A new subspecies of Salsola canescens (Chenopodiaceae) from SW Anatolia, Turkey

Authors: Freitag, Helmut, and Özhatay, Engin

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HELMUT FREITAG & ENGIN ÖZHATAY

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Abstract

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Salsola canescens subsp. *serpentinicola* from the Sandras Dağı and adjacent mountains is described as a subspecies new to science and illustrated, and its ecology as well as phytogeography is considered. The new subspecies differs from subsp. *canescens* by longer anther appendages, glabrous tepals, and subulate, glaucous leaves with sparse ciliate indumentum. It is restricted to open plant communities on serpentinic rocks at altitudes of 1500-2000 m. The new taxon is the first true serpentinophyte in the genus *Salsola*, and has, probably, derived from subsp. *canescens* during the Pleistocene.

In the course of floristic investigations of the Sandras Dağı in the province of Muğla, SW Anatolia, by the second author (Özhatay 1981, 1993), a population of dwarf subshrubby *Salsola* was discovered in 1978. The attempts to identify these plants using the *Salsola* treatment by Aellen (1967) gave no satisfying result. Therefore the material was forwarded for taxonomic study to the first author. Meanwhile the taxon has been recollected several times, and has been found also in adjacent mountain ranges. The long anther appendages leave no room for doubt about its position in *Salsola* sect. *Belanthera*, where it comes closest to *Salcola canescens* (Moq.) Spach. However, the next known localities of this species are far away in Central Anatolia, the both taxa differ strongly in their ecology, and the specimens from SW Anatolia exhibit several morphological peculiarities, altogether justifying the establishment of a new subspecies.

Salsola canescens (Moq.) Spach subsp. ***serpentinicola*** Freitag & E. Özhatay, **subsp. nova** – Fig. 1–2.
Holotypus: Turkey, Muğla, distr. Köyceğiz, Sandras Dağı, Serçe Gediği, 1650 m, open *Pinus nigra* forest, serpentinic rock, 6.9.1978, *N. & E. Özhatay* (ISTE 51122; isotypi: ISTO 20668, KAS).

A subspecie *canescens* foliis, bracteis, bracteolisque crassiusculis subulatis ciliatis et tepalis glabris bene distinguitur.

The morphological differences between subsp. *serpentinicola* and subsp. *canescens* are listed in Tab. 1. As stated and exemplified by Freitag (1997), *S. canescens* is a highly polymorphic taxon. However, having compared the plants from SW Anatolia with the very rich material of

Fig. 1. *Salsola canescens* subsp. *serpentinicola* Freitag & E. Özhatay (holotype, ISTE 51123).

subsp. *canescens* still at hand from the *Salsola* account for "Flora iranica", the SW Anatolian plants proved to be sufficiently distinct to give them, at least, subspecific rank. We hesitated to describe them as a new species because all differences except the length of anther appendages could well be induced by the peculiar habitat conditions. This refers in particular to the subulate leaves of subsp. *serpentinicola* (Fig. 2D), because similar thick and stiff leaves have been seen in a few specimens of subsp. *canescens* from dry localities in N Iran.

Tab. 1. Diagnostic characters of the two subspecies of *Salsola canescens*.

Characters	subsp. *serpentinicola*	subsp. *canescens*
Leaves, bracts & bracteoles		
colour	glaucous	greyish
cross section shape	obtusely triangular	flattened on both sides
indumentum	marginally and apically ciliate	densely hairy throughout
Tepals	all glabrous	at least outer dorsally hairy
Anther appendages	1.5–2.0 mm, as long as or longer than thecae	0.7–1.5 mm, shorter than thecae

The new subspecies usually grows as a dwarf subshrub from a sturdy taproot of more than 30 cm length (Fig. 1). The blackish, gnarled woody branches remain both parallel and very close to the ground, and flatten strongly with increasing age. The plants have a pronounced tendency towards a cushionlike appearance, due to the numerous, almost rosulate vegetative shoots, which are densely covered with small, glaucous needlelike leaves, 4–7 × 0.5 mm in size. The few erect flowering shoots are only 3–15 cm high, loosely beset with c. 10 mm long leaves and a few bracts each carrying in its axil two somewhat recurved bracteoles and a 3.5–4.5 mm long flower. The diameter of the winged fruit reaches 11 mm, that of the seed 2.5–3 mm.

Flowering time: August - September; fruiting time: September - November.

Conservation status: rare.

Additional specimens examined

C2 MUGLA: type locality, 12.10.1978, *E. Özhatay* (B, ISTE 51123, ISTO 20742); ibid. 5.9.1993, *N. & E. Özhatay* (ISTE 69874); Sandras Dağı, Çiçekbaba tepesi, serpentinic rocks, 3.9.1980, *E. Özhatay 2845* (ISTO); Sandras Dağı, 11 km from Ağla to Çiçekbaba, 1650 m, *K. Alpinar* (ISTE 63382, KAS). — C2 DENIZLI: Konak-Acipayam, Külü pass, open *Pinus nigra* forest on dry serpentinic rocks, 1570 m, 28.5.1995, *N. Özhatay & al.* (ISTE 70455). — C2 BURDUR: Distr. Korkuteli SE of Altinyayla, Dirmil pass, open, stony places on serpentinic rocks, 1600 m, 22.4.1994, *N. Özhatay, E. Özhatay & M. Johnson* (ISTE 67377); ibid., 29.5.1995, *id.* (ISTE 70554).

Ecology

Salsola canescens subsp. *serpentinicola* occurs in the higher montane belt at 1600–2000 m, growing in open plant communities on sceletal soils derived from serpentinic rocks, and also in rock fissures. Locally the new subspecies is a rather frequent component of the dwarf shrub communities with scattered trees of *Pinus nigra* subsp. *pallasiana*. Dominant and characteristic species of these communities are *Dactylis glomerata, Bromus tomentellus, Rostraria cristata* var. *cristata, Dianthus zonatus* var. *zonatus, Acantholimon androsaceum* subsp. *androsaceum* var. *purpurascens, Convolvulus compactus, Sideritis bilgeriana, Stachys cretica* subsp. *cretica, Centaurea drabifolia* subsp. *drabifolia* and subsp. *cappadocica, Echinops ritro, Helichrysum pallasii*. Endemic species in these communities are, e.g., *Polygonum karacae, Bolanthus thymoides, Cerastium macranthum, Minuartia anatolica* var. *phrygia, Rosularia serpentinica, Euphorbia austroanatolica, Viola sandrasea,* and several *Verbascum* species.

The absence of subsp. *serpentinicola* from other substrates than serpentinic soils might be due to ecophysiological specialization or competition with more vigorously growing species.

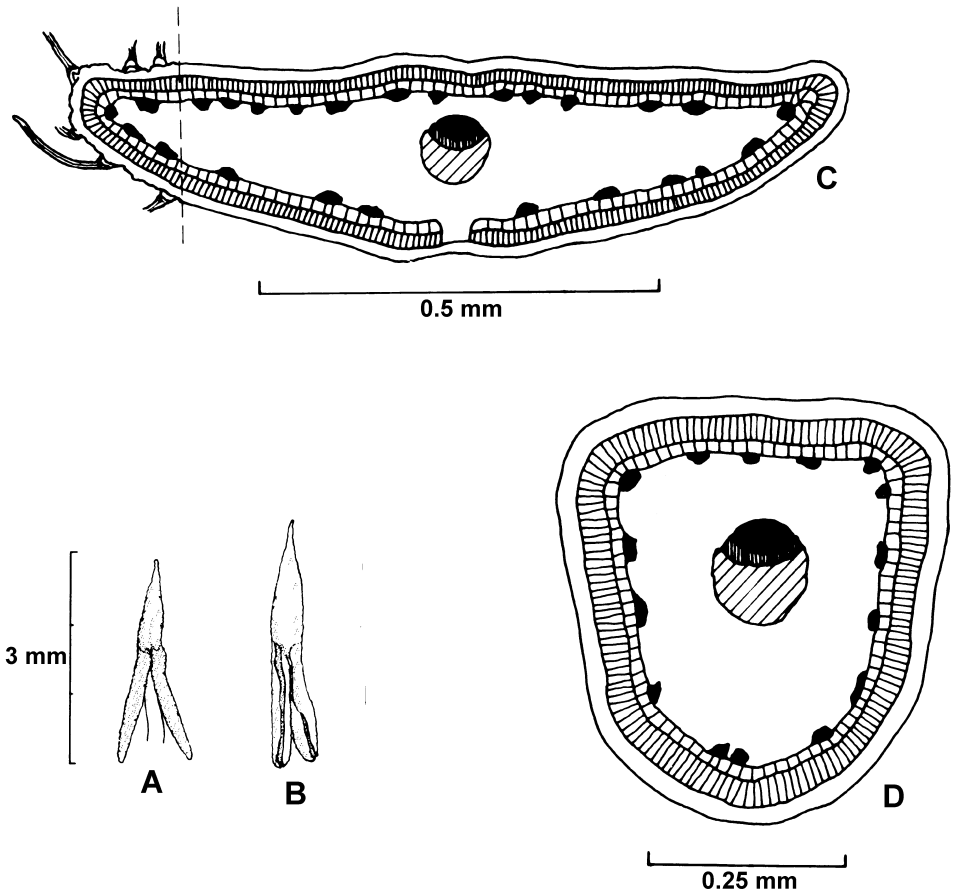

Fig. 2. Morphological and anatomical differences between both subspecies of *Salsola canescens* – A-B: anthers with appendages, A: subsp. *canescens* (after *Sintenis 3223*), B: subsp. *serpentinicola* (after ISTE 51123); C-D: leaf cross sections, C: subsp. *canescens* (after *Aucher 2756*); D: subsp. *serpentinicola* (after ISTE 51123).

The comparatively thin plant cover on serpentinic soils certainly favours the light-demanding taxon. Being a dwarf subshrub, subsp. *serpentinicola* is well adapted to the harsh winter conditions in the mountains, as these are much softened under the thick snow cover. The climate is characterized by a prolonged summer drought and high to very high winter precipitations. Even in Muğla, which is situated at an altitude of 648 m in the same distance from the Mediterranean Sea as, and only 50 km away from the type locality, the mean annual precipitation is 1220 mm (Walter & Lieth 1960–67). In the Sandras Dağı, with elevations up to 2294 m, the precipitation at 1600 m must be considerably higher, and lies probably between 1500 and 2000 mm. This is much more than is received in the area of subsp. *canescens* in the Irano-Turanian mountain ranges from Central Anatolia across Iran and Afghanistan where comparable temperatures occur, and, moreover, is unusually high and unfavourable for any known *Salsola* species.

Phytogeographical considerations

The discovery of the new subspecies in the Sandras Dağı and adjacent mountain ranges came as a surprise, because these localities are in about 400 km distance from the westernmost localities

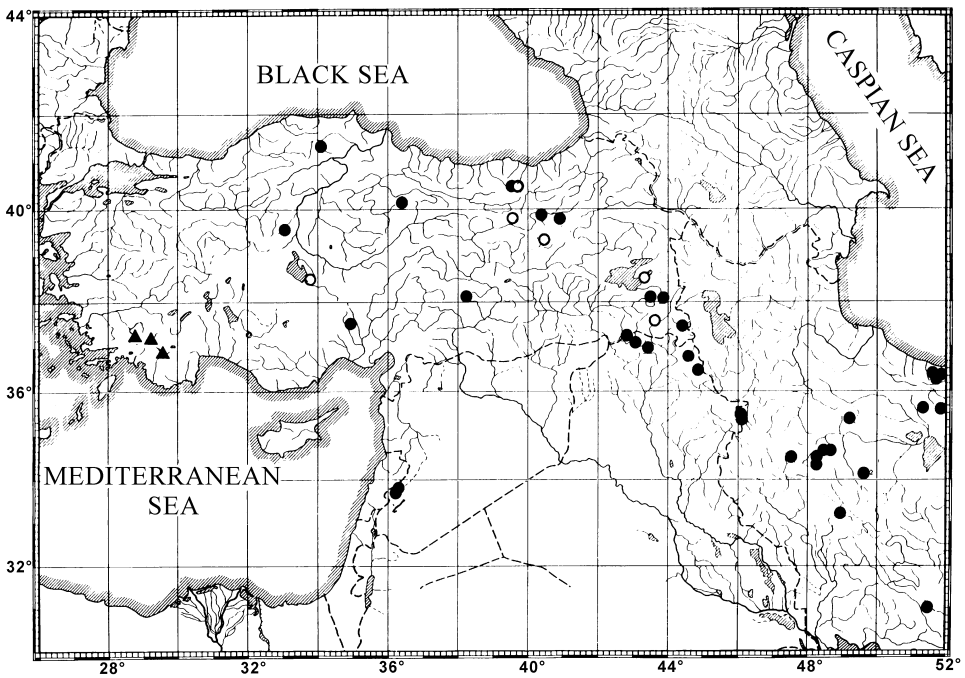

Fig. 3. Distribution of *Salsola canescens* subsp. *serpentinicola* ▲, and of subsp. *canescens* in the Near East (● specimens seen, ∇ literature records).

of *Salsola canescens* subsp. *canescens* (Fig. 3). As there can be no doubt that subsp. *serpentinicola* is a segregate of subsp. *canescens,* the question arises how the geographical separation of both subspecies did occur. We offer the hypothesis that during a drier and possibly cooler period of the early pleistocene or an interglacial period with similar climatic conditions, *S. canescens,* probably together with other Irano-Turanian mountain species, was able to migrate westwards, along the Taurus Mts, to the Sandras Dağı. During a subsequent moister period, *S. canescens* then was repelled into the drier eastern regions by the strong competition of plants adapted to more humid conditions, but has been able to survive in the west on the serpentinic sites due to the peculiar adverse effects of serpentine on the growth of most plants. In isolation, by time and probably favoured by genetic drift, in one or a few small populations comparatively quick evolution of some characters typical for serpentinophytes, as indicated first by Pichi-Sermolli (1948) and confirmed by many later authors, took place. In case of the new subspecies, such characters are predominantly expressed in leaf morphology, like stenophyllism, glabrescence and glaucescence. Other well-known morphological features of serpentine plants like plagiotropism, nanism and the extraordinary development of the root system (best expressed in the strong and deep-reaching taproot, see Fig. 1) can be seen in the new taxon, but they are equally represented in the typical subspecies of *Salsola canescens* on non-serpentine substrates.

As far as we know, *Salsola canescens* subsp. *serpentinicola* is the sole serpentinophyte in the genus *Salsola.* Interestingly enough, also the parental taxon differs from the bulk of *Salsola* species, being a normal xerophyte instead of being adapted to saline habitats.

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Addresses of the authors:
Prof. Dr H. Freitag, Kassel University, Dept. of Plant Taxonomy, D–34132 Kassel, Germany, Fax 0561 804 4200.
Prof. Dr E. Özhatay, Marmara University, Atatürk Education Faculty, Dept. of Biology, Turkey.