Year of CfP: 2009

Project No 0901-006

Project title: Development of a non-destructive near infrared spectroscopic phenotyping methodology for mandarin fruits as an aid to the study of phenotypic variability in response to water stress and to varietal selection

Unit managing the project: Qualisud (Integrated food processing) [CIRAD, Montpellier SupAgro, UMI, UMII]

Project leader: Guy Self [guy.self(a)cirad.fr]

Countries involved in the project: Morocco

Sub-thematic axes: IPB-1 (Integrative Plant Biology 1: *Genetics and genomics, plant breeding, ecophysiology*), STDI-1 (Socio-Technical Dynamics of Innovation 1: *Agri-environmental innovations, agri-ecosystems, resources management*), STDI-2 (Socio-Technical Dynamics of Innovation 2: *Agrifood innovations, food and non-food use of plant crops*)

Objectives:

Improving management of water resources, while increasing product quality to support a sustainable agriculture is one challenge currently facing the Mediterranean basin. Of tropical and subtropical origin, citrus, the region's principal fruit crop provides an excellent model to study this challenge as it requires both water and heat to produce quality fruit. With water resources in the Mediterranean basin becoming more scarce, in part due to global climate change, their judicious management will be key in producing citrus in the future. For instance, it has been shown that water stress applied at precise times during fruit development resulted in better quality mandarin fruit. Progress in breeding can also improve water-use efficiency. Increases in productivity, plant vigour, harvest index and photosynthetic efficiency should all lead to substantial economies in water use. Recent work has shown that triploidy increases tolerance to salt stress and water deficit. Most current varieties are diploid, self-incompatible and produce quality fruits without seeds. However, their pollen and ovules are viable and produce seeds by cross pollination with other citrus varieties. This creates an important commercial problem, because consumers tend not to accept seedy mandarins. Triploids are sterile and usually do not produce seeds. We have started a triploid breeding program and have now created more than 3000 triploid hybrids. In addition to fruit quality monitoring, it is necessary to evaluate the water use efficiency of those new hybrids. At the same time, it is vital to maintain or even improve fruit quality to sustain performance in highly competitive markets.

The speed and ease with which quality criteria can be evaluated is essential in order to accelerate gains in water resource management whether by genetic improvement or innovative production methods. Near infrared spectroscopy (NIRS) is a proven technology for the non-destructive quality evaluation of agro-food products, including citrus fruits. Portable NIR spectrometers have been used in the field to evaluate mango fruit quality, but progress has been limited by the performance, portability and ease of use of available equipment.

The objective of this project is to develop NIRS for the rapid evaluation of citrus fruit quality in the field. This phenotyping method can be applied to improve water management and to select high quality mandarin hybrids. This is expected to allow for the investigation of water use efficiency of the better selected hybrids as well as the effect of a more limited irrigation on the fruit quality of those hybrids.

Total Agropolis Fondation funding: €31,200 (equipment, travel expenses, running costs)

Funding category(ies): Agropolis Fondation small grants (support for small exploratory, risky and innovative projects, « proof of concept », new frontier research…)

Project duration: 01 September 2009 - 31 December 2012

Keywords: spectroscopy – mandarin fruit – selection – water stress – phenotype