

DIVERSITY, PHYLOGENY AND DISTRIBUTION OF NI-HYPERACCUMULATOR ENDEMIC OF *ALYSSUM* SECT. *ODONTARRHENA* (BRASSICACEAE) IN THE TYRRHENIAN AREA: MORPHOLOGICAL AND MOLECULAR EVIDENCE

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Nickel hyperaccumulation is the ability to uptake and store more than 1000 $\mu\text{g}\cdot\text{g}^{-1}$ of Ni in above ground tissues dry-weight without toxicity symptoms, a rare physiological trait shared by a small number of plant taxa growing on metalliferous soils, especially serpentine. The taxonomically critical group of *Alyssum* sect. *Odontarrhena* is the most diverse Ni-hyperaccumulator lineage in the Euro-Mediterranean area, finding its differentiation hot-spot on the vast ophiolitic outcrops in the southern Balkans and Anatolia. In the Ligurian-Tyrrhenian and west Alpine area, the group includes three serpentinicolous, endemic taxa: *A. robertianum* Bernard ex Gren. & Godr., *A. bertolonii* Desv. and *A. argenteum* All. At least two other species, i.e. *A. nebrodense* Tineo on the Madonie massif in Sicily and *A. alpestre* L. on the W Alps, are instead found on limestone and/or dolomite. Nevertheless, both the taxonomical limits and the phylogenetic relationships between these taxa remain largely unknown, and the distribution of some species appears still unclear. In a recent study on the evolutionary dynamics of Ni-hyperaccumulation in the Euro-Mediterranean members of tribe Alysseae (Cecchi *et al.*, 2010), evidence emerged for a polyphyletic and polytopic origin of such specialization in *A. sect. Odontarrhena*, and for the existence of three major clades with no internal geographic cohesion. While *A. argenteum* was found to be nested in the continental and mainly Balkan group of *A. murale* Waldst. & Kit., the Tuscan populations of *A. bertolonii* resulted unexpectedly closer to those from the calcareous massifs in central-eastern Sardinia. Most of the authors included these insular populations in *A. robertianum*, while a few others referred them to the separate species, *A. tavolarae* Briq. In this study, the lack of typical material of *A. robertianum* from Corsican serpentine did not allow to shed light on this point. Similar doubts still exist on also the identity of the serpentine populations from the the northern Apennine outcrops (Emilia-Romagna and Lombardia), that are currently included in *A. bertolonii* (e.g. Pignatti, 1982; Conti *et al.*, 2005) though referred to the alpine *A. argenteum* by others (Vergnano, 1992). Thanks to a wider population sampling, we could address these questions using classical morphological and karyological methods combined with a molecular phylogenetic approach based on nuclear and plastid markers. These studies are highlighting an unexpected diversity and suggest the closer affinity of the Corsican and north Apennine accessions with the continental lineage of *A. argenteum-murale*, thus implying the separate status of *A. tavolarae* (Sardinian endemic) and a narrower distribution range for *A. bertolonii* (Tusco-Ligurian endemic).

Cecchi L., Gabbrielli R., Arnetoli M., Gonnelli C., Hasko A., Selvi F., 2010. Evolutionary lineages of nickel hyperaccumulation and systematics in European Alysseae (Brassicaceae): evidence from nrDNA sequence data. *Annals of Botany* 106: 751-767.

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