Addition to the flora of Kyrgyzstan

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ABSTRACT

The paper proposes new data and contributions related to distribution of some species from the family Rosaceae in Kyrgyzstan. Five species of the genus Potentilla are newly recorded for the flora of Kyrgyzstan, of which Potentilla tuvinica is a new taxon for the Tian Shan Mountain Range. One species from the genus Fragariastrum and one from the genus Sibbaldia, as well as 16 species of Potentilla have been indicated for some biogeographic regions of Kyrgyzstan for the first time. The area of distribution of Potentilla ferganensis is specified, and data on distribution of Potentilla tobolensis are supplemented. Specific habitats are reported for Potentilla ecuta and Potentilla penniphylla described from Kyrgyzstan, but not included in the lists of plants growing in this territory. For each species presented, the general distribution outside Kyrgyzstan is indicated. The endemism of the genus Potentilla in the study area is analyzed. For Potentilla biflora, a nomenclature correction is provided. A map of the biogeographic regions of Kyrgyzstan is presented. It displays the distribution of the rarest Potentilla species.

Keywords: floristic findings, Pamir-Alai, Tian Shan, Rosaceae, Sibbaldia, Fragariastrum, general distribution, endemism

REЗЮМЕ

Кечайкин А.А., Лазков Г.А., Шмаков А.И., Усманов С.А. Дополнение к флоре Кыргызстана. Представлены новые данные о распространении представителей семейства Rosaceae на территории Кыргызстана. Впервые приводятся 5 видов рода Potentilla, из которых P. tuvinica является новым таксоном для горной системы Тянь-Шань. По одному виду родов Fragariastrum и Sibbaldia, а также 16 видов Potentilla впервые указаны для отдельных биогеографических районов. Уточняется район распространения Potentilla ferganensis и добавляется информация о распространении Potentilla tobolensis. Для Potentilla ecuta и Potentilla penniphylla, описанных с Кыргызстана, но не включенных в списки растений данной территории, приводятся конкретные местообитания на территории республики. Распространение наиболее редких видов указано на схематической карте биогеографического районирования. Для каждого вида дано общее распространение. Для Potentilla biflora дается коррекция автора этого таксона. Проводится анализ эндемизма рода Potentilla флоры исследуемой территории.

Ключевые слова: флористические находки, Памиро-Алай, Тянь-Шань, Rosaceae, Sibbaldia, Fragariastrum, общий распространение, эндемизм

This study is devoted to new findings from the family Rosaceae Juss., namely, the genus Potentilla L. and close taxa of the flora of Kyrgyzstan. The country is located in Central Asia (the term Middle Asia is used in most Russian-language sources). The main part of Kyrgyzstan is occupied by the Tian Shan and Pamir-Alai mountain ranges, intermountain hollows and depressions. In the north-eastern part, there is Issyk-Kul, one of the largest mountain lakes of Eurasia. The highest mountain ranges that cover more than 75 % of the area and large water reservoirs make the climate of Kyrgyzstan unique, which causes its floral diversity. According to the estimates by Lazkov & Sultanova (2014), the flora of Kyrgyzstan includes 3927 species of wild and adventive vascular plants from 834 genera that belong to 114 families. However, Kamelin (2002) stated more than 4000 species of vascular plants from 870–875 genera and 140 families growing in Kyrgyzstan. For comparison, the floristic diversity of Mongolia with the area almost eight times greater than that of Kyrgyzstan and not less unique nature includes 3127 vascular plants from 683 genera and 112 families (Urgamal et al. 2014).

One of the most numerous families in Kyrgyzstan’s flora is the family Rosaceae, where the genus Potentilla is the first in the number of species. The abundance and, hence, diversity of the species composition of the genus Potentilla in floras of the Central Asian republics of the former USSR differ significantly. Thus, only 8 species of Potentilla are cited for Turkmenistan’s flora (Blinovsky 1950); for Uzbekistan’s flora – 28 species (Botchantsev 1955); for Kyrgyzstan’s flora – 29 species (Kashchenko 1957); for Tajikistan’s flora – 34 species (Ovzenninov & Koczkareva 1975); for Kazakhstan’s flora – 48 species (Baytenov 1961). Uneven distribution of species abundance is primarily due to the confinement of these regions (or their proximity) to mountain ranges, which genesis has no common features. For example, the species diversity of Potentilla (and many genera from other families) in Kazakhstan is affected by four different mountain ranges: the Urals (the southern part), the Tian Shan, the Dzungar Alatau and the Altai.

The above data on the number of Potentilla species in the Central Asian regions of the former USSR obtained in

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the middle of the last century have changed so far. In particular, according to Lazkov & Sultanova (2014), the species composition of the genus *Potentilla* s.l. (including *Argentina Hill, Drymasialis* Fourn. ex Rydb. and *Schistophyllidium* (Juz. ex Fed.) Ikonn.) in Kyrgyzstan is represented by 40 species. For more than 55 years, the flora of Kyrgyzstan has been replenished with 11 new *Potentilla* taxa. Within five years after the release of the second volume of the Cadastre of Flora of Kyrgyzstan (Lazkov & Sultanova 2014), new data have been gained, which expand understanding of the flora in the study area and distribution of individual *Potentilla* species.

**M A T E R I A L  A N D  M E T H O D S**

The study was performed on the specimens from the genus *Potentilla* L. and close taxa of the Kyrgyzstan’s flora investigated in several of the largest herbaria, and on the materials collected during fieldworks. Herbarium specimens were investigated in Russian herbaria: LE (St. Petersburg), MW (Moscow), TK (Tomsk), and in collections from other countries: DR (Germany, Dresden), PR (Czech Republic, Prague) and TASH (Uzbekistan, Tashkent). In addition, some of the materials used were taken from electronic herbaria K (Royal Botanic Gardens Kew 2019), MW (Seregin 2019) and E (Royal Botanic Garden Edinburgh 2019). Fieldworks were carried out in the Priftergansky biogeographic region in 2018. The materials collected during these works are stored in the Herbarium ALTB collections (Russia, Barnaul). Modern revisions of the flora of the Central Asia were used to identify species of the genus *Potentilla* and related taxa (Li et al. 2003, Sojak 2004, 2012, Shah 2009). A map of the biogeographic regions of Kyrgyzstan proposed by Abdashitova et al. (1996) in the Cadastre of the genetic fund of Kyrgyzstan and Lazkov & Sultanova (2011) in the Cadastre of Flora of Kyrgyzstan (Fig. 1) was used in the study:

**NK** – Northern Kyrgyzstan (Chui valley, the Chon-Kemin river valley with adjacent northern slopes of the Kyrgyz range and Kungei Ala-Too);

**PI** – Issyk-Kul valley (including northern slopes of the Terseki Ala-Too, southern slopes of the Kungei Ala-Too and the Tup river valley);

**CT** – Central Tian Shan (Sary-Djaz river basin);

**WT** – Western Tian Shan (including the Toktogul depression, and Talas and Chatkal valleys);

**SF** – Subfergansky regions of Kyrgyzstan (including southern slopes of the Chatkal and Fergana ranges and northern slopes of the Alai and Turkestan ranges);

**IT** – Inner Tian Shan (in the north, the region is bounded by the Kyrgyz range, in the southwest, it is bounded by the Fergana range, and in the southeast, it is bounded by the Kokshaal-Too range);

**A** – Alai valley (including southern slopes of the Alai and northern slopes of the Zaalarai ranges).

The taxon nomenclature is given in accordance with the *Potentillinae* J. Presl subtribe system proposed by Kechaykin & Shmakov (2016), and the International Plant Name Index (http://www.ipni.org/). Herbarium acronyms are listed according to Index Herbariorum (Thiers 2017). The relevant species and indication of their distribution in Kyrgyzstan and outside the study area are listed below. We provide all data from the herbarium label that can be used to refer the species to a specific biogeographic region. The biogeographic regions where the species was newly found are marked with "*". For some of the taxa, comments are provided. The distribution of the rarest *Potentilla* species in Kyrgyzstan is displayed on the map.

**RESULTS AND DISCUSSIONS**

**New species in the flora of Kyrgyzstan**

*Potentilla flabellata* Regel et Schmalh.

**A:** "Alai range, dry meadow steppe, Kosh-Karchi (Kochkor) riv. head. 30.06.1936. No. 147. I. Tyshchenko, M. Rozhkovskaya" (MW0840212); "Alai valley, Dzhaylyau Kosh-Carchi, alpine meadows. 27.06.1931. No. 223. S. Lipchitz" (MW0840211, MW0840216) (Fig. 1).

**General distribution:** Central Asia.

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**Figure 1** A map of the biogeographic regions of Kyrgyzstan (see explanation in the text) and distribution of the rarest *Potentilla* L. species (number in circles: 1 – *P. flabellata* Regel et Schmalh., 2 – *P. regelina* Th. Wolf, 3 – *P. tatarica* Artemov, 4 – *P. × ala-arczae* Sojak, 5 – *P. ecuta* Sojak, 6 – *P. ferganensis* Sojak, 7 – *P. × kiszbekeensis* Sojak, 8 – *P. kamelinii* Lazkov, 9 – *P. recta* L., 10 – *P. penniphylla* Sojak, 11 – *P. algida* Sojak.
The species occurs in four countries: the south-western part of Uzbekistan (Gissar, Zeravshun and Turkestan ranges), Tajikistan (except Khatlon region and northern part of Sogd region), the north-eastern regions of Afghanistan and the north of Pakistan in the Hindu Kush. A new locality discovered in Kyrgyzstan is in the northern boundary of the P. flabelata habitat.

**Potentilla recta** L.

**SF:** "East Fergana, Jalal-Abad distr. Tentyak-su riv. basin, Almanbek riverhead, walnut forest. 20.06.1936. No. 106, T. Semenikhina" (TASH) (Fig. 1).

**PI:** "S slope of Kangei-Alatau range, Bakhtu-Dolonoto riv. basin. 20.06.1936. No. 106, T. Semenikhina" (TASH) (Fig. 1).

**CT:** "Przhevalsky distr., Mynurt pass. 28.07.1912. V. Sapo­n­shin­ko­v, B. Shish­kin" (TK); "Central Tian Shan. Syrts, right bank of Sor-Bulak riv. (right-bank tributary of Kuilu riv.). 29.08.1936. I. Shehukin" (MW/0840766).

**General distribution:** North (Altai) and Central Asia.

This single herbarium specimen is represented by two different species. The upper part of the herbarium specimen displays two specimens of *P. tursinica*, the lower part shows one specimen of *P. esetita Th. Wolf*. The upper specimens are cited by G.A. Lazkov as *P. multifida* L. × *P. sp. Indeed, *P. tursinica* is a hybrid species originated through hybridization between *P. multifida* and *P. esetita* with *P. regelina* as a closest related taxa (Artemov 2005, Gundemgenova & Kechhaykin 2018). *P. tursinica* is newly recorded for the Tian Shan mountain range. The nearest locality of this species is approximately 1300 km to the northeast in the Altai Mts.

**New species in some biogeographic regions of Kyrgyzstan**

**Fragariastrum biflorum** (Willd. ex D.F.K. Schult.) Kechhaykin et Shmakov

KYRGYZSTAN: NK, PI, SF and IT as *Potentilla biflora* Willd. ex D.F.K. Schult. (Lazzkov & Sultanova 2011); CT* – "Irtash riv. basin and Jaman-Su riv. valley. 08.1936. No. 419. E. Korovin" (TASH)

**General distribution:** North and Central Asia; North America.

Schlechtendal cited as the only author of *P. biflora* in one of the studies (Braun & Heuchert 2013) and in the International Plant Name Index and Tropicos (http://www.tropicos.org/) databases. In other studies, Wildenow is referred to as the only author of this species (Sojak 2004, 2012). Most likely, a technical error was made in the sources cited above. Not only the name, but also the description of this species was first given by Wildenow. Like many other Wildenow’s potentillas, *Potentilla biflora* was validated by Schlechtendal after the death of Wildenow (Schlechtendal 1816). Thus, according to Art. 46 of the International Code of Nomenclature for Algae, Fungi, and Plants (Turland et al. 2018), this species must be attributed to Willd. ex D. F. K. Schultt.
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P. hololeuca Boiss. ex Lehm.

**Potentilla hololeuca** Boiss. ex Lehm.

**General distribution:** North (Altai) and Central Asia.

This species was previously cited for the flora of Kyrgyzstan: CT; "Semirech. region, Przhevalsky distr., Kuelu riv. opposite Torp[1] riv. N steppe slope. 11.08.1912. V. Sapozhnikov; B. Shushkina" (herbarium specimen is defined as *P. multifida* L. var. angustifolia Lehm. and *P. multifida* L. var. angustifolia Th. Wolf) (TK) (Kechaykin 2016); "Semirech. region, Przhevalsky distr., Ken-Su riv., Aksai western source, h. solon. desert steppe. 7.07.1913 V. Sapozhnikov" (TK) (Kechaykin 2016).

**Potentilla approximata** Bunge

**General distribution:** North (Altai) and Central Asia.

**Potentilla argentea** L.

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**General distribution:** North (Altai) and Central Asia.

**Potentilla arcuata** Willd.

**General distribution:** Eastern Europe; North and Central Asia.

**Potentilla angustifolia** Lehm.

**General distribution:** North (Altai) and Central Asia.

**Potentilla asiatica** Rehder & E.H. Wilson.

**General distribution:** Central Asia.

**General distribution:** North (Altai) and Central Asia.

**Potentilla pensylvanica L.**


**General distribution:** Southern and Eastern Europe; North, Central and East (north) Asia; North and Central America.

**Potentilla tephroleuca** Th.Wolf


**General distribution:** Central Asia.

**Potentilla virgata** Lehm.

KYRGYZSTAN: NK; PI; WT; IT; A* – "Vill. Irkeshtam env. 18.09.1940" (MW0840780).

**General distribution:** Eastern Europe; North (southern Siberia) and Central Asia.

**Sibbaldia cuneata** Edgew.


**General distribution:** Central, South and East Asia.

### Other additions

1. In 1986, Sojak described a new species of *Potentilla exuta* Sojak based on materials collected earlier in Mongolia, Eastern Siberia and Kyrgyzstan (Sojak 1986). Subsequently, no data on *P. exuta* were available in the studies on the flora of Kyrgyzstan. Type specimens of this species were collected from Kuyandy riv. head, Przhevalsky distr. by Sapozhnikov in 1913. This locality in Sary-Dzaj riv. basin is a part of the Central Tian Shan (CT) (Fig. 1). The specimen from Kuyandy riv. stored in LE collection is a paratype of *P. exuta*.

2. According to Lazkov & Sultanova (2011), *Potentilla ferganensis* Sojak can be found in the Prifergansky distr. of Kyrgyzstan (SF). This species is described from specimens collected in Suyek tract, At-Bashinsky distr., which corresponds to the Inner Tian Shan (IT) (Fig. 1). The only type specimen of *P. ferganensis* is stored in LE herbarium.

3. In 1987, *Potentilla peniphylla* (Sojak 1987b) was described from the southwestern and northeastern parts of Kyrgyzstan, but the species was not included in the lists of species growing in the study area. According to the protolog and type materials stored in LE, *P. peniphylla* Sojak occurs in the following biogeographic regions of Kyrgyzstan: SF – Alai range; Cholak boguz (locus classicus); CT – Kuelu riv. valley; right tributary of Sary-Dzaj riv.; SF – Alai range, Osh distr., Tor-Chetan (Fig. 1).

4. According to Lazkov & Sultanova (2014), *Potentilla tobolensis* Th. Wolf ex Juz. is distributed in PI and WT biogeographic regions of Kyrgyzstan. In addition, a new locality was reported for *P. tobolensis*: Goguz-Torau, Kokirim riv., vill. Tirovka env. (Kechaykin 2016). This collection stored in TK herbarium belongs to the Inner Tian Shan (IT). *P. tobolensis*, hybridogenic taxon with a wide range of habitat, is actively distributed by seeds dispersed along the roads, railway tracks, and along the banks of large rivers, lakes and water reservoirs (Kechaykin 2012, 2013).

### Analysis of endemism of the genus Potentilla L. s. str. flora of Kyrgyzstan

Endemic elements are a specific part of any flora. Identification of these elements and their subsequent research are crucial for differentiation of particular flora from others. In some cases, endemic species grown in isolation in small localities are carriers of a unique genebank, and therefore are of high conservation priority (Lazkov & Umralina 2015). According to the Cadastre of Flora of Kyrgyzstan (Lazkov & Sultanova 2014), 15 endemic and subendemic species of the genus *Potentilla* s. str. can be found in Kyrgyzstan, some of them are quite rare and localized within specific boundaries. However, the atlas Endemics and Rare Plant Species of Kyrgyzstan does not provide any data on these species (Lazkov & Umralina 2015). Thus, the analysis of endemism of the genus *Potentilla* from Kyrgyzstan is of high relevance.

A list of endemic and subendemic species proposed by Lazkov & Sultanova (2014) with indication of species distribution in Kyrgyzstan with regard to new data is provided below.

#### Legends:

- [E] – endemic species (occur in Kyrgyzstan only);
- [SE] – sub-endemic species (cover Kyrgyzstan and some areas of Central Asian republics of the former USSR and Northwest China).

1. *P. × ala-arcaghe Sojak: NK; [E].
2. *P. algida* Sojak: NK, SF; [SE].
3. *P. asiacea* Ovcz. et Koczk.: NK, PI, SF, WT, IT, A; CT; [SE].
5. *P. bishkekensis* Sojak: NK; [E].
7. *P. ferganensis* Sojak: IT; [E].
8. *P. grisea* Juz.: A, NK, SF; [SE].
10. *P. nervosa* Juz.: A, NK, PI, WT, SF, IT, CT; [SE].
12. *P. pamirrolaisia* Juz.: A, IT, WT, SF; [SE].
13. *P. stanjukoviczii* Ovcz. et Koczk.: A, IT, PI, CT; [SE].
14. *P. tephroleuca* (Th.Wolf) B. Fedtsch.; IT, WT; [SE].
15. *P. tophiroscia* Juz.: WT, SF; [SE].

We propose to exclude some of the *Potentilla* species listed above, which, according to some data, have a wider area of distribution (marked with "#" in the list) from the category of subendemic species of Kyrgyzstan. These species include *P. algida* growing in Afghanistan (Sojak 2012); *P. asiacea* that is considered synonymous with *P. multifida* (see above); *P. asiatica* growing in the area from Afghanistan to Eastern Siberia (Sojak 2004, 2012, Kechaykin 2012); *P. grisea* restricted to Afghanistan, Pakistan and Kashmir (Sojak 2009, 2012); *P. pamirica* and *P. pamirrolaisia* distributed from Turkey to Altai (Sojak 2007, 2012, Kurbatsky & Ebel 2011, New species to the flora of Kyrgyzstan


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Kechaykin et al. 2014; P. stanjekovičii that is considered synonymous with P. agrimonioides (see above).

Thus, only 8 Potentilla endemics occur in the flora of Kyrgyzstan, of which 4 species are local endemics that require special observation and monitoring (P. × atri-ararug), P. × bishkekensis, P. ferganensis and P. kamleini (Fig. 1), and 4 species are subendemic (P. feldschunnana, P. nervosa, P. tetrapoda and P. teplushenienia). The number of endemics and subendemics is 18.6% of the total number of Potentilla s. str. growing in Kyrgyzstan. Such low percentage, in our opinion, does not reflect the autochthonous tendencies in the formation of the Potentilla species composition in this area. The highest occurrence of endemics and subendemics of Potentilla in the flora of Kyrgyzstan is observed in the Western Tian Shan biogeographic region, where 5 species are found to grow. In addition, three more Potentilla species found nowhere else and associated with P. feldschunnana have been described from the Western Tian Shan. In Uzbekistan, these are P. × solitaria Sojak and P. tshimganica Sojak found in the Big Chimgan Mountain Range; in Kazakhstan – P. katarayica Juz. growing in the Karatau range. These species are likely to occur in Kyrgyzstan as they grow in close proximity to the border. The physiographic conditions of the Western Tian Shan make it an area with active speciation in the genus Potentilla associated primarily with processes of hybridization.

CONCLUSION

Within five years after the release of the second volume of the Cadastre of Flora of Kyrgyzstan, the number of species of the genus Potentilla in the study area have increased by nine taxa, and now it accounts for 49 species s. l. or 43 species s. str. In this paper, 5 new Potentilla species with specific localities have been newly recorded for the first time for the flora of Kyrgyzstan. Of these, P. tsviniša is a newly recorded species from the Tian Shan mountain range. The conducted analysis of endemism showed that 8 endemic and subendemic Potentilla species occur in the flora of Kyrgyzstan. The endemics and subendemics of Potentilla are mostly found in the Western Tian Shan biogeographic region associated with species formation of the genus in this area. We believe that the study of the genus Potentilla and close taxa is currently being initiated in Kyrgyzstan, and in the Tian Shan and Pamir-Alai mountain ranges. New findings are expected to expand the overall picture of the genus Potentilla in Central Asia. In conclusion, we would like to quote the words of R.V. Kamelin, a famous expert on the flora of Central Asia, "Such is the flora of Kyrgyzstan, which has not been fully studied in terms of its systematic composition and for practical needs" (Kamelin 2002).

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LITERATURE CITED


