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Ridha El Mokni & Duilio Iamonico

A new record for the non-native flora of Tunisia, *Eclipta prostrata* (*Asteraceae*), and a note on the national status of *Erigeron bonariensis*, *Symphyotrichum squamatum* (*Asteraceae*), and *Lepidium didymum* (*Brassicaceae*)

Abstract

El Mokni, R. & Iamonico, D.: A new record for the non-native flora of Tunisia, *Eclipta prostrata* (*Asteraceae*), and a note on the national status of *Erigeron bonariensis*, *Symphyotrichum squamatum* (*Asteraceae*), and *Lepidium didymum* (*Brassicaceae*). — Fl. Medit. 28: 145-153. 2018. — ISSN: 1120-4052 printed, 2240-4538 online.

Floristic and phytosociological surveys in NE-Tunisia allowed to discover *Eclipta prostrata* (*Asteraceae*) which represents the first record at national level. A description of the species, notes on its ecology and phytosociological remarks are provided. We also stated, for the first time in Tunisia, the status of naturalization of three species (*Erigeron bonariensis*, *Symphyotrichum squamatum*, and *Lepidium didymum*) which does not appear still published until now.

Key words: Alien species, Naturalization, North Africa.

Introduction

Invasions by non-indigenous plant species has become an important component of global environmental change (e.g., Mack & al. 2000). Ruderal environments as well as coastal and riverine habitats have often been reported to harbor many neophytes (Sobrino & al. 2002; Bruno & al. 2004; Dark 2004; Von Holle & Motzkin 2007; Chytrý & al. 2007). Several studies of the coastal region of the Mediterranean Basin have shown a high degree of naturalization of introduced species (see e.g., Badano & Pugnaire 2004; Campos & al. 2004). Tunisia is no exception and several aliens have been recorded in the last decade along the coasts (El Mokni & al. 2013, 2016; Iamonico & El Mokni 2017).

Eclipta L. is a small genus of 4–5 species native to North America (Chen & Hind 2011). Some *Eclipta* species occur outside of their natural range (Greuter 2006+; Chen & Hind 2011; SANBI 2012; Atlas Living of Australia 2016) and, in some cases, they have spread causing ecological and economic impacts (e.g., Holm & al. 1977; Moody 1989; Das & Duarah 2013).

During botanical field surveys carried out along coastal territories of North-eastern Tunisia (Bizerta city), aimed at improving knowledge on the vascular flora of Tunisia, we found a population which can be ascribed to *Eclipta prostrata* (L.) L., a species that was not previously recorded in the country. At the same time, we observed the populations of other three species [*Erigeron bonariensis* L., *Lepidium didymum* L., and *Symphyotrichum squamatum* (Spreng.) G. L. Nesom] that participate to the vegetation communities in which *E. prostata* occurs. We here clarify their status at national level for the first time.

Materials and methods

The present work is based on field surveys (since 2011 to today), analysis of relevant literature (e.g. Pottier-Alapetite 1981; Greuter 2006+; Le Floc'h & al. 2010; Dobignard & Chatelain 2011; SANBI 2012) and examination of specimens preserved at K, P, PAL, RO, and WU (acronyms according to Thiers 2018+) and the personal collection of R. El Mokni deposited in the herbarium of the Faculty of Pharmacy of Monastir (University of Monastir), herbarium of the Faculty of Sciences of Bizerta (University of Carthage).

The description of the species is based on Tunisian specimens, while the status of naturalization and/or degree of invasion of plants was assessed according to the criteria proposed by Richardson & al. (2000) and Pyšek & al. (2002, 2004).

Results and discussion

Eclipta prostrata (L.) L., Mant. Pl. Alt.: 286. 1771 ≡ *Verbesina prostata* L., Sp. Pl. 2: 902. 1753 ≡ *Cotula prostrata* (L.) L., Syst. Nat., Ed. 12, 2: 564. 1767 ≡ *Eclipta alba* var. *prostrata* (L.) Miq., Fl. Ned. Ind. 2: 66. 1856.

Lectotype (designated by Wijnands 1983: 74): [Icon] *Chrysanthemum maderaspatanum*, *Menthae arvensis* folio & facie, *floribus bigemellis*, ad foliorum alas, pediculis curtis in Plukenet (1691: t. 118, f. 5); image of the lectotype available http://bibdigital.rjb.csic.es/ing/Libro.php?Libro=4826&Pagina=73.

– *Eclipta alba* var. *prostrata* (L.) Kuntze, Revis. Gen. Pl. 1: 334. 1891, isonym (Art. 6.3 Note 2).

Description (Fig. 1)

Annual, biannual or perennial herb; stem 10–30 cm tall, erect or prostrate, weak, scabrous, ribbed, branched; adventitious roots develop when plants are prostrate or submerged. Leaves opposite, sessile, oblong to lanceolate (4–13 × 0.8–2.0 cm), margins entire to shortly and irregularly dentate, apex acute-acuminate, cuneate at base, pubescent on both surfaces (hairs adpressed). Flowers arranged in terminal and axillary capitula, each one hemispherical, up to 1 cm in diameter, heterogamous; peduncles up to 7 cm long. Involucral bracts 8–10, herbaceous, ovate (6 mm long), acute, pubescent; receptacular scales setaceous, ciliate at apex; ray-florets 30–50, the pistillate one with corolla 4–5-fida; ligules 2–6 mm long, white, entire or bifid, disc-florets perfect; anthers apically blunt, basally slightly sagittate. Fruits of ray-florets (achenes)

Fig. 1. *Eclipta prostrata*. A) habitus, B) leaves, C) capitulum, D) different stages of flowers with black and glabrous mature achenes in the older flower (photos by R. El Mokni). Tunisia, Bizerta city, 22 December 2015.

3-angled in transversal section with two short cartilaginous margins, those of disc-florets 4-angled; all fruits strongly tuberculate, black, glabrous, except for a few apical hairs, depressed-truncal; seeds with neiloid to conic shape (2.0–2.2 × 0.8–1.0 mm), scarce hairs at apex; pappus is represented by some scattered hairs or a minute cup of 2 or 3 short tooth-like awns.

Habitat and ecological notes

Eclipta prostrata grows in Tunisia along roadsides at altitudes of about 10 m a.s.l. In 2011, the Tunisian population of *E. prostrata* found in Bizerta consisted of approximately 20 individuals forming small scattered sub-populations distributed over an area of 60×100 m (approximately 6.000 m^2), whereas since 2015 to present, the population comprised approximately 30 individuals mostly in small scattered tufts distributed over an area of 100×100 m (approximately 10.000 m^2). We suspect that this species was accidently introduced with ornamental plants or by commercial seeds used as food for domestic birds. According to Pyšek & al. (2002) criteria and categorisation, *E. prostrata* can be considered as a naturalized alien species in Tunisia (not invasive).

Phenology

Flowering and fruiting times in Tunisia, June–January.

Native and introduced range

Eclipta prostrata is native to the Americas (Chen & Hind 2011) but some authors (e.g., Stone 1970) suggest an Asiatic origin, while it is considered as an alien species (sometimes naturalized or invasive) in the other continents [see e.g., Greuter (2006+), Domina & al. (2018), Galasso & al. (2018) for Europe, Chen & Hind (2011) for China, Atlas Living of Australia (2016) for Australia]. In Africa, this species has been reported from Egypt, and Morocco as naturalized alien (Fennane & Ibn Tattou 1998; Boulos 2002; Greuter 2006+; APD 2017), it was also recorded from Angola, Côte d'Ivoire, Ghana, Nigeria, South Africa, and Sudan (see http://www.cabi.org/isc/datasheet/20395). In Tunisia, our first observation of *E. prostrata* was in October 2011 along the coast in Bizerta city (north-east of Tunisia). *E. prostrata* was recorded again at the same site some years later (December 2015, November 2016, June 2017, July 2018), and its population appeared to be increased.

Notes on vegetation

Eclipta prostrata was found in open and herbaceous communities which are characterized mainly by medium-sized therophytes, both native and aliens (see Table 1).

These plant communities develop from autumn to spring in ruderalized soils, mainly on road margins (typically between the pavement slabs of streets) and in irrigated gardens with fertile soils. From the phytosociological point of view, the communities belong to the alliance of the *Sclerochloo durae-Coronopodion squamati* Rivas-Martínez 1975 and the association *Poo annuae-Coronopodetum didymi* Carretero & Aguilella 1995 (see Ninot & al. (2010-2011) where *Poa annua* subsp. *annua*, and *Lepidium didymum* are the characteristic species.

Table 1. Floristic composition of the Tunisian communities in which *Eclipta prostrata* was found. The alien status (3rd column) follow the Greuter (2006+) and Le Floc'h & al. (2010).
Abbreviations. 2nd column: G = geophyte, H = hemicryptophyte, T = therophyte; 3rd column: NAT = naturalized, INV = invasive. Asterisks (*, 1st column) indicate the species for which the status of naturalization is defined for the first time in the present paper.

Plants name	Life-form	Status
Amaranthus deflexus L.	T	Alien (NAT)
Amaranthus viridis L.	T	Alien (NAT)
Brassica nigra (L.) Koch	T	Native ?
Catapodium rigidum (L.) C.E. Hubb. s. str.	T	Native
Chenopodiastrum murale (L.) S. Fuentes et al.	T	Native
Chenopodium album L. *s. lat.*	T	Native
Convolvulus arvensis L.	G	Native
Cymbalaria muralis P. Gaertn., B. Mey. & Scherb.	C	Native
Cynodon dactylon (L.) Pers.	G	Native
Cyperus longus L.	G	Native
Cyperus rotundus L. subsp. *rotundus*	G	Native
Dittrichia graveolens (L.) Greuter	T	Native
Echinochloa colonum (L.) Link.	T	Native (Le Floc'h & al 2010)
**Erigeron bonariensis* L.	T	Alien (NAT)
Lepidium coronopus (L.) Al-Shehbaz	T	Native
**Lepidium didymum* L.	T	Alien (INV)
Malva parviflora L.	T	Native
Oxalis corniculata L.	H	Native
Parietaria judaica L.	H	Native
Poa annua L. subsp. *annua*	T	Native
Polygonum aviculare L. s. str.	T	Native (Le Floc'h & al 2010)
Polygonum rurivagum Boreau	T	Native (Le Floc'h & al 2010)
Portulaca oleracea L. *s.lat.*	T	Native
Senecio leucanthemifolius Poir. s. str.	T	Native
Setaria adhaerens (Forssk.) Chiov.	T	Native
Sonchus oleraceus L.	T	Native
Sonchus tenerrimus L.	T	Native
Stellaria pallida (Dumort.) Piré	T	Native
**Symphyotrichum squamatum* (Spreng.) G.L. Nesom	T	Alien (NAT)
Urtica urens L.	T	Native

Note on status of naturalization of *Erigeron bonariensis*, *Symphyotrichum squamatum*, and *Lepidium didymum*

The status of naturalization of these three species has not previously been defined in Tunisia. *Erigeron bonariensis* and *Symphyotrichum squamatum* were indicated by Greuter (2006+) as "Alien (status unknown)", while Le Floc'h & al. (2010) did not indicate any status for these two taxa. The populations of *E. bonariensis* and *S. squamatum* found by us appear to be well established, since we observed them during the last six years. However, these populations do not seem to increase their areas, so we here consider both species as naturalized for Tunisia. As regards *Lepidium didymum*, Marhold (2011) reports "Cultivated, doubtfully escaping", while Le Floc'h & al. (2010: 141) indicated this species as both casual and naturalized based on previous published works and avoided a conclusion about its status in Tunisia. The population of this species at Bizerta is not only well established, but it also tends to expand itself, and, as a consequence, we here assess the status of alien invasive for *L. didymum*.

Notes on nomenclature

D'Arcy (1975: 1102) indicated the specimens nos. 1020.4 or 1020.5 (at LINN) as the type of *Verbesina prostrata* L., presumably in error as both are associated with the name "*Eclipta latifolia*". Neither these two Linnaean specimens, nor the LINN-1020.7, which is a post-1753 Browne's collection treated as the lectotype by Kupicha (1975: 46), are original material for the name. Grierson (1980: 212) treated the material preserved in the Herb. Plukenet (BM-SL) as "type" but this would not have been seen by Linnaeus and is not original material either. Wijnands' (1983) choice of Plukenet's illustration as lectotype is correct.

Taxonomic notes

Some achenes of disc-florets appear to be similar to those characterizing *Eclipta platyglossa* F. Muell s. str. especially concerning the fruit shape and seed surface. However, *E. platyglossa* can be easily distinguished from *E. prostrata* by the color of the ligules (yellow vs. white or whitish in *E. prostrata*), and the number of ray flowers (10 vs. 50 in *E. prostrata*) (see Orchard & Cross 2013).

Selected specimens examined

TUNISIA, Bizerta, South-Bizerta, Bridge, 37°16′15.12″ N, 09°52′33.97″ E, ruderalized soils, mainly in path and road margins, and typically between the pavement slabs of streets, in irrigated gardens, 7 m a.s.l., 03/10/2011, *R. El Mokni s.n.* (Herb. El Mokni!); *ibidem* 18/09/2012, *R. El Mokni s.n.* (Herb. El Mokni!); *ibidem*, 11/10/2013, *R. El Mokni s.n.* (Herb. El Mokni!); *ibidem*, 06/11/2014, *R. El Mokni s.n.* (Herb. El Mokni!); *ibidem* 07/01/2016, *R. El Mokni s.n.* (Herb. El Mokni, PAL, and RO); *ibidem* 27/09/2016, *R. El Mokni s.n.* (Herb. El Mokni!).

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Addresses of authors:
Ridha El Mokni[1, 2, *] & Duilio Iamonico[3],
[1]Department of Life Sciences, Faculty of Sciences of Bizerte (FSB), Laboratory of Botany and Plant Ecology, Jarzouna-7021, Bizerte, University of Carthage, Tunisia.
E-mail: riridah@hotmail.com
[2]Department of Pharmaceutical Sciences "A", Laboratory of Botany, Cryptogamy and Plant Biology, Monastir Faculty of Pharmacy, BP. 207, Avenue Avicenna, Monastir-5000, University of Monastir, Tunisia.
[3]Laboratory of Phytogeography and Applied Geobotany, Section Environment and Landscape, Department PDTA, University of Rome Sapienza, Via Flaminia 72, 00196 Rome, Italy.
* Corresponding author.