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Muscari baeticum (Scilloideae, Asparagaceae), a new addition to the native flora of Tunisia and third report to Mediterranean Africa

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Key words: Asparagales, *Muscari* subg. *Botryanthus*, chorology, new record.

Ključne besede: Asparagales, *Muscari* subg. *Botryantus*, horologija, nova najdba.

Abstract

Muscari baeticum, originating from western Europe, is here recorded as new from the central eastern part of Tunisia. So far, it was known only from Algeria and Morocco within the southern part of the Mediterranean basin. Description of the species as well as first data about its ecology in Tunisia together with geographical distribution and diagnostic features of closely related species are given. Photographic illustrations of the new reported taxon and an updated key to the *Muscari* species in North Africa are also provided.

Izvleček

V članku je opisana nova najdba zahodnoevropske vrste *Muscari baeticum* v vzhodni Tuniziji. Doslej je bila na južni obali Sredozemskega bazena znana le iz Alžirije in Maroka. Podan je opis vrste in prvi podatki o njeni ekologiji v Tuniziji ter geografska razširjenost in diagnostične značilnosti sorodnih vrst. Dodane so tudi fotografije taksona in posodobljen določevalni ključ za vrste iz rodu *Muscari* v Severni Afriki.

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Introduction

The genus *Muscari* Mill. (Miller, 1754) belongs to Scilloideae subfamily and Scilleae tribe (Engler, 1887) has a pan-Mediterranean origin with numerous variety of species, it is well distributed from Mediterranean Europe and North Africa to Caucasus, North-Western, South-West and Central Asia (Rechinger, 1990; Kubitzki, 1998; Jafari & Maassoumi, 2011; Byng, 2014; Yıldırım, 2015, 2016; Yıldırımli & Kılıç, 2019; Eker & Yıldırım, 2021). *Muscari* has about 77 to 80 taxa around the world (WCSP, 2020), only four of which are reported widely in Tunisia (Dobignard & Chatelain, 2010). Following that the genus has been splitted into four different genera: *Leopoldia* Parl., *Muscari, Muscarimia* Kostel. ex Losinsk. and *Pseudomuscari* Garbari & Greuter (based on their karyological and morphological characteristics, Garbari & Greuter, 1970), only two of the Tunisian species belong to genus *Muscari* (*M. parviflorum* Desf. and *M. neglectum* Guss. ex Ten.), the others are included to *Leopoldia* genus. In this paper, the finding of unexpected species belonging to the genus *Muscari*, new to Tunisia and third report to North Africa.

Materials and Methods

During botanical field surveys undertaken between 2017 and 2021 in Centre Eastern of Tunisia, (North Africa), interesting individuals of a little Muscari were seen during their flowering period which initially show high macromorphological affinities to *Muscari neglectum*. Several specimens were collected from two distant natural subpopulations within Monastir region, digital photographs and GPS coordinates were also taken in the field. Voucher specimens are stored at the personal herbarium of the author (REM) deposited in the Faculty of Pharmacy of Monastir (not yet listed in Index Herbariorum, Thiers, 2021). For identification, investigated features of collected specimens were compared with the relevant taxonomic literature in the national keys of the genus in Cuénod et al. (1954) and in the keys of the floras of neighbouring countries mainly Lybia (Jafri & El-Gadi, 1978), Algeria (Quézel & Santa, 1962) and Morocco (Fennane et al., 2014). It was realized that collected specimens are different from known *Muscari* species in Tunisia and historical works on the floras of the neighboring countries. More European references were therefore checked for the successful identification of these specimens (e.g. Davis & Stuart, 1980, pp. 46–49; Suárez-Santiago et al., 2007; Suárez Santiago & Blanca, 2013). Plant names here cited as associated species are according to APD (2021).

Results and Discussion

Muscari baeticum Blanca, Ruíz Rejón & Suár.-Sant. Taxon 56(4): 1184 (Figure 3) (2007).

Holotypus. Sierra Nevada, Dornajo (in Hispaniae provincia granatensi), 1950 m, in genistetis, locis petrosis, dolomiticis, ubi M. RUIZ REJÓN legit die 30 mensis Iunii anni 1998 (GDA 44686).

Morphology (Figure 1). Perennial herbaceous, scapous, bulbous plant. Bulb 1.7–2.5(–3) × 1.3–1.6 cm, ovoid; outer tunics membranaceous brown or dark brown, almost black; bulbils 0–2, formed outside the main bulb. Scapes 1–2(–3) per bulb, simple, 110–170 × 2.0–2.8 mm. Leaves 2–6 per bulb, 1.0–1.5(–2.0) as long as scape and 2.0–2.8 mm wide, basal, prostrate, sessile, simple, linear to subcylindrical, canaliculate, almost glaucous, parallel-nerved, with 11–12 nerves. Inflorescence racemose simple, with short, ovoid or ovoid-cylindrical, and dense raceme which lengthens up to (2–)2,5–5 cm in fruiting, bracteate; bracts ovate or linear, white; pedicels 3.0–3.5 mm in anthesis, shorter than perianth. Apical flowers c. 9(–10) 20–36% of the total, sterile, different from fertile, with pedicels up to 2.5 mm, patent or erect-patent; perianth up to 6 × 4 mm, smaller towards the apex of the inflorescence, oblong, oblong-obovoid or claviform, usually not opening, pale blue-violet or lilac in color. Flowers remaining 11–29, fertile, pendulous; bracts 2, from c. 1 mm, the basal ones of the inflorescence free, the rest concrescent, arranged ± at the same level, ovate, lanceolate or oblanceolate, white, bluish-white or bluish towards the apex of the inflorescence; pedicels (1.5–)2–3.5 mm in anthesis, shorter than the perianth, ± reflexes, which become patent and lengthen up to 6 mm at fruiting; perianth 5–7.5(–8) × (3.2–)3.5–5(–5.5) mm, oblong-ellipsoid or oblong-obovoid, contracted at the apex, with an aperture of (1.6–)2 –2.5(–3) mm in diameter, dark purplish blue with six apical lobes; lobes 1.0–1.5 mm, recurved, broadly ovate, obtuse, uniformly white or with violet tints in the center; perianth mouth 1.6–3.0 mm in diameter. Androecium with 6 stamens, the 3 lower stamens inserted towards the middle part of the perianth and the upper ones 0.5–1 mm above those i.e. in the upper third; filaments (0.8–) 1–1.4 mm; anthers 1.3–1.5 mm, attached by middle, introrse, included, purple in color. Ovary superior 1.5–2.5 × (1.2–)1.5–2.2 mm, ovoid, 3-chambered, light green, with 1 style included; style 1.4–2.6 mm, white, greenish-white at the base; stigma broadened and faintly three-lobed, white. Capsule 5.5–7.5(–8) × 6–8(–8.5) mm, membranous, suborbicular or very broadly obovate outline, strongly three-lobed, with a truncate or slightly emarginate apex. Seeds (1.5–)1.8–2.5(–3) × 1.5–2(–2.2) mm, 2 per loculum, ellipsoidal or subglobose, black (e.g. Suárez-Santiago et al., 2007; Suárez Santiago & Blanca, 2013).

Figure 1. *Muscari baeticum* in Centre Eastern Tunisia. **A**: habit of a flowering plant in its natural habitat; **B:** flowering spike; **C:** fruiting spike; **D:** typical bulbs (NE Tunisia, North Africa); photographs Ridha El Mokni, 11 March 2021.

Slika 1. *Muscari baeticum* v osrednji vzhodni Tuniziji. **A**: habitus cvetoče rastline v njenem naravnem habitatu; **B:** socvetje; **C:** plodeč grozd; **D:** tipične čebulice (SV Tunizija, Severna Afrika); fotografije Ridha El Mokni, 11. 3. 2021.

Phenology. Flowering occurs from February to March.

Iconography. Suárez-Santiago et al. (2007, p. 1175, Figure 3).

Native range and actual distribution area. *Muscari baeticum* has a western Mediterranean distribution (Suárez Santiago & Blanca, 2013). In Europe, its presence is restricted to Spain, France and Germany whereas in North Africa, it was reported only from Algeria and Morocco (Suárez Santiago & Blanca, 2013; GBIF 2022) and here is its third report for the African continent from CE Tunisia (Monastir).

Habitat and distribution in Tunisia. *Muscari baeticum* grows in open clayey and sandy substrates with calcareous crusts in margins of olive groves (native habitat are Mountain meadows in rock crevices and limestone substrates, see Suárez Santiago & Blanca (2013, p. 176). In Tunisia, its presence till now is restricted to three localities (two in Monastir city at 20 m a.s.l. and one in Chott Meriam-Sousse at 50 m a.s.l.). Historically, the plant has never been cited before in any of these localities or around despite its presence. It is assumed that it was not well distinguished and/or misidentified to *M. neglectum* Guss. ex Ten. (Figure 2).

Notes on the main associated species. Reported subpopulations counting more than one hundred individuals observed growing in wild over an area of about 4000 sq.m. (for Monastir city) and an area covering about 100 sq.m. (for Chott Meriam-Sousse), together with several thermo-xerophilous herbs and grasses, mainly: *Asparagus horridus* L., *Calendula arvensis* (Vaill.) L., *Diplotaxis muralis* (L.) DC., *Fagonia cretica* L., *Launaea nudicaulis* (L.) Hook. f., *Phagnalon rupestre* subsp. *illyricum* (H. Lindb.) Ginzb., *Salvia aegyptiaca* L. and *Stipa capensis* Thunb.

Examined specimens (our collections). TUNISIA. Monastir: Monastir-city, 35°45'39"N, 010°47'48"E, in the margins of olive groves, about 20 m a.s.l., 24 Febru-

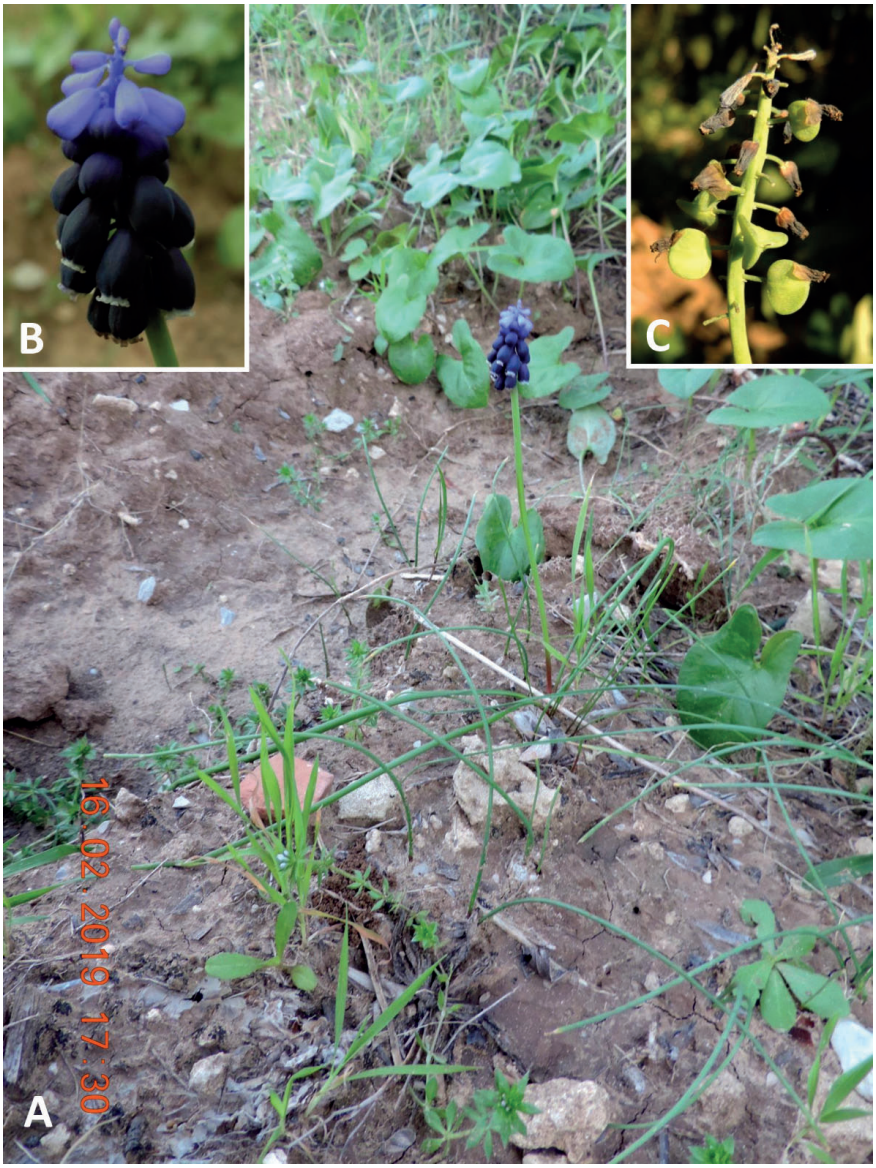

Figure 2. *Muscari neglectum* in Tunisia. **A:** habit of a flowering plant in its natural habitat; **B:** flowering spike; **C:** fruiting spike (NE Tunisia, North Africa); photographs Ridha El Mokni, 16 February 2019.

Slika 2. *Muscari neglectum* v Tuniziji. **A:** habitus cvetoče rastline v njenem naravnem habitatu; **B:** socvetje; **C:** plodeč grozd (SV Tunizija, Severna Afrika); fotografije Ridha El Mokni, 16. 2. 2019.

ary 2017, *El Mokni s.n.* (*Herb. R. El Mokni*!), *ibidem*, 02 March 2021, El Mokni s.n. (*Herb. R. El Mokni*!).

Diagnostic features. Compared to the closest species (all polyploid!), *Muscari baeticum* produces very few bulblets (0–2(6)), whereas *M. neglectum* shows 10 to 20 (50) bulblets for each bulb. The species is characterized by an ovoid or ovoid-cylindrical, dense inflorescence with pale blue-violet or lilac sterile flowers while in *M. neglectum* the inflorescence is short and dense with sterile flowers blue-violet or violet. Furthermore, *M. aeticum* shows bluish-violet or bluish-purple fertile flowers and prostrate leaves, while *M. neglectum* has dark-blue fertile flowers and arched-ascending leaves (cf. Suárez-Santiago et al., 2007).

Conclusion

As far as known, *Muscari baeticum* was cited only for Algeria and Morocco from the works on the flora of North Africa and is here reported as a new discovery for Tunisia and third record for the continent. With this addition, the number of species in the *Muscari* genus is increased to 3 in Tunisia. This should be considered as its third official mention for the southern shore of the Mediterranean basin (North Africa) and in large scale for the entire African continent. Hereafter, an updated diagnostic key is proposed for the species of the genus *Muscari* in North Africa (cf. Cuénod et al., 1954; Quézel & Santa, 1962; Suárez Santiago & Blanca, 2013; Fennane et al., 2014).

Dichotomous key to North African species of Muscari

1. Suberect leaves; autumn flowering; fertile flowers up to 4 mm long, patent or erect-patent, pale violet-blue with 6 darker longitudinal stripes; sterile flowers 0–2, sessile..... ***M. parviflorum*** Desf.
– Leaves prostrate to arcuate-upward or arcuate-reflexive; spring flowering; fertile flowers more than 4 mm long, pendulous, blue-violet, blue-purple or violet, without longitudinal stripes; sterile flowers more than 2, stalked **2**
2. Bulblets (5)10–50; fertile flowers of a blue-violet or violets; sterile flowers blue-violet or violet **3**
- Bulblets 0–2(6); fertile flowers of a purplish-blue; sterile flowers pale violet-blue or lilac..... **4**
3. Inflorescence (1.5)2–2.8(3) cm in blooming, ellipsoid, dense; stems (1)1.5–2.5(3) mm in diameter; leaves (1.5)2–3.5(4) mm wide; fertile flower pedicels (1.5)2–2.5(3) mm at anthesis; anthers 0.8–1.2 mm.. ..... ***M. neglectum*** Guss. ex Ten.
– Inflorescence (2.3)2.5–4(6) cm in blooming, oblong-obovoid, lax; stems (2)2.5–3.5(4) mm in diameter; leaves (2.5)3–7 mm wide; fertile flower pedicels (2.5)3–4.5(5) mm at anthesis; anthers 1–1.5 mm..... .....***M. olivetorum*** Blanca, Ruíz Rejón & Suár.-Sant.
4. Inflorescence ovoid or ovoid-cylindrical, dense; sterile flowers (10) 20–36% of the total, which do not open; bracts arranged ± at the same level; inclusive anthers – the upper ones reach the middle third or the base of the upper third of the perianth..... ..... ***M. baeticum*** Blanca, Ruíz Rejón & Suár.-Sant.
– Inflorescence narrowly cylindrical, lax; sterile flowers 30–60% of the total, which often open; bracts arranged at different levels; anthers somewhat exserted –the upper ones reach the opening of the perianth.... ..... ***M. atlanticum*** Boiss. & Reut.

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