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Bacopa (*Scrophulariaceae*) in Greece and adjacent countries

Abstract

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Within the Mediterranean area, two species of the chiefly tropical genus *Bacopa (Scrophulariaceae)*, viz. *B. monnieri* and *B. rotundifolia*, are known to occur in Portugal, Spain, Egypt and Palestine, the former locally naturalized, or even native in the Levant, on river banks and in wet coastal places, the latter as a weed in rice fields. Recent floristic investigations revealed the occurrence of *B. rotundifolia* also in N Greece where its status of naturalisation is yet unclear.

Introduction

Bacopa Aubl. (*Scrophulariaceae*) is a genus of c. 60 mostly aquatic or paludal species distributed in tropical and subtropical regions around the world. Estimations of species numbers have been varying decreasingly from c. 100 to c. 50, depending on diverging taxonomic concepts (see, e.g., Willis 1973; Cook 1996; Mabberley 1997; for generic synonyms and segregates see Cook & al. 1974 and Cook 1990).

A few synanthropic, somewhat weedy *Bacopa* species regularly invade rice fields in tropical and warm-temperate regions, e.g. *B. monnieri* (L.) Pennell and *B. rotundifolia* (Michaux) Wettst. Within the Mediterranean area, the former is known to occur, locally naturalized on river banks and in other wet coastal places in N Portugal and NW Spain (Philcox 1972), and in the SE corner of the Mediterranean basin from the Upper Jordan valley (Feinbrun-Dothan & Danin 1991) to the Nile delta (Boulos 1995) whereas the latter has been reported only recently (Perez Chiscano 2000) as a weed of rice fields in the province of Badajoz, Spain. There have been no previous published records of *B. rotundifolia* from the whole of Europe nor from the Med-Checklist area.

The genus *Bacopa* is not treated in relevant basic floras of France, Italy, the Balkan Peninsula, Asia Minor and North Africa west of Egypt. Recent floristic investigations related to the ‚Flora Hellenica' project, however, revealed the occurrence of *B. rotundifolia* as a weed of rice fields also in N Greece:

- Greece: Nomos & Eparchia Serron, along main road Serres - Thessaloniki, just east of Strimonas river bridge, alt. 100 m, weed in rice field, in 10 cm deep water, corolla white, 25.6.1988, Strid & al. 27365 (C, G, GB; herb. Kit Tan !).

- Greece: Nomos & Eparchia Xanthis, along road Neo Erasmio - Dasochori (40°55'N/24°50'30"E), alt. 2-5 m, weed in rice field, fruiting, rooting at the nodes in mud, 2.10.1992, Raus & Schiers 19582 (B !).

Taxonomic and morphological remarks

Within the *Scrophulariaceae* (*Scrophularioideae*, *Gratioleae*; Melchior 1964), *Bacopa* is taxonomically differentiated by a combination of anther, style and sepal characters from its other generic relatives – *Limnophila* R. Br., *Limosella* L., *Peplidium* Del., etc. (Wettstein 1897); from a European floristic point of view, Webb (1972) ranged it between *Lindernia* All. and *Limosella*. The xenophytic representatives of *Bacopa* in Europe are perennial low, usually mat-forming herbs with the leaves opposite, entire, sessile, and often somewhat succulent. The 5-merous flowers exhibit campanulate, slightly zygomorphic corollas bearing 4 fertile stamens. The numerous small seeds are shed from a loculicidal and septicidal, thinly walled, 2-valved capsule, with the valves 2-parted (Jepson 1951; for the whole, much wider range of vegetative and generative characters found in *Bacopa* see Pennell 1946). For the Mediterranean area, a key for the two species under discussion is provided here (chiefly following Diggs & al. 1999):

- Leaves 1-nerved, spathulate, narrowed towards the non-clasping base; flowers solitary per node, pedicels much exceeding the subtending leaves, with 2 linear bracts just below the calices; corolla usually pale blue or whitish-lilac; fruiting capsule shorter than sepals.....*B. monnieri*
- Leaves palmately many-nerved, suborbicular to ovate, not distinctly narrowed towards the base and usually clasping; flowers usually 2-4 per upper node, pedicels without bracts, shorter than the subtending leaves; corolla usually white with yellow throat; fruiting capsule c. as long as sepals.....*B. rotundifolia*

Comparative diagnostic drawings of both species are found in relevant North American basic floras and handbooks (viz. Correll & Correll 1975; Godfrey & Wooten 1981; Diggs & al. 1999). Illustrations (incl. photos) of *B. monnieri* – instructive, with regard to growth form and habit, beyond the classical icon in Curtis's Botanical Magazine (Sims 1824, under *Herpestis monnieria* β *portulacacea*) – are offered by, e.g., Cook & al. (1974), Feinbrun-Dothan (1978), Rechinger (1981), Al-Saadi & Al-Mayah (1983, as "*B. monnieria* (L.) Hayata & Matsum."; for correct epithet and authorship of *B. monnieri* see Philcox 1979), Migahid (1989), Vlugt (1992; several close-up photos of corollas), and Collenette (1999). A colour photo of *B. rotundifolia* is found in Rickett (1970).

Chorology and status in Europe and the Mediterranean

In areas south and east of the Mediterranean, viz. the Nile valley, the Arabian Peninsula, Mesopotamia, and the Flora iranica area, *B. monnieri* was known to occur from the late 18th century onwards (Boissier 1879, as *Herpestis monnieria* (L.) Kunth; Hepper & Friis 1994) and is supposed an indigenous member of the vascular flora of, e.g., coastal Arabia and the Yemen (Wood 1997; Collenette 1999). Status, whether native or doubtfully so, is

surprisingly not addressed in SE Mediterranean basic floras (Täckholm 1974; Feinbrun-Dothan 1978; Danin 1998). Fragman & al. (1999) however, by not applying the symbol for introduced plants in their most recent ecological data-base, qualify *B. monnieri* as native to the Flora Palaestina and Sinai areas. Danin (in litt., 27.7.2000) observed the species also in Jordan, on the eastern side of the Dead Sea valley.

Records of *B. monnieri*, as a xenophyte (with unknown source of introduction) naturalised in the northwesternmost corner of the Iberian Peninsula (Amaral Franco 1984; Smythies 1986), go back to Merino (1906) who found mat-forming ["profusamente"] populations of this species along river banks in the province of Galicia, Spain. Merino's misinterpretation of the New World plant ["especie americana"] as "*Vandellia erecta* Benth.", according to Pilcox (1968) a synonym of *Lindernia procumbens* (Krock.) Philcox, was corrected by later authors (for relevant synonymy see, e.g., García 1991). Although said to be fully established in NW Spain, populations of *B. monnieri*, casual or established, are absent from the atlantic parts of Europe north of Spain (Balayer & Napoli 1999; Clement & Foster 1994; Kerguélen 1993; Stace 1997) probably due to low water temperatures especially in early spring; submersed plants of *B. monnieri*, cultivated in the open under the maritime climate conditions of the Netherlands and still observed assimilating in mid winter, finally broke down in March (Vlugt 1992). Thus, a somewhat puzzling distribution pattern of *B. monnieri* in the Mediterranean emerges from the floristic data summarized above (Fig. 1), suggesting a phytogeographical disjunction which is actually by haphazard.

The second *Bacopa* species adventive to Europe, *B. rotundifolia*, is ecologically exclusively connected to rice (*Oryza sativa* L.) cultivation. In phytocoenological terms, Perez Chiscano (2000) gives the habitat of the Spanish locality as settled by the rice weed

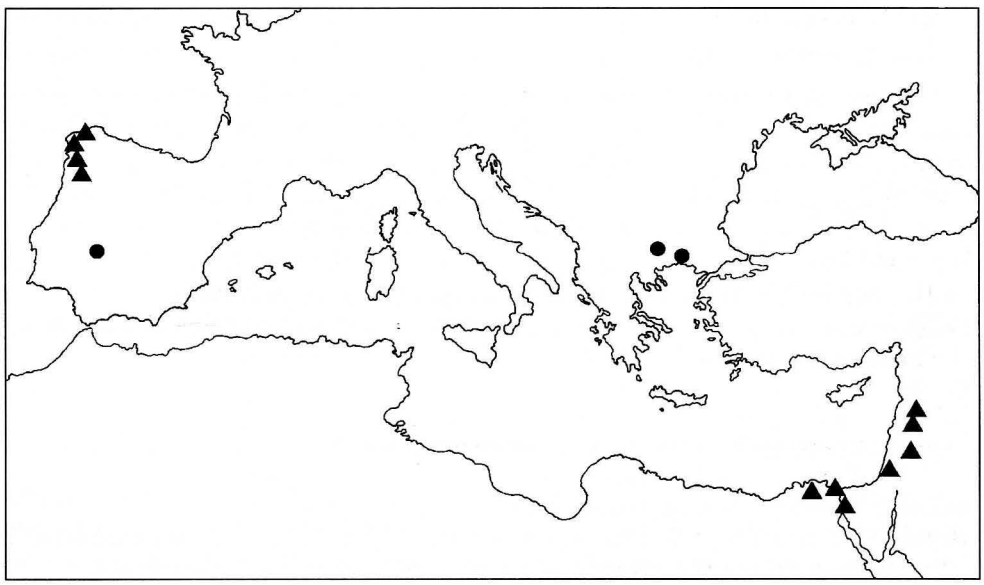

Fig. 1. Known distribution of *Bacopa* spp. in Europe and the Mediterranean. Triangles: *B. monnieri*; dots: *B. rotundifolia*. (orig. Th. Raus).

vegetation order of *Cypero difformis-Echinochloetalia oryzoidis* within the class of *Oryzetea sativae* (see Miyawaki 1960). The same ecology proves true for the newly revealed Greek populations of *B. rotundifolia*; associated weedy species in Thrace, NE Greece (Raus, obs.) included *Ammannia coccinea* Rottb. (see also Raus 1997), *Cyperus difformis* L., *Echinochloa oryzoides* (Ard.) Fritsch, *Lindernia dubia* (L.) Pennell, and *Schoenoplectus mucronatus* (L.) Palla.

The Greek *Bacopa* populations have certainly the status of "aliens" which rapidly vanish if rice cultivation is abandoned. Interestingly, unlike the rice accompanying species *Cyperus difformis* and *Lindernia dubia* (Raus 1991), *Bacopa* populations have so far not been found in Greece in semi-natural habitats such as river banks and lake shores. Plants of *B. rotundifolia* however, found in paddy fields at the eastern outskirts of the Nestos delta in autumn, bore lots of ripe seeds wich contribute to the local seed bank so that progeny is secured on the spot provided that cultivation of rice will continue.

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