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ABSTRACTS

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An integrated analysis of functional and genetic diversity in depicting the adaptive strategies of plants. The case study of *Silene paradoxa*

Lorenzo Lazzaro[1], Daniele Ciampi[1], Ilaria Colzi[1], Cristina Gonnelli[1], Lorenzo Lastrucci[2], Daniele Viciani[1], Andrea Coppi[1]

[1]Department of Biology, University of Florence, Via G. La Pira, 4 - I 50121 Firenze, Italy; [2]Natural History Museum, University of Florence, via G. La Pira 4, I-50121 Firenze, Italy.

According to Grime's CSR theory (1) the selective pressures to which plants are subjected induce adaptive responses that follow three main directional lines. C-selected plants have developed highly competitive abilities, S-selected plants possess physiological peculiarities necessary to tolerate environmental stress and R-selected plants display characteristics necessary for the colonization of disturbed habitats. Such strategies reflect in a number of different plant traits, whose measurement can be used to place the plant in the CSR framework. Recently, Pierce et al. (2) showed that the position of individuals in the CSR framework can be reasonably deduced *via* the measurement of only three specific functional traits: leaf area (LA), leaf dry matter content (LDMC) and specific leaf area (SLA), representing interspecific variation in plant size and conservative vs. acquisitive resource economics, respectively. It is conceivable that individuals of the same species, grown in different environments, present different adaptive strategies and consequently differences in functional traits (3). Such adaptations to environmental changes may be the response of the combination of two main mechanisms: phenotypic plasticity and adaptive genetic variation.

The present study aimed to verify whether there are detectable differences in the CSR coordinates, identified through the measurement of LA, SLA and LDMC of individuals of *Silene paradoxa* L. (Caryophyllaceae) from environments with contrasting stress levels. The two selected environments were serpentine soils, characterized by high levels of heavy metals, and non-contaminated soils. We sampled 120 individuals from 12 populations, 6 growing on serpentine sites and 6 on non-serpentine sites. Moreover, the present study aimed to investigate the possible relationship between phenotypic plasticity and genetic diversity, through DNA-fingerprinting techniques. The analysis of the functional traits showed a marked phenotypic plasticity of *S. paradoxa*, with the populations of serpentine sites significantly polarized towards the S component of the CSR triangle. The ecological constraints responsible for the development of functional plasticity could have also influenced the genetic structure of populations. In fact, even if the values of genetic diversity at the intra-population level did not differ between populations of serpentine and non-serpentine sites, we recorded a shift in gene pool selection. It is therefore conceivable that the stress due to the presence of heavy metals acted as a filter of the populations' gene pool. The effect due to the particular edaphic conditions seems to have also acted on the selection of some regions of the genome of the species, with various portions of the genome that are exclusive, or clearly prevalent, of the serpentine and non-serpentine populations.

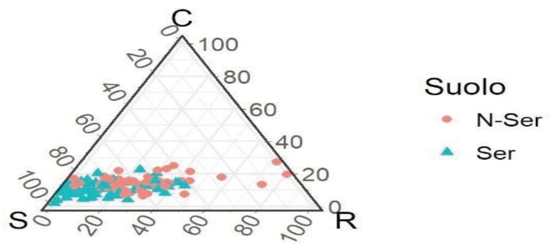

Fig. 1 *Silene paradoxa* on serpentine soil. Fig. 2. CSR tri-plot for the 120 individuals of *S. paradoxa* growing on serpentine (Ser) and non-serpentine (N-Ser) sites.

1) J.P. Grime (1977) American Nat., 111, 1169-1194
2) S. Pierce, D. Negreiros, B.E.L. Cerabolini et al. (2017) Funct. Ecol., 31, 444-457
3) G. Astuti, D. Ciccarelli, F. Roma-Marzio et al. (2018) Plant Biosyst.: DOI:10.1080/11263504.2018.1435576