

Year of CfP: 2007

Project No: 07042 Completed

Project title: The varietal diversification process in fig and olive in Morocco: an ethnobiological and genetic interdisciplinary approach.

Unit managing the project: AGAP (Genetic improvement and Plant adaptation, CIRAD, INRA, Montpellier SupAgro)

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Country involved in the project: Morocco

Research units from the Foundation's scientific network involved: DIADE

Subthematic axes: IPB-1 (Integrative Plant Biology 1: *Genetics and genomics, plant breeding, ecophysiology*), STDI-3 (Socio-Technical Dynamics of Innovation 3: *Innovation processes, social management of innovations*)

Objectives:

The aim of the project is the identification of the varietal diversification processes in two Mediterranean fruit species with strong emblematic, cultural, social and economic value—fig and olive. Cultivation of the two species is very ancient around the Mediterranean but their situation is very contrasted in Morocco as regards genetic structure, functions and uses. This unique, paradoxical feature leads us to questioning firstly the biological and genetic foundations and secondly the historical, social and cultural bases that have resulted in this contrasted situation. We address the question using a combined genetic and ethnobiological interdisciplinary approach. A common field for the work undertaken in the Rif region in Morocco will make a solid contribution to enriching the combined use of the two disciplines.

Two initial actions are planned for fig to establish solid foundations for knowledge:

- verification of the hypothesis of the existence in Morocco of multiple centres of local domestication of fig using a genetic approach
- identification of the social and cultural factors in the Rif fig diversification process.

Action carried-out and results obtained:

This research project was focused mainly on gaining insight into and identifying the key biological and social factors that determine the variety diversification process in two emblematic fruit tree species with high socioeconomic potential—fig and olive. We investigated this issue essentially with respect to fig trees through an interdisciplinary ethnobiological–genetic approach.

The thesis research of H. Achtak involved surveys and sampling of local fig varieties and spontaneous populations (seedling) in six eco-geographic zones in northern, central and southern Morocco where traditional agroecosystems prevail. These fig samples were analysed with microsatellite markers and a population genetics approach. The thesis research of Y. Hmimsa involved surveys in 189 villages in the Rif region of northern Morocco, which is a mountainous area inhabited by three distinct sociocultural groups (Jbala, Zenetes and Ghomara), in order to record fig variety names and their pomological characteristics. Semi-structured interviews and ethnobiological surveys were conducted in the village of Talandaoued to assess the classification of fig varieties in that region.

The ethnobiological analysis revealed that fig is a key element in traditional mountain agroecosystems such as those found in northern Morocco. The varietal diversity is the result of farmers' practices associated with the social organization, family choices and plant exchange

conditions. Fig varieties are exchanged between neighbouring areas and seldom over long distances. We also examined the role of different types of management of spontaneous figs within cultivated areas and the classifications of these seedlings. We thus identified a social and technical varietal selection process that is under way in northern Morocco (thesis of Y. Hmimsa).

The genetic analysis revealed that domestication of spontaneous fig trees is a highly localised process (within geographical zones such as the Rif in northern Morocco and the oases in the south). There is high genetic proximity between spontaneous fig seedlings and local varieties within each region. These close genetic relationships could also be partly explained by gene flow between varieties and spontaneous figs, and also by farmers' practices that were highlighted by the ethnobiological studies, including caprification and management of seedlings and vegetatively propagated trees within cultivated fields (thesis of H. Ahtak).

In light of the interdisciplinary ethnobiological–genetic study findings in this project, we propose a scenario explaining the domestication and diversification processes under way, which would warrant further study, especially in relation to in situ conservation. In fig, varietal diversification is the result of farmers' selection of local spontaneous figs, while the combined effects of biological traits of the tree and socioeconomic factors are also involved. In olive, ongoing research (thesis of H. Haouane) has indicated that diversification may be the result of primary domestication and secondary diversification facilitated by the combined presence of vegetatively propagated trees and spontaneous figs within cultivated fields. This shows the dynamic role of farmers' practices in the varietal diversification process.

Publications:

H Ahtak, A Oukabli, M Ater, S SantoniJ. F Kjellberg, B Khadari (2009) Microsatellite Markers as Reliable Tools for Fig Cultivar Identification , AMER. SOC. HORT. SCI. 134(6):624–631. 2009.

H Ahtak, A Oukabli, M Ater, S SantoniJ. F Kjellberg, B Khadari (2010) Traditional agroecosystems as conservatories and incubators of cultivated plant varietal diversity: the case of fig (*Ficus carica* L.) in Morocco, BMC Plant Biology, 10:28

Prospects for the future:

On the basis of several projects and collaborations (FruitMed 901-007, GDR Mosaique 3353, collaboration with ICARDA), we are pursuing our research by conducting an in-depth study on the role of clonally propagated trees and spontaneous figs in the diversification of Mediterranean fruit trees. In addition, we will assess the roles of public policies and new stakeholders such as nursery growers in the configuration of tree agrodiversity in the Mediterranean region. Following the discussions currently under way on the research organization in the Mediterranean Basin, we plan to develop a large-scale ANR project on diversification processes in relation to in situ conservation and the evolution of traditional agroecosystems.

Total Agropolis Fondation funding: € 75,980 (salary for two PhD students, travel expenses, running costs)

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