

Short communication

***Echinochloa colona* (L.) Link (Poaceae), a new species in the flora of Croatia**

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Abstract – During floristic research into the eastern parts of Mt Medvednica (NW Croatia), in the period from 2007 to 2010, the neophyte taxon *Echinochloa colona* (L.) Link was found. Since *E. colona* is not included in plant identification handbooks, a new determination key for the two closely related taxa of genus *Echinochloa*, presented in Croatia, has been prepared, and the biology of this new alien plant is briefly discussed.

Keywords: Croatia, *Echinochloa colona*, Medvednica, neophyte, new species

Introduction

The genus *Echinochloa* Beauv. includes about 50 species that are widespread in both tropical and temperate regions of the world in dry or water-flooded soils (YABUNO 1966, MICHAEL 1983). The most widespread species of the genus are *Echinochloa crus-galli* (L.) P. Beauv. and *Echinochloa colona* (L.) Link (YABUNO 1983), two of the worst weeds in crop fields (HOLM et al. 1977). *Echinochloa colona* (L.) Link (name accepted from MICHAEL 2009) is a grass plant native to India and now widespread, especially beyond 30°N and 30°S latitude (MICHAEL 1983). As a cosmopolitan weed, it is known under many synonyms: *Panicum colonum* L., Syst. Nat. ed. 10, 2: 870 (1759); *Milium colonum* (L.) Moench, Methodus: 202 (1794); *Oplismenus colonus* (L.) Kunth in F. W. H. von Humboldt, A. J. A. Bonpland and C. S. Kunth, Nov. Gen. Sp. 1: 108 (1816); *Echinochloa zonalis* (Guss.) Parl., Fl. Panorm. 1: 119 (1839); *Brachiaria longifolia* Gilli, Ann. Naturhist. Mus. Wien 69: 39 (1966) (CLAYTON et al. 2002) and common names: jungle rice, little barnyard grass, corn panic grass, Deccan grass, jungle rice grass, millet rice, southern cockspur, swamp grass (CABI 2012). In Europe, the species is established in France, Greece, Italy, Spain, Cyprus, the European part of Turkey and on the Mediterranean islands like Balearics, Corsica and

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Sicily (PIROLA 1965, DAISIE 2012). According to NOBANIS (2012), the species is also known from Sweden, where it was first recorded in 1924 and it is listed in the flora of Czech Republic as a casual neophyte (PYŠEK et al. 2012).

Materials and methods

Study area

Mt Medvednica is 42 km long and approximately 9 km wide (POLJAK 2007), stretching in a NE-SW direction in northwest Croatia, in the Continental biogeographical region (cf. RADOVIĆ et al. 2009). Here, on only 0.4% of state territory, 1,205 taxa are present, which represent 22% of total Croatian flora (NIKOLIĆ and KOVAČIĆ 2008). In order to protect the flora and vegetation, especially the forest habitats, Medvednica Nature Park was proclaimed in 1981 and currently covers an area of 17,938 ha (ANONYMOUS 2009b). The researched area (Fig. 1), which is heavily anthropogenically influenced, occupies 5.5 km² outside the Nature Park's borders. It is located between four settlements – Čučerje on the West and Vugrovec on the East, the northern border is the road via Goranec which connects two places mentioned above, and the southern border is near Šimunčevac. Although the massif is mainly built of Palaeozoic and Triassic metamorphic rocks (predominantly green schist) (ŠIKIĆ 1995), the study area is characterised by carbonate and dolomite bedrock covered with limestone-dolomite black soil (kalkomelanosol) and brown soil on the limestone and dolomite (kalkokambisol) (ANONYMOUS 2011). According to the climate classification by Köppen, Mt Medvednica belongs to the temperate C climate (warm-temperate rainy cli-

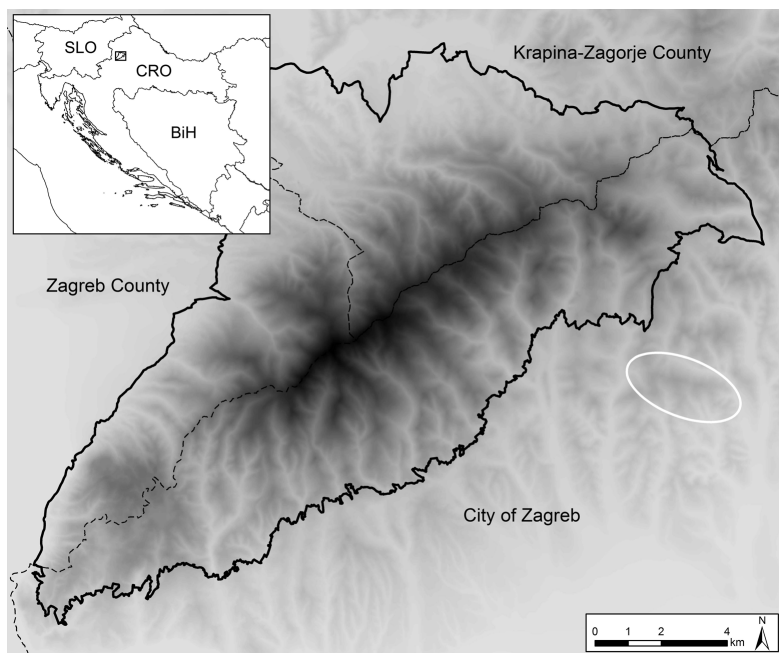


Fig. 1. Upper left corner – position of Mt Medvednica in Croatia. Larger image – Medvednica Nature Park is marked with black line and the studied area is indicated as a white oval circle.

mate – Cfb) (BERTIĆ et al. 2005) with 1,238 mm of annual precipitation on Sljeme (NIKOLIĆ and KOVAČIĆ 2008).

Plant identification and mapping

Plant identification was done by using relevant the determination key for European vascular flora (CLAYTON 1980) and checked again by two additional keys (MICHAEL 1983, FELGER 1990). Collected plant specimens were deposited in the Zagreb Herbarium (ZA). Geocoding of the site was performed with the use of a GPS device.

Results and discussion

A small population of *Echinochloa colona* with fewer than ten individuals was found in the area of Vugrovec (45°52'52.49"N, 16°06'25.41"E). Plants were grown in the ditch alongside the road, in the edge of crop field, mixed with other ruderal species such as *Artemisia vulgaris* L., *Ambrosia artemisiifolia* L. and *Festuca arundinacea* Schreb. After being recorded for the first time in the area of Mt Medvednica (HRUŠEVAR 2009), the species was also recorded in Zagreb (BASTJANČIĆ 2010). Even though the continental climate of Croatia is not quite suitable for *E. colona*, special attention should be given to its potential to become naturalized, especially should it occur in the Mediterranean region, where it could become invasive. It is also possible that *E. colona* was misidentified in previous research, due to its similarity with some unawned varieties of *E. crus-galli* (MICHAEL 1983). Until the finding of *E. colona*, there was only one barnyard grass species occurring in Croatia: *Echinochloa crus-galli*. This species is well known weed and common grass in the flora of Croatia (HULINA 1998, NIKOLIĆ 2012), where it forms the alliance *Panico-Setarion* Sissingh in Westhoff et al. 1946 (ANONYMOUS 2009a). According to MAREKOVIĆ et al. (2009), it is the second most widespread grass species in Medvednica Nature Park. Even though *E. colona* and *E. crus-galli* are hexaploids, they differ in genome constitution so their F₁ hybrids are sterile (YABUNO 1962).

Echinochloa colona (Fig. 2) is an annual or occasionally perennial grass, up to 60 cm high. Culms are stout, usually reddish-purple, erect, ascending or decumbent, often branching from the base, and rooting at the lower nodes. Sheath is 3–7 cm long, compressed, keeled and glabrous. Ligule is absent. Leaf blade is light green, sometimes with transverse purple bands, flat, glabrous, elongate, 4–10 cm long, 3–8 mm wide, with occasionally scabrous margins, apex is acute. Panicle is erect or nodding, green or purple-tinged, 5–15 cm long. Racemes are numerous, 2–4 cm long, spreading, ascending, sometimes branched, the lower ones up to 1 cm apart, the upper ones crowded. Spikelets are green tinged with purple, crowded, arranged in circa 4 rows, about 3 mm long, rarely with a short point up to 1 mm long. First glume is 1.2–1.5 mm long, 3-nerved, nearly half as long as the spikelet; second glume is 2.5–3 mm long, 7-nerved; the first lemma is similar to the second glume, first palea ovate, circa 2 mm long, glabrous; second lemma, broadly ovate, circa 2 mm long, glossy. Caryopsis is whitish, broadly ovate, 1.7–2 mm long, flat on one side, convex on the other (WAGNER et al. 1999). Chromosome number is $2n = 6x = 54$ (YABUNO 1962).

E. colona inhabits cultivated areas, waste grounds, ditches and fields (CABI 2012), from sea level to the height of 2000 m (HOLM et al. 1977, LAZARIDES 1980). We supposed that jungle rice was introduced with the import of crop seeds or with the transport of soil, which is possible due to the significant human impact in the researched area, such as traffic, agri-



Fig. 2. Habitus of *Echinochloa colona* (photo by Dario Hruševar).

cultural and construction activities. One plant of *E. colona* can produce from a few thousand (HOLM et al. 1991, CHAUHAN and JOHNSON 2010) to more than 40,000 seeds (MERCADO and TALATALA 1977). The flowering period starts 3–4 weeks after germination, quickly followed by fructification. The first seeds mature 45 days after flowering. The minimum, optimum and maximum temperature for germination temperatures are 15, 30 and 40 °C (UREMIS and UYGUR 1999). It propagates mostly by seeds but also vegetatively, by rooting at its nodes. The seeds are spread by farm machinery, in crop seed, in irrigation canals, on the feet, fur, feathers, and skin of rodents, birds, and larger animals, including humans (HOLM et al. 1991). *E. colona* has a wide ecological niche, it is adapted to full sunlight or partial shade, and grows on loam, silt and clay soils (MANIDOOOL1992). According to HOLM et al. (1977), *E. colona* is associated with 35 crops in more than 60 countries.

Determination key for *Echinochloa* species in Croatia

1. Spikelets 1.5–3 mm, regularly arranged in 4 rows. First glume regularly half the length of the spikelet. Sterile lemma and second glume often with a few hairs or short spines but not beset with harsh spines. Long bristles mostly absent from main axis and branches of inflorescence, occasionally a few scattered along the branches and clustered at the nodes. Anthers purple. Caryopses whitish. *Echinochloa colona*
2. Spikelets mostly more than 3 mm, irregularly arranged. First glume about one-third the length of spikelet. Sterile lemma and second glume with harsh spines. Long bristles along main axis and branches of inflorescence present or absent. Anthers brown or yellow. Caryopses brownish *Echinochloa crus-galli*

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