

Communication

First records of alien *Panicum miliaceum* subsp. *miliaceum* (Poaceae) in Tunisia

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Abstract

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Botanical surveys aiming to update alien flora in various rural regions of northern and central Tunisia have been conducted since 2015. These led to the discovery of four localities of an annual *Panicum* species not recorded in Tunisia. After a critical study of the collected specimens and a comparison with native species of the genus, as well as a review of the relevant literature and herbarium specimens, all the plants were identified as *Panicum miliaceum* L. subsp. *miliaceum*. This taxon, known as a weed and (or) an accidental escapee in most parts of Europe and North Africa, is reported here for the first time as a naturalising weed in Tunisia. Data on the distribution, ecology and phenology of *Panicum miliaceum* subsp. *miliaceum* in Tunisia were analysed. A key with diagnostic characters for the identification of *Panicum miliaceum* subsp. *miliaceum* and other related alien species in the Mediterranean was compiled.

Keywords: alien species, Gramineae, grasses, new records, *Panicum*, Tunisia.

INTRODUCTION

The genus *Panicum* L. (Poaceae, Panicoideae) is one of the largest grass genera, with approximately 300 species distributed worldwide. Most species have a tropical or subtropical native range (Zuloaga & Soderstrom, 1985; Zuloaga et al., 2018). In the Mediterranean flora, *Panicum* is represented by thirteen species, of which only six occur in North Africa. Four species are native, and two are alien to North Africa (*Panicum capillare* L., *Panicum miliaceum* subsp. *miliaceum*). The former has been reported as naturalised only in the Canary Islands, Algeria and Morocco. In contrast,

the latter has been reported as naturalised only in the Canary Islands, Morocco, Libya and Egypt and as cultivated in Algeria (Valdés et al., 2009).

Panicum miliaceum subsp. *miliaceum* is of Eurasian origin and is now thought to be native to South Asia. It is widely cultivated as a fodder crop in the southeastern USA and other regions of the world (Weakley, 2010). The taxon is naturalised in North and South America and Australia and is quite common as a weed in cereal crops or as a casual ruderal in most of Europe (Valdés et al., 2009). *Panicum miliaceum* subsp. *miliaceum* is reported here for the first time in Tunisia as a naturalising alien plant in the cen-

tral and northern parts of the country. As a contribution to the knowledge of monocots (Commelinidae, Poales) in Tunisia (El Mokni & Verloove, 2019a, 2019b, 2021, 2022), we present here a note dealing with the first reports of *Panicum miliaceum* L. subsp. *miliaceum* at the national level. Tunisia is the fourth country in the North African inland where this plant has been recorded. An identification key for alien species of the genus *Panicum* in the Mediterranean is also proposed.

MATERIALS AND METHODS

The plants were collected during floristic surveys, and studies carried out in the last two decades in different phytogeographical regions and districts of Tunisia. The collected specimens were analysed in fresh state and identified mainly according to Verloove (2001), Freckmann & Webster (2012). The herbarium specimens deposited at the Herbaria of BR, CLF, GAP, LY, MARS, MPU, P and VIL (herbarium codes according to *Index Herbariorum*; Thiers, 2024) were also consulted. Herbarium specimens of *Panicum miliaceum* subsp. *miliaceum* collected during this study are deposited at the Herbarium of Monastir University (not yet listed in the *Index Herbariorum*). The description of *Panicum miliaceum* subsp. *miliaceum* was made after Baltensperger (1996, 2002), Sheahan (2014), Bhat et al. (2019) and Freckmann & Lelong (2003). To confirm the absence of historical records of *Panicum miliaceum* subsp. *miliaceum* in Tunisia, species checklists and indices published in the literature (Cuénod et al., 1954; Dobignard & Chatelain, 2010) and online databases (GBIF, 2024; POWO, 2024) were consulted. Data on habitats, plant abundance, and regional distribution were mainly based on personal observations in the field and were reported according to the system of national phytogeographic regions (Cuénod et al., 1954). Naturalisation status was assessed and defined according to Pyšek et al. (2004). The nomenclature follows Verloove (2001) and Scholz & Mikolá (1991).

RESULTS

***Panicum miliaceum* L. subsp. *miliaceum*.** Annual, hairy plant with fibrous roots. Stems are stout, robust, and almost smooth up to 100 cm tall, branching

at the base (Fig. 1). Sheaths open, 3.5–8 cm long, with long, spreading hairs. Ligules membranous, 1–3 mm long, ciliate. Leaf blades 10–20 cm long, 6–25 mm wide, upper surface velvety or rough-hairy. Inflorescences are spreading panicles 10 to 40 cm long, dense (Fig. 1, A) and not fully extended from the leaf sheath, green, with long, erect branches and glabrous axis. Panicle branches ascending to appressed. Spikelets (Fig. 1, B) are quite large (4–5 mm), oblong-acute, two-flowered; the upper floret is fertile, the lower is sterile; one spikelet per node, 4.5–5.5 mm, about 2.0–2.5 mm wide, elliptic, green to brown. Glumes are unequal, multinerved, acuminate, and lower glume 2.8–3.5 mm, one-half to three-quarters the length of the spikelet, 5–7-veined, acute. Lower florets are sterile. Upper florets are 3.0–3.8 mm long, 2.0–2.5 mm wide, stramineous to orange, unarticulated. Seeds are smooth, shiny, olive-brown to black. In Tunisia, as elsewhere in the world, flowers and seeds ripen from July to September(–October).

Occurrence, habitats and ecology in Tunisia

In 2023 and 2024, *Panicum miliaceum* subsp. *miliaceum* was found in four localities in three governorates of northern and central Tunisia (Fig. 2).

Subpopulations of almost a hundred individuals were observed along roadsides and railway lines, in wasteland and pots of nursery plants, sometimes as weeds in crops and gardens. It grew together with several species, characteristic of ruderal nitrophilous communities, most often with *Amaranthus retroflexus* L., *Amaranthus viridis* L., *Amaranthus deflexus* L., *Centaurea calcitrapa* L., *Chenopodium murale* (L.) Fuentes, Uotila & Borsch, *Erigeron bonariensis* L., *Euphorbia serpens* Kunth, *Euphorbia maculata* L., *Portulaca oleracea* L. and *Setaria adhaerens* (Forssk.) Chiov.

At present, this alien species can be considered a naturalising weed in Tunisia. Further studies are needed to confirm its presence in other Tunisian regions (highly probable) and to monitor its further spread in the country.

Taxonomic notes. *Panicum miliaceum* L. (subg. *Panicum* sect. *Panicum*) is a morphologically variable species; three subspecies were described. The type subspecies (subsp. *miliaceum*) is distinguished from the other subspecies by its non-caducous spikelets, which remain on the panicle branches. The pani-



Fig. 1. *Panicum miliaceum* subsp. *miliaceum* in Tunisia. A – plant with characteristic wide leaves and elongated drooping panicle; B – closeup of panicle and spikelets (11 July 2023, Tunis, northeastern Tunisia). Photographs by R.El Mokni.

cle of this subspecies has ascending branches, which soon droop under the weight of the ripening seeds in fertile florets, turning stramineous to orange at maturity. *Panicum miliaceum* subsp. *rudemale* (Kitagawa) Tzvelev, in contrast, has caducous spikelets, more open panicles with branches ascending to spreading, and glossy, blackish seeds in fertile florets that easily detach from the inflorescence below the glumes at maturity. *Panicum miliaceum* subsp. *agricolum* H. Scholz & Mikolá has non-caducous spikelets. However, the panicle remains more or less erect or slightly drooping, with glumes remaining on the panicle branches after the fertile florets have fallen.

Specimens examined. 1. Tunis, Ariana, along

roadsides, railways and in waste places, 11 June 2023, El Mokni; 2. Monastir, Kheniss, 2 August 2023, grassland with ornamental plants along roadsides, Saâd and El Mokni; 3. Sousse, Sousse town, in pots with plants grown in nurseries and along roadsides, 16 September 2023, El Mokni; 4. Monastir, Mognine, a weed in crops and gardens, and pots with nursery plants, 14 August 2024, El Mokni.

DISCUSSION

The species composition of the genus *Panicum*, native to the Mediterranean region of North Africa, is well known. So far, only four native species (*Panicum*

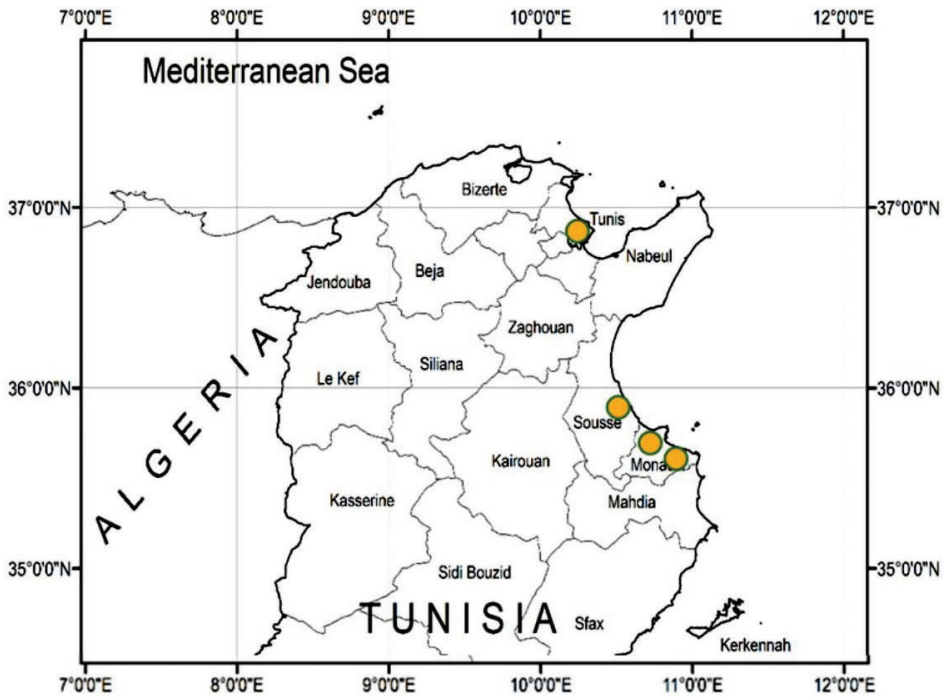


Fig. 2. Known localities (yellow dots) of *Panicum miliaceum* subsp. *miliaceum* in Tunisia.

coloratum L., *Panicum hygrocharis* Steud., *Panicum repens* L. and *Panicum turgidum* Forssk.) occur in this region (Dobignard & Chatelain, 2010; POWO, 2024). In the Mediterranean region of Europe and Asia, this genus is represented by only two alien species: the widely naturalised *Panicum miliaceum* L. s. l., native to South Asia, and the mostly casual but in some areas naturalised *Panicum capillare* L., native to North America (POWO, 2024; GBIF, 2024). The number of alien *Panicum* species in North Africa remains underestimated compared to the Mediterranean region of Europe, where six alien species of this genus (*Panicum capillare* L., *Panicum dichotomiflorum* Michx., *Panicum gattereri* Nash, *Panicum hillmanii* Chase, *Panicum miliaceum* L. s. l., and *Panicum schinzii* Hack.) have been recorded (Valdés et al., 2009). Although *Panicum dichotomiflorum* seems to be the most successful invader of this genus in the Mediterranean region of Europe, it has not yet been recorded in the Mediterranean region of North Africa. Old and sporadic records of *Panicum capillare* have been reported from inland North Africa (Maire, 1952), but its current distribution and naturalisation status are unknown.

Exact pathways of *Panicum miliaceum* subsp. *miliaceum* introduction in the Mediterranean region

of North Africa, as well as in Tunisia, are not known. Still, we suspect that it is most often introduced as a component of commercial birdseed (millet) and thrown away with leftovers and with potted plants from nurseries. As a result, *Panicum miliaceum* subsp. *miliaceum* spreads from these sources into crops, gardens, roadsides, railway embankments and wastelands. At present, we consider this species naturalising in Tunisia and assume that it was introduced and started to spread at least a decade ago, but remained unnoticed.

To facilitate the identification of *Panicum miliaceum* subsp. *miliaceum* from other alien species of the genus *Panicum* occurring in the Mediterranean, we propose a simplified identification key, adapted mainly from Reznicek et al. (2011) and Verloove (2014).

Key to the alien species of the genus *Panicum* occurring in the Mediterranean region

1. Lower glume $\frac{1}{4}$ – $\frac{1}{5}$ of spikelet length. Leaf sheaths glabrous (young sheaths occasionally slightly hairy).....2
- Lower glume more than $\frac{1}{2}$ of spikelet length. Leaf sheaths are always distinctly hairy3

2. Spikelets obtuse to bluntly acute at the apex. Palea of the lower floret (almost) equal in length and width to upper lemma *Panicum schinzii*
- Spikelets acute at apex. Palea of the lower floret much narrower and usually shorter than upper lemma *Panicum dichotomiflorum*
3. Panicle less than ½ the length of the entire plant *Panicum miliaceum*
- Panicle equal to or more than ½ the length of the entire plant 4
4. Panicle about ½ as long as the length of the entire plant *Panicum gattingeri*
- Panicle usually or more than ½ the length of the entire plant 5
5. Palea of the lower floret well developed, at least ½ the length of the upper lemma, 1.0–1.5 mm long. Upper lemma plump (1.1–1.3 mm width), dark brown at maturity with two conspicuous, lunate swellings at the base. Culms usually stout, panicle soon exerted from the leaf base *Panicum hillmanii*
- Palea of the lower floret absent (rarely vestigial and then at most 0.3 mm long). Upper lemma is elliptic (0.5–0.9 mm width), yellowish-brown at maturity, without swellings at the base. Culms often more slender, panicle usually long, remaining inserted in the leaf base *Panicum capillare*

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