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Seed germination reports for *Onopordum tauricum* (*Asteraceae*)

Abstract

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This study deals with the seed germination for *Onopordum tauricum* (*Asteraceae*). The cypselae were collected from two populations in the Marche and Umbria Region (Italy). The highest germination value (93.6%) was obtained after 24 hours of soaking in a 500 ppm GA_3 solution and then incubated at a constant temperature of 20°C with a 12/12h light-dark photoperiod.

Key words: *Onopordum*, dormancy-breaking, gibberellin, milk-clotting agent.

Introduction

Onopordum tauricum Willd. occurs in uncultivated, ruderal environments and sometimes behaves as a nitrophilic plant. It is native to Eurasia mainly with a Pontian range.

This species has been chosen as candidate wild plant for possible use as milk-clotting agent within the international PRIMA Project "Valorisation of thistle-curled Cheeses in Mediterranean marginal area" (VEGGIE-MED-CHEESES), which is focused on the production of traditional Mediterranean cheeses with non-animal rennet in order to meet the increasing demand of vegetarian and animal rights consumers.

The germination ecology of *O. tauricum* had never been investigated so far. The study is based on germination protocols for similar taxa (Baskin & Baskin 2014; Royal Botanic Gardens Kew 2020).

37. *Onopordum tauricum* Willd. (*Asteraceae*)

Accession data:

It: Umbria. Foligno (Perugia), loc. Colfiorito (WGS84: 43.050304°N 12.912574°E), bordo strada a lato di campi coltivati, 761 m a.s.l., 8 Aug 2019, *S. Casavecchia, S. Zitti, V. Di Cecco, L. Di Martino* (MSB VEGGIE19A02, Majella Seed Bank).

It: Marche. Visso (Macerata), loc. Cupi (WGS84: 42.999108°N 13.114858°E), bordo strada nei pressi di una stalla, 979 m a.s.l., 8 Aug 2019, *S. Casavecchia, S. Zitti, V. Di Cecco, L. Di Martino* (MSB VEGGIE19A01, Majella Seed Bank).

Germination data

Pre-treatments: soaking in water for 24h, sterilization with a solution of 3% sodium hypochlorite plus Tween 20 for 5 minutes followed by 3 rinses in sterile distilled water. 1) Soaking in a 500 ppm GA_3 solution for 24 hours; 2) soaking in a 250 ppm GA_3 solution for 24 hours; 3) vernalization for 50 days at 5°C.

Germination medium: 1% agar.

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

Germination	Thermoperiod	Photoperiod [light/dark]	T_1 [d]	T_{50} [d]	T_{max} [d]	MTG [d]	Accession code
93.6%(1)	constant 20°C	12/12h	3.8	5.3	8.0	5.8	19A02
86.7%(1)	alternate 25/10°C	12/12h	3.3	4.2	7.5	4.5	19A02
84.7%(2)	constant 20°C	12/12h	3.8	5.4	7.8	5.9	19A02
80.3%(3)	constant 20°C	12/12h	3.5	7.2	9.8	7.4	19A01

Observations

Cypselae of *O. tauricum* have a fairly thick pericarp, but its breakage/scarification does not increase the final germination percentage. The tests showed the presence of a physiological dormancy. Vernalization or pre-treatment with GA_3 broke dormancy, allowing high final germination rates. Other tested protocols showed high germination rates: with 500 ppm GA_3 and alternating temperature of 25/10°C (12/12 light-dark) the final percentage was 86.7%, lowering the concentration of GA_3 to 250 ppm at 20°C (12/12 light-dark) the final percentage remains high (84.7%). Exposing the cypselae to vernalization at 5°C in a moist environment for 50 days and then incubating at 20° C with a photoperiod of 12/12 light-dark, a final per-

Fig. 1. Germinated seed of *Onopordum tauricum.*

centage of 80.3% was recorded. All the other tests investigated several variables such as scarification, substrate, and temperature, showing final germination percentages lower than 80%. The viability of the non-germinated seeds at the end of each test was estimated by cutting test. No statistically significant differences between the two investigated populations were detected for all tested conditions.

As the species often grows in nitrified areas, soils added of nitrogen compounds and humic acids were also tested. The percentage of germination on these substrata, compared with the un-nitrified control under the same conditions, was lower than 23%. The seeds became infected very easily and were difficult to sterilize.

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This paper is dedicated to the memory of our dear co-worker Silvia Zitti, who passed away while this paper was being peer-reviewed. Silvia was respected and loved by all whose lives she touched – her more senior advisors and mentors, her peers, and her students and junior colleagues. She was kind and available with all, and she had a positive intensity and infectious enthusiasm for her research and teaching, which was exceeded only by her dedication to her family. We will miss her very much.

References

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