

Job description: Postdoctoral position in cellular biology – Editing groups of *cis*-regulatory elements to improve maize tolerance to water deficit, a multi-level study

W/M Postdoctoral position, 24 months

Work environment, missions and activities

The postdoctoral fellow will be welcomed in the GEvAD team (Evolutionary Genetics and Crops Adaptation, <http://moulon.inrae.fr/en/equipes/gevad/>) at the UMR Quantitative genetics and Evolution (GQE) – Le Moulon (Gif-sur-Yvette, France). At GEvAD, we combine different approaches (lab and field experiments, models, population genetics, genomics, and systems biology) to explore the evolutionary mechanisms underlying plant domestication and adaptation of crops to the environment. The lab is part of IDEEV (the Institute for the Diversity, Ecology and Evolution of the Living World, <https://www.ideev.universite-paris-saclay.fr/en/>), located on the Paris-Saclay campus. The postdoctoral fellow will participate to the ANR DEREgULE project, led by Maud Fagny, and funded by the Advanced Plant Breeding PEPR.

As part of the ANR JCJC NETWITS (2024-2029) project, we have identified key *cis*-regulatory elements involved in the rewiring of gene regulatory networks in response to water deficit for five maize genotypes in five different tissues. We showed that affected pathways differed between genotypes, according to their macroscopic response to water deficit. This work allowed us to identify dozens of *cis*-regulatory elements regulating different genes within a few biological pathways.

The aim of DEREgULE is to validate the function of the identified *cis*-regulatory elements, and to obtain maize lines more tolerant to water deficit by CRISPR edition of their genome.

To lead this work, we are looking for a postdoctoral fellow with cross-disciplinary skills in molecular/cellular biology and genomic data analyses. For the few targets already identified, the postdoctoral fellow will first perform *in vivo* validation of these elements through protoplast transforming assays. In the meantime, the postdoctoral fellow will identify other *cis*-regulatory elements involved in water deficit response in B73 to be tested. In particular, they will aim to identify families of *cis*-regulatory elements carrying the same transcription factor binding sites and regulating genes within the same biological pathways. To this end, they will (1) analyze several datasets (networks, eQTLs, GWAS, chromatin opening/closing in response to water deficit), (2) check for the presence of homologs in the transformable A188 line using comparative genomics approaches and (3) validate the targets *in vivo*. In collaboration with the RDP lab in Lyon, the fellow will then obtain edited maize lines that will be assessed for phenotypic response to water deficit. This work will be supervised by Maud Fagny and Clémentine Vitte, and be led in collaboration with Carine Réjoué, labmanager. The greenhouse experiments in S2 will be carried out with the help of the technical team, in particular Florie LeGentil, responsible for the greenhouse experiments for the GEvAD team.

Your aims will be:

- To perform a meta-analysis of several studies to identify the best candidates for the editing experiment, in collaboration with the students and researchers having generated the data.

- To set up and perform enhancer/silencer reporter assays and deadCas9 assays in protoplasts to validate candidates and identify the edition targets in collaboration with the RDP lab. The editing experiment itself will be performed at the RDP.
- To design and perform a phenotyping experiment of edited maize lines in an S2 greenhouse.
- To perform a comparative genomic analysis to study the dynamic and evolution of these elements in large available datasets.
- To organize data for publication in public repositories (<https://data.gouv.fr>), in collaboration with the lab's bioinformatics engineers.
- To participate to project meetings with the collaborators
- To participate to the diffusion and valorisation of the results by writing articles, presenting posters and giving talks at conferences.

To be noted: Some remote working is possible (3 days a week max, depending of the tasks to be performed). In-person attendance at team meetings, axes meetings and semIDEEV is mandatory.

Required skills and knowledges

- The candidate is required to hold a PhD.
- Technical and theoretical knowledges are required in
 - o advances in molecular and cellular biology and functional genomics (advanced)
 - o genomics and data analyses (intermediate)
- Knowledges in comparative genomics and population genetics are will be appreciated but are not necessary.
- The candidate is required to have practical knowledge of some bioinformatics analyses tools. Programming skills are required in at least one of the following languages: python or R. Skills in shell and SLURM-based computational clusters and a knowledge of FAIR data handling principles will be appreciated.
- Writing scientific articles, giving poster presentations and talks are required skills to valorize the scientific results.
- Spoken & written English: B1 to B2 level (Common European Framework of Reference for Languages) is required.
- A capacity to work in a interdisciplinary (computational biology and cellular biology) team is required.
- Interest in supervising students (Licence and Master internships) will be appreciated. The candidate will have the opportunity to help supervise PhD students.