Aridity Gradients Shape Intraspecific Variability of leaf functionl Traits in Native *Olea europaea* L. of Morocco

Abstract

Investigating the adaptive mechanisms of plants to drought is imperative for ecological studies, particularly in the current era of climate change and escalating aridity. This study specifically delves into the intraspecific variations of phenotypic traits in the wild olive (*Olea europaea* subsp. *europaea* var. *sylvestris*), a quintessential model species of the Mediterranean Basin, as influenced by diverse environmental factors. The primary objective of this functional analysis is to assess nine distinct leaf and plant-size related traits across a sample of 130 trees belonging to 13 populations. These populations are dispersed across varying environmental conditions. The results indicate discernible patterns of covariation in the nine scrutinized traits along the studied environmental gradients. These trends are intricately linked to distinct plant strategies, notably centered around resource acquisition, resource allocation, and water utilization. In this context, the wild olive trees exhibit substantial intraspecific diversity, both across different populations and within each population, in direct correlation to the environmental gradients. The comprehensive analysis reveals that a combination of climate factors, altitude variations, and the extent of vegetation cover collectively account for an impressive 93.8% of the observed trait covariations. Crucially, the study elucidates the underlying mechanisms employed by wild olive trees to counter the adversities of challenging environmental conditions. The findings underscore a pronounced shift in the species towards a conservative plant strategy characterized by diminished resource allocation and heightened efficiency in water usage. This resilient strategy enables the wild olive trees to withstand and endure the pressures of extreme environmental stress. Significantly, the study accentuates the critical significance of accounting for intraspecific variations in plant responses when studying the impacts of environmental stressors.