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Inventory of Genus Primula (Family Primulaceae) in the Herbarium of Agricultural University - Plovdiv (SOA), Bulgaria

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Abstract. Genus *Primula* L. (Primulaceae) is represented in Bulgaria by 8 species. The study is an observation of the whole recent collection of the genus, stored in the Herbarium of Agricultural University - Plovdiv (SOA). The collection consists of 352 herbarium sheets (185 of them from Bulgarian localities), representing 36 species (8 from Bulgaria). The chorological information from the literature and from the herbarium specimens is databased and mapped. In spite of the relatively low representativeness, the *Primula* collection of SOA is an important resource for the taxonomical and chorological investigations in this group.

Key words: *Primula*, herbaria collection, SOA.

Introduction

The typical genus *Primula* consists about 500 species, with highest diversity level in the mountain regions of Eastern Asia (HU & KELSO, 1996), Himalayas and West China (KOVTONIUK & GONCHAROV, 2009). A few species are distributed in the mountains of Africa, tropical Asia and South America. In one of the newest classifications of genus *Primula* is divided to 37 sections (RICHARDS, 2003). The genus is represented in Europe with 34 species, grouped in 4 sections and in North America - 20 species, grouped in 5 sections. The current data for the flora of Bulgaria describes 8 species (PEEV, 1982; DELIPAVLOV, 2003; ASSYOV & PETROVA, 2012).

A comprehensive work on the genus *Primula* is that of SMITH & FLATCHER (1949), dealing mainly with species of Nepal and Himalayas. A center with a great biodiversity in the world is Western China,

where about 300 species of *Primula* known, and the process of describing new taxa continues (YUAN XU *et al.*, 2016).

Historically, the knowledge of the genus in our flora can be tracked back to the first edition of VELENOVSKY (1891) and the later Supplementum (VELENOVSKY, 1898), with included 4 species: *P. vulgaris* Huds., *P. elatior* (L.) Hill, *P. veris* L. and *P. frondosa* Janka. The number of species and their treatment in different floristic editions can be traced in "Flora of Bulgaria". The first edition of the "Flora" (STOJANOV & STEFANOV, 1925) lists 7 species. In the second edition (STOJANOV & STEFANOV, 1933) the authors consider a hybrid combination *P. acaulis* (L.) Hill × *P. officinalis* (L.) Hill. In the third edition (STOJANOV & STEFANOV, 1948) are mentioned 8 species. Variability is considered - Only one variety of *P. officinalis* is indicated - var. *suaveolens* Bert. For *P. elatior* Jacq. is considered var. *icarnata*

(Godr. et Gren.) Pax. In the fourth edition (STOJANOV *et al.*, 1966) is added the new variety of *P. officinalis* var. *columnnae* Ten. The authors also include 3 widely cultivated ornamental species – *P. sinensis* Lindl., *P. obconica* Hance and *P. malacoides* Franch. In the taxonomical work for vol. 8 of *Flora Reipublicae Bulgaricae* (PEEV, 1982) are represented the investigations on the genus till the beginning of the 80's of 20'th century. The species count remains the same. The author also describes a cultivated hybrid *P. hortensis* Host (*P. elatior* × *veris* × *vulgaris*) and mentions also 4 rarely cultivated species.

A review of the available literature on the genus *Primula* indicates that the species have not been a subject of targeted in-depth research for the last 35 years in Bulgaria. The available materials date from the period 1880-1980, and in the recent decades there is a lack of modern collections from the country.

The number of species cited by DELIPAVLOV (2003) for our country is 9 – the decorative species *Primula auricula* L. is included. In one of the recent generalizations on the chorology of higher plants in Bulgaria, 8 wild species of needles are mentioned (ASSYOV & PETROVA, 2012).

The primary purpose of the study is inventory and evaluation of *Primula* collections in SOA herbarium.

Materials and Methods

The classification scheme for the Bulgarian species follows the main taxa adopted by DUBY (1828), with few exceptions uniquely accepted in the modern taxonomy of the genus *Primula*.

The available samples of genus *Primula*, stored in the collections of Agricultural University Plovdiv - SOA (according to Index Herbariorum - Tiers, 2016) are inventoried.

The progress of the taxonomic perceptions of the *Primula* genus over the years has created great synonymy, which is also present in the SOA collection. In order

to avoid synonymous errors, a synonymous list of the species is drawn up.

The data from the supporting information are stored in a relational database. The chorological information is organized according the recent floristic regions (KOZUHAROV *et al.*, 1983) The floristic regions are databased and described in the maps and the text using the codes: 1s – Black Sea Coast (south), 1n – Black Sea Coast (north), 2 – North-Eastern Bulgaria, 3 – Danubian Plain, 4w – Balkan Foothill Region (west), 4e – Balkan Foothill Region (east), 5w – Balkan Range (west), 5c – Balkan Range (central), 5e – Balkan Range (east), 6 – Sofia Region, 7 – Znepole Region, 8 – Vitosha Region, 9 – West Frontier Mountains, 10s – Struma Valley (south), 10n – Struma Valley (north), 11 – Belasitsa, 12 – Slavianka, 13 – Mesta Valley, 14s – Pirin (south), 14n – Pirin (north), 15 – Rila, 16w – Sredna Gora (west), 16e – Sredna Gora (east), 17w – Rhodopes (west), 17c – Rhodopes (central), 17e – Rhodopes (east), 18 – Tracian Lowland, 19 – Toundja Hilly Plain, 20 – Strandja (Fig. 1).

The countries are listed with their ISO 3166-1 Alpha 2 codes: AT- Austria, AZ- Azerbaijan, BA- Bosnia and Hertzegovina, CH- Switzerland, DE- Germany, DK- Denmark, ES- Spain, FI- Finland, FR- France, GB- United Kingdom, GE- Georgia, HR- Croatia, IT- Italy, KZ- Kazakhstan, MK- North Macedonia, NO- Norway, PL- Poland, RO- Romania, RS- Serbia, RU- Russian Federation, SE- Sweden, SI- Slovenia, SK- Slovakia, TR- Turkey, US- United States of America, UZ- Uzbekistan, ?- unknown.

The information from the herbarium sheets is stored in a relational database using the software application dSOA, following an approved model (STOYANOV, 2009). Each record contains the sample number, taxon name, floristic region, WGS84 coordinates, UTN (MGRS) code, altitude, nearest toponym, date, authors, and memo field with the text from the label. The maps are generated by the same software using the UTM coordinates.

The status of the taxa is referred in the

database [International Plant Name Index \(IPNI\)](#). The reference for the Bulgarian taxa, their status and chorology is done from the Bulgarian "Floras" and "Keys", as well as the known floristic records cited in the text. The available information in SOA is compared to the data from the *Conspectus of Higher Plants in Bulgaria*, which also the reference to the floristic elements ([ASSYOV & PETROVA, 2012](#)).

The results are presented in a taxonomic scheme, with their names accepted and their synonyms noted. Each inventory taxon is presented with a heading in a comparable, uniform pattern.

The recent data about genus *Primula* in Bulgaria (horizontal and vertical distribution, chorology, ecology, and phenology) are reviewed from the literature and from the herbarium sheets.

Results and Discussion

Genus *Primula* L.

Sect. *Primula*

Primula vulgaris Huds. Syn. *Primula acaulis* (L.) Hill., Veg. Syst. 8: (1765) 25; *P. officinalis* Hill; *Primula veris* var. *acaulis* L. Sp. Pl. 143 (1753).

European floristic element, indicated for the whole territory of Bulgaria, on 0 - 900 m a.s.l. Available materials from *P. vulgaris* show poor representation in the SOA collection. 26 specimens are deposited in the herbarium, of which 11 are from Bulgarian localities (Fig. 1-H), the rest are comparative materials (Table 1). The Bulgarian specimens from SOA confirm the regions: 1n, 5, 7, 8, 11, 16.1, 18 and 20. There are two subspecies within the species: subsp. *vulgaris* with the same distribution, and subsp. *sibtorpii* (Hoffman) Sm. & Forest found in the regions 1s, 5e and 20 (5e and 20 confirmed in SOA). The hybrid combination *P. vulgaris* × *P. veris* subsp. *canescens* is not confirmed in wild, because these materials are revised by Peev (1974r.) as *P. veris* subsp. *canescens*.

Primula elatior (L.) Hill., Veg. Syst. 8: 25 (1765). Syn. *Primula veris* var. *elatior* L., Sp. Pl. 143 (1753).

European floristic element, indicated for the regions 5w, 5c, 8, 9, 14n, 15, 17w, 17c, in the alpine zone, on 2000 - 2800 m a.s.l. The Bulgarian localities are represented by 14 herbarium sheets from 5c, 14n, 15, 17w and 17c (Fig. 1-A). The comparative materials are 13 (Table 1).

Primula veris L., Sp. Pl. 142 (1753). Syn. *Primula suaveolens* Bertol., J. Bot. (Desvaux) 2: 76 1813; *Primula veris* var. *officinalis* L., Sp. Pl. 142 1753.

European-Mediterranean floristic element, indicated for the whole country, from the sea level up to 2500 m. The deposited specimens are 72, and 17 are from abroad (incl. *Primula columbiae* Ten., Table 1). The materials from Bulgaria localities represent the regions: 4w, 5c, 5e, 6, 7, 8, 9, 10s, 11, 16w, 16e, 17w, 17c, 18, 19 and 20, in altitudes 130 - 2200 m a.s.l. (Fig. 1-G).

Sect. *Auricula* Duby

subgen. *Auriculastrum* Schott; sect. *Cyanopsis* Schott, Sippen Österr. Primeln 14. 1851.

Primula deorum Velen., Syn. *Auricula-ursi deorum* (Velen.) Soják; *Primula bulgarica* Georgieff ex. Degen.

Bulgarian endemic species, local for Rila Mts, on altitude 1900-2800 m a.s.l., around along streams, glacial lakes, peatlands and snow drifts. Listed in the Bulgarian Law of Biological Diversity (Appendix 3) and the Red Data Book of Bulgaria ([PEEV & TSONEVA, 2011](#)) - in the category „Vulnerable“, in the [IUCN Red List and in the Bern Convention](#).

In SOA are deposited 23 specimens. The earliest collections are done by Urumov (SOA 8530, 1907), or marshy places in the Rhodopes, but without exact locality or toponym. The data to the specimen is probably referring to the Rila-Rhodope mountain range without exact location. The rest of the specimens are collected in the 60s and 70s of the 20th century. They represent some alpestric localities from Rila Mts (fig. 1-B), with altitudes between 1990 and 2660 m a.s.l. Two exsiccates signed as *Primula deorum* Velen. f. *alba* Delip. & Cheschm.,

(1972) are deposited in the herbarium. This variability is not accepted in the taxonomical review of the genus (PEEV, 1982).

Primula minima L., Sp. Pl. ed. 1 (1753) 143.

Alpine-Carpatic-Balkan floristic element, indicated for altitudes 2000-2900 m a.s.l., in the regions 5w, 5c, 8, 14, 15, 17w и 17c. The specimens in SOA are 24 (Fig. 1-C) from Bulgaria and 1 from abroad. The Bulgarian exsiccates are from the regions 5c, 14n и 15. The specimens deposited in 5c, showed lower limit of altitude range – up to 1530 m.

Sect. *Aleuritia* Duby

Primula farinosa L., Sp. Pl. 143 (1753). 1768. Syn. *Primula farinosa* subsp. *exigua* (Velen.) Hayek, Repert. Spec. Nov. Regni Veg. Beih. 30(2): 25 1928; *Primula exigua* Velen., Sitzungsber. Königl. Böhm. Ges. Wiss., Math.-Naturwiss. Cl. 1888: 32 1889.

European floristic element, indicated in 5w, 5c, 8, 9, 14n, 15, 17w, 17c, between 1600-2600 m a.s.l. The deposited herbarium sheets are 38 образци, and 9 of them are from abroad (Tab. 1). The Bulgarian specimens are from the regions 5w, 5c, 8, 14n and 15, collected from altitudes 980 to 2700 m a.s.l. (Fig. 1-E).

Primula frondosa Janka, Syn. *Primula farinosa* subsp. *frondosa* (Janka) Stoj. et Stef., Fl. Bulg., ed 1, vol. 2 (1925) 861.

Bulgarian endemic, local for 5c, on altitudes 900-2000 m. This species is listed in the Red Data Book (PEEV & TSONEVA, 2011) in the category “endangered”, and in the IUCN Red List. The exsiccates are from altitudes between 970 and 2200 m a.s.l. (Fig. 1-E).

Primula halleri G. F. Gmel., Syn. *Aleuritia halleri* (J.F.Gmel.) Soják

Alpine-Carpatic-Balkan floristic element, indicated only for the regions 14 and 15, on altitudes between 2250 and 2800 m a.s.l. The 12 specimens in SOA are from the both regions (Fig. 1-F). One specimen is from Austria. Specimens with numbers 8525 (Arnautski Peak, Stojanov & Stefanov) and 48110 (Rila Monastery, Stojanov) decrease the lower limit of vertical distribution to 1100 m.

Table 1. Comparative specimens of genus *Primula* in SOA.

Species	Count	Origin
<i>P. auricula</i> L.	12	AT, AZ, DE, HU, PL, SK, UZ, ?
<i>P. austriaca</i> Wetsst.	1	?
<i>P. balbisii</i> Lehm.	1	?
<i>P. bicolor</i> Raf.	1	?
<i>P. carpathica</i> Fuss.	1	?
<i>P. cortusoides</i> L.	1	?
<i>P. clusiana</i> Tausch	3	AT, ?
<i>P. carniolica</i> Jacq.	2	IT
<i>P. daonensis</i> (Leyb.) Leyb.	2	AT
<i>P. discolor</i> Schur	1	?
<i>P. elatior</i> (L.) Hill.	13	BA, DE, FR, PL, SE, SI
<i>P. farinosa</i> L.	9	AT, BA, DE, SE, SK
<i>P. dryadifolia</i> Franch.	1	?
<i>P. glutinosa</i> Wulfen	5	AT, DE
<i>P. grandiflora</i> Lam.	1	?
<i>P. halleri</i> G.F.Gmel.	1	AT
<i>P. hirsuta</i> All.	5	AT, FR, ?
(<i>P. viscosa</i> Vill.)		
<i>P. integrifolia</i> L.	1	CH
<i>P. kitaibeliana</i> Schott	1	HR
<i>P. latifolia</i> Lapeyr.	2	DE, FR
<i>P. longipes</i> Freyn & Sint.	1	TR
<i>P. malacoides</i> Franch.	1	?
<i>P. minima</i> L.	1	RO
<i>P. marginata</i> Curtis	3	?
<i>P. mistassinica</i> Michx.	1	US
<i>P. nivalis</i> Pall.	1	UZ
<i>P. nutans</i> Georgi	4	FI, SE
(sub <i>P. sibirica</i> Jacq.)		
<i>P. palinuri</i> Petagna	1	IT
<i>P. pedemontana</i> Thomas ex Gaudin	1	RS
<i>P. scotica</i> Hook.	5	NO, ?
<i>P. spectabilis</i> Tratt.	3	IT
<i>P. stricta</i> Hornem.	4	NO, SE
<i>P. villosa</i> Wulfen	3	AT
		AT, ES, FR, GE,
<i>P. veris</i> L.	17	MK, RO, RU, SE, SK
		BA, DK, GB, DE,
<i>P. vulgaris</i> Huds.	15	IT, KZ, MK, UZ
<i>P. wulfeniana</i> Schott	1	SI

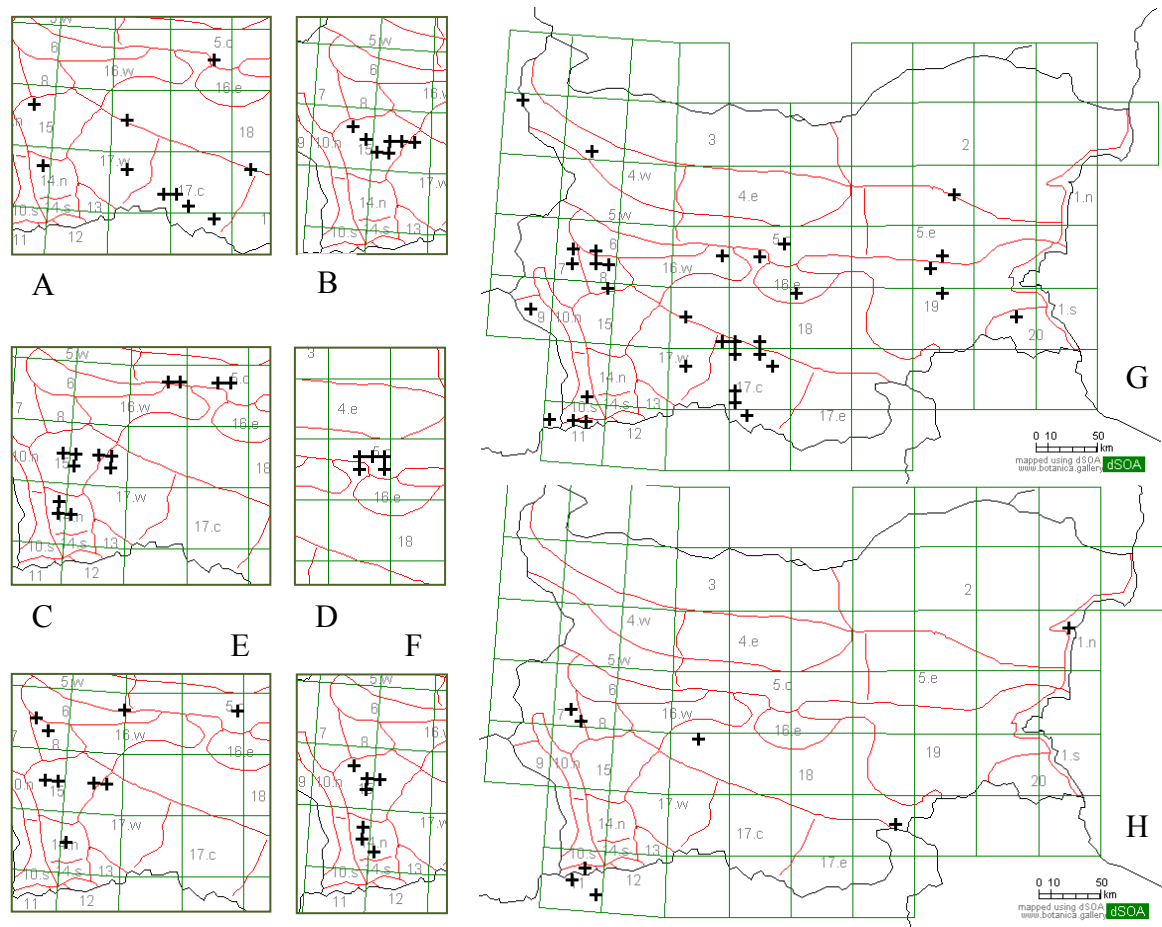


Fig. 1. Specimens of genus *Primula* deposited in SOA: A- *P. elatior*; B- *P. deorum*; C- *P. minima*; D- *P. frondosa*; E- *P. farinosa*; F- *P. halleri*; G- *P. veris*; H- *P. vulgaris*.

The collection of genus *Primula* in SOA consists 352 herbarium sheets. 185 of them (54%) are from Bulgarian localities, 159 (45%) - from abroad, 8 - without geographic data. Four samples are not determined as species. The phenologic data is noted on the labels of 290 herbarium labels.

The phase with flowers is the most suitable for determination. That's why, the preferred period for the collections is May-July. Fewer materials are collected in April and August. Single plants are collected from March and September.

This corresponds to the altitude and the months of flowering. The earliest flowering species are *P. veris* and *P. vulgaris*, but they are poorly represented as number of specimens and this is the reason for the

small harvests during these months. The prevalence of collections from the summer months corresponds to the high altitudes, typical of highland and alpine species.

Most specimens are collected from the 5c, 14n, 15 and 17w regions. In general, the fact that the materials deposited in the SOA collection are locally mainly in southern Bulgaria (Fig. 1).

The analysis of the materials studied shows a reduced scientific interest in the genus as a whole. This is evidenced by the small number of herbarium specimens for a period of more than 100 years - 184 sheets of Bulgarian collections are deposited during 1887 - 2012. It is also noteworthy that the authors of the collections are more than 20 botanists, the largest number of them being collected by: D. Delipavlov (49

records); Art. Dimitrov (42 records); N. Stojanov (38 records); M. Popova (20 records); B. Stefanov (17 records); I. Cheshmedzhiev (12 records); and other botanists, authors of single collections. About 20 specimens have not data about the authors. The most intensive collection period is 1894 – 1980. The oldest bulgarian specimens of *Primula* are collected since 1856. All this points to the lack of targeted studies within the genus, which led to a backlog of up-to-date information on the number of species and their distribution on the territory of our country. The major revision notes of the genus in SOA have been made by Peev since 1974 and are the basis for the development in Flora of Bulgaria item 2 (PEEV, 1982). Subsequent to this period, the intake of materials into the herbarium was of low intensity,

both by region and by the author of the collections, carried out sporadically, on various botanical expeditions. The new literary chorological data for the *Primula* species are few.

The SOA collection contains a considerable number of comparative materials of *Primula* species – 93 herbarium sheets (about 40% of the collection). Along with the species found in Bulgaria, 28 other species that are not found in Bulgaria are presented (Table 1). This is the heritage in result of the intensive interinstitutional exchange during the period of the active inventory work of Bulgarian flora. The bigger part of the materials are collected between 1864 and 1926, from various phytogeographic areas from whole Europe.

Materials of some natural hybrids of *Primula* are stored too (Table 2).

Table 2. Natural hybrids of *Primula* stored in SOA.

Hybrid	Count	Countries
<i>P. × biflora</i> Hutter ex A.Kern.	1	?
<i>P. × bosniaca</i> Beck ex Fiala	1	?
<i>P. × brevistyla</i> DC.	1	?
<i>P. columnae</i> × <i>P. vulgaris</i>	1	BA
<i>P. × digenea</i> A.Kern.	1	?
<i>P. × intermedia</i> Port.	1	?
<i>P. × media</i>	1	FR
<i>P. × pannonica</i> A.Kern.	4	AT, RS, SK
<i>P. × ternovania</i> A.Kern.	1	?
<i>P. × travnicensis</i> Wiesb.	1	BA

Conclusions

The herbarium SOA represents all species of *Primula* in Bulgaria – *P. veris* (67); *P. farinosa* (38); *P. minima* (33); *P. elatior* (30); *P. vulgaris* (25); *P. deorum* (22); *P. frondosa* (13) and *P. halleri* (12). Although *P. veris*, *P. vulgaris* and *P. elatior* are indicated throughout the country the materials in SOA do not represent the actual distribution by floristic regions.

On the basis of the literature and the deposited specimens of *Primula* in SOA, it is visible that the studies of this genus doesn't cover all floristic regions. Displayed by floristic regions, the region with highest count of specimens is 15 (48 records) followed by 17 (32 records), 5 (29 records), 14 (27 records) and 11 (6 records). Few, often single, materials are from the regions 1, 6, 9, 16, 18 and 20, which considers a lower biodiversity level. Materials from the

regions 3 and 12 are not found.

The vertical distribution of the species in the country displays a highest diversity in the mountain and alpine belt (1600 – 2900 m a.s.l.). As habitat features, these are mountain and alpine meadows, peatlands, streams and moist soils, as well as rocky crevices, etc., generally localities of natural character and high humidity. This group includes local and regional endemic species such as *Primula frondosa*, *P. deorum* and *P. halleri*, as well as the alpine species *P. minima* and *P. farinosa* with specific edaphic preferences. The widest range of vertical distribution (0–2200 m a.s.l.) is established for *P. veris*, followed by *P. frondosa* (900 – 2000 m a.s.l.). Part of the samples, with inaccurate or incomplete topographic information about locality and altitude, were not included in the analysis (about 25 exsiccates).

As a drawback of the collection, it can be noted that, despite the taxonomic revisions of part of the materials, no intraspecific taxa were identified in the polymorphic groups of *P. officinalis* and *P. elatior*; there is material with incomplete chorology and inaccurate data regarding the localities; unspecified taxa have been imported. Over 20 species and natural hybrids are stored in the herbarium, including local endemics from the Balkan Peninsula and protected taxa from different parts of Europe.

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References

- ASSYOV B., A. PETROVA (Eds.) 2012. *Conspectus of the Bulgarian vascular flora. Distribution maps and floristic elements*. 4th edition. Bulgarian Biodiversity Foundation, Sofia.
- DELIPAVLOV D. 2003. *Primula* L. – In: Delipavlov D. & Cheschmedzhiev I. (Eds.), [Key to the plants in Bulgaria], Agricultural University Press, Plovdiv, pp. 151-152. (In Bulgarian).
- DUBY J.E. 1928. *Primula*. – In: Candolle A.P. de. *Botanicon Gallicum; seu, Synopsis plantarum in flora Gallica descriptorum*. Pars prima Plantas Vasculares. pp. 383-384.
- HU C.M., S. KELSO. 1996. Primulaceae. – In: Wu Z.Y., P.H. Raven, (Eds.): *Flora of China*, Vol.15. Beijing, Science Press; St. Louis: Missouri Botanical Garden Press, pp. 99-185.
- Index Herbariorum. 2016. NYBG Steere Herbarium. Available at: [sweetgum.nybg.org].
- IPNI. 2019. International Plant Names Index. Available at: [ipni.org].
- IUCN. 2019. Red List of Threatened Species. Available at: [iucnredlist.org].
- KOVTONYUK N. & A. GONCHAROV. 2009. Phylogenetic relationships in the Genus *Primula* L. (Primulaceae) inferred from the ITS region sequences of nuclear rDNA. – *Russian Journal of Genetics*, 45(6): 663–670.
- KOZUHAROV S., D. PEEV, N. NIKOLOV. 1983. Conservation, representation and use of the current chorological information. – *Fitologija*, 22: 61-80.
- PEEV D. & S. TSONEVA. 2011. *Primula deorum* Velen. and *Primula frondosa* Janka - In: Peev D. (ed.), Red Data Book of the Republic of Bulgaria. Vol. I. Plants and Fungi, Bulgarian Academy of Sciences & Ministry of Environment and Water. Available at: [e-ecodb.bas.bg].
- PEEV D. 1982. Genus *Primula* L. – In: Velcev, V. (d.), *Flora Reipublicae Popularis Bulgariae*. 8:324-336. Aed. Acad. Sci. Bulgariae. (In Bulgarian).
- RICHARDS J. 2003. *Primula*: Illustrated by B. Edwards, Portland: Timber Press.
- SMITH W.W., H.R. FLETCHER. 1949. The genus *Primula*: sections *Cuneifolia*, *Floribundae*, *Parryi*, and *Auricula*. – *Transactions of the Royal Society of Edinburgh*, 61(3): 631–686.
- STOJANOV N., B. STEFANOV. 1925. *Flora of Bulgaria*. Vol. 2. State Printing House, Sofia (in Bulgarian).
- STOJANOV N., B. STEFANOV. 1933. *Flora of Bulgaria*. Ed. 2. Guttenberg, Sofia.
- STOJANOV N., B. STEFANOV. 1948. *Flora of Bulgaria*. Ed. 3. Univ. Press, Sofia (In Bulgarian).
- STOJANOV N., B. STEFANOV, B. KITANOV. 1966. *Flora of Bulgaria*. Ed. 4, vol. 2. Nauka & Izkoustvo, Sofia (In Bulgarian).
- STOYANOV K. 2009. Status of the electronic documentation system in the Herbarium of Agricultural University – Plovdiv (SOA). – In: Ivanova, D. (ed.), *Plant, fungal and habitat diversity investigation and conservation. Proceedings of IV Balkan Botanical Congress*, Sofia, 20–26 June 2006. pp. 701–709. Institute of Botany, Sofia.
- VELENOVSKY J. 1891. *Flora Bulgarica*. Descriptio et enumeratio systematica plantarum vascularium in principatu Bulgariae sponte nascentium. Prague.
- VELENOVSKY J. 1898. *Flora Bulgarica*. Supplementum I. Prague.
- YUAN XU, XUN-LIN YU, CHI-MING HU, GANG HAO. 2016. Morphological and molecular phylogenetic data reveal a new species of *Primula* (Primulaceae) from Hunan, China. Public Library of Science, [DOI].

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