

Morphological characterization, germination ecology and conservation of narrow endemic plant species of the Aeolian Islands (Sicily)

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Aeolian Islands have a very rich biodiversity. Aeolian flora includes two priority species of Community interest listed in the Annex II and IV of the EEC Habitats Directive, i.e. *Cytisus aeolicus* Guss. and *Silene hicesiae* Brullo & Signorello, some narrow endemic taxa, such as *Genista tyrrhena* Vals. ssp. *tyrrhena*, *Centaurea aeolica* Guss. ssp. *aeolica*, *Erysimum brulloi* Ferro, *Bituminaria basaltica* Minissale et al. and *Anthemis aeolica* Lojac., as well as many other endemic species, in common with Sicilian, Apulian, Thyrrenian or C-Mediterranean territories [*Dianthus rupicola* Biv. subsp. *aeolicus* (Lojac.) Brullo & Minissale, *Limonium minutiflorum* (Guss.) O. Kuntze, *Ranunculus spicatus* Desf. subsp. *rupestris* (Guss.) Maire, *Seseli bocconi* Guss., *Bellis margaritaefolia* Huter, Porta & Rigo, *Carlina hispanica* Lam. subsp. *globosa* (Arcang.) Meusel & Kastner, *Eokochia saxicola* (Guss.) Freitag & Kadereit, *Helichrysum litoreum* Guss., *Heliotropium suaveolens* M. Bieb. subsp. *bocconeii* Guss., *Matthiola incana* (L.) R. Br. subsp. *rupestris* (Raf.) Nyman, *Glandora rosmarinifolia* (Ten.) DC. Thomas, etc.].

This study is focused on four narrow endemic species of the Aeolian flora: *Anthemis aeolica*, *Erysimum brulloi*, *Cytisus aeolicus* and *Silene hicesiae*.

Morphological characterization of seeds, seed germination and dormancy regulation have been investigated for these species. Specific experimental protocols were carried out to ensure plant propagation and long-term conservation both of seeds in the Catania Seed Bank and living specimens in field collections. Plant living collections, in particular, represent main resources for research studies, institutional exchanges, and production of certified native plants finalized to start recovery and restoration programs addressing the GSPC 2011-2020 targets.

Seed lots of the investigated species were collected in the respective type localities (Lisca Bianca, Stromboli e Vulcano, Alicudi, Panarea) between 2013 and 2015. Germination tests were carried out applying various thermoperiod regimes, either constant temperature (from 3 to 30°C) or alternating temperature

(10/15, 10/20, 15/20 e 20/25°C), with 12/12h and full darkness photoperiod. Plant propagation (seedling emergence tests) were carried out in late winter under greenhouse (10/25°C daily thermal excursion), using alveolar trays with 6:3:1 mixture of peat, volcanic ash soil and pumice.

Seeds of *Cytisus aeolicus*, similarly to many other legumes, showed a physical dormancy due to the hard and impermeable coats; different scarification methods (mechanical, thermal and chemical) had positive effects on seed germination. Seed ripening stage also influenced germination ability and dormancy induction. Fresh seeds, at different ripening stages (green, yellowish-green, yellow, brownish-yellow, brown hydrated), revealed diverse germination percentage, from 100% to 15%. Ripe brown and markedly dehydrated seeds exhibited hard impermeable seed coats, remained dormant and did not germinate without specific pretreatment.

Seeds of *Erysimum brulloi* and *Silene hicesiae* were characterized by high values of germination percentage and rate, both in light and darkness. *E. brulloi* reached up to 100% of seed germination at constant temperatures ranging between 10 and 25°C, while seeds of *S. hicesiae* needed 10 to 20°C to germinate, either in 12/12 h photoperiod or full darkness regime. Such absence of light sensitivity for seed germination is to assume that seed placement, both in open areas and under a vegetation canopy, is not a limiting factor to germination.

Anthemis aeolica produced dimorphic cypselas (dark and light coloured), which showed a different germination behaviour. Dark cypselas displayed a deep dormancy and no germination at any test condition, while the light ones had high germination percentage (>90%) at ranging temperature from 10 to 25°C and 12h daily alternating photoperiod.

Tests conducted on *E. brulloi*, *S. hicesiae* e *A. aeolica* seeds under alternating regimes of thermoperiod provided best germination responses (80-100%) at the following ranges, 15/10, 20/10 e 20/15°C, either with 12h daily light or total darkness photoperiod.

As far as seedling emergence is concerned, fastest and more uniform rates were recorded in *A. aeolica* (light cypselas), *E. brulloi* and *S. hicesiae* (from 80 to 94%); on the contrary, *C. aeolicus* showed lower and slower values ($\pm 50\%$).

The analyses of the main factors affecting seed germination processes in the investigated species (temperature, light, seed ripening) provided relevant information about seed ecophysiology useful for the determination of appropriate propagation and conservation procedures.



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