environment.

The first part of the work will be to train Sinara Oliveira de Aquino to the bioinformatics management of NGS (resequencing) data and the use of R Programming (for statistical analysis). She will follow the training sessions proposed by the i-trop platform at IRD.
Then, Sinara Oliveira de Aquino will analyze climatic data (downloaded from public platforms) in both present and future environment.

Finally, based on a robust statistical approach, we propose to assess relationships between genomic and climate data to provide a comprehensive map of selection signals in the genome.
A manuscript will be initiated to publish the main results.

RESULTS

Adapt-in-Wild will allow the training of a Brazilian Ph.D. student in the latest bioinformatics appoaches, climatic models and genome wide association studies (GWS).
Adapt-in-Wild will strengthen the collaboration between UMRs DIADE & IPME and their Brazilian partners (EMBRAPA and UFLA).
The detection of putative adaptive regions of the genome of the present populations will help to predict their response to future environmental changes.