



Postdoctoral position on apocarotenoid signaling of proximity vegetation and shade

We are seeking for a motivated postdoctoral researcher to work on plant adaptation to nearby vegetation and shade in intercropping agricultural systems and on the role of volatile carotenoid cleavage products in this adaptation. This work is part of the international and multi-disciplinary UToPIQ project funded by PRIMA (Partnership for Research and Innovation in the Mediterranean Area). The main goal of UToPIQ is to develop and use tomato lines tolerant to proximity shade to increase yield in intercropping agrosystems.

Duration: 2 years.

Location: The Bioscience and Biotechnology Institute (BIAM) of Aix-Marseille located at CEA/Cadarache, 13115 Saint-Paul-lez-Durance in the South of France. The Institute is a joint unit run by CNRS, CEA and Aix-Marseille University which has recently moved to a new building (March 2021) equipped with all modern facilities in biology and plant sciences.

Intercropping is a conservation agriculture practice that involves growing two or more crops in close proximity to one another. Intercropping promotes biodiversity and enhances crop resilience to extreme environmental changes, but it can also increase crop yields in both low-input (traditional) and high-input (intensive) agrosystems. Development of intercropping is currently limited by the reduced toolbox of crop varieties amenable to this farming practice and by our limited understanding about the biochemical and molecular basis of the communication among plants. The work that will be conducted by the recruited postdoctoral fellow is centered on this second aspect of shade adaptation.

Exposure of *Arabidopsis* plants to proximity shade results in carotenoid degradation (Ortiz-Alcaide et al. 2019), which could be regulated by carotenoid cleavage dioxygenases (CCDs). CCD activity produces carotenoid cleavage products (apocarotenoids), some of which regulate plant development and stress responses (Felemban et al. 2019, Havaux 2020). In particular, volatile β -cyclocitral and derived water-soluble metabolites, such as β -cyclocitric acid, are known to induce the expression of nuclear genes involved in defense mechanisms against environmental stresses (photooxidative stress, drought) and to inhibit gene expression related to development, cell division, elongation and growth (Ramel et al. 2012, D'Alessandro et al. 2018, 2019). Volatile β -cyclocitral is also released by tomato fruits, strongly contributing to flavor and overall acceptability. The main goal of this project is to investigate the role of apocarotenoids, including β -cyclocitral, released by shade-exposed plants in the regulation of the development of neighboring plants. UToPIQ will investigate this aspect using *Arabidopsis* and tomato. This research will use physiological, biochemical and molecular biological tools as well as several BIAM platforms (Phytotech, HelioBiotec, ...). The results might lead to novel discoveries that will eventually contribute to improve crop performance in intercropping agroecosystems.

Candidates with background in plant biochemistry and/or molecular biology are invited to apply for this position by sending their CV and motivation letter to Dr. Michel Havaux at michel.havaux@cea.fr

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