

## The distribution of *Ranunculus psilostachys* Griseb. in Hungary and the question of its indigenoussness

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*Abstract:* *Ranunculus psilostachys* is native to the Balkan Peninsula and in Hungary it is currently known from the Villány Mountains and the Nyárád–Harkány Plain. Its origin in Hungary (native vs. introduced) has been debated since it was first discovered in the country. In this paper we provide an overview of the distribution of the species in Europe and Hungary, then we classify its Hungarian occurrences into six categories based on their naturalness level. We think that *R. psilostachys* may be native in its natural and seminatural habitats but because of its impressive appearance it is presumably planted in some secondary habitats, including sacred sites. We assume that these occurrences are not independent from one another, i.e., local people used native populations as a source of the species used as an ornamental plant.

*Keywords:* adventive flora, nature conservation, Nyárád–Harkány Plain, protected species, Villány Mountains.

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## Introduction

*Ranunculus psilostachys* Griseb. (Fig. 1) is a Balkan species found in the following countries of the Balkan Peninsula: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Kosovo, Montenegro, North Macedonia, Serbia, and Turkey-in-Europe (Hörandl & Raab-Straube 2015). It has been reported from Italy (Mayer 1910), where it has never been found later (Ballelli ex litt., also see Conti et al. 2005). The species has been inadvertently introduced to and/or planted as an ornamental species in Germany, Denmark, Sweden, and Norway (Ludwig 2005; Lye 2009; Tyler et al. 2015).

In its natural range, *R. psilostachys* is a species of thermophilous forests (Bergmeier & Dimopoulos 2008) as well as dry (Ćušterevska et al. 2012; Čarni et al. 2014; Avdiu et al. 2018), mesic (Mamolos et al. 2011) and subalpine grasslands (Roukos et al. 2017).

In Hungary, the species was first found by Horvát & Boros (1943) near Máriagyűd in the Villány Mts, among vineyards and orchards. However, first they thought the plant was the hybrid of *Ranunculus illyricus* and *R. bulbosus* (Fig. 2). It was realised later that it was *R. psilostachys* (Boros 1944). Later, the species was discovered in several other parts of the Villány Mts (e.g. Nagy 1963; Vöröss 1966; Dénes 1996), in the South Baranya Hills (Horvát 1975), and the Nyárád–Harkány Plain (Kevey 2013a).

*Ranunculus psilostachys* is on the red list of the Hungarian vascular flora (Király 2007). In Hungary, the species is legally protected (<https://termeszetvedelem.hu/talalati-oldal/?type=vedett-fajok&id=511>). The world population is not threatened, but the Hungarian population is threatened (Farkas 1999; Király 2007).

It has long been a debated issue if *R. psilostachys* is native to Hungary. According to Boros (1944), the fact that its occurrence near Máriagyűd is far away from main roads shows that it is either native or was introduced a long time ago. Nagy (1963) thought that the species' native origin was beyond question. However, currently there is no agreement about whether it is native or of anthropogenic origin (Soó 1966; Vöröss 1966; Simon 2000; Király 2009; Bartha et al. 2015). Molnár et al. (2017) argue that the species is a post-glacial relict in Hungary. *R. psilostachys* has been discovered in several new localities recently (Kevey 2013a; Bátori et al. 2014; Aradi et al. 2017; Erdős et al. 2018), which makes it timely to review its Hungarian occurrences and evaluate the facts suggesting its native or anthropogenic origin.

## Material and Methods

During the last ten years we have carried out intensive field works in southwestern Hungary, particularly in the Villány Mts and its surroundings. During these studies, we revisited the known localities of *R. psilostachys*, and discovered several new occurrences.

We prepared a complete list of all known Hungarian occurrences of *R. psilostachys*, based on earlier publications and some new, previously unreported localities.

Whenever possible, we also identified the plant association the species was found in.

Plant species names are used according to Király (2009), while plant association names follow Borhidi et al. (2012). For the geographical units, we relied on the work of Dövényi (2010). To collect Hungarian records of *R. psilostachys*, the following herbaria were checked: Hungarian Natural History Museum, Budapest (BP) and University of Pécs, Pécs (JPU).

## Results

In Hungary, *Ranunculus psilostachys* has been reported from three basic geographical units (I: Villány Mts, II: South Baranya Hills, and III: Nyárád–Harkány Plain), of which it can be found in two units currently. In the following list, localities are ordered to settlements within the geographical units. To ease the subsequent discussion, each locality received an Arabic numeral. Localities in the Villány Mts and the Nyárád–Harkány Plain are also shown in Fig. 3.

### I: Villány Mts

Nagyharsány: (1) the species was found in May 1962 on the south-facing near-



**Fig. 1** *Ranunculus psilostachys* Griseb.  
Photo by Attila Molnár V.



**Fig. 2** Herbarium specimen of *Ranunculus psilostachys* from 1944, when it was thought to be a hybrid of *R. illyricus* and *R. bulbosus* (leg. Horvát A. O., 15.05.1943; BP-420238).

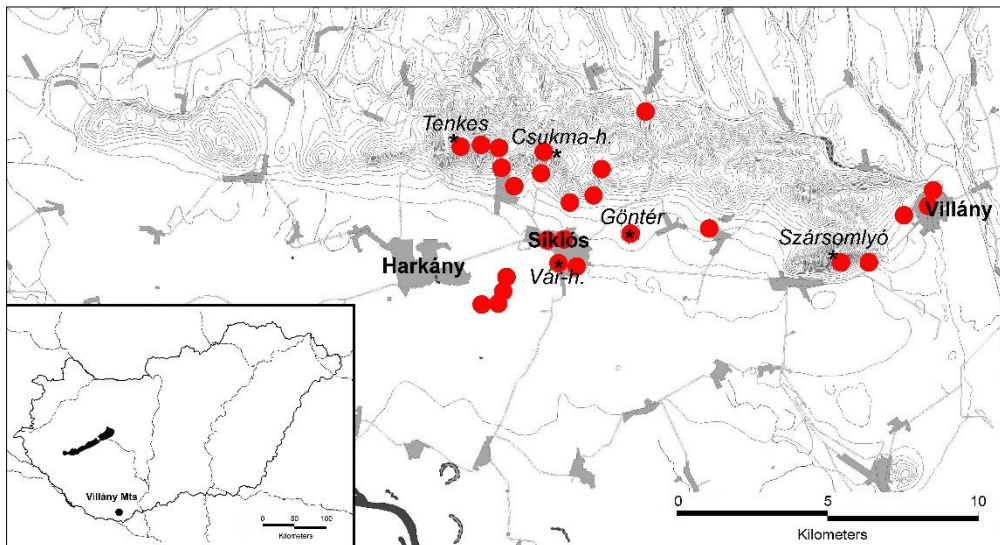
natural rocky slopes of Mt Szársomlyó (*Sedo sopianae–Festucetum dalmaticae*) (Nagy 1963; Vöröss 1966); (2) Mt Szársomlyó, at a degraded place near the former bauxite loading area (Vöröss ex litt. 1985) (3) Mt Szársomlyó, near the southeastern foot of the mountain, along a path overgrown by shrubs (Erdős ined. 2020).

Kisharsány: (4) in the sward of the cemetery (Erdős ined. 2021).

Máriagyúd: (5) among the vineyards and orchards known as ‘Epres’ (Horvát & Boros 1943; Boros 1944); (6) ‘Felső-legelő,’ in a degraded grassland near the hut on the mountain top (Dénes 1996); (7) in the edge of the *Aesculus hippocastanum* alley next to the Roman Catholic Church (Dénes 1996); (8) Mt Tenkes, near a path in a thermophilous forest (*Tamo–Quercetum vitgilianae*) (Kevey 2012; Dénes ex litt. 2020); (9) ‘Köves-máj,’ in a thermophilous forest (*Tamo–Quercetum vitgilianae*) (Kevey 2012).

Siklós: (10) in the town, with no further information on the exact location (Vöröss 1965; Priszter and Borhidi 1967); (11) around the castle (Vöröss 1966; Dénes 2000); (12) cemetery (Vöröss 1966); (13) along roads in the northern part of the town (Vöröss 1966); (14) ‘Csukma-dűlő,’ along roads between vineyards (Vöröss 1966); (15) ‘Akasztófa-dűlő,’ along roads between vineyards (Vöröss 1966), herbarium specimen and tissue samples were also collected there by Bauer & Márkus in 2015 (GBBN barcode: HNHM-CGR 023543); (16) ‘Zuhánya-dűlő,’ along roads between vineyards (Vöröss 1966); (17) ‘Zuhánya-dűlő,’ in the forest patch over the quarry (Papp in Dénes 1996); (18) along a road on the ridge of Mt Csukma, in a calcareous scrub (*Inulo spiraeifoliae–Quercetum pubescentis*) (Dénes 1996); (19) Göntér Hill, in the mown grasslands around the tombstone (Erdős et al. 2018).

20



**Fig. 3** The distribution of *Ranunculus psilostachys* in the Villány Mts and the Nyárad–Harkány Plain. The inset shows the position of the Villány Mts in Hungary.

Villány: (20) next to a roadside crucifix among vineyards (Bátori et al. 2014); (21) Calvary Hill, in a mown grassland (Aradi et al. 2017), (22) Zrínyi Miklós street, in a roadside flowerbed (Erdős ined. 2019).

Vokány: (23) in a fragmentary oak-ash-elm forest (*Knautio drymeiae–Ulmetum*) near the road between Vokány and Siklós (Priszter & Borhidi in Vöröss 1966; Priszter & Borhidi 1967; Dénes 2000; Kevey 2019).

#### II: South Baranya Hills

Pereked: (24) no details on the exact location were published (Horvát 1975). Despite considerable field efforts, we did not manage to find the population.

#### III: Nyárád–Harkány Plain

Harkány: (25) without details on the exact location (Horvát 1975); (26) 'Harkány-forest' (Kevey 2013a).

Siklós: (27) 'Hatos-erdő,' in a closed loess steppe forest and its edge (*Pulmonario mollis–Quercetum roboris*) (Kevey 2013a, 2016); (28) 'Bojár,' in a narrow clearing between *Robinia* and *Pinus* plantations (Kevey 2013a); (29) 'Községi-forest,' in an oak-hornbeam forest (*Corydali cavae–Carpinetum*) and a *Robinia* plantation (Kevey 2013a, b).

### **Discussion**

Among the 29 identified occurrences of *R. psilostachys* in Hungary, the occurrence in Pereked (locality 24) is uncertain. Locality 10 is probably the same as localities 11, 12, and 13, while locality 25 is probably the same as locality 26. This means that the species has a total of 26 known populations in Hungary.

In the followings we classify all occurrences into six groups according to the naturalness of the habitats. Localities belonging to each group are given in parentheses. We think that the probability of anthropogenic origin increases with increasing degradation (and decreasing naturalness).

#### Near-natural habitat with no visible signs of degradation (1)

The most natural habitat of *R. psilostachys* in Hungary has been found on the southern slope of Mt Szársomlyó, in an open rocky grassland (Nagy 1963; Vöröss 1966), which is not unlike the natural habitats of the species in the Balkan Peninsula (Adamović 1909; Tomović et al. 2005; Čušterevska et al. 2012; Čarni et al. 2014; Avdiu et al. 2018). In the dry grasslands of Mt Szársomlyó, there are several other sub-Mediterranean and Balkan species (e.g., *Festuca dalmatica*, *Colchicum hungaricum*, and *Trigonella gladiata*). The favourable microclimatic conditions of the steep south-facing slope may have enabled *R. psilostachys* to survive as a relict species.

However, the anthropogenic origin of *R. psilostachys* cannot be completely excluded here. *Crocus* species have been planted to the northern side of the ridge of Mt Szársomlyó (Kevey 1989, 1993). It has to be noted, however, that, in contrast to the *Crocus* species, there are no concrete data suggesting the intentional

introduction of *R. psilostachys*. Also, the shallow and rocky soil of the steep south-facing slope is not ideal for planting.

*Ranunculus psilostachys* is mainly characterised by short-range (vegetative) dispersal, with only a subordinate importance of long-distance dispersal (Tyler et al. 2015). Nevertheless, as the south-facing slope of Mt Szársomlyó was used as a pasture for many centuries (Erdős et al. 2013), the introduction of *R. psilostachys* by grazing animals cannot be ruled out. However, the species has not been found in the village at the foot of the mountain, from where grazing animals were driven to the mountain slope.

#### Near-natural habitats with a moderate level of degradation (2, 8, 9, 17, 18, 23, 26, 27, 29)

Thermophilous forests and scrubs on Mt Tenkes, Mt Csukma, and near the town of Siklós are among the most characteristic habitats of *R. psilostachys*. These plant communities are somewhat similar to the communities that are among the natural habitats of *R. psilostachys* in the Balkan Peninsula (*Quercus frainetto* and *Q. pubescens* forests, *Ostrya carpinifolia* and *Corylus avellana* scrubs, and *Castanea sativa* plantations) (Bergmeier & Dimopoulos 2008; Gerasimidis & Korakis 2009; Samaras et al. 2017). In the thermophilous forest and scrub communities of southern Hungary, other Balkanic (e.g., *Helleborus odoratus*) and Atlantic–Mediterranean (e.g., *Ruscus aculeatus* and *Tamus communis*) species are also typical. Their microclimate may have also proved favourable for *R. psilostachys*. The occurrence in the oak-ash-elm forest near Vokány (located in a valley-bottom on a north-facing mountain slope) and the oak-hornbeam forest near Siklós was also categorised into this group. In these latter cases, microclimatic conditions are likely less favourable for Balkan species.

#### Semi-natural habitats with strong degradation (3, 6)

The anthropogenic origin (intentional or inadvertent introduction) of *R. psilostachys* is possible, but its indigenoussness cannot be excluded either, given the species' tolerance to disturbance and its strong competitiveness in semi-natural habitats (Tyler et al. 2015).

#### Artificial habitats with remainders of the natural vegetation (28, 29)

Similarly to the previous category, both the native and the anthropogenic origin of *R. psilostachys* is conceivable here.

#### Artificial habitats with no remainders of the natural vegetation (5, 14, 15, 16)

As no remainders of the natural vegetation have survived in these habitats, the anthropogenic origin of *R. psilostachys* seems likely along roads and in the proximity of buildings among vineyards. The largest Hungarian population of *R. psilostachys* has been found in exactly such a place (locality 14), with tens of thousands of

individuals (Erdős ined. 2020). This may also indicate that the species is able to perform strong spontaneous vegetative spread in mown grasslands.

#### Artificial habitats with human structures (4, 7, 11, 12, 13, 19, 20, 21, 22)

Where the occurrences of *R. psilostachys* are next to human structures, especially sacred ones (church, cemetery, roadside crucifix, tombstone, calvary hill), the intentional introduction of the species is likely. Due to its decorative flowers and leaves, the species is occasionally used as an ornamental plant even today ([www.flora-germanica.de](http://www.flora-germanica.de)). In earlier times, when the selection of exotic ornamental plants was considerably smaller than it is today, *R. psilostachys* might have been a locally popular ornamental plant. As it does not need any care, has an excellent vegetative spreading ability, and tolerates trampling and mowing, its populations could have easily persisted in these sites.

### **Conclusion**

In this work we compiled all known occurrences of *R. psilostachys* in Hungary, based on literature data, herbarium specimens, and our own observations. After classifying these occurrences according to habitat naturalness, we found that *R. psilostachys* occurs along a long gradient of naturalness, ranging from near-natural habitats with minimum human intervention to strongly anthropogenic habitats with human structures (typically around sacral sites). We think that *Ranunculus psilostachys* may be native in its most natural habitat (open rock sward on Mt Szársomlyó), but possibly also in its other near-natural habitats (mainly thermophilous forests and scrubs). We think the species is presumably planted in some secondary habitats, especially sacred sites. Only a genetic comparison of the Hungarian populations with those of the neighbouring countries could clear this issue.

In our view, the fact that the probably native and the potentially planted populations are spatially strongly linked (the populations in the Villány Mts and the Nyárád–Harkány Plain are in the immediate proximity, while no other populations, native or anthropogenic, are known from Hungary), may indicate that the native and anthropogenic occurrences are not independent. To put it differently, if the species was in fact used as an ornamental plant, it was used in and around the Villány Mts precisely because in this region the species was available in its natural habitats. As an analogy, we may mention *Ruscus aculeatus*, which is used as an ornamental plant in southwestern Hungary (where it is native), while it is hardly used as an ornamental plant elsewhere. Similarly, *Erythronium dens-canis* is encountered in the gardens of Jósvalfő and the neighbouring villages, probably originating from the nearby wild population.

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Tab.1 Herbarium material of *Ranunculus psilostachys* collected in the Carpathian Basin, in major Hungarian collections (without duplicates).

Taxon	Taxon name	Nr.	Collector	Date	Locality	Herb.
<i>Ranunculus psilostachys</i> Griseb.*	<i>Ranunculus abbatís</i> Vendelini, Horvát & Boros ( <i>R. illyricus</i> × <i>bulbosus</i> nov. spec. Hybr.)	420239	Boros Á.	17/04/1942	Máriagyűd: Epres	BP
<i>Ranunculus psilostachys</i> Griseb.*	<i>Ranunculus abbatís</i> Vendelini, Horvát & Boros ( <i>R. illyricus</i> × <i>bulbosus</i> nov. spec. Hybr.)	420238	Boros Á.	15/05/1942	Máriagyűd	BP
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	216817	Horvát Olivér	12/05/1960	Siklós: next to the castle	BP
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	430377	Boros Á.	27/04/1962	Siklós: graminosis castelli	BP
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	430376	Boros Á.	27/04/1962	Siklós: graminosis castelli	BP
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	583538	Nagy István	11/05/1962	Villány: Mt. Szársomlyó	BP
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Nagy István et Vöröss László Zs.	11/05/1963	Nagyharsány: the south-facing rocky slope steppe of Mt. Szársomlyó	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	14/04/1964	Siklós: Váralja (next to the castle), shrubby grassland	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	19/15/1964	Siklós: Csukma-dűlő. ditch shore	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	19/05/1964	Siklós: Csukma-dűlő. gully slope	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	19/05/1964	Siklós: Váralja (next to the castle), shrubby grassland	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	19/05/1964	Siklós: Zuhánya-dűlő. ditch shore	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	01/11/1964	Siklós: Váralja (next to the castle), grassland	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	23/12/1964	Siklós: Váralja (next to the castle). shrubby grassland	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	30/01/1965	Siklós: Váralja (next to the castle). shrubby grassland	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	09/04/1965	Siklós: reformed cemetery, within the tombs and along roads	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	09/04/1965	Siklós: Váralja (next to the castle). grassland	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	28/04/1965	Nagyharsány: Mt. Szársomlyó. slope steppe.	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	20/05/1965	Siklós: Csukma-dűlő. ditch shore	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/a	Vöröss László Zs.	20/05/1965	Siklós: Váralja (next to the castle). grassland	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/p.	Vöröss László Zs.	14/04/1966	Siklós: heroes' cemetery	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	1337/p	Vöröss László Zs.	05/05/1966	Siklós: reformed cemetery, among tombs	JPU
<i>Ranunculus psilostachys</i> Griseb.	<i>Ranunculus psilostachys</i> Griseb.	HNHM-TRA 00017562	Bauer N. et Márkus A.	20/05/2015	Siklós: Akasztófa-dűlő	BP

\*Rev. Boros Á. 1944.08.05

