



Refinding of the critically endangered species *Eranthis hyemalis* (L.) Salisb. in Western and Eastern Serbia

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ABSTRACT: *Eranthis hyemalis* is a critically endangered species in Serbia, where it is protected by national law. The only confirmed finding place of the species in Serbia was the Bagremara forest near Bačka Palanka. It was assumed that the species disappeared from other recorded localities, or else the data were not confirmed. During a field study in 2016, we registered this species in Valjevo, a town in Western Serbia. A previous record of the species at this locality dates from 1992, but the precise location was not known. We also registered a small population in Eastern Serbia (on the hill Vrška Čuka). Both localities were georeferenced with GPS devices. Small groups of individuals are present at these locations, and they are endangered by multiple factors. All chorological data for Serbia are presented on a UTM grid map with squares of 10 km × 10 km. Protection measures are urgently required.

KEYWORDS: *Eranthis hyemalis*, critically endangered, distribution, Serbia

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The genus *Eranthis* Salisb. of the family Ranunculaceae comprises seven species native to Europe and Asia. In Serbia, this genus is represented by *E. hyemalis* (L.) Salisb., commonly known as winter aconite (in Serbian: „kukurjak“). *Eranthis hyemalis* is a perennial herb 5-15 cm high with tuberous rhizomes. It has three stem leaves, which are sessile and dissected. Basal leaves are formed after flowering, and they have long petioles with 5-7 linear sections. Measuring 20-30 mm in diameter, the flowers are yellow, cup-shaped, formed from six petals. The flowering period is at the end of February and beginning of March (BUDAČ 1999).

Winter aconite in the wild grows in the region of the Southern Alps (France, Italy and Slovenia). It is also present on the Balkan Peninsula (Serbia, Bulgaria, Croatia and Bosnia and Herzegovina), as well as in Hungary. The species has been cultivated since 1570 and is widely naturalised in the USA and Western Europe (BRUJIĆ *et al.* 2006; RYSIAK & ZURAW 2011).

In Slovenia, Croatia and Hungary, it is considered a rare (R) species, while in Romania this taxon is in the DD (data deficient) category (BUDAČ 1999). In Bosnia and Herzegovina, winter aconite was considered to be a probably extinct (EX?) species, but a change of this status to critically endangered (CR) was proposed when four populations were found by BRUJIĆ *et al.* (2006). Present populations in Bosnia and Herzegovina contain a small number of individuals and occupy a small area (BRUJIĆ *et al.* 2006).

Although *E. hyemalis* has been registered at eight locations in Serbia (Sombor-Bački Monoštor, Kozara forest; Bačka Palanka, Bagremara forest; Ruma, Donji Tovarnik, Lošinci forest; Valjevo; Knjaževac, Novi Han; Vrška Čuka; Zaječar, Koprivnica; Niš, Koritnik, Banjsko Brdo) (BUDAČ 1999), only a few findings have been confirmed. The biggest population at present is in the Bagremara forest near Bačka Palanka. A smaller population exists at the location of Ruma, Donji Tovarnik,

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Lošinci forest. The population recorded between Sombor and Bački Monoštor should be investigated further because estimation of its size is impossible due to insufficient data. The species is strictly protected by national law in Serbia (SGRS 5/2010, 47/2011), and according to "The Red Data Book of Flora of Serbia 1" it is considered to be a critically endangered (CR) species (BUDAČ 1999). The species was evaluated using the IUCN criteria and categories, version 2.3 (1994).

During a field study in 2016, we registered this species in the town of Valjevo in Western Serbia and confirmed a personal communication of Dragan Nešić for the locality of Prlita on the hill Vrška Čuka in Eastern Serbia.

Literature and herbarium records

Bč/dd – Bačka (JAVORKA 1924)

CR47/cr1 – Sombor – Bački Monoštor, Kozara forest [anonym. HIPNS! (Herbarium of the Institute for Nature Conservation of Vojvodina Province)]

CR71/cr3 – Bačka Palanka - Bagremara forest (Radonić 1979, HIB! (Herbarium of the Institute of Botany, University of Novi Sad); Stojšić & Panjković 1997, 1998, HIPNS!)

DQ16/cr2 – Ruma, Donji Tovarnik, Lošinci forest (GAJIĆ & KARADŽIĆ 1991)

DQ10 – Valjevo (GAJIĆ 1992)

FP05 – Vrška Čuka (FRITSCH 1899, Randelović, comm.)

FP07/dd – Zaječar, Koprivnica (GAJIĆ 1992)

EP02/dd – Knjaževac, Novi Han (GAJIĆ 1992)

EN89/ex – Niš, Koritnik, Banjsko Brdo (PETROVIĆ 1882)

New and confirmed chorological data

DQ10 – Valjevo, eastern periphery of the town, 44.274436 N, 19.930364 E, 165 m (Petrović, I., Petrović, P., field obs., 28.02.2016., BEOU-17270)

FP05 – Vrška Čuka, Prlita, near the top, 43.834142 N, 22.367997 E, 671 m (Stojanović, D., Petrović, I., field obs, 10.04.2016)

FP05 – Vrška Čuka, Vlaški do, Prlita, two places - near the river and close to the top on the valley side (Nešić, D., field obs, 18.03.2012., personal comm.)

FP05 – Ljuti do, Vratarnica-Zmijanac (Nešić, D., field obs, 21.02.2016 – personal comm.)

GAJIĆ (1992) recorded the taxon's presence near Valjevo, but no further findings were recorded until now. In the course of our field studies, we found *E. hyemalis* in the town of Valjevo (Figs. 1, 2). The finding refers to a small group of individuals (56 turfs grouped in 12 groups). The width and length of each turf were measured, and it is estimated that winter aconite occupies an area of just 5.14 m².

Most of the findings were in one of the five biggest groups, which were found growing in a small *Robinia pseudoacacia* L. stand surrounded by agricultural land. The majority of *Robinia pseudoacacia* trees in the stand



Fig. 1. *Eranthis hyemalis* (L.) Salisb. – Valjevo, eastern periphery of the town (44.274436 N, 19.930364 E, 165 m); A – whole plants (Photo: I. Petrović, 28.02.2016), B – flowers (Photo: M. Jeremić, February, 2016).

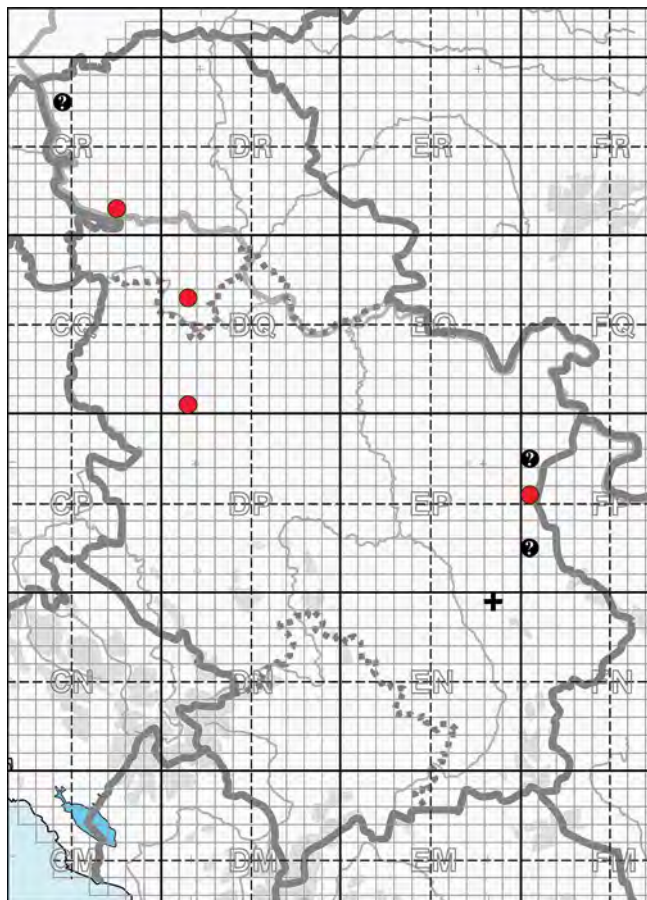


Fig. 2. Distribution of *Eranthis hyemalis* (L.) Salisb. in Serbia (UTM grid zone 34T; basic square 10 × 10 km, according to LAMPINEN 2001). Locality symbols: black crosses - extinct, red circles - confirmed presence, question mark - insufficient data.

have been cut down, and there are seven Persian walnut trees (*Juglans regia* L.) growing in half of the location. In the shrub layer, we registered only *Sambucus nigra* L. and *Euonymus europaeus* L. In the herbaceous layer, the most frequent species is *Aegopodium podagraria* L., while other herbaceous plants present are *Veronica persica* Poir., *Urtica dioica* L., *Lamium purpureum* L., *Ficaria verna* Huds., *Arum maculatum* L., *Daucus carota* L. and *Rubus* sp.

Around 50 % of individuals of *E. hyemalis* in these groups were flowering, and each flowering turf developed around 1-5 fruits per turf. A small number of individuals (five small groups) are present on the edges of the main location, in a parcel planted with *Medicago sativa* L. This area is mowed yearly, and plants are not flowering and fruiting. That is also the case with plants in the two last groups, which were found growing on the boundary between two agricultural parcels. The boundary is covered with *Clematis vitalba* L.

Situated a few metres from this location is a plantation of *Robinia pseudoacacia* (black locust). According to information provided by the local people, this location was the habitat of a bigger group of a winter aconite, but creation of the “Sepije” waste dump next to the plantation contaminated the area. The plantation is covered with solid waste, and chemical pollution is also present, especially due to medical waste. The area is affected by floods that carry the waste and polluted water to the surrounding area in conditions of high water levels. The existing population of *E. hyemalis* is endangered by those factors, and protection measures are urgently required.

The first report indicating the presence of this species at the locality of Vrška Čuka in Eastern Serbia was published by FRITSCH (1899). Later, N. Randelović reported that he found the species at the same locality (Randelović, personal comm. in BUDAČ 1999), but BUDAČ (1999) finally concluded that *E. hyemalis* is extinct from all known localities south of the Sava and Danube Rivers in Serbia, including the locality of Vrška Čuka.

The first documented refinding of the species on Vrška Čuka in Serbia was made by D. Nešić (18.03.2012), who registered its presence in two places at the sublocality of Vlaški do, Prlita, near the river and close to the top of the valley side.

BUDAČ (1999) indicated that winter aconite in North-East Serbia seems to belong to the taxon *E. hyemalis* var. *bulgarica*. In the “Red Data Book – Republic of Bulgaria” (VLADIMIROV 2015), *E. bulgaricus* is considered a critically endangered species present in Serbia and Bulgaria (on the shared slopes of Vrška Čuka), but the precise distribution of the plant in Serbia is not evaluated.

During our field study in Eastern Serbia, we also found the species at the locality of Prlita on Vrška Čuka, near the top of the hill. Twenty-two individuals occupying a small area (2.4 m²) were counted there. The field study was done in April of 2016, so it was not possible to collect data about flowering and fruiting of the plants.

Besides those two locations, in February of 2016 D. Nešić (personal comm.) registered the presence of the species at the locality of Ljuti do, Vratarnica-Zmijanac, in Eastern Serbia.

The populations recorded in Valjevo and on Vrška Čuka in Serbia are small and occupy a small area. They are under an extremely high risk of becoming extinct. The population in Valjevo is especially fragile because of its exposed location in the centre of the town near a waste dump. We recommend that the conservation status of this species as critically endangered in Serbia be maintained and that urgent conservation measures be implemented for protection of the existing populations.

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Botánica SERBICA



REZIME

Potvrđen nalaz kritično ugrožene vrste *Eranthis hyemalis* (L.) Salisb. u zapadnoj i istočnoj Srbiji

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Kukurjak (*Eranthis hyemalis*) ima status krajnje ugroženog taksona (CR) u Srbiji i zaštićen je zakonom. Do nedavno je jedino potvrđeno nalazište kukurjaka u Srbiji bila šuma Bagremara u blizini Bačke Palanke. Tokom terenskog istraživanja 2016. godine, vrsta je pronađena u zapadnoj Srbiji, u Valjevu. Vrsta je zabeležena na ovom lokalitetu 1992. godine, ali do sada nalaz nije potvrđen. Registrovali smo, takođe, malu populaciju vrste na Vrškoj Čuki u istočnoj Srbiji. Svi poznati lokaliteti u Srbiji su predstavljeni na UTM mapi (10 × 10 km), a za dva novopotvrđena nalaza u Srbiji južno od Save i Dunava su ustanovljene i koordinate pomoću GPS uređaja. Na oba lokaliteta su prisutne male grupe biljaka koje su ugrožene većim brojem faktora. Neophodno je sprovesti adekvatne mere zaštite.

KLJUČNE REČI: *Eranthis hyemalis*, krajnje ugrožen takson, rasprostranjenje, Srbija