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Commelina virginica (*Commelinaceae*), a "phantom" alien in the Euro-Mediterranean area

Abstract

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Commelina virginica, a North American xenophyte recorded in the Euro-Mediterranean area since the late 19th century, is excluded from the flora of this region. As a result of extensive literature and herbarium research, all the records of this species proved to be erroneous and referable mostly to *C. communis*. The first historical and misleading record of *C. virginica* is discussed in detail and the diagnostic morphological features actually accepted to distinguish the two species are reported.

Additional key words: *Commelina communis*, misidentification, neophyte, North America, rice fields flora, taxonomy, weeds

Introduction

Commelina L. (*Commelinaceae*: *Commelineae*) is a genus of about 170 species, distributed worldwide, mainly in tropical and subtropical regions (Faden 1998, 2000; Burns & al. 2011). Some species are economically important either as ornamentals or as noxious weeds in agricultural production systems (Isaac & al. 2013). Ten species are recorded in the Euro-Mediterranean region (Clement & Foster 1994; DAISIE 2003+; Euro+Med 2006+), three of which are native to Egypt (*C. boissieriana* C. B. Clarke and *C. forsskalii* Vahl) and Madeira and the Canary Islands (*C. diffusa* Burm. f.) (Euro+Med 2006+), while eight are neophytes, mostly casual, with the exception of *C. communis* L., a troublesome glyphosate-resistant weed of rice field embankments in NW Italy (Rissone 2008; Nandula & al. 2005; Banfi & Galasso 2010; Weller & al. 2010).

As a consequence of recent floristic explorations in the rice fields of NW Italy, doubts arose about the existence in this area of *Commelina virginica* L., a North American neophyte first recorded in Europe near the town of Pavia (N Italy) at the end of the 19th century (Bozzi 1888). Even though this finding (repeated by Fiori 1896) was soon regarded as questionable by Farneti (1900), the species persisted in subsequent national and international floras (e.g. Saccardo 1909; Fiori 1923; Viegi & al. 1974; Zangheri 1976; Pignatti 1982; Webb 1980; Conti & al. 2005; Celesti-Grapow & al. 2009). Additionally, new records from further Italian localities and European countries increased, especially during the last six decades.

The purpose of this paper is to verify whether or not *Commelina virginica* is present in the Euro-Mediterranean area by checking all the literature records and the related herbarium voucher specimens.

Material and methods

The present study is based on the critical revision of herbarium specimens originally labelled as "*Commelina virginica*" stored in the following herbaria (codes according to Thiers 2014+): BON, FI, HBBS, MI, MSNM, P, PAV,

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RO, TO and TSM. The herbaria were selected on the basis of being (1) the location of the voucher specimens reported in the surveyed literature, and (2) the largest collections, which were supposed to include material of our interest.

The identity of each specimen was checked by consulting descriptions and keys reported in the recent taxonomic treatments of the genus *Commelina* in North America (Faden 1993, 2000) and by comparison with the type specimens of *C. chamissonis* Klotzsch ex C. B. Clarke (at B) and *C. communis* and *C. virginica* (both at LINN).

Results and Discussion

Luigi Bozzi's first record

Commelina virginica was recorded for the first time in the European continent by Luigi Bozzi (Bozzi 1888: 285–286), assistant at the Botanical Garden of the University of Pavia (1882–1883) and physician in that city (Saccardo 1895: 36; 1901: 23, 140), today best remembered as the person responsible for the first and intentional introduction of *Azolla filiculoides* Lam. into Italy (Bozzi 1888: 287–288). Bozzi first observed *C. virginica* around 1883–1884 near the village of Cava Manara, province of Pavia, N Italy (WGS84: 45.15177°N, 09.09629°E), on the suggestion of the botanist Romualdo Pirotta, who found it around the late 1870's (Bozzi 1888: 286). In 1890, Pirotta recorded *C. communis* L. for the first time in Lombardia, collected during August 1889 in Garlasco, 15 km NW of Cava Manara, emphasizing the presence of two different species of *Commelina* in a restricted area (Pirotta 1890; Banfi & Galasso 2010; specimens in FI! and P!).

Taking into account the morphological characters of *Commelina virginica* actually regarded as diagnostic to distinguish this species from *C. communis* (Table 1), most of the bibliographical sources consulted by Bozzi to identify the specimens from Cava Manara (Linnaeus 1762: 61; Willdenow 1797: 251; Pursh 1814: 31; Hooker 1826; Clarke 1881: 182–183) appear to be inaccurate and superficial (Bozzi additionally mentioned specimens of *C. virginica* in FI used for comparison, but he did not examine them personally). Among these, the most complete description was reported by Linnaeus (1762: 61) (then repeated by Willdenow 1797: 251), who specified both the colour of the hairs on the leaf sheath summit ("*pilis ferrugineis*"), clearly visible on the lectotype, and the presence of three blue petals. On the other hand, the description by Pursh (1814: 31) is poor (the hair colour is not mentioned), while that of Hooker (1826, under *C. deficiens* Hook.), along with his iconography, is controversial: firstly the provenance of the described specimen is "the neighbourhood of Rio Janeiro" (*C. virginica* is distributed only in E North America), and secondly the illustration is ambiguous, showing, along with reddish hairs clearly noticeable on the leaf sheaths, the absence of the proximal petal and a solitary spathe. Similarly, Clarke (1881: 182–183), besides omitting the colour of the sheath hairs and the number of blue petals, reported the occurrence of different varieties in South America, among these *C. virginica* var. *angustifolia* (Michx.) C. B. Clarke (≡ *C. angustifolia* Michx.), a synonym of *C. erecta* L. (Faden 2000): Clarke's description includes a mix of characters both from *C. virginica* and *C. erecta*, as evidenced, for example, by the citation of "auricled leaf sheaths" ("*vaginae saepe inflato auriculato*"), a typical character of *C. erecta* (Faden 1993, 2000).

These heterogeneous and partially incongruent treatments clearly influenced and misled Bozzi, who stated that his specimens did not fit with the descriptions provided by Linnaeus and Pursh, but were instead "perfectly correspondent" to those by Clarke and Hooker (which were ambiguous). In Bozzi's description, in fact, flowers are reported to feature two blue petals and a third one similar to the "colourless and transparent" sepals, while the sheath hairs are described as "short and barely visible" (Bozzi 1888: 286), characters unmistakably leading to *Commelina communis* (Table 1). Bozzi's specimens stored at FI, MI and RO (Fig. 1) are congruent with his description and feature all the diagnostic characters of *C. communis* reported in Table 1 (Fig. 2), with the exception of the capsules: described as 3-locular by Bozzi (character typical of *C. virginica*), they were not observed on the investigated specimens.

Table 1. Nomenclature and diagnostic characters of *Commelina virginica* and *C. communis*, based on Faden (2000) and personal observations.

Nomenclature	*Commelina virginica* L., Sp. Pl., ed. 2., 1: 61. 1762 ≡ *C. caerulea* Salisb., Prodr. Stirp. Chap. Allerton: 216. 1796, nom. illeg. – Lectotype (designated by Hunt 1993: 145): Herb. Linn. No. 65.7 (LINN [digital image!]). = *C. deficiens* Hook. in Bot. Mag. 53: t. 2644. 1826.	*Commelina communis* L., Sp. Pl., 1: 40(–41). 1753. – Lectotype (designated by Faden & Reveal in Jarvis & al. 1993: 36): Herb. Linn. No. 65.1 (LINN [digital image!]).
Spathes	clustered, surface uniformly green, without contrasting veins, margins connate	solitary, surface green, pale or whitish basally with contrasting dark green veins, margins distinct to base
Leaf sheath summit	with long red hairs	glabrous or with short to long white hairs
Petals	all pale blue, proximal one smaller	proximal petal paler or white, much reduced, distal ones blue to bluish purple
Antherodes	entirely yellow	entirely yellow or with central maroon spot
Capsule	3-locular	2-locular

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Fig. 1. Specimen of *Commelina communis*, identified as "*C. virginica*", collected in 1889 by Luigi Bozzi in Cava Manara and stored at the "Erbario Generale" of the Sapienza University of Rome (RO). – Scan by M. Iberite.

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Further literature and herbarium records

The floristic record by Bozzi (1888), associated with imprecise and erroneous morphological descriptions of *Commelina virginica* in some Italian floras (e.g. Fiori 1923; Pignatti 1982) and the incorrect synonymy of *C. virginica* with *Tradescantia virginiana* L. introduced by Zangheri (1976), led to an overestimation of the presence of this species, at least in Italy. Based on extensive literature and herbarium research, *C. virginica* is absent from the Euro-Mediterranean flora. The records of this species are to be referred mostly to *C. communis*, and, to a lesser extent, to *C. chamissonis*, *T. fluminensis* Vell. and *T. virginiana* (see also Specimens examined).



Fig. 2. Detail of Bozzi's specimen labelled as "*Commelina virginica*", belonging to the Ferdinando Sordelli herbarium stored at MI (Andreis 2000). Some relevant diagnostic features of *C. communis* are clearly identifiable: spathes solitary, pale green basally, with darker contrasting veins, lack of long red hairs at the leaf sheath summit and only two well-developed blue distal petals. – Photograph by N. M. G. Ardenghi.

Italy — Two years after Bozzi's record (1888), Rodolfo Farneti, from the University of Pavia, searched for *Commelina virginica* in the province of Pavia, but without any success; he added that specimens assigned to that species examined by himself (probably the same ones collected by Bozzi) belonged to *C. communis* (Farneti 1900: 157). Unfortunately, his interesting remarks passed unnoticed and *C. virginica* was subsequently accepted and treated in the major national floras and checklists, such as Saccardo (1909: 41), Béguinot & Mazza (1916: 425), Fiori (1923: 227), Viegi & al. (1974: 158), Zangheri (1976: 895), Pignatti (1982: 448) and Conti & al. (2005: 79). Italian records of *C. virginica* increased during the second half of 20th century and an updated national distribution was later outlined by Celesti-Grapow & al. (2009), based on literature references and personal communications.

Piemonte — Montelucci (1949: 692–693) indicated *Commelina virginica* for the mouth of the torrent Orco, near Chivasso. This record, missed by Celesti-Grapow & al. (2009), refers to *C. communis*, as can be seen by the examined voucher at RO. Montelucci's finding was repeated by Abbà (1980) under the binomial *Tradescantia virginiana*; probably, Abbà's incorrect synonymization of *C. virginiana* with *T. virginiana* derived from Zangheri (1976). Abbà (1980) additionally reported a "genuine" record of *T. virginiana* from the province of Asti (Piemonte), taken from Camisola (1854). Abbà's records and erroneous synonymy were then cited by Viegi & Cela Renzoni (1981), who, on the other hand, accepted *C. virginica* as the correct binomial, treating *T. virginiana* as its synonym.

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Lombardia — After Bozzi (1888), the species was recorded for further localities in the province of Pavia by Pignatti (1957: 259) (Villanova d'Ardenghi, Pieve Albignola, fields between Sairano and Zinasco Vecchio) and Pavan Arcidiaco & al. (1990: 19) (town centre of Pavia); no specimens of Pignatti were traced, whereas the voucher collected by Pavan Arcidiaco and colleagues (PAV) is to be assigned to *Commelina communis*, as is the collection from Bosco Fontana, Mantova, by R. Barini stored at FI. The record for the province of Brescia by Banfi & Galasso (2010), ignored by the subsequent flora of that province (Martini & al. 2012), originated from the misinterpretation of a personal communication by E. Zanotti, whose collections, stored at HBBS, comprise only one specimen of *C. communis* (a variegated form, identifiable, according to Faden 2000, as var. *ludens* (Miq.) C. B. Clarke f. *aureostriata* MacKeever) and one of *Tradescantia virginiana*. The occurrence in the province of Varese, reported by Banfi & Galasso (2010), was based on a nomenclatural mistake during a field observation of *T. virginiana* by G. Galasso.

Friuli-Venezia Giulia — Two specimens collected by C. Zirnich in Zaule (Trieste) and Gorizia (TSM) during the first half of the 20th century (later mentioned by Mezzena 1986: 62) were re-identified as *Commelina communis*; no vouchers relating to the records of Martini & Poldini (1995: 238) and Poldini (2009: 240) were found.

Liguria — A peculiar series of mistakes involved the most recent record for this region, a short note by Iamonico (2010: 533); it is based on an exsiccatum stored at FI, actually belonging to *Tradescantia fluminensis*, collected by G. Gresino in Varazze (Savona) in 1927. The specimen was originally identified by its collector as "*Tradescantia virginica* ε *f. a fiori bianchi*", then revised by Iamonico as *T. virginiana*, but, for inexplicable reasons, recorded by the latter as *Commelina virginica*. An additional specimen labelled as "*C. virginica*", collected in 1928 by O. Mattirolo and P. Fontana in Riomaggiore (La Spezia) and stored in TO, is similarly referable to *T. fluminensis*. The record of *C. virginica* for Liguria by Viegi & Cela Renzoni (1981) was probably based on both or one of these two exsiccata.

Emilia-Romagna — The indication by Celesti-Grapow & al. (2009), the only one known for this region, is erroneous, as communicated to us by A. Alessandrini, regional referee for that work.

Toscana — The herbarium voucher at FI, collected by A. Chiarugi in 1956 in Badia a Settimo (Firenze province), is to be assigned to *Tradescantia fluminensis*. All the records of *Commelina virginica* from Toscana were solely based on this specimen (Viegi & Cela Renzoni 1981: 28–29; Arrigoni & Viegi 2011: 118).

Lazio — As pointed out by L. Celesti-Grapow (pers. comm.), the records by Celesti-Grapow & al. (2009, 2014: 1075) for Lazio and the city of Roma respectively, are erroneous, possibly to be referred to *Tradescantia virginiana*.

Great Britain — Clement & Foster (1994: 368) reported *Commelina virginica* for a single locality, Trafford Park, Manchester. The related voucher specimen (under the binomial *C. caerulea* Salisb.), stored at BON, was examined and assigned to *C. communis*. This record is not mentioned in later British floras, such as Sell & Murrell (1996) and Stace (2010).

Croatia — *Commelina virginica* is mentioned as "previously registered" for Croatia by Milović & al. (2010: 412). However, this statement is incorrect, as communicated to us by Milović himself, after checking the Croatian floristic literature and the Zagreb herbarium (ZA). Moreover, the species does not appear in the Flora Croatica Database (Nikolić 2014).

Algeria — Two specimens from Algeria labelled as "*Commelina virginica*" were discovered at the Herbier National de Paris (P). These exsiccata, collected by R. Maire, actually belong to *C. chamissonis*, a neophyte native to the Philippines and possibly Australia (Merrill 1925: 195; Maire 1957: 328) and already known for Algeria (Maire 1957: 327–328; Euro+Med 2006+; African Plant Database 2012+). Identification of these collections was made by comparison with the holotype of *C. chamissonis* (stored at B [digital image!]), its protologue (Clarke 1881: 186–187) and the description provided by Maire himself (Maire 1957: 327–328), who seemingly misidentified the plant with *C. virginica* when he first collected it.

Specimens examined

Commelina chamissonis Klotzsch ex C. B. Clarke
Algeria: Alger, naturalisé dans le jardin de l'Université, Aug–Sep 1922, *R. Maire 4569* (P P02203469, P02203470 sub *Commelina virginica*).

Commelina communis L.
Great Britain: Greater Manchester: Trafford Park, "superheaters", found by Rev. C. E. Shaw, 15 Sep 1959, *B. W. Fox s.n.* (BON 85.1984.291 sub *Commelina caerulea*). Italy: Piemonte: Presso Chivasso, nel greto dell'Orco, presso l'incrocio con la strada di Torino, nuova per il Piemonte, 7 Sep 1943, *G. Montelucci 6250* (RO sub *Commelina* "dubbia"). — Lombardia: Anlimata [?] presso Pavia, 9 Aug 1888, *L. Bozzi s.n.* (FI sub *C. virginica*); Altipiano di Cava Manara a 6 Chilometri da Pavia, Aug [1889], *L. Bozzi s.n.* (RO sub *C. virginica*); Altipiano di Cava Manara, Aug 1889, *L. Bozzi s.n.* (MI-Sordelli sub *C. virginica*); Vigevano: dintorni, comunissima d'estate lungo fossati, siepi ecc. ecc., s.d., *L. Bozzi s.n.* (MI-Sordelli sub *C. virginica*); Mantova, Bosco Fontana, fossati dietro la palazzina NW, 20 Aug 1977, *R. Barini 409* (FI sub *C. virginica*); Entro il perimetro delle mura della città di Pavia, Via Calchi, 12 Jul 1980, *L. Pavan*, *M. G. Valcuvia* & *M. Vittadini s.n.* (PAV sub *C. virginica*); Oglio Barco, Orzinuovi, incolto, 13 Jun 1983, *E. Zanotti s.n.* (HBBS 21175-027577). — Friuli-Venezia Giulia:

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Zaule (Trieste), dietro gli oleifici, 18 Aug 1930, *C. Zirnich 632* (TSM-Zirnich sub *C. virginica*); Dietro il Giardino Pubblico di Gorizia lungo il Corno in un solo punto, ma ivi copiosa, 4 Oct 1943, *C. Zirnich 631* (TSM-Zirnich sub *C. virginica*).

Tradescantia fluminensis Vell.
Italy: Liguria: Varazze, in un fosso, spontanea, 18 Jun 1927, *G. Gresino s.n.* (FI sub "*Tradescantia virginica* ε f. a fiori bianchi"); Riomaggiore (Spezia), nei canale [sic] presso il paese, 4 Jun 1928, *O. Mattirolo & P. Fontana s.n.* (TO sub *Commelina virginica*). — Toscana: Badia a Settimo (Firenze), Podere "Grioli", 7 Apr 1956, *A. Chiarugi s.n.* (FI sub *C. virginica*).

Tradescantia virginiana L.
Italy: Lombardia: Breno (BS), coltivato nelle aiuole di una stazione di servizio di carburante, 8 Jul 1993, *S. Danieli s.n.* (HBBS 21176-033551); Lonato (Esenta), coltivata in un giardino, 25 May 1995, *E. Zanotti s.n.* (HBBS 21177-027578).

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