

Notes on *Potentilla*. V.

Potentilla pensylvanica group in the Old World

Poznámky k r. *Potentilla*. V.

Skupina *Potentilla pensylvanica* ve Starém světě

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The Siberian *P. sibirica* WOLF (*P. strigosa* auct. ross. non PALL.) is identical with the American *P. pensylvanica* L. This species also occurs in Karelia, SW Alps and Spain. The correct name for the derivatives of the hybrids *P. pensylvanica* × *P. sanguisorba* is *P. nudicaulis* WILLD. ex SCHLECHTEND. [s. orig. non s. JUZ., quod est *P. acervata* SOJÁK] (= *P. strigosa* PALL. s. orig. non s. JUZ., quod est *P. pensylvanica* L.); this taxon occurs from Tien Shan to Chukotka. *P. agrimonioides* M. BIEB. is derived from *P. pensylvanica* × *P. sericea*; it is not an endemic of the Caucasian region but occurs also in the territory from N Iran to the Himalaya and from Afghanistan to Transbaikalia. Three west-mediterranean species evolved from *P. agrimonioides*: *P. hispanica* ZIMM. and *P. oreodoxa* SOJÁK (both in Spain) and *P. ibrahimiana* MAIRE em. SOJÁK (Atlas). *P. dentata* FORSSK., closely related to *P. pensylvanica*, occurs in Yemen, Ethiopia and Kenya. *P. conferta* BUNGE and *P. chalthorum* SOJÁK have their centres of distribution in S Siberia and in Mongolia. *P. lomakinii* GROSSH. (E Turkey, Soviet Transcaucasia, N Iran) is derived from *P. agrimonioides* (or *P. pensylvanica*) × *P. argentea*.

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TAXONOMY

P. pensylvanica

According to WOLF (1908) *Potentilla pensylvanica* L. is restricted to North America and similar Siberian plants belong to a separate species which he described under the name *P. sibirica* WOLF. The latter should have lower and thinner stems, smaller leaves and leaflets, less numerous flowers on thinner pedicels and smaller calyces. JUZEPČUK (1941) accepted this concept but adopted the earlier name *P. strigosa* PALL. ex PURSH for Siberian plants. Other Soviet authors followed him. BALL, PAWLOWSKI and WALTERS (1968) however refer plants from the Old World again to *P. pensylvanica*. The present paper discusses the relationships between Euro-Siberian and American plants and the evolutionary tendencies within the *P. pensylvanica* group.

The Siberian plants (e.g. *P. sibirica* WOLF) appear to be homogenous. Their variability in taxonomically important characters is insignificant.¹⁾ There is some variation in those characters which depend on ecological conditions of the habitat, such as the size of the plants and density of indumentum of leaflets. The shape and size of indentation of leaflets can also vary. On the other hand, the indumentum on petioles and stems remains

¹⁾ WOLF (1908) mentioned the great variability of *P. sibirica* in Altai and Tien Shan, but the revision of his herbarium revealed that he included in *P. sibirica* some nothomorphs of the hybrid *P. pensylvanica* × *P. sericea*.

very constant: it is formed of very short hairs mixed with 1—2 mm long hairs. Siberian plants often hybridize with *P. sanguisorba* WILLD. ex SCHLECHTEND. or *P. sericea* L. Hybrids are very variable, often similar to their respective parent species, but in general do not obscure species limits. One can easily identify the hybrids of *P. sericea* by their large petals and often also by the long hairs ($\pm$ 2—4 mm) on petioles. Hybrids of *P. sanguisorba* are easily recognizable only in intermediate forms and when closer to *P. sanguisorba*; the whole plant or at least leaflets' undersides or calyces have a sparser indumentum.

In North America the situation is not any simpler. In addition to several related but undoubtedly separate species (e.g. *P. litoralis* RYDB., *P. normalis* BESSER ex SPRENG., *P. lasiodonta* RYDB.), there are two distinct taxa (most likely varieties) within *P. pensylvanica*. One has petioles and stems with 1—2 mm long hairs; the other has hairs 0.6—1 mm long. Both taxa are widespread. The variety with short hairs, however, is more common in Canada while the taxon with long hairs is more common in the U.S.A.

North American plants with 1—2 mm long hairs on petioles and stems are identical to those found in Siberia. There was no morphological character which would enable me to distinguish plants from the two geographical areas. Authentic specimens of *P. pensylvanica* in Linnaeus' herbarium (LINN) correspond to these plants. The use of the name *P. pensylvanica* for Euro-Siberian plants is therefore appropriate and the name *P. sibirica* must be considered a later synonym.

It is difficult to explain why WOLF concluded that there were two distinct species, one in Siberia and the other in North America. Morphologically identical specimens from the two areas were deposited in his own herbarium. But he was so confident that he could distinguish Siberian plants that he attached the following annotation to a specimen collected in New Mexico (FENDLER 202, PR): „Die Pflanze stammt sicher nicht aus Amerika sondern aus Sibirien.“ He was obviously influenced by his observations of plants cultivated in European botanical gardens (as well as those in his own garden) and those which escaped from cultivation in Boulogne near Paris. Specimens of these plants are plentiful in European herbaria and they are always very robust. Specimens of North American plants, collected in the wild, were generally smaller and WOLF failed to associate them with the Siberian plants. JUZEPCZUK, who was otherwise an excellent taxonomist, was misled by WOLF's authority.

LINNAEUS described *P. pensylvanica* from specimens collected from garden material which probably originated in North America. They have large leaves, which is typical of cultivated plants, and petioles with 1—2 mm long hairs. Plant LINN 655.12 has a denser indumentum on the upper sides of leaflets than LINN 655.13 but I have selected the latter as a lectotype of the species since it comes from the Uppsala gardens, which is in accordance with the protologue.

The variety of *P. pensylvanica* with hairs on petioles 0.6—1 mm long is missing from Asia. Because I failed to find an earlier name, I describe it as *P. p.* var. *brevipila* SOJÁK. *P. finitima* KOHLI et PACKER recently described from North America also has 0.6—1 mm long hairs on petioles but is distinguished, according to KOHLI and PACKER (1967), from all other forms of *P. pensylvanica* (in addition to the different chromosome number) by the

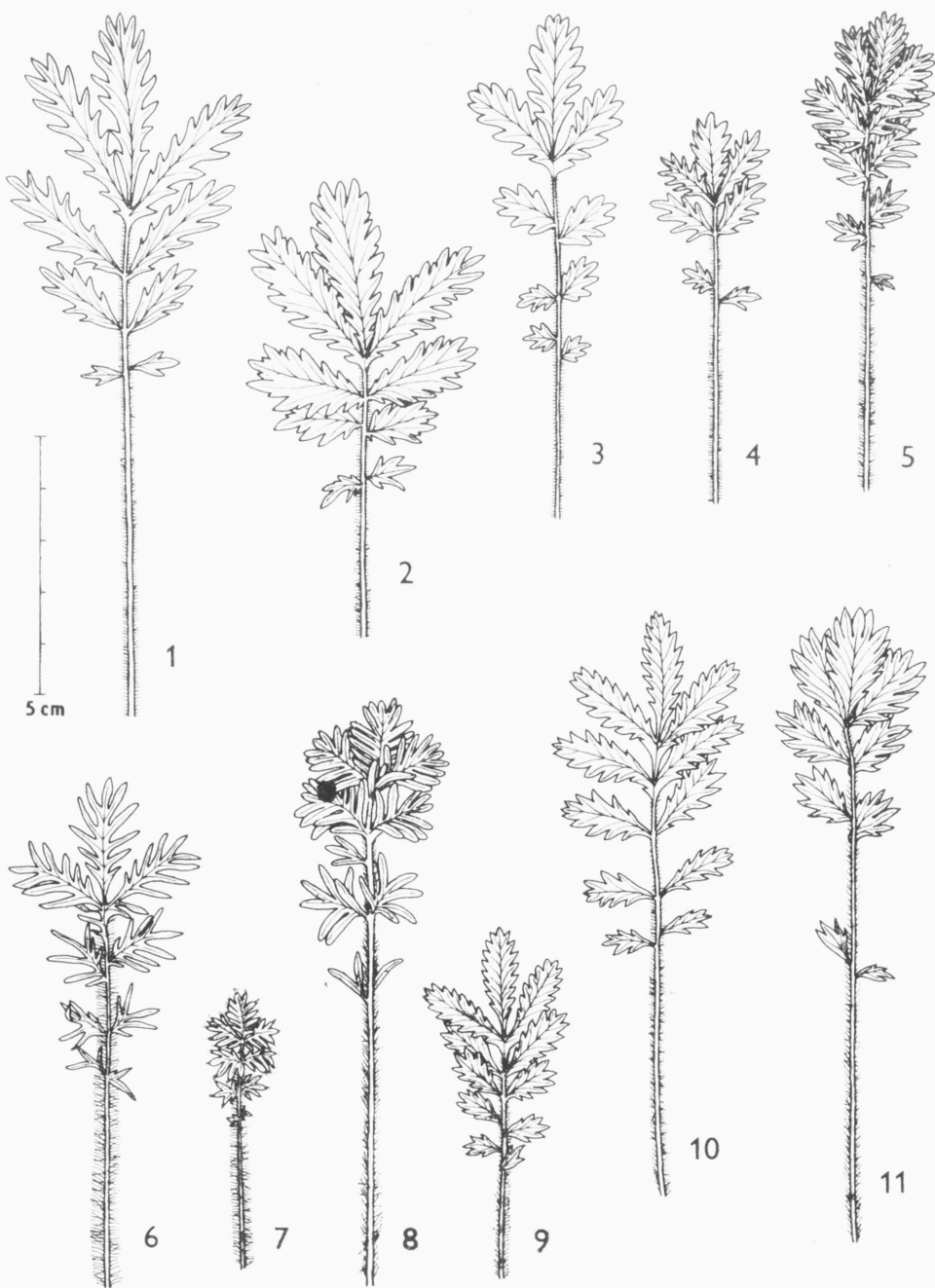


Fig. 1.—11. Basal leaves: 1. *Potentilla pennsylvanica*, 2. *P. pennsylvanica* var. *sanguisorbifolia*, 3. *P. nudicaulis*, 4. *P. agrimonioides* var. *strigosella*, 5. *P. agrimonioides* var. *agrimonioides*, 6. *P. agrimonioides* var. *intercedens*, 7. *P. agrimonioides* var. *malacotricha*, 8. *P. agrimonioides* var. *micans*, 9.—10. *P. oreodoxa*, 11. *P. ibrahimiana*.

dense, strongly impressed reticulate venation on the upper side of the leaflets, a more compact inflorescence and epicalyx-segments wider and longer than sepals. *P. pensylvanica* var. *brevipila* is not identical with *P. finitima* but the possibility cannot be excluded that in the future it will be reclassified as a variety of *P. finitima* instead of *P. pensylvanica*. In that case *P. finitima* would include all the plants with a short indumentum on petioles, regardless of the characters on veins, the inflorescence and epicalyx-segments (e.g. the Yellowknife specimen, CODY and McCANS 3094, identified by KOHLI and PACKER as *P. pensylvanica*, would belong to *P. finitima*). If, however, future studies show that *P. pensylvanica* var. *brevipila* is a tetraploid, its inclusion in the diploid *P. finitima* would be inappropriate.

The continuous distribution of typical *P. pensylvanica* extends from W Manchuria and Transbaikalia to the region of the S Urals (Bashkirskaya ASSR). Plants from two isolated localities in Karelia have a slightly sparser indumentum on leaflets than typical Siberian populations. These plants probably just represent a form of *P. pensylvanica*. The introgression of a second species (such as *P. sanguisorba*) in the Karelian populations is unlikely and would be difficult to prove.

In southern Europe *P. pensylvanica* occurs in a very isolated area of the SW Alps and in the mountains of central Spain. These plants are typical *P. pensylvanica* and do not have any characters indicating introgression with *P. sanguisorba*, *P. sericea*, or any other species. In spite of their long isolation from populations in Siberia, mediterranean plants do not differ from Siberian plants in any taxonomically important characters. The only reason for classifying southern European plants as a distinct variety (*P. pensylvanica* var. *sanguisorbifolia* F. O. WOLF ex T. WOLF) is the double serration of some leaflets. This character is only exceptionally present in Siberian plants, but is quite in plants from the Alps and Spain. However, double serration occurs only in certain individuals of mediterranean populations, making the taxonomic status of this variety somewhat doubtful.

The autochthonous occurrence of *P. pensylvanica* in the SW Alps was questioned by various authors (cf. WOLF 1908). There is no doubt, however, that the plants from the Alps belong to the same variety as the Spanish plants and both are native in their respective areas of occurrence.²⁾ Neither WOLF (1908) nor BALL, PAWLOWSKI and WALTERS (1968) report *P. pensylvanica* (or *P. sibirica*) from Spain. This is interesting, especially since *P. pensylvanica* is more common in Spain than *P. hispanica* aggr., and there are many collections of this species in European herbaria.

P. pensylvanica × *P. sanguisorba*

In Asia typical forms of *P. pensylvanica* occur in Siberia, W Manchuria, the northern parts of Kazakhstan and Mongolia.³⁾ In Tien Shan there are rare occurrences of atypical plants of *P. pensylvanica* that have a sparser indumentum on both sides of the leaves and on calyces. The difference between these plants and typical plants of *P. pensylvanica* is small, being rather

²⁾ The Siberian *Potentilla multifida* is also found in similar, isolated localities in the western Alps.

³⁾ HANDEL-MAZZETTI's (1939) report of *P. pensylvanica* (as *P. conferta*) in China (Chili, Hsiao-Wu-Tai-Shan) is erroneous.

conspicuous on live material but less so on herbarium specimens. Even in the herbarium material, however, the difference is constant and quite obvious. In my opinion the Tien Shan plants represent a stabilized nothomorph of the hybrid *P. pensylvanica* $\times$ *P. sanguisorba*, which is morphologically closer to *P. pensylvanica*. Although the sparser indumentum could have resulted from the hybridization of *P. pensylvanica* with any non-tomentose species (especially those of the section *Tanacetifoliae*), *P. sanguisorba* is the most likely second parent because these two species are prone to inter-specific hybridization. Furthermore, I have examined hybrid swarms of these two species in northern Mongolia, and Tien Shan plants are morphologically identical to one nothomorph of these hybrid swarms. On the other hand, a similar hybrid, *P. pensylvanica* $\times$ *P. tanacetifolia*, is extremely rare and known to me only from a single locality.

It is unlikely that the sparser indumentum of Tien Shan *P. pensylvanica* originated through the evolution of an isolated population without any hybridization. My experience with this species [and other members of the sections *Pensylvanicae* (= *Multifidae*) and *Tanacetifoliae*] both in the field observations and hybridization experiments indicates that *P. pensylvanica*, without hybridization, exhibits remarkable stability of morphological characters. The same stability is also demonstrated by the isolated Spanish populations.

A similar situation exists north of the distributional limit of *P. pensylvanica*. This species does not occur in the Arctic part of Siberia. On the other hand, the hybrid *P. pensylvanica* $\times$ *P. sanguisorba* occurs there relatively often. In this region one finds all the nothomorphs of the hybrid, including plants very similar to one or the other of the original parents. Because of the existence of a wide range of nothomorphs, compared with the uniformity of the Tien Shan populations, the hybrid origin of these plants is indisputable, even though none of the parents actually reaches the Arctic (cf. JURTZEV 1984).

The hybrid *P. pensylvanica* $\times$ *P. sanguisorba* was first collected by PALLAS. One specimen, labelled *P. strigosa* PALL., eventually got into LAMBERT's herbarium; the other, with no name on its label, was acquired by WILLDENOW. The name *P. strigosa* PALL. was first published by PURSH (1814) in his synonymy of *P. pensylvanica* var. *strigosa*. Its first valid publication was that by TRATTINICK (1824). The name was later used by LEDEBOUR (1830). The type specimen is deposited in the British Museum (BM). WILLDENOW wrote *P. nudicaulis* on the second specimen's label, and this name was used in SCHLECHTENDAL's diagnosis of the taxon. This specimen was later sent to the *Potentilla* monographer LEHMANN, who lived in Hamburg, and after his death the *Potentilla* material in his estate went to Prague (PR). PALLAS' plants are from a rather rare nothomorph with glabrate stems but with a rather dense indumentum on the leaves. Since both specimens belong to the same nothomorph and are prepared in the same way, they could be parts of the same collection. The name *P. nudicaulis* WILLD. ex SCHLECHTEND. is the oldest name for *P. pensylvanica* $\times$ *P. sanguisorba*, and for the hybridogenous species derived from this hybrid.

JUZEPCZUK (1941) erroneously applied the name *P. nudicaulis* WILLD. to another species, a plant from the vicinity of *P. longifolia* WILLD. ex SCHLECH-

TEND.⁴) It is characterized by large petals and a loose inflorescence. I described this species under the name *P. acervata* SOJÁK. JUZEPCZUK was obviously misled by SCHLECHTENDAL's laconic diagnosis. He, however, examined a plant derived from a hybrid of *P. pensylvanica* × *P. sanguisorba* from Chukotka and labelled it *P. tundrarum* JUZ. The following scheme compares JUZEPCZUK's nomenclature with mine:

JUZEPCZUK

present author

P. strigosa PALL.

P. nudicaulis WILLD.

P. tundrarum JUZ. in sched.

P. pensylvanica L.

P. acervata SOJÁK

P. nudicaulis WILLD. = *P. strigosa* PALL.

P. pensylvanica × *P. sericea*

The hybridization of *P. pensylvanica* and *P. sericea* L. is frequent in areas where both species occur. The species are sympatric in southern Siberia and Mongolia. The hybrid *P. pensylvanica* × *P. sericea* is very interesting. This hybridization is an excellent example of what is called peripheral hybridogenesis. It is not too evident in the centres of the species' distributions, but the hybrid usually replaces its parents beyond their distributional limits, both horizontal and vertical (cf. SOJÁK 1986).

The parent species are morphologically quite remote, and the hybrids vary over a wide range of morphological characters between them. The hybrid has such a fortunate combination of characters, however, that its identification is very reliable even in nothomorphs that are close to either of the original parents. All nothomorphs of the hybrid differ from *P. sericea* by having glandular sepals. They differ from *P. pensylvanica* by having large petals⁵) and often also long hairs on petioles. In hybrids, glandular sepals are inherited from *P. pensylvanica*, and large petals and long hairs on petioles from *P. sericea*.

Although the hybrid *P. pensylvanica* × *P. sericea* does not extend north of the area of distribution of *P. sericea*, in the mountains south of Tien Shan it spreads into areas where neither of the parents grows. The southern limit of distribution of the parent species runs through Kazakhstan (Dzhungarskiy Alatau and Zailiyskiy Alatau). The hybrid (or more appropriately the hybridogenous species) however occurs in the Caucasus and in Transcaucasia, Iran, Afghanistan, in the Pamir, Karakoram, the Himalayas and S Tibet. It was often collected in these areas but always misidentified. Most often it was mistaken for *P. sericea*. From the Himalayas it was described by BERTOLONI as *P. cinerascens*, but this name was consequently dropped from use. A conspicuously densely hairy nothomorph from the Pamir was described as *P. malacotricha* JUZ., and another from the same area as *P. stanjukoviczii* OVCZ. et KOCZK.

There are no reports of *P. pensylvanica* × *P. sericea* from the Caucasus in the Russian literature, although the hybrid is well represented there by all nothomorphs ranging from those close to *P. sericea* through the intermediate

⁴) In Russian literature the name *P. nudicaulis* is first correctly applied in JURTZEV (1984) who, through our correspondence, is familiar with my arguments.

⁵) In the rich material deposited in Leningrad (LE) I found only one exceptional sheet (with several specimens) exhibiting small petals. But it was still identifiable as a hybrid because it had long hairs on petioles.

types to those close to *P. pensylvanica*. One of the nothomorphs was described by MARSCHALL-BIEBERSTEIN as *P. agrimonioides* M.-BIEB. and treated by WOLF (1908) as a variety of the Spanish *P. hispanica* ZIMM. JUZEPCZUK (1941) and other recent authors from the Caucasian region considered it to be an endemic species. The main reason why the hybrid character of *P. agrimonioides* was not identified was the incorrect view that neither of the parent species grew in the area. This view was put forth by WOLF (1908) and accepted by all subsequent authors. As a matter of fact, true *P. sericea* does occur in the Caucasus. It was not recognized as such, but regarded as an endemic species called *P. alexeenkoi* LIPSKY. *P. pensylvanica* makes a rare appearance in Armenia (vicinity of Lake Sevan).

JUZEPCZUK (1941) used the name *Potentilla agrimonioides* for plants which are almost identical to *P. pensylvanica* but have large petals (it is possible that he did not see any collections closer to *P. sericea* from the Caucasus). I describe these plants as *P. agrimonioides* var. *strigosella* SOJÁK.⁶⁾ Similar plants occur also in Siberia. In all the regions where the derivatives of *P. pensylvanica* × *P. sericea* occur, plants intermediate⁷⁾ between the parent species are most common. They are characterized by long hairs on petioles and deeply dissected leaflets. I call this taxon *P. agrimonioides* var. *intercedens* SOJÁK. So far I have not seen any variety other than the one from the Himalayas, Mongolia, and Iran. I also include forms approaching *P. sericea* in this variety. In my opinion, there is no need to treat these forms as a different taxon, since they usually do not form isolated populations but occur in those which gradually pass into *P. a.* var. *intercedens*.

BIEBERSTEIN's type material represents plants that are between *P. agrimonioides* var. *strigosella* and *P. a.* var. *intercedens* in morphological characters. They cannot be assigned to either of these two varieties and should be treated as a transitional taxon, *P. a.* var. *agrimonioides*.

Nothomorphs of *P. pensylvanica* × *P. sericea* usually amalgamate the whole range of characters from both parent species. There are, however, some populations, sometimes restricted to certain areas, which seem to deviate from the continuous range of nothomorphs. One such segregate is formed of plants whose pinnatisect leaflets are silvery tomentose on both sides, covered with dense, short, straight hairs. This variant, which I call *P. a.* var. *micans* SOJÁK, is common in the Altai, but also occasionally collected in Dagestan. Slightly atypical specimens are also found elsewhere. Although *P. a.* var. *micans* diverges considerably from the most common *P. a.* var. *intercedens*, transitional forms between these two varieties and the lack of a distinct area of distribution of *P. a.* var. *micans* indicates that it does belong to *Potentilla agrimonioides*.

Another interesting taxon belonging to this complex occurs in the Pamir. Plants are characterized by a much branched caudex and leaflets with long, soft hairs. They were described as *P. malacotricha* Juz. In the Pamir there are plants which are transitional between "*P. malacotricha*" and *P. a.* var. *intercedens* and in other mountain ranges (including those of southern Siberia) there are convergent forms. This suggests that plants labelled *P. malacotricha*

⁶⁾ Since *P. agrimonioides* is not a primary hybrid, but represents a hybridogenous species, I use the rank variety for the designation of infraspecific taxa.

⁷⁾ The designation "intermediate" is very subjective. For example WOLF would treat the form that I consider intermediate as typical *P. sericea*.

are also the product of hybridization of *P. pensylvanica* and *P. sericea*. If, however, evidence is found that *P. malacotricha* originated by another process, such as from the hybrid *P. soongorica* $\times$ *P. sericea*, it would have to be treated as a distinct species. This is also true of *P. stanjukoviczii* Ovcz. et KOCZK. This taxon probably also originated from the hybrid *P. pensylvanica* $\times$ *P. sericea* and I place it in *P. a.* var. *intercedens*.

P. hispanica aggr.

Both the geography and evolution of the Spanish species *P. hispanica* ZIMM. and *P. oreodoxa* SOJÁK are very interesting. In my opinion they are both derived from *P. pensylvanica* $\times$ *P. sericea*. Their ancestor must have migrated to the Iberian peninsula from Caucasus or Transcaucasia. This migration was separate from that of *P. pensylvanica*. As a result of long isolation, they evolved into two endemic species, distinct from the original *P. pensylvanica* $\times$ *P. sericea* hybrid. Among the large array of nothomorphs of this hybrid from Siberia, Mongolia, central Asia, and the Caucasus there are no specimens identical with the Spanish taxa. This situation is well documented in the Leningrad herbarium (LE) and was confirmed by my field studies in Mongolia, the Tien Shan, Elburz, and Caucasus. Spanish species have eglandular carpels, more shallowly dissected leaflets, and slightly larger petals and anthers than plants from Asia. *P. oreodoxa* is closer to the Asiatic plants than *P. hispanica*. The two Spanish species differ in the size of glands on sepals, the shape of leaflets' teeth, and by the length of hairs on petioles. Their variability is very small. The shape of leaflets and the teeth, as well as the indumentum on petioles, is very constant. They both differ from *P. pensylvanica* in that their petals and anthers are about twice as large. Neither of these two species hybridizes with *P. pensylvanica*. *P. hispanica* is restricted to a single mountain range close to Granada and *P. oreodoxa* grows in several ranges of central Spain. BALL, PAWLOWSKI and WALTERS (1968) unjustly omitted *P. oreodoxa*; its difference from *P. hispanica* is quite constant. SMYTHIES (1984) amalgamated *P. hispanica*, *P. oreodoxa* and *P. pensylvanica* into a single species. This is not acceptable, even within the concept of very broad species.

In the Atlas Mountains *P. hispanica* and *P. oreodoxa* are replaced by a closely related endemic species *P. ibrahimiana* MAIRE emend. SOJÁK. I believe that it evolved from the same ancestor as the Spanish endemic species, i.e. from a hybrid of *P. pensylvanica* $\times$ *P. sericea*. It is very probable that a hybridization of this ancestor with one or two other species was responsible for the origin of *P. ibrahimiana*. Unlike the Spanish endemics, *P. ibrahimiana* is very variable. One finds forms with leaflets that are green beneath, as well as those with leaflets that are grey or snow-white tomentose beneath. Some specimens have leaves with 2 approximated pairs of leaflets; others have leaves with 3—5 remote pairs. There are no plants resembling *P. ibrahimiana* in Asia.

P. dentata

WOLF (1908) classified plants similar to *P. pensylvanica*, which occur in Ethiopia, as *P. hispanica*. This is obviously an error. This remarkable plant which also occurs in Yemen and was recently collected in Kenya, has short

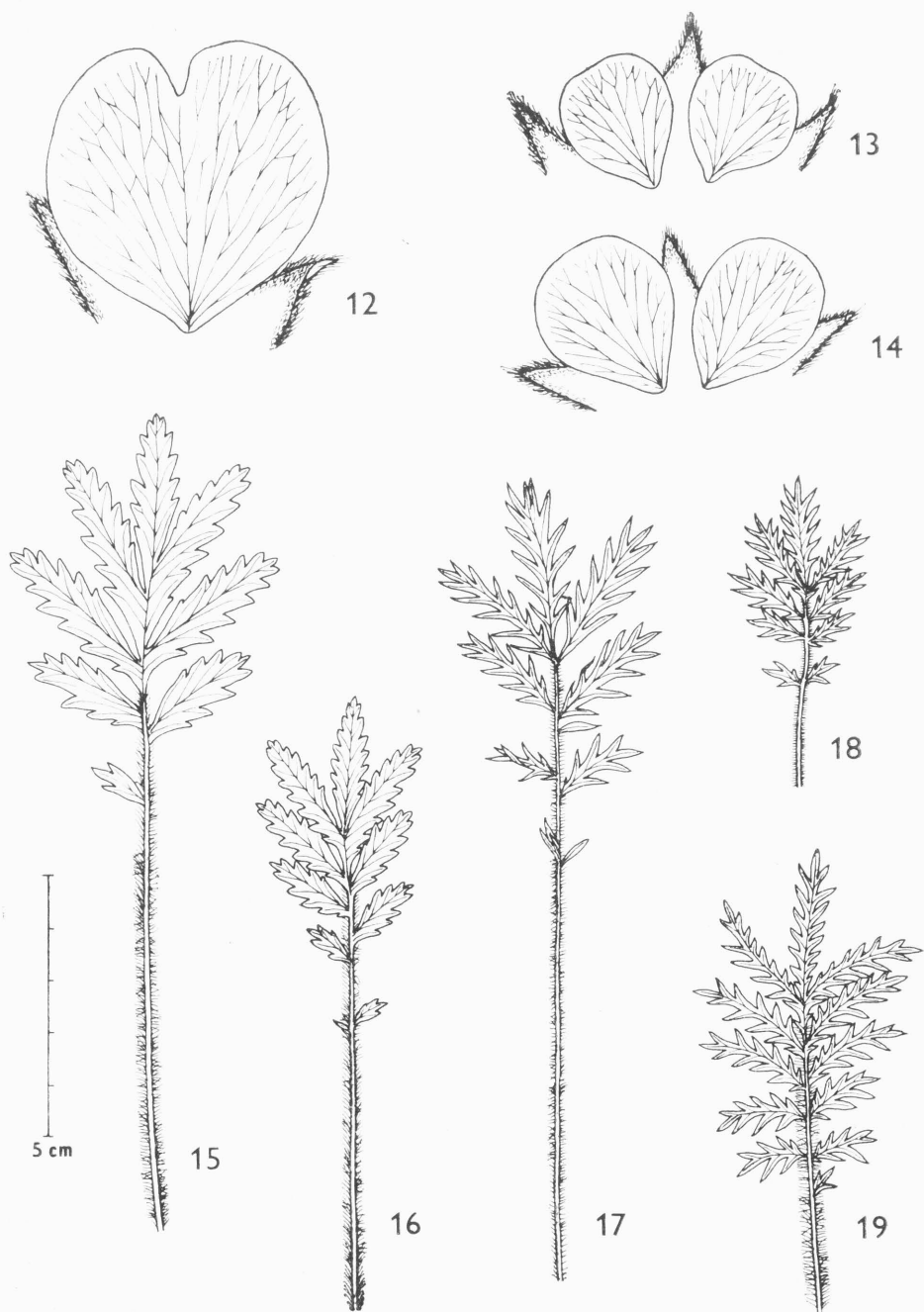


Fig. 12.—19. 12. Petal of *Potentilla oreodoxa*. 13.—14. Petals of *P. pensylvanica*. Basal leaves: 15.—16. *P. hispanica*, 17.—18. *P. chalchorum*, 19. *P. conferta*.

petals and is without doubt related to the Siberian *P. pensylvanica*. I consider it a distinct species *P. dentata* FORSSK. I plan to deal with this species in a separate paper.

P. conferta and *P. chalthorum*

The relationships of *P. conferta* BUNGE and *P. chalthorum* SOJÁK to the *P. pensylvanica* group are uncertain. These species resemble *P. pensylvanica* but are not necessarily related to it.

P. conferta (Siberia, Mongolia, Manchuria, Soviet Central Asia) has long [2—3(—4) mm] indumentum of petioles. Thus it is similar to *P. agrimonioides* but has always small petals, 3—4(—5) well developed cauline leaves (which have 3—4 pairs of leaflets even in the upper half of stem) and contracted inflorescence. The differences between *P. conferta* and *P. agrimonioides*, though minute, are constant so that both the species are almost always readily distinguished. Populations of *P. conferta* from Soviet Central Asia have somewhat shorter indumentum on the petioles and their inflorescences are less contracted. I consider them to be a separate variety, *P. c. var. laxiuscula* SOJÁK.

P. chalthorum (Siberia, Mongolia, Hebei = Chili) has short (1—2 mm) indumentum of the petioles, thus approaching *P. pensylvanica*, but the sessile glands beneath the indumentum on the underside of the leaflets are absent. The glands on the sepals of *P. chalthorum* are missing or are small and scanty. The differences between *P. chalthorum* and *P. conferta* given by PESCHKOVA (1979) are correct but more important seems to be the presence or absence of sessile glands on the underside of the sparsely tomentose leaflets and the length of the indumentum of the petioles.

P. lomakinii

P. lomakinii GROSSH. is an extremely variable species, with some forms conforming, by their habit, to *P. pensylvanica* and others approaching *P. argentea* L. *P. lomakinii* is probably derived from *P. agrimonioides* (or *P. pensylvanica*) × *P. argentea*. So far it has been known from Soviet Armenia and Azerbaydzhan. However, it occurs also in E Turkey (Ararat, Szovits s.n. DR, LE, PR) and N Iran (Elburz, Kandavan, SOJÁK s.n. PR, Lar Valley, TROTT 894, K). Reports of *P. approximata* BUNGE in Talish (cf. SCHIMAN-CZEIKA 1969) refer to *P. lomakinii*.

NOMENCLATURE

Potentilla pensylvanica L.

Mant. Pl. 76. 1767. — *P. pubescens* MOENCH, Methodus 657. 1794 nom. illeg. Typus LINN 655.13! (lecto, hic design.).

P. hispida WILLD. Enum. Pl. Hort. Berol. 1 : 553. 1809. — *P. pensylvanica* [subspec.] *hispida* (WILLD.) TRATT. Rosac. Mon. 4 : 30. 1824. — *P. pensylvanica* β [var.] *grandiflora* LEHM. Nov. Stirp. Pug. 9 : 41. 1851. Typi B—W (photo!; no. 957/2, 957/3 — lecto, hic design., 957/4, non 957/1 — quod est *P. longifolia* WILLD. ex SCHLECHTEND.).

P. pectinata FISCH. ex SER. in DC. Prodr. 2 : 581. 1825 pro syn. Specim. orig. G—DC (photo!).

P. pectinata FISCH. ex LEHM. in HOOK. Fl. Bor.-Amer. 1 : 188. 1832 pro syn. — *P. sibirica* var. *pectinata* [FISCH. ex LEHM.] WOLF, Biblioth. Bot. 71 : 190. 1908 [deser.]. Typus PR! (holo.).

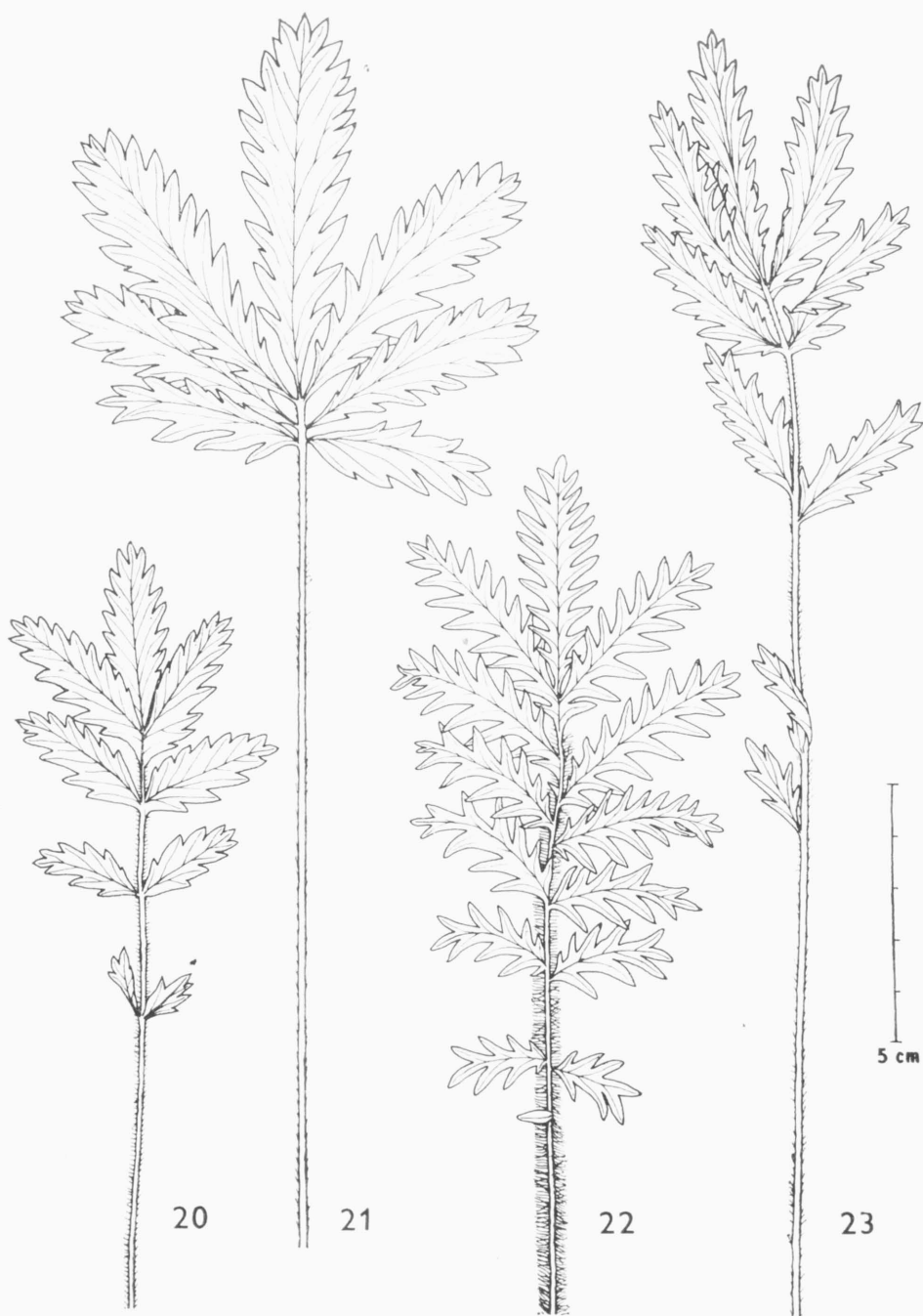


Fig. 20. — 23. Basal leaves: 20. *Potentilla dentata*, 21. and 23. *P. lomakinii*, 22. *P. conferta*.

- P. absinthifolia* [GMEL.] DOUGLAS ex LEHM. in HOOK. Fl. Bor.-Amer. 1 : 188. 1832 pro syn. Specim. orig. BM!, K!
- P. effusa* γ [var.] *gossypina* NUTT. ex TORREY et GRAY, Fl. N. Amer. 1 : 437. 1840 p.p. — *P. gossypina* NUTT. ex HOOK. London J. Bot. 6 : 219. 1847 p.p., i.e. specim. orig. in BM!, K!, PR!, non specim. orig. in BM!, quod est *P. effusa* DOUGLAS.
- P. pennsylvanica* var. *conferta* A. GRAY, Mem. Amer. Acad. Arts ser. 2. 1 (1) : 42. (= Pl. Fendler. 42) 1849 — non (BUNGE) LEDEB. 1843. — *P. pennsylvanica* ε [var.] *arachnoidea* [DOUGLAS] LEHM. Nov. Stirp. Pug. 9 : 41. 1851 [postea LEHM. Revis. Potentill. 59. 1856 cum descr. auct. propria]. — *P. arachnoidea* DOUGLAS ex LEHM. Nov. Stirp. Pug. 9 : 41. 1851 pro syn. — *P. arachnoidea* DOUGLAS ex RYDB. N. Amer. Fl. 22 : 350. 1908 [cum descr.]. Typus PR! (iso) — planta Fendleriana [planta Douglasiana in K!].
- P. rubricaulis* DOUGLAS ex LEHM. Revis. Potentill. 58. 1856 pro syn. — non LEHM. 1830. Specim. orig. K!
- P. brevicaulis* NUTT. in sched. Specim. orig. BM!
- P. sanguisorbifolia* F. O. WOLF ex ZIMM. 14-Jahresber. St.-Ober-Realschule Steyr 7. 1884. — *P. pennsylvanica* var. *sanguisorbifolia* F. O. WOLF ex T. WOLF Biblioth. Bot. 71 : 186. 1908. — *P. pennsylvanica* f. *sanguisorbifolia* (ZIMM.) BECK in RECHB. Icon. Fl. Germ. Helv. 25 : 50. 1912. Typus ignotus.
- P. sibirica* WOLF, Biblioth. Bot. 71 : 188. 1908. — *P. sibirica* var. *genuina* WOLF, l.c. 189. 1908. Typi DR! (lecto), LE!
- P. sibirica* var. *elata* WOLF, Biblioth. Bot. 71 : 190. 1908. Typi DR! (lecto), LE!
- P. sibirica* var. *longipila* WOLF, Biblioth. Bot. 71 : 191. 1908. Typi DR! (lecto), LE!
- P. atrovirens* RYDB. Mem. Dep. Bot. Columbia Univ. 2 : 95. 1898. — *P. pennsylvanica* var. *atrovirens* WOLF, Biblioth. Bot. 71 : 187. 1908. Typus NY! (holo).
- P. pennsylvanica* var. *arida* BOIVIN, Phytologia 4 : 91. 1952. Typus DAO! (holo).

All the synonyms mentioned above refer to *P.p.* var. *pennsylvanica*, except *P.p.* var. *sanguisorbifolia* (which seems to represent a separate variety) and *P.p.* var. *conferta*. The position of the latter is uncertain because FENDLER's plant (PR) has no basal leaves and hairs on petioles of stem leaves are transitional between *P.p.* var. *pennsylvanica* and *P.p.* var. *brevipila*.

The name *P. missourica* LINDL. Bot. Reg. 17 : 1412. 1831 (*P. pennsylvanica* [var.] *missurica* (LINDL.) LEHM. Nov. Stirp. Pug. 9 : 41. 1851), so far considered to be a synonym of *P. pennsylvanica*, belongs, according to the type (K!), which corresponds to the original illustration, to the synonyms of *P. normalis* BESSER ex SPRENG. Syst. Veg. ed. 16. 4(2) : 199. 1827, holotypus PR! (= *P. bipinnatifida* DOUGLAS ex LEHM. in HOOK. Fl. Bor.-Amer. 1 : 188. 1832; cf. SOJÁK Folia Geobot. Phytotax. 4 : 207. 1969).

The name *P. virgulata* A. NELS. Bull. Torrey Bot. Club 27 : 265. 1900 (isotype K!), sometimes referred to the synonyms of *P. pennsylvanica*, is in reality a synonym of *P. litoralis* RYDB. Bull. Torrey Bot. Club 23 : 264. 1896 (= *P. pectinata* RAF. Autik. Bot. 164. 1840 nom. illeg., quoad descr., excl. syn.).

Potentilla nudicaulis WILLD. ex SCHLECHTEND.

Ges. Naturf. Freunde Berlin Mag. 7 : 287. 1816. — *P. pennsylvanica* γ [var.] *nudicaulis* (WILLD.) LEHM. Nov. Stirp. Pug. 9 : 41. 1851. Typus PR! (holo).

P. pennsylvanica β [var.] *strigosa* (PALL.) PURSH Fl. Amer. Sept. 1 : 356. 1814. — *P. strigosa* PALL. ex PURSH Fl. Amer. Sept. 1 : 356. 1814 pro syn. — *P. strigosa* PALL. ex TRATT. Rosac. Mon. 4 : 31. 1824 [postea item PALL. ex LEDEB. Fl. Altaic. 2 : 237. 1830]. Typus BM! (holo).

Potentilla agrimonioides M. BIEB.

Fl. Taur.-Caucas. 1 : 403. 1808. — *P. multifida* γ [var.] *agrimonioides* (M.-BIEB.) SER. in DC. Prodr. 2 : 581. 1825. — *P. pennsylvanica* η [var.] *agrimonioides* (M.-BIEB.) LEHM. Nov. Stirp. Pug. 9 : 41. 1851. — *P. sericea* β [var.] *agrimonioides* (M.-BIEB.) BOISS. Fl. Orient. 2 : 709. 1872. — *P. hispanica* var. *agrimonioides* (M.-BIEB.) WOLF, Biblioth. Bot. 71 : 193. 1908. Typi DR!, H!, LE! (lecto), PR!

? *P. Biebersteiniana* TRATT. Rosac. Mon. 4 : 24. 1824. Typus ignotus.

P. cinerascens BERTOL. Mem. Accad. Sci. Inst. Boulogna ser. 2. 3 : 421. 1863. Typus K! (holo).

P. sericea var. *genuina* f. *alpina* WOLF, Biblioth. Bot. 71 : 162. 1908. Typus LE! (lecto).

P. malacotricha JUZ. Fl. URSS 10 : 610. 1941. Typus LE! (holo).

P. Stanjukoviczii OVCH. et KOCH. Fl. Tadžik. SSR 4 : 539. 1975. Typus LE! (holo).

P. sibirica × *P. soongorica* WOLF, Biblioth. Bot. 71 : 163 et 192. 1908 et *P. sericea* × *P. sibirica* WOLF, l.c. 191. 1908. Specim. orig. DR!, LE!

Potentilla hispanica ZIMM.

14-Jahresber. St.-Ober-Realschule Steyr (=Eur. Art. Pot.) 7. 1884. — *P. pennsylvanica* subsp. *hispanica* (ZIMM.) MAIRE in JAHAND. et MAIRE, Cat. Pl. Maroc 2 : 338. 1932 quoad nomen. Typus IBF †.

Potentilla oreodoxa SOJÁK

Sborn. Nár. Mus. v Praze, Řada B, 20 : 285. 1964. — *P. hispanica* subsp. *oreodoxa* (SOJÁK) SOJÁK Folia Geobot. Phytotax. 4 : 207. 1969. Typus PR! (holo).

Potentilla ibrahimiana MAIRE

in JAHAND. et MAIRE, Cat. Pl. Maroc 2 : 338. 1932 pro hybr. *P. hispanica* × *P. recta*, descr. in WOLF, Biblioth. Bot. 71 : 352. 1908. emend. SOJÁK. Typus DR! (lecto).
P. hispanica var. *sericea*, f. *viridis* et var. *longepilosa* H. LINDB. Itin. Medit. 74. 1932. Typi B! (f. *viridis*, var. *longepilosa* — holo), H! (f. *sericea*, holo).
P. hispanica var. *nivea* ANDREÁNSZKY, Index Horti Bot. Univ. Budapest. 3 : 38. 1938. Typus BPU!

Potentilla dentata FORSSK.

Fl. Aegypt.-Arab. 98. 1775. Typus C (photo!, holo).

Potentilla conferta BUNGE

in LEDEB. Fl. Altaic. 2 : 240. 1830. — *P. pennsylvanica* β (var.) *conferta* (BUNGE) LEDEB. Fl. Ross. 2 : 40. 1843. Typi LE! (lecto), PR!
P. sibirica var. *longipila* WOLF, Biblioth. Bot. 71 : 191. 1908 p.p. max., excl. lectotypo. Specim. orig. DR!, LE!
P. Martjanowii POLOZH. Zametki Faune Fl. Sib. 15 : 62. 1949.[descr. in LEDEB. Fl. Altaic. 2 : 239 ut *P. agrimonioides* M.-BIEB.], Typi LE (n.v., holo), PR! (in herb. Lehm. 2 clepto).
P. multifida × *P. sericea* (?) WOLF, Biblioth. Bot. 71 : 162. 1908 p.p. et *P. chinensis* × *P. sibirica* WOLF, l.c. 192 et *P. sibirica* × *P. tanacetifolia* WOLF, l.c. 316 p.p. Specim. orig. DR!, LE!

Potentilla chalthorum SOJÁK

Folia Geobot. Phytotax. 5 : 104. 1970. Typus PR! (holo).
P. super-chinensis × *P. multifida* WOLF, Biblioth. Bot. 71 : 182. 1908 et *P. sibirica* × *P. tanacetifolia* WOLF, l.c. 316 p.p. Specim. orig. DR!

Potentilla lomakinii GROSSH.

Žurn. Russk. Bot. Obšč. Akad. Nauk SSSR 14 : 308. 1930. Typi LE!, MW!, TBI! (lecto).

APPENDICES

Varieties of *P. pennsylvanica* group

P. pennsylvanica L.
var. *pennsylvanica*

Petioles pilis brevissimis et 1–2 mm longis vestiti.

var. *brevipila* SOJÁK var. nova

Petioles pilis brevissimis et 0.6–1 mm longis vestiti.

Typus: Canada, Yukon Territory, Sunnydale about 3 miles S of West Dawson, 1949, CALDER and BILLARD 3395, PR.

P. agrimonioides M.-BIEB.
var. *agrimonioides*

P.a. var. *strigosellae* proxima, a qua petiolorum pilis nonnullis longioribus (ad 2.5–3 mm), foliis latioribus, profundius dissectis et segmentis approximatis differt. Transitum inter var. *strigosellae* et var. *intercedentem* format.

var. *strigosella* SOJÁK, var. nova

Foliola plerumque solum ad $1/2-2/3$ ($-3/4$) divisa, supra pilis densis subappressis brevissime et longiuscule pilosa, subtus $\pm$ cana, ad nervos pilis longis rectis, inter nervos pilis brevibus curvatis vel rectiusculis et glandulis obiecta; pili petiolorum semper ad $(1-)$ $1.5-2$ (-2.5) mm longi.

Planta vestitu petiolorum brevi a varietatibus ceteris *P. agrimonioidis* facile dignoscitur. Notis omnibus *P. pensylvanicae* convenit, a qua tantum petalis magnis (calycem longe superantibus) bene discrepat.

Typus: Caucasus, in rupestribus herb. ad fontes fl. Kuban, 1900, DESULAVI 2160, PR.

var. *intercedens* SOJÁK, var. nova

Foliola segmentis plerumque profundis instructa, supra pilis longis et item brevibus dense vel rarius modice induta, subtus ad paginam pilis brevibus curvatis vel rectiusculis aut visibilibus aut pilis longis densis $\pm$ appressis obiectis vestita; petiolorum (saltem nonnullorum) pili $2.5-3$ (-4 , raro ad 5) mm longi; flores magni.

Planta caudice eramoso vel parum ramoso, caule mediocri; variabilis, habitu aut inter parentes media aut *P. sericeae* propior (rarissime *P. pensylvanicae* similis, tum pilis petiolorum ± 3 mm longis significatur).

Typus: Kirgisia, Tian-Sehan, mt. Kirgizskij Chr.: in valle riv. Alaarča ad merid. versus ab opp. Frunze, 1981, SOJÁK s.n., PR.

var. *micans* SOJÁK, var. nova

Foliola utrinque argenteo-cano-albida, leviter nitida, supra pilis rectis densissimis subappressis modice longis crasse tomentosa, subtus similiter vestita (i.e. pili recti $\pm$ appressi densissimi relative breves praevaletentes); segmenta foliolorum mediorum et inferiorum saepe a sese remota, semper longa; pili petiolorum $(1-)$ $1.5-3$ mm longi, horizontales vel arrecte oblique subpatentes; sepala indistincte glandulosa (i.e. glandulae minutae, hyalinae, dispersae); carpella glandulosa.

Planta foliolis utrinque argenteo-micantibus (tomento falso denso tectis) conspicua, habitu *P. sericeae* similis, a qua segmentis foliolorum remotis longioribus minus numerosis subtus brevius tenuius pilosis et carpellis glandulosis inter alia differt.

Typus: Altai, 1835, LEDEBOUR s.n., PR.

var. *malacotricha* (JUZ.) SOJÁK, stat. novus

bas.: *P. malacotricha* JUZEPCZUK, Flora URSS 10 : 610. 1941.

Foliola supra pilis longis (plerumque item brevibus immixtis) densis subpatentibus rectis vel flexuosis induta, subtus cana vel cano-albida, opaca, pilis longis et saepe item brevibus, omnibus rectis vel flexuosis patentibus vel subpatentibus (margines apicesque segmentorum longe superantibus) dense obiecta; pili petiolorum $(1-)$ $1.5-3$ (-3.5) mm longi.

Plantae parvae, omnino dense, patenter, molliter villosae, caudice ramosissimo notabiles (notis aliis *P.a.* var. *intercedenti* conveniunt).

var. *capitata* SOJÁK, var. nova

Foliola forma et vestitu *P.a.* var. *malacotrichae* similia (i.e. supra pilis longis $\pm$ patentibus rectis vel flexuosis dense tecta, subtus cana vel cano-albida, pilis longis $\pm$ densis patentibus rectis vel flexuosis dominantibus vestita); pili petiolorum $(1-)$ $2-3$ mm longi; inflorescentia contracta; flores omnes insigniter parvi, ca. $0.6-0.8$ cm in diam.; sepala $2.5-4$ mm et episepala $1.5-3$ mm longa; petala $3-4$ mm longa, sepala parum superantia vel subaequilonga, extus densissime glandulosa; styli $0.7-0.8$ mm longi; nuculae glandulosae, parvae ($1.2-1.5$ mm).

Planta floribus parvis congestis et petalis $3-4$ mm longis insignis, notis aliis plus minusve cum *P.a.* var. *malacotricha* congruit.

Typus: Pamir, preveal Tagarkaty, 4200 m, 1962, LUKANENKOVA 182, LE.

var. *kobdoensis* SOJÁK, var. nova

Caules numerosi, decumbentes, supra ascendentes, a medio ramosi, usque 25-flori; foliola segmentis utrinque $3-4$ remotis profundis apice rotundatis, supra canescentia, opaca, pilis medioeriter densis longis et brevibus tecta, subtus cana, ad nervos pilis longis numerosis, ad paginam pilis brevibus curvatis vel flexuosis densiuscule tecta; pili petiolorum $\pm$ horizontales, $2-3.5$ mm longi; sepala parva, post anthesin $3-4.5 \times 2-3$ mm magna.

Typus: Mongolia bor., circa lacus Ubsa et Kirgiz-nor: kotlovina oz. Cholbo-nor, 1879, POTANIN s.n., LE.

P. conferta BUNGE

var. *conferta*

Petioli foliorum internorum pilis ± 3 (interdum usque 4) mm longis vestiti; inflorescentia plerumque conferta; sepala plerumque glandulis splendide citrinis obsita; carpella ad apicem glandulosa (rarissime eglandulosa).

var. *laxiuscula* SOJÁK, var. nova

Petioli foliorum internorum pilis 2 (–2.5) mm longis vestiti; inflorescentia laxiuscula vel laxa; sepala plerumque glandulis sordidis vel dilute aurantiaco-brunneolis obsita; carpella eglandulosa (rarius ad apicem glandulis minimis sparsis provisa).

Typus: Semipalatinsk. obl., Pišpekskij u., r. Vostočnyj Karakol, 1916, SOVETKINA et ČAUSOVA 2243, LE.

Emendation of *P. ibrahimiana*

P. ibrahimiana MAIRE in JAHANDIEZ et MAIRE, Cat. Pl. Maroc 2 : 338. 1932 (pro hybr.) emend. SOJÁK hoc loco. Foliola subtus aut tomentosa aut etomentosa, alba, cana vel viridia, folia radicalia saepe 3–5-juga. Species in montibus Atlante distributa, praeter specimen unicum, quod WOLF sicut MAIRE ut *P. recta* $\times$ *P. hispanica* designaverunt, item specimina omnia alia includit, quae MAIRE (eodem loco ubi *P. ibrahimiana* denominata est) pro *P. hispanica* aestimat.

Key to *P. pensylvanica* group in the Old World

1. Basal leaves with 2–3 approximate (1–3 mm) pairs of leaflets — 2
— Basal leaves with 3–5 remote pairs of leaflets — 3
2. Anthers 0.5–0.9 mm long — *P. lomakinii*
— Anthers 1.1–1.9 mm long — *P. ibrahimiana*
3. Petals as long or slightly longer than sepals — 4
— Petals much longer than sepals — 8
4. Glands on sepals large, numerous; leaflets with subsessile glands under the tomentum beneath; pedicels usually thicker — 5
— Glands on sepals absent or small and few; leaflets eglandulose under the tomentum beneath; pedicels thin — *P. chalthorum*
5. Hairs on petioles short (0.6–2 mm) — 6
— At least inner leaves with long (2–3 mm) hairs on petioles — *P. conferta*
6. All glands subsessile, light lemon yellow; infrutescence lax; carpels glandular; styles thin, 0.8–1 (–1.1) mm long — 7
— At least some glands on stems, pedicels and petioles distinctly stipitate, light orange yellow or brownish; inflorescence and infrutescence conspicuously contracted; carpels eglandular; styles thick, 1–1.3 mm long — *P. dentata*
7. Leaflets $\pm$ grey-white beneath, with $\pm$ dense hairs (the surface of the leaflets hardly visible), forming false tomentum; calyces densely hairy — *P. pensylvanica*
— Leaflets grey-green (sometimes green) beneath, with $\pm$ thin hairs (the surface of the leaflets well visible); calyces $\pm$ sparsely hairy — *P. nudicaulis*
8. Basal leaves (10–) 20–30 cm long; at least some long hairs on petioles appressed — *P. lomakinii*
— Basal leaves shorter; long hairs on petioles usually patent — 9
9. Carpels eglandular; petals 7–10 (–15) mm long; leaflets to 2/5–1/2 divided — 10
— Carpels usually glandular; petals $\pm$ 5–7 mm long; leaflets to 1/2 or more divided — *P. agrimonioides*
10. Glands on sepals small — 11
— Glands on sepals large — *P. oreodoxa*
11. Teeth of leaflets remote, as long as wide; leaflets of the uppermost pair widely decurrent to the next pair; glands on sepals numerous; leaflets grey beneath — *P. hispanica*
— Teeth of leaflets approximate, $\pm$ longer than wide; leaflets of the uppermost pair non-decurrent or shortly decurrent; glands on sepals few (then leaflets whitish-grey beneath) or numerous (then leaflets greenish beneath) — *P. ibrahimiana*

Key to varieties of *P. agrimonioides*

1. Flowers 0.6–0.8 cm in diameter; petals $\pm$ 3–4 mm long, only slightly longer than sepals or almost as long — *P. a.* var. *capitata*

- Flowers much larger; petals $\pm$ 5–7 mm long, much longer than calyx — 2
- 2. Caudex much branched; leaflets on both sides covered with long, patent, straight or flexuose hairs conspicuously exceeding margins and tips of segments; stems low — *P. a. var. malacotricha*
- Caudex usually not much branched; long hairs straight, not conspicuously exceeding margins and tips of segments; stems taller (always distinctly longer than basal leaves) — 3
- 3. Leaflets on both sides sericeous, grey- or silvery-tomentose, with dense, straight, subappressed, rather short hairs, their segments long; sepals $\pm$ indistinctly glandular — *P. a. var. micans*
- Leaflets on both sides not sericeous and silvery-tomentose; calyx distinctly glandular — 4
- 4. Hairs on all petioles (1–) 1.5–2 (rarely up to 2.5) mm long; leaflets with segments extending to 1/2–2/3 (–3/4) — *P. a. var. strigosella*
- Hairs on some petioles 2.5–3 (–4) mm long; leaflets deeply pinnatisect — 5
- 5. Some hairs on petioles 1.5–2.5 mm long, others 2.5–3 mm long; leaflets wide, with long, deep, $\pm$ contiguous segments — *P. a. var. agrimonioides*
- At least some petioles with $\pm$ all hairs 2.5–3 (–4) mm long (in addition to very short trichomes) — 6
- 6. Sepals in fruit 3–4 (–4.5) mm long; stems numerous, at least in lower half decumbent, $\pm$ in the upper half branched, up to 25-flowered — *P. a. var. kobdoensis*
- Sepals in fruit usually longer; stems $\pm$ ascending; inflorescence 3–12-flowered — *P. a. var. intercedens*

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SOUHRN

Stat přináší hlavní výsledky revize skupiny *Potentilla pensylvanica* ve Starém světě. Obsahuje řešení sporných problémů a četná nová zjištění.

P. pensylvanica, totožná s eurosibiřskou *P. sibirica* (*P. strigosa* auct.), roste v území od záp. Mandžuska až po Baškirskou ASSR, dále v Karélii, jz. Alpách a ve Španělsku. Na již. Sibíři se tento druh často kříží s *P. sanguisorba* a *P. sericea*. Z obou hybridních kombinací se vyvinuly významné druhy: *P. nudicaulis* (od Ťan-Šanu po Čukotku) a *P. agrimonioides* (od Kavkazu po Himálaj a okolí Bajkalu). *P. agrimonioides* pronikla kdysi paralelně s *P. pensylvanica* do Španělska a je předkem *P. hispanica* a *P. oreodoxa* (endemiti Španělska) i *P. ibrahimiana* (endemit Atlasu). *P. dentata* roste v Jemenu, Etiopii a Keni (druh je v této statí vzkříšen po více než 200 letech zapomenutí) a nemá vztahy k rostlinám z Atlasu, nýbrž k sibiřským populacím *P. pensylvanica*. *P. lomakinii* (od Araratu po Elburz v Íránu) je odvozena od *P. agrimonioides* $\times$ *P. argentea*. Zbývající druhy skupiny, *P. conferta* a *P. chalthorum*, mají centrum vývoje na již. Sibíři a v Mongolsku.

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V době mých univerzitních studií nám byla doporučována monografie K. Tubeufa (1923) jako souborný pramen informací o jmelí. Od té doby však vyšla řada prací pojednávajících o této rostlině, a to z nejrůznějších hledisek. Autoři recenzované knihy si proto vytkli za cíl shrnout roztroušené poznatky výzkumů z jednotlivých oborů — od botaniky, přes chemii a farmakologii až k medicíně (včetně experimentálních, diagnostických a léčebných výsledků) — do jediného svazku. Ale nebyl to pro ně cíl snadný. První autor je vedoucím imunologického oddělení Výzkumného ústavu pro nemoci plicní a tuberkulózu v Berlíně (Berlin-Buch); zabývá se lektiny a jejich užitím, dále problémy infekční imunologie a konečně otázkami biochemicko-farmakologickými a alergologickými. Druhý autor je profesorem farmaceutické biologie na Univerzitě v Heidelbergu a pracuje především v oboru metabolismu sekundárních produktů u rostlin, dále v oboru rostlinných buněčných kultur a konečně analytiku přírodních látek. Proto nepřekvapuje, že se na titulní straně knihy setkáváme vedle jmen uvedených autorů se jmény pěti jejich specializovaných spolupracovníků: Rita Leroi, George Sallé, Rainer Samtleben, Helga Schmollgen, Eisenwerth a Ingrid Schrt.