6 = Effects of environmental heterogeneity on phenotypic variations of *Lilium pomponium* L.

Luigi Minuto[1], Carmelo, N. Macrì[1], Davide Dagnino[1], Maria Guerrina[1], Frédéric Médail[2], Gabriele Casazza[2]
[1]Department of DISTAV, University of Genoa, Corso Europa 26, 16132, Genoa, Italy; [2]Aix Marseille Université, Avignon Université, CNRS, IRD, IMBE. Technopôle de l'Arbois-Méditerranée, BP 80, 13545 Aix-en-Provence cedex 4, France

Species response to environmental changes is mainly determined by the response of ecologically marginal populations. Thus, to quantify the variation in the ecological traits across a species' geographic range is crucial to understand factors shaping the distributional patterns. In this study, we compared phenotypic variation in climatically marginal and central populations of *Lilium pomponium* L., a plant endemic to the Maritime and Ligurian Alps, spanning from Mediterranean to Alpine habitats. We used bioclimatic variables to group the populations into marginal Mediterranean (MM), marginal continental (MC), central (CC) and marginal subalpine (MS), based on their distance from the climatic optimum of the species. Phenotypic traits related to plant-pollinator interaction and to reproductive capacity (seed production and germination) were considered to verify differences in species performance from the center towards the margins. In particular, we evaluated: (I) the presence of the pollen limitation; (II) seeds production; (III) the capacity for self-fertilization; (IV) seed germination capacity; (V) flower dimension; (VI) the number of flowers per scape; (VII) the relative position of the sexual organs.
In *L. pomponium* geographic and environmental gradients was not concordant, in fact MC populations occupied the southern climatic margin, although they were not on the geographical periphery but closed to the centre of the distributional range. The MM and MC groups were more pollen-limited than CC and MS, no significant differences in seed production and seed set were detected among groups. This result may be explained by different factors like resources limitation, seed predation and herbivory can reduce seed production in CC and MS groups. Moreover, marginal groups did not show an increase in self-fertilization rate. Seed size increased from warm (MM and MC) to cold (MS) edges and in all groups seed germination decreased at high temperature, especially in CC and MS groups. These differences may be a strategy to increase the possibilities of germination, in fact in warm edge, seeds are small because they need less water to germinate than cold edge ones. Moreover, the exposure to warmest summer temperatures could make warm edge seeds more resistant to temperature increase. Flower dimension decreased from warm to cold edge likely because populations in warm edge (MM and MC) presents a short flowering period and require large flowers to attract pollinators. Moreover, in MC group plants had more flowers par scape to increase the level of geitonogamy, as the ability to carry out self-pollination is less than 0.1%. The results of the traits associated with the interaction plant-insect revealed that in *L. pomponium* the separation of sexual organs varied between individuals and populations, nevertheless the proportion of flower showing this separation was significantly higher in MM group. The difference detected in phenotypic traits suggests that populations occurring under different climatic conditions are exposed to different environmental pressure.