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***Implanteus Graduate School* Academic**

**Year 2021 - 2022   
Proposal of M2 Internship**

***Title: Melon diversity and reproductive barriers***

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**Context:** Genetic diversity is an essential lever for meeting the challenges of agro-ecological transition in agriculture, reducing the use of pesticides and adapting crops to climate change. Genetic resource collections are essential for the variety improvement process. At INRAE-GAFL we have very rich genetic resource collections in 5 important vegetable species, which are maintained in the Vegetable Biological Resource Center. The use of these resources is limited by reproductive barriers, between domesticated and wild pools within species and between domesticated and related species.

In this internship, we propose to study reproductive barriers in melon (*Cucumis melo* L.), an allogamous species with strictly entomophilic reproduction. *C. melo* is a model species for the study of the reproductive system in plants. We previously identified the genes that control co-existing of unisexual female and male flowers on the same plant (Boualem et al. Science 2015; Plos One 2016). Melon is a species with a very high genetic diversity worldwide, especially a high diversity of fruits, consumed sweet or immature. The wild compartment of melon and melon-related species (*Cucumis* ssp.) constitute a reservoir of diversity that is still poorly understood and underused. The melon genome is small (450 Mb) and has been fully sequenced and more than 1000 accessions have recently been resequenced, allowing for a history of melon domestication and diversification (Zhao et al., Nature Genetics, 2019).

**Objectives:** This project aims to explore the diversity of a melon collection and identify reproductive barriers (1) within *C. melo*, between 20 wild and 20 domesticated accessions from Sudan to get as close as possible to the domestication process and (2) between melon and wild relatives, to explore the possibilities of interspecific crosses. The objectives of the internship are:

- to analyze the genetic variability of domestication-related traits between wild and cultivated pools, by analyzing data already acquired on 40 accessions from Sudan

- to identify and phenotype traits related to vigor and fertility of intraspecific hybrids obtained between wild and domesticated pools and interspecific hybrids between melon and related species.

The methods implemented are:

- phenotypic evaluation of quantitative traits related to the domestication process (seed and organ size, pollen fertility etc.) and hybrid vigor (number of seeds, germination rate, seedling vigor, flowering earliness and hybrid fertility) in the greenhouse and in the laboratory

- statistical analysis of data (comparison methods, genetic variation and diversity analysis)

**Prerequisite skills**: Knowledge in genetics, statistical analysis with R, rigorous phenotypic measurements