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Germination data of four Mediterranean species of coastal sand dunes

Abstract

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The present work gathers new germination assays of four Mediterranean species of coastal sand dunes. The studied species are: *Anthemis maritima* L. subsp. *maritima*, *Crucianella maritima* L., *Eryngium maritimum* L. and *Thinopyrum junceum* (L.) Á.Löve. Seeds were collected at the time of natural seed dispersal in two sites in the South of Sardinia. The germination tests were carried out at the Sardinian Germplasm Bank (BG-SAR). Our results show a high germination capability and germination rate for the tested plant species.

Key words: vascular plants, Mediterranean coasts, dune habitats, Sardinia.

Plant species who colonize coastal dune live in a sensitive equilibrium with some extreme conditions like high salinity, the lack of soil nutrients and wind exposure (Brown & McLachlan 1990). However, Mediterranean coastal dunes are threatened by several factors such as unsustainable tourism and invasive alien species. These threats can modify the dune structure, the vegetation and cause a loss of biodiversity. As a consequence, the knowledge of the best germination condition is important in the broader perspective of conservation action.

This work illustrates new germination data of four species of coastal dunes which are spread throughout the Mediterranean area: *Anthemis maritima* L. subsp. *maritima*, *Crucianella maritima* L., *Eryngium maritimum* L. and *Thinopyrum junceum* (L.) Á.Löve.

11. *Anthemis maritima* L. subsp. *maritima* (Asteraceae)

Accession data

Sa: Domus de Maria (Sud Sardegna), loc. Porto Campana, Chia (WGS84: 38.887864°N, 8.868983°E), duna costiera, 4 m a.s.l., 09 Jul 2014, M. Orrù & M. Duran (BG-SAR-2014-0089, Sardinian Germplasm Bank).

Germination data

Pre-treatments: no treatment.

Germination medium: 1% agar.

Sample size: 60 seeds (20 × 3 replicates).

Germination	Thermoperiod	Photoperiod [light/dark]	T ₁ [d]	T ₅₀ [d]	T _{max} [d]	MTG [d]
82.6%	constant 20°C	12/12h	3.0	6.0	35.0	9.5

Observations

Anthemis maritima subsp. *maritima* is a perennial species of white dunes distributed throughout the Mediterranean area in which contributes to coastal sand dune edification and restoration (De Lillis & al. 2004). Seeds of *A. maritima* subsp. *maritima* showed an optimal germination temperature of 20°C; in addition, high germination was obtained also at 15°C reaching value of 72.7%. The results obtained by BG-SAR, testing the seeds at both 15 and 20°C, showed higher germination percentages than reported by Benvenuti (2016) for *A. maritima* collected in Torre Mozza (Livorno, Italy). Very few germination data are present in literature for this species.

12. *Crucianella maritima* L. (*Rubiaceae*)

Accession data

Sa: Villasimius (Cagliari), loc. Simius (WGS84: 39.121822°N, 9.523533°E), duna costiera, 2 m a.s.l., 18 Jul 2011, *M. Orrù* & *S. Pinna* (BG-SAR-2017-0523, Sardinian Germplasm Bank).

Germination data

Pre-treatments: no treatment.

Germination medium: 1% agar.

Sample size: 100 seeds (25 × 4 replicates).

Germination	Thermoperiod	Photoperiod [light/dark]	T ₁ [d]	T ₅₀ [d]	T _{max} [d]	MTG [d]
95.2%	constant 15°C	0/24h	–	–	21.0	–

Observations

Crucianella maritima is a suffruticous chamaephyte considered an important species of the coastal fixed dunes habitat. As reported by Del Vecchio & al. (2012), germination of *C. maritima* seeds is characterized by photoinhibition and intraspecific differences in final germination percentages was highlighted depending on the seed provenance. Germination was scored only at the end of the test (21 days) so it was not possible to calculate T₁, T₅₀ and MTG. In accordance with the previously reported data, the results shown here and

obtained from seed collected in Villasimius population highlighted high germination when tested at 15°C in dark conditions. Contrarily, percentages of 73% (at 10°C) and 57% (at 20°C) obtained under light condition (8h light/16h dark) have been reported for *C. maritima* by Royal Botanic Gardens Kew (2019).

13. *Eryngium maritimum* L. (*Apiaceae*)

Accession data

Sa: Domus de Maria (Sud Sardegna), loc. Dune Campana, Chia (WGS84: 38.887650°N, 8.869067°E), duna costiera, 13 m a.s.l., 18 Oct 2011, *M. Orrù* (BG-SAR-2017-0776, Sardinian Germplasm Bank).

Germination data

Pre-treatments: Cold stratification at 5°C for 60 days.

Germination medium: 1% agar.

Sample size: 75 seeds (25 × 3 replicates).

Germination	Thermoperiod	Photoperiod [light/dark]	T ₁ [d]	T ₅₀ [d]	T _{max} [d]	MTG [d]
85.9%	constant 15°C	12/12h	11.0	12.0	56.0	12.6

Observations

Eryngium maritimum is a psammophilous plant species growing on sand dunes; although the taxon is listed as widespread species in western and southern Europe, its populations are declining in many areas (van der Maarel & van der Maarel-Versluys 1996). Necajeva & Ievinsh (2013) reported that no seeds of *E. maritimum* from the Kurzeme coast of Latvia on the Baltic Sea germinated within two months without cold stratification and few seeds germinated after only one month of cold stratification; however, the germination percentage increased further after two, three, and four months of cold stratification. Our results are in accordance with the results reported by these authors, in which germination percentage of ca. 85% was obtained only after two months of cold stratification. In general, other studies reported very low germination percentages for the seeds of this species (Walmsley & Davy 1997; Curie & al. 2007). Royal Botanic Gardens Kew (2019) reported percentages of 51 and 67% obtained without a cold pre-treatment; however, these percentages were reached after a long time (154 and 105 days respectively), likely due to the cold stratification requirements for dormancy breaking.

14. *Thinopyrum junceum* (L.) Á.Löve (*Poaceae*)

Accession data

Sa: Domus de Maria (Sud Sardegna), loc. Su Giudeu, Chia (WGS84: 38.884236°N, 8.863153°E), duna costiera, 2 m a.s.l., 22 Jul 2011, *M. Orrù & S. Pinna* (BG-SAR-2017-0708, Sardinian Germplasm Bank).

Germination data

Pre-treatments: no treatment.

Germination medium: 1% agar.

Sample size: 80 seeds for each test (20 × 4 replicates).

Germination	Thermoperiod	Photoperiod [light/dark]	T ₁ [d]	T ₅₀ [d]	T _{max} [d]	MTG [d]
91.3%	constant 20°C	12/12h	3.0	4.0	21.0	5.5
88.8%	constant 15°C	12/12h	4.0	9.0	15.0	7.4

Observations

Thinopyrum junceum is one of the most common species of Mediterranean coastal areas growing in particular in the foredune systems (Feola & al. 2011). Our germination tests permitted to define the best germination temperatures of *T. junceum* seeds of a Sardinian population. In details, mature seeds of this species germinated without any specific treatment and high germination percentages were obtained at 15 and 20°C within 21 days.

References

- Benvenuti, S. 2016: Seed ecology of Mediterranean hind dune wildflowers. – *Ecol. Eng.* **91(1)**: 282-293. <https://doi.org/10.1016/j.ecoleng.2016.01.087>
- Brown, A. C. & McLachlan, A. 1990: *Ecology of Sandy Shores*. – Amsterdam.
- Curie, C. M., Stabbetorp, O. E. & Nordal, I. 2007: *Eryngium maritimum*, biology of a plant at its northernmost localities. – *Nord. J. Bot.* **24(5)**: 617-628. <https://doi.org/10.1111/j.1756-1051.2004.tb01647.x>
- De Lillis, M., Costanzo, L., Bianco, P. M. & Tinelli, A. 2004: Sustainability of sand dune restoration along the coast of the Tyrrhenian Sea. – *J. Coast. Conserv.* **10(1)**: 93-100. [https://doi.org/10.1652/1400-0350\(2004\)010\[0093:sosdra\]2.0.co;2](https://doi.org/10.1652/1400-0350(2004)010[0093:sosdra]2.0.co;2)
- Del Vecchio, S., Mattana, E., Acosta, A. T. & Bacchetta, G. 2012: Seed germination responses to varying environmental conditions and provenances in *Crucianella maritima* L., a threatened coastal species. – *C. R. Biol.* **335(1)**: 26-31. <https://doi.org/10.1016/j.crv.2011.10.004>
- Feola, S., Carranza, M. L., Schaminée, J. H. J., Janssen, J. A. M. & Acosta, A. T. R. 2011: EU habitats of interest: an insight into Atlantic and Mediterranean beach and foredunes. – *Biodivers. Conserv.* **20(7)**: 1457-1468. <https://doi.org/10.1007/s10531-011-0037-9>

- Maarel van der, E. & Maarel-Versluys van der, M. 1996: Distribution and conservation status of littoral vascular plant species along the European coasts. – *J. Coast. Conserv.* **2(1)**: 73-92. <https://doi.org/10.1007/bf02743039>
- Necajeva, J. & Ievinsh, G. 2013: Seed dormancy and germination of an endangered coastal plant *Eryngium maritimum* (Apiaceae). – *Estonian J. Ecol.* **62(2)**: 150-161. <https://doi.org/10.3176/eco.2013.2.06>
- Royal Botanic Gardens Kew. 2019: Seed Information Database (SID). Version 7.1. – <http://data.kew.org/sid/> [Last Accessed 20 July 2019].
- Walmsley, C. A. & Davy, A. J. 1997: Germination characteristics of shingle beach species, effects of seed ageing and their implications for vegetation restoration. – *J. Appl. Ecol.* **34**: 131-142. <https://doi.org/10.2307/2404854>

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