

PROJECT TITLE

Phenotyping cork oak (*Q. suber* L.) seedlings for investigating local adaptation to long-term drought

CONSORTIUM

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SUMMARY OF THE REPORT

The CREA Research Centre for Forestry and Wood in Arezzo (Italy) focuses on sustainable silviculture, forest genetic resources management, improvement and conservation, forest multifunctionality, resilience and adaptability to global environmental changes as well as agroforestry and valorisation on wood and non-wood products.

Cork oak (*Q. suber* L.) is an evergreen species native of the Mediterranean basin. Summer drought is the most important selection agent in Mediterranean ecosystems and plants exhibit morphological and physiological adaptations to cope with this environmental stress. Cork oak is one of the most economically important species in the Mediterranean area. Its value relies on cork production, used in several industrial processes, and on silvo-pastoral activities. Environmental changes in the Mediterranean basin have raised the concern on the resilience of *Q. suber*. In fact, several cork oak populations have declined due to forest fires and diseases, overgrazing, land abandonment and exploitation, with subsequent biodiversity loss and degradation of ecosystem services (Costa et al. 2010).

Cork oak is genetically unstructured species, with genetic divergence assessed by neutral molecular markers, but a recent paper has showed the existence of variation clines for the individuals to cope with local conditions (Pina-Martins et al. 2019), in particular with climate variables related to temperature and precipitation gradients and consequently drought. Additionally, population differentiation has been found in seed size (an important trait for tolerance to drought stress; Ramírez-Valiente et al. 2009a), jointly to capability to develop local adaptations in response to natural selection (Ramírez-Valiente et al. 2009b; Ramírez-Valiente et al. 2011).

Therefore, distinguishing different responses of cork trees to the long-term drought in accordance to their origin, would be an important asset to plan strategies for afforestation projects and productive plantations. In Italy, Sardinia is the main region having cork cover. Recently, a strategy to certificate local cork oak populations has started, in accordance to the Directive 1999/105/EC, which implemented the definition of the Regions of Provenance for this species and the identification of source-identified seed sources (de Dato et al. 2018). Our preliminary studies on seedlings from these seed-source forests suggest that, under controlled environmental conditions, two populations from areas with dissimilar climate have different responses to water stress. The main purpose of this access is to assess whether we can use phenotyping platforms to quantify this response in the young plants of a long lived tree species.

Phenotypic characterization by the Aberystwyth plant phenotyping platforms will allow us to determine how much is the influence of original environment/population on seedling performance and would place a key stone for future steps into selection of this species in Italy.