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## Environmental gradients shape the genetic structure of two medicinal *Salvia* species in Jordan

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**Abstract:** Environmental gradients, and particularly climatic variables, exert a strong influence on plant distribution and, potentially, population genetic diversity and differentiation. Differences in water availability can cause among-population variation in ecological processes and can thus interrupt populations' connectivity and isolate them environmentally. The present study examines the effect of environmental heterogeneity on plant populations due to environmental isolation unrelated to geographic distance. Using AFLP markers, we analyzed genetic diversity and differentiation among 12 *Salvia spinosa* populations and 13 *Salvia syriaca* populations from three phytogeographical regions (Mediterranean, Irano-Turanian and Saharo-Arabian) representing the extent of the species' geographic range in Jordan. Differences in geographic location and climate were considered in the analyses. For both species, flowering phenology varied among populations and regions. Irano-Turanian and Saharo-Arabian populations had higher genetic diversity than Mediterranean populations, and genetic diversity increased significantly with increasing temperature. Genetic diversity in *Salvia syriaca* was affected by population size, while genetic diversity responded to drought in *S. spinosa*. For both species, high levels of genetic differentiation were found as well as two well-supported phytogeographical groups of populations, with Mediterranean populations clustering in one group and the Irano-Turanian and Saharo-Arabian populations in another. Genetic distance was significantly correlated to environmental distance, but not to geographic distance. Our data indicate that populations from moist vs. arid environments are environmentally isolated, where environmental gradients affect their flowering phenology, limit gene flow and shape their genetic structure. We conclude that environmental heterogeneity may act as driver for the observed variation in genetic diversity.