Rubus gayeri and Rubus slavonicus, two new species of Rubus ser. Micantes (Rosaceae) from Central and South-Eastern Europe

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Abstract

Two new apomictic species of bramble occurring in Hungary and adjacent regions, Rubus gayeri and R. slavonicus, section Rubus, subsection Hiemales E. H. L. Krause, series Micantes Sudre, are described. Diagnostic features, pen drawings and photographs of both new species are presented; moreover, distribution maps, list of revised specimens and habitat characteristics are included as well. R. gayeri is a regional bramble species occurring on the eastern foothills of the Alps (W Hungary, SE Austria and N Slovenia); its range is of approximately 120 km diameter. Originally, it was connected with acidophilous oak-hornbeam and beech forests and forest fringes, expanding later (due to anthropogenic influences) to secondary coniferous woods of base-poor soils. R. slavonicus has a specific long-drawn range from the northwestern Balkans (Bosnia & Herzegovina) to the centre of the Pannonian Basin (Hungary) of approximately 250 km diameter. Throughout its range it typically occurs in pedunculate oak-hornbeam forests of lower altitudes with several sub-Mediterranean elements. In the northernmost isolated part of the range (N of Lake Balaton) it is found in extrazonal beech forests on basalt bedrock.

Keywords: Rubus, ser. Micantes, taxonomy, biogeography, apomixis, Central & SE Europe

Introduction

The European representatives of blackberries (Rubus Linnaeus 1753: 492 subgen. Rubus) form a complex of a few sexual diploid species and numerous agamospermic polyploids (Holub 1992, Weber 1995, 1999). Based on regional studies (Weber 1973, 1985, Matzke-Hajek 1997), the taxonomy of the subgenus is well known in central and north-western Europe, whereas first modern insights on the blackberries of south-eastern Europe (e.g. Trávníček & Zázvorka 2005, Kurtto et al. 2010) have only been published recently. Rubus subsect. Hiemales E. H. L. Krause (in Prahl et al. 1890: 57) ser. Micantes Sudre (1908: 16) is a somewhat heterogeneous, possible polyphyletic group, including species created as a result of hybridization between biotypes with and without stalked glands (Holub 1992, Weber 1995, Tomaszewski et al. 2013). The number of species in the series is approximately 60; the centre of their distribution is in central and north-western Europe, whereas first modern insights on the blackberries of south-eastern Europe (e.g. Trávníček & Zázvorka 2005, Kurtto et al. 2010) have only been published recently.

Rubus subsect. Hiemales E. H. L. Krause (in Prahl et al. 1890: 57) ser. Micantes Sudre (1908: 16) is a somewhat heterogeneous, possible polyphyletic group, including species created as a result of hybridization between biotypes with and without stalked glands (Holub 1992, Weber 1995, Tomaszewski et al. 2013). The number of species in the series is approximately 60; the centre of their distribution is in central and north-western Europe (Kurtto et al. 2010). A recent revision of ser. Micantes in Hungary (Király et al. 2013) reconfirmed the occurrence of three widely distributed species (R. clusii Borbás 1885: 40, R. styriacus Halácsy 1890: 432, and R. tabanimontanus Figert 1905: 178), and one endemic regional species (R. balatonicus Borbás 1900: 414). In neighboring territories of eastern Austria and Slovenia two species of the series were recorded (R. clusii and R. styriacus); occurrences of both species in adjacent territories of Croatia were considered as doubtful (Weber & Maurer 1991, Maurer & Drescher 2000). Other parts of south-eastern Europe are practically unexplored from the point of view of modern botany (Kurtto et al. 2010), thus, although several taxa of ser. Micantes have been reported e.g. from Romania (Nyárády 1956), they are, due to the use of obsolete perspective of Sudre (1908–1913), unreliable.

In the course of field studies on brambles in central and south-eastern Europe (Austria, Croatia, Hungary and Slovenia) we repeatedly observed two biotypes of Rubus ser. Micantes differing in several important features from the formerly described species of the series. Further assessments indicated that they represent hitherto unexplored and
neglected species. The aim of the present study is to describe them as new apomictic species named *Rubus gayeri* and *Rubus slavonicus*.

### Material and methods

Field studies were conducted between 2009 and 2013 at approximately 900 localities of *Rubus* in Austria, Bosnia & Herzegovina, Croatia, Hungary and Slovenia. For each locality, the geo-coordinates were determined using a Trimble Nomad GPS handheld device in WGS 84 projection.

Specimens in the following herbaria were searched for records of *Rubus* ser. *Micantes* from the studied area: BP, BPU, DE, GJO, GZU, JPU, LJU, OL, PECS, SAMU, W, ZA and ZAHO (acronyms given according to Thiers 2014). The conspectus of data follows the (bio)geographical systems presented by Nikolić *et al.* (1998) for Croatia, Dövényi (2010) for Hungary and Perko (1998) for Slovenia, whereas for Austria and Bosnia & Herzegovina the administrative boundaries were used. The characterization of the newly described species, *R. gayeri* and *R. slavonicus*, was based on the revision of 30 specimens for each collected recently by the authors. First-year branches with well-developed leaves were examined together with the flowers and fruits of living material; abnormal and injured plants were not included in the assessments. Additional reference material for the comparative study of similar species was derived from the herbaria listed above. The concept of the terms adopted in the ecological characterization of the species follows Weber (2001).

### Results and discussion

**Rubus gayeri** Király, Trávníček & Žíla, sp. nova

*Type:*—HUNGARY. Vas County, Szentpéterfa (Petrovo Selo), 2.6 km E of the village along the road to Ják, “Szentpéterfai-erdő” forest, Scots pine plantations; N47.097500°; E16.523889°; 240 m, 16.9.2013, fruiting, G. Király (holotype: BP732260 and BP732261 (parts of the same specimen); isotypes: BP733730, BP733731, GJO, GZU, LJU, OL, W)

*Description:* Shrub, usually up to 80 cm tall. First-year stems low-arching, rooting at apex, bluntly angled, 3–7 mm in diameter. Sides ± flat or infrequently slightly convex, green or only slightly reddish when exposed to sun, with few 0.2–0.3 mm long hairs (later often glabrescent) and with 0–7 (–12) stalked glands (0.3–0.5 mm long) per 1 cm length of stem side. Prickles 8–14 (–18) per 5 cm length of stem, usually on angles, compressed and abruptly broadened at the base, straight or indistinctly curved, declining, (1–)2.5–6 mm long, yellowish with sometimes purplish tip. Leaves pedate, 5-foliolate, usually dark green, smooth to the touch, almost glabrous above (with few adpressed hairs on the veins), and with scattered 0.2–0.5 mm long hairs on the leaf margin; grayish-green and dense tomentose beneath, with felted hairs. Leaflets slightly imbricate, terminal ones with petiolules 17–31% as long as the petiole, slightly cordate or rounded at the base, gradually tapering to an acuminate apex 15–20 mm long. Basal leaflets ovate, (0.75–)0.9–1.1× as long as the petiole; petiolules 2–5 mm long. Indentation markedly uneven, teeth cuspidate, distinctly broader (2–4 mm) than long (1–2 mm). Petioles sparingly hairy, with many ± sessile and few stalked glands and with 14–20 curved prickles. Stipules filiform, ca. 0.5 mm broad, with sparse pilose hairs and stalked glands. Inflorescence paniculate, truncate near apex, conspicuously few-flowered, with patent branches, distal 2–8 cm leafless, below with 3-foliolate leaves; indumentum of inflorescence leaves is similar to those of the sterile stems. Inflorescence axis densely pubescent, with (5–)15–50 stalked glands per 1 cm length. Prickles 4–18 per 5 cm length of axis, slender, subulate, slightly curved or straight, declining, 2–5 mm long. Pedicels 0.5–1.5 cm long, densely pubescent, with 3–30 stalked glands; prickles 5–20, ± straight, 0.5–2 mm long. Sepals 6–9 mm long, greyish-felted with scattered stalked glands and slender pricklets, entirely reflexed after anthesis. Petals early falling, not touching each other, light pink, ± spatulate, (5–)6–7 (–8) mm broad and (9–)10–13 (–15) mm long, emarginate or sometimes rounded at the apex. Stamens somewhat longer than the light green styles; anthers glabrous, yellow; filaments whitish. Carpels and receptacle glabrous. Flowering VI–VII.

Iconography and photos of the species are shown in Figures 1 and 2.
FIGURE 1. Drawings of *Rubus gayeri*: (a) inflorescence; (b) leaf; (c) detail of first-year branch with prickles; (d) margin of terminal leaflet; (e) axis of inflorescence; (f) peduncle; (g) detail of flowers; (h) petal. Del. J. Táborská.

FIGURE 2. Photos of *Rubus gayeri*: (a) first-year branch with typical leaves; (b) typical few-flowered inflorescence with patent branches (loc.: W Hungary, Szentpéterfa, locus classicus)
Taxonomical remarks: *Rubus gayeri* is easily distinguishable from the majority of the representatives of ser. *Miacantes* in the region (*R. balatonicus*, *R. clusii* and the newly described *R. slavonicus*) by the strongly different shape of leaves and by pink petals. It also differs from *R. balatonicus* and *R. slavonicus* by having reflexed sepals after anthesis, from *R. clusii* by the considerably lower number of stalked glands on the sterile stems. Nevertheless, *R. liubensis* W. Maurer 1979: 142 is separable from *R. gayeri* only on the basis of substantial morphological analysis (see Table 1). The main diagnostic characters of *R. gayeri* against *R. liubensis* are the higher number of prickles on the petiole, the density of stalked glands on the pedicel and on the surface of the sepal, and the glabrous ovary. *R. liubensis* was described as a member of ser. *Rhhamnifolii* (Bab.) Focke (1877: 125) by Maurer (1979), but later it was transferred to ser. *Discolores* (P. J. Müll.) Focke (1914: 152) by Weber & Maurer (1991). However, due to its stalked glands on sterile stem, inflorescence axis and stipules, its proper position is undoubtedly in ser. *Miacantes*.

| TABLE 1. Main distinctive features of *Rubus gayeri* and *Rubus liubensis* |
|---------------------------------|-----------------|-------------------|
| First-year stem                 | Rubus gayeri    | Rubus liubensis   |
| Number of stalked glands of first-year stem (per 1 cm of stem side) | 0–7(–12) | 0–1(–3) |
| Ratio (%) of length of petiolule and lamina of terminal leaflets | 17–31 | (26–)30–38 |
| Number of prickles of petiole   | 14–20 | 9–16 |
| Number of prickles per 5 cm length on the inflorescence axis | 4–18 | 2–8 |
| Number of stalked glands per 1 cm length on the inflorescence axis | (5–)15–50 | 3–15 |
| Number of stalked glands on the pedicel | 3–30 | 0(–5) |
| Surface of sepals               | with scattered stalked glands | without stalked glands (rarely up to 2 glands near the tip) |
| Ovary                           | glabrous | sparsely hairy |

Etymology: The name “gayeri” refers to Gyula Gáyer (1883–1932), outstanding botanist coming from western Hungary; expert in *Rubus*, author of the first complete Hungarian identification key of blackberries (Gáyer 1924–25).

Distribution: We could not find any former collection of the species in herbaria examined, thus, we describe its range solely based on own collections and observations. *Rubus gayeri* is a regional bramble species with main part of the distribution area in western Hungary (“Nyugat-magyarországi peremvidék” macroregion), also occurring in south-eastern Austria and northern Slovenia. The range of the species is approx. 120 km long and 80 km broad in SE-NW direction on the eastern foothills of the Alps, its southernmost record is located near the town Lenti along the Hungarian-Slovenian borderline, whereas, the northernmost one is located near Fertőszentmiklós at the periphery of Lesser Plain (“Kisalföld”) (Figure 5a, Appendix 1). It is widespread in western Hungary, where it is abundant in Órség and Göcsej Hills, scattered in the Kemeneshát and Sopron–Vasi-sík regions. In Austria, *R. gayeri* was recorded in southern Burgenland, and at a single locality south of Graz in Styria. In Slovenia it is scattered in the Goričko region. In terms of altitude, *R. gayeri* grows only in hilly environment and is missing in the submontane belt of the region; the recorded localities range from 143 to 380 m a.s.l.

Ecology and biogeography: *R. gayeri* is moderately thermophilous and often strikingly suffers from heat stress and low relative air humidity in summer. It prefers nutrient-poor, acidic, semi-dry to moist or occasionally waterlogged soils, it is most abundant in areas covered by tertiary clayey and gravelly sediments; whereas it is absent both from nutrient-rich soils of higher altitudes and base-rich soils of loess-covered areas. Originally, it was connected with acidophilous oak-hornbeam and beech forests and forest fringes, expanding later to secondary coniferous woods of base-poor soils (Figure 6a). Typical companion species of bramble are *R. bifrons* Vest 1821: 163, *R. clusii*, *R. holosericeus* Vest 1821: 163, *R. radula* Weihe (in Boenninghausen 1824: 152), and *R. styriacus*. The considerably rapid increase of coverage of Scots pine plantations in western Hungary from the 1950s has presumably played a prominent role in the migration of the species; the most abundant stands were found in this habitat type. According to our data, *R. gayeri* belongs to the few native brambles in the Pannonian Basin which migration and recent distribution was highly influenced by modern-day anthropogenic land-use modifications.
Rubus slavonicus Király, Trávníček & Žíla, sp. nova

Type:—HUNGARY. Somogy County, Kaszó, 0.2 km W of the settlement, pedunculate oak wood; N46.320127°; E17.218524°; 172 m, 7.9.2013, fruiting, G. Király & D. Schmidt (holotype: BP732259, isotype: BP733732, BP733733, GJO, GZU, OL, W, ZA)

Description: Shrub, usually up to 80 cm tall. First-year stems low-arching, rooting at apex, bluntly angled, 3–7 mm in diameter. Sides ± flat, dull green, in sunny places suffused red-brown, with 10–30 ± patent hairs 0.2–0.6 mm long per 1 cm length of stem side and with numerous sessile glands; stalked glands (ca. 0.5 mm long) very scattered or absent. Prickles 7–15 per 5 cm length of stem, usually on angles, strongly compressed, gradually broadened at the base up to 5 mm, distinctly to strongly curved, 3–6(–7) mm long, yellowish or often reddish. Leaves palmate, 5-foliolate, usually dark green, with up to 50 appressed hairs per cm² above when young, later often glabrescent; greyish-green beneath with dense stellate hairs. Terminal leaflets with petiolules 22–36% as long as its lamina, ovate, rounded or indistinctly cordate at the base, with a gradually tapering apex 20–25(–30) mm long. Basal leaflets ovate, with petiolules 2–6 mm long, (0.8–)0.9–1.4× as long as the petiole. Indentation regularly or often irregularly periodic, with incisions 1–3(–4) mm deep, teeth ± triangular. Petioles hairy, with several sessile glands and scattered stalked glands of different length; and with 10–22 curved prickles. Stipules 0.4–0.6 mm broad, with eglandular hairs and stalked glands. Inflorescence panicle, its form various, conical, pyramidal or cylindrical, with erecto-patent branches; distal 5–10 cm leafless, then with 1–2 simple or divided leaves, below with 3-foliolate leaves; inflorescence leaves with often deeper indentation; their indumentum is similar to those of the sterile stems. Inflorescence axis densely pilose, with (5–)10–60(–100) stalked glands per 1 cm length. Terminal part of the inflorescence axis with few 1–3 mm long, rather slender, slightly curved, distant or indistinctly declining prickles. Lower part of the inflorescence with 3–8 prickles per 5 cm length of inflorescence axis; prickles strongly curved and declining, 3–5 mm long. Pedicels 1.2(–2.5) cm long, densely pilose, with (2–)5–20(–50) stalked glands; pricklets 7–15, ± straight, 0.5–2 mm long. Sepals 5–8 mm long, ovate-lanceolate, whitish-greyish-felted with stellate hairs; with sparse stalked glands and few slender pricklets, strikingly stellate-patent after anthesis, later often reflexed. Petals not touching each other, white, ± spathulate, 6–9 mm broad and 10–13 mm long, rounded at the apex. Stamens longer than the light green styles; anthers glabrous, yellow, filaments whitish. Ovaries sparsely pilose, rarely near glabrous. Receptacle pilose. Flowering VI–VII.

Iconography and photos of the species are shown in Figures 3 and 4.

**FIGURE 3.** Drawings of *Rubus slavonicus*: (a) inflorescence; (b) leaf; (c) margin of terminal leaflet; (d) axis of inflorescence; (e) peduncle; (f) detail of flowers; (g) petal. Del. J. Táborská
**Taxonomical remarks:** *Rubus slavonicus* distinctly differs from *R. clusii* by the lack of stalked glands on the sterile stem, the lower number of prickles on the inflorescence axis and the position of sepals; also shape and some dimensions of leaf are (with overlaps) dissimilar. It is also easily told from *R. balatonicus* by the lower number of prickles on the sterile stem, and by the length and position of sepals. Nevertheless, it is rather similar to *R. ambulans* Matzk. 2004: 28 (described from western central Europe, with easternmost localities in Bavaria; Matzke-Hajek 2004). The main diagnostic characters of *R. slavonicus* against *R. ambulans* are the presence of stalked glands on the inflorescence axis and pedicels, the position of sepals after anthesis (patent versus reflexed) and the different serration of leaflets (periodic versus regular) (see also Table 2).

**Etymology:** The epithet refers to the historical region “Slavonia” in north-eastern Croatia.

**Distribution:** We recorded only two older herbarium specimens of the species (collected in the vicinity of Barcs, SW Hungary, where it has been found recently as well; these specimens in PECS were formerly misidentified as “*R. gremlii* Focke”), thus, we characterize its range predominantly based on own collections and observations. *Rubus slavonicus* is a regional bramble species with some tendency to a wide distribution, with a specific long-drawn range (approx. 250 km long and 50 km broad in N-S direction) from the northwestern Balkans to the centre of the Pannonian Basin. Its southernmost locality was found in northern Bosnia, and the northernmost ones are located near Uzsa in Transdanubian Mts (Dunántúli-középhegység), central Hungary (Figure 5b, Appendix 2). It is scattered (but locally abundant) in Belső-Somogy region (southwestern Hungary). In Croatia, it was recorded in significant number in the borderland of western Slavonia (Gornjoposavska mezoregija).

**Ecology and biogeography:** *R. slavonicus* is a thermophilous and heliophilous bramble usually growing in sunny habitats (forest fringes, roadsides, clearings and young crops). It prefers nutrient- and base-rich, semi-dry to moist soils, and is most abundant in areas covered by alluvia or tertiary sandy sediments. Throughout its range it typically occurs in pedunculate oak-hornbeam forests (Figure 6b) of lower altitudes with several sub-Mediterranean elements (e.g. *Euphorbia dulcis* L., *Lamium orvala* L., *Primula vulgaris* Huds., *Tamus communis* L.). In the northernmost, isolated part of the range (Keszthely Mts north of the Lake Balaton) it is found in extrazonal beech stocks on basalt bedrock. Typical companion species of bramble in Croatia and southwestern Hungary are several biotypes of ser. *Discolores* and ser. *Vestiti* (Chaboiss.) Focke (1877: 285). In Keszthely Mts it grows together with several taxa of ser. *Discolores*, with *R. macrophyllus* Weihe & Nees 1824: 35, and with closely related taxa of ser. *Micantes* (*R. balatonicus* and *R. clusii*), thus, this mountains is an evident “hot-spot” of the latter group in this region.
TABLE 2. Main distinctive features of *Rubus slavonicus* and related species (based on own observations, in the case of *R. ambulans* also with respect of Matzke-Hajek 2004 and Matzke-Hajek, pers. comm.)

<table>
<thead>
<tr>
<th>Character</th>
<th><em>Rubus slavonicus</em></th>
<th><em>Rubus ambulans</em></th>
<th><em>Rubus balatonicus</em></th>
<th><em>Rubus clusii</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of stalked glands of first-year stem (per 1 cm of stem side)</td>
<td>0(–2)</td>
<td>0(–2)</td>
<td>0(–2)</td>
<td>(3–)5–20</td>
</tr>
<tr>
<td>Number of prickles (per 5 cm of stem side)</td>
<td>7–15</td>
<td>7–15</td>
<td>(8–)13–25(–35)</td>
<td>11–25</td>
</tr>
<tr>
<td>Ratio (%) of length of petiole and of basal leaflet</td>
<td>(70–)75–105(–120)</td>
<td>(75–)80–110(–120)</td>
<td>(65–)70–95(–110)</td>
<td>(70–)85–115(–120)</td>
</tr>
<tr>
<td>Ratio (%) of width of basal and terminal leaflet</td>
<td>(42–)46–65(–72)</td>
<td>56–70</td>
<td>(40–)46–64(–70)</td>
<td>(40–)44–56(–61)</td>
</tr>
<tr>
<td>Serration of terminal leaflet, depth of indentation (mm)</td>
<td>periodic, 1–3(–4)</td>
<td>regular (to indistinctly periodic), 1.5–2.5</td>
<td>periodic, 1–3(–4)</td>
<td>± periodic, 2–4</td>
</tr>
<tr>
<td>Number of prickles of petiole</td>
<td>10–22</td>
<td>12–17</td>
<td>14–28</td>
<td>17–27</td>
</tr>
<tr>
<td>Number of prickles per 5 cm length on the inflorescence axis</td>
<td>3–8</td>
<td>3–8</td>
<td>13–30</td>
<td>8–12</td>
</tr>
<tr>
<td>Number of stalked glands per 1 cm length on the inflorescence axis</td>
<td>(5–)10–60(–100)</td>
<td>0(–1)</td>
<td>12–45</td>
<td>&gt;25</td>
</tr>
<tr>
<td>Number of stalked glands on the pedicel</td>
<td>(2–)5–20(–50)</td>
<td>0</td>
<td>(1–)3–20(–40)</td>
<td>&gt;30</td>
</tr>
<tr>
<td>Length of sepals (mm)</td>
<td>5–8</td>
<td>5–8</td>
<td>8–15</td>
<td>5–8</td>
</tr>
<tr>
<td>Position of sepals after anthesis</td>
<td>stellate-patent</td>
<td>reflexed</td>
<td>erect</td>
<td>reflexed</td>
</tr>
<tr>
<td>Ovary</td>
<td>sparsely hairy</td>
<td>sparsely hairy</td>
<td>± glabrous</td>
<td>sparsely hairy</td>
</tr>
</tbody>
</table>

FIGURE 5. Distribution maps: (a) *Rubus gayeri*; (b) *Rubus slavonicus*
FIGURE 6. (a) Typical habitat of *Rubus gayeri*: Scots pine plantation with monodominant carpet-like occurrence of the species (loc.: W Hungary, Szentpéterfa, locus classicus); (b) Typical habitat of *Rubus slavonicus*: Lowland pedunculate oak wood (loc.: S Hungary, Kaszó, locus classicus).

Acknowledgements

Thanks are due to Antun Alegro (Zagreb), Zoltán Barina (Budapest), János Csiky (Pécs), Andrea Dénes (Pécs), Nejc Jogan (Ljubljana), Attila V. Molnár (Debrecen), Bruno Wallnöfer (Vienna) and Kurt Zernig (Graz) for their technical help in the course of herbarium revisions, and for supply of literature sources and photographs on herbarium material. We appreciate kind comments of Günter Matzke-Hajek (Alfer) regarding to distinctive features of *Rubus ambulans* and constructive suggestions of the two anonymous reviewers which helped us to improve the manuscript. The study of Gergely Király was supported by project “Agrárklima.2 VKSZ-12-1-2013-0034”, those of Bohumil Trávníček by the Czech Science Foundation (project no. 206/08/0890) and an internal grant of the Palacký University (PrF 2014/001). Richard Lansdown (Stroud) and Petra Šarhanová (Olomouc) kindly improved our English.

References


Appendix 1: Distribution data of Rubus gayeri

Specimens seen:
AUSTRIA: (1) Deutsch Ehrensdorf, 0.4 km N of the village (N47.106861°; E16.410894°); 298 m (16.9.2013, coll. G. Király: herb. G. Király); (2) Moschendorf, 0.9 km of “Bergen Häuser” settlement (N47.051389°; E16.441667°); 235
Recorded localities:

Appendix 2: Distribution data of Rubus slavonicus

Specimens seen:

BOSNIA AND HERZEGOVINA: (1) Podovi, 0.5 km N of the village (N44.674114°; E16.771853°); 198 m (29.9.2013, coll. G. Király, Z. Barina and D. Piškó: herb. G. Király).


HUNGARY: (10) Sümeg, 2.5 km SE of the town, forest fringes near to the road nr. 84 (N46.951147°; E17.307217°); 184 m (27.6.2013, coll. G. Király: herb. G. Király); (11) Úzsa, 1.6 km SW of railway station (N46.908333°; E17.3181°); 205 m (17.6.2012, coll. G. Király: herb. G. Király, BP733746; 7.7.2012, obs. G. Király, B. Trávníček & V. Žíla, coll. B. Trávníček: OL, G. Király: BP733745, herb. G. Király); (12) Úzsa, 0.8 km W-SW from railway station (N46.913889°; E17.321944°); 170 m (27.6.2013, coll. G. Király: herb. G. Király); (13) Úzsa, 0.9 W-NW of the village (N46.898115°; E17.318255°); 260 m (27.6.2013, coll. G. Király: herb. G. Király); (14) Barcs, Kuti-őrház – Halastó (7.8.1984, coll. Zs. Petrovics as “R. gremlíi”, PECs); (15) Darány, 1 km W of the settlement (N45.978946°; E17.570885°); 130 m