

SahelPalms

Sustainable development of palm based agroABSYSs in Sahel using innovative sex markers

ABSTRACT

The Sahel, whose population will double by 2050, faces a major humanitarian challenge with over 17 million people affected by the food crisis. The 128.5million inhabitants of sub-Saharan countries are heavily dependent on agriculture, which is experiencing one of the most severe forms of degradation of plant genetic resources amplified by climate change and insecurity. In such a context, Sahel countries must develop an agriculture based on the sustainable management of agroecosystems in order to ensure the food and nutritional security of the populations. Three palm species, the Date palm (*Phoenix dactylifera*), Rhun palm (*Borassus aethiopum*) and Doum palm (*Hyphaene thebaica*), are among the plant species adapted to the semi-arid environments of the Sahel. They are an important food and medicinal resource and generate significant incomes through associated activities (crafts, construction, firewood, etc.). In addition, these palm trees provide plant cover and are the basis of diversified agrosystems. Today, palm groves are aging and threatened by overexploitation, and their preservation and sustainable development is a key issue. However, these species are dioecious, i.e. male and female flowers are borne by different individuals, and sexual multiplication produces as many male and female individuals, whereas only the latter are sought after for the production of fruits. Therefore, late sex identification (5 to 15 years after planting) and the cultivation costs of unproductive male plants are an obstacle to the development of palm groves.

The SAHEL PALMS project relies on the use of a technological innovation based on genetic markers associated with early sexing of palm trees. Our team has indeed already developed such markers for the date palm, and the proposed activities build upon our previous works.

Our objective is dual:

- 1) To search for new sex-linked sequences for Rhun and Doum palms by exploiting genomic data and using a probabilistic tool called SD-POP,
 - 2) To provide for the first time the proof of concept for the large-scale use of these sex markers for the early selection of female Date palm seedlings and evaluate the operational potential of this approach.
- This multi-actor and trans-national project, which includes research, innovation and training components, will be developed within the DIADE unit and with partners from ISEM, LBBE, Switzerland, Djibouti, Niger and Benin. It relies upon the participation of stakeholders from the palm value chain, including farmers, NGOs and academics, and will promote experience exchange and capacity building. The project will allow to identify new sex-related DNA sequences opening the way towards new sex markers for dioecious palm species. Also, we will produce a guide to good practices for date palm early sexing, to valorise our findings.

SAHEL PALMS paves the way for the development of new agroecosystems and the restoration of threatened ones, and will contribute to reducing poverty and enhancing biodiversity, food security and welfare of Sahel populations.

Keywords : Palm tree, Sex markers, *Borassus aethiopum*, *Hyphaene thebaica*, *Phoenix dactylifera*

Year : 2021

Project number : 2101-014

Type of funding : AAP OS

Project type : AAP

Research units in the network :

Start date : 2022-01-01

End date : 2022-12-31

Flagship project : no

Project leader : Frederique ABERLENC

Project leader's institution : IRD

Project leader's RU : DIADE DIADE

Budget allocated : 29160 €

Total budget allocated (including co-financing) : 29160 €

Funding : Labex

GOAL

The general objective is the development and use of a technological innovation based on molecular markers for the early sexing of palm trees. We propose to exploit the potential of high throughput genome sequencing methods and the exploration of palm genomic data to identify new sex markers. In collaboration with our partners from Niger, Benin and Djibouti, we propose to develop and evaluate innovative early sexing tools to select female plants with high added value to support actors in local sectors in a strategy of palm trees sustainable management in Sahelian countries. Thus, we will be able to create innovative solutions and assess their operational potential in the field, with a view to scaling up the technological approach across all the countries concerned.