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Annotated Chromosome Numbers of Selected Asiatic *Potentilla* Species

KEYWORDS

Karyology, Taxonomy

ABSTRACT

Chromosome numbers are reported for 19 collections representing 16 Asiatic *Potentilla* taxa. The first chromosome records are reported for *P. desertorum* BUNGE var. *amavatusensis* WOLF ($2n = 28$), *P. festiva* SOJÁK ($2n = 28$), *P. griffithii* HOOK f. subsp. *beauvaisii* (CARDOT) SOJÁK ($2n = 42$), *P. micropetala* D. DON subsp. *byssisecta* (SOJÁK) MĚSÍČEK et SOJÁK ($2n = 14$), *P. mollissima* LEHM. ($2n = 28$), *P. moorcroftii* WALL. ex LEHM. ($2n = 42$), *P. multicaulis* BUNGE ($2n = 14$), *P. [x] omissa* SOJÁK ($2n = 35, 56, 70$) and *P. stanjukoviczii* OVCZ. ex KOČEK. ($2n = 14$). Counts differing from those previously recorded are given for *P. ulgida* SOJÁK ($2n = 56$) and *P. flagellaris* WILLD. ex SCHLECHT. ($2n = 42$). Chromosome numbers of the following species were confirmed: *P. [x] agrimonoides* BIEB. ($2n = 42$), *P. chinensis* STEIN in DC. ($2n = 14$), *P. fragarioides* L. ($2n = 14$), *P. lineata* TREV. ($2n = 14$) and *P. sericea* L. ($2n = 28$). Taxonomy is briefly discussed. A new combination *P. micropetala* D. DON subsp. *byssisecta* (SOJÁK) MĚSÍČEK et SOJÁK stat. nov. is proposed.

INTRODUCTION

The sampling of chromosome numbers in such genera as *Potentilla*, in which an apomictic mode of reproduction is often prominent and species or their complexes share a high ability to cross mutually, is undoubtedly less important than in groups comprising karyologically discrete units. Nevertheless there seem to be two types of species in *Potentilla*. The first are uniform in their ploidy level throughout their distribution area. The others form complexes

in which almost each population or even each individual has a different chromosome number. With regard to the first group the sampling concerned appears to be of some value.

The chromosome observations were made on mitosis in root tips of young seedlings or in top meristems of mature plants. Smear slides were prepared from material treated by p-dichloro-benzene, fixed in the standard AAA solution and stained with lacto-propionic-orceine.

Complete sets of voucher specimens have been deposited in the herbarium of the National Museum in Prague (PR).

RESULTS

This report presents chromosome numbers for 19 populations representing 16 Asiatic taxa of *Potentilla*. The results are listed in Tab. 1.

Table 1. Chromosome numbers of the taxa examined and localities of voucher specimens. H. & H. = J. HALDA and J. HALDOVÁ, S. = J. SOJÁK (collectors).

Taxon	2n	Locality	Voucher
<i>P. [x] agrimonoides</i> BUB.	42	Tadzhikistan, Pamir: ad fontes rivi Aličur, ad pagum Ak-zoo; ca 5000 m; 37°35', 73°30'.	H. & H. s.n., 15/8, 1992
<i>P. algida</i> SOJÁK	56	Tadzhikistan, Pamir: in pratis prope pagum Aličur; ca 1400 m; 37°49', 73°25'.	H. & H. s.n., 9/8, 1991
	56	ibidem	H. & H. s.n., 18/8, 1992
<i>P. chinensis</i> SER. in DC.	14	China, Yunnan: distr. Likiang, ad pagum Daju; in pratis; 1500 m; 27°18', 100°15'.	S. s.n., 20/7, 1990
<i>P. desertorum</i> RÜNGE var. <i>arnevaticensis</i> WOLF	28	Tadzhikistan, Pamir: ad margines merid. glaciei "Fedčenko" supra pagum Jazgulem; ca 4000 m; 38°30', 72°15'.	H. & H. s.n., 20/7, 1991
	28	Tadzhikistan, Pamir: in pratis prope pagum Matravn; 2000 m; 38°12', 71°35'.	H. & H. s.n., 14/8, 1992
<i>P. festiva</i> SOJÁK	28	China, Yunnan: ad pedem orient. mt. Yulongshan prope pag. Baishui (distr. Likiang); in pratis; 3150 m; 27°05', 100°15'.	S. s. n., 22/7, 1990

Taxon	2n	Locality	Voucher
<i>P. flagellaris</i> WILLD. ex SCHLEGHT.	42	Mongolia bor.: declivia montis Bogd-ól prope opp. Ulan-Bator; in pratis; 1800 m; 47°51', 106°57'.	S. s.n., 16/8, 1990
<i>P. fragarioides</i> L.	14	Mongolia bor.: in pratis prope flumen Selenga prope opp. Suche-Bator; ca 500 m; 50°16', 106°08'.	S. s.n., 16/8, 1990
<i>P. griffithii</i> HOOK. f. subsp. <i>dearsvissii</i> (CARDOT) SOJÁK	42	China, Yunnan: ad marginem bor.-orient. oppidi Likiang; in pineto; 2600 m; 26°54', 100°15'.	S. s.n., 20/7, 1990
<i>P. lineata</i> TREV.	14	China, Yunnan: ad pedem orient. mt. Yulongshan prope pag. Baishui (distr. Likiang); in pratis; 3150 m; 27°05', 100°15'.	S. s.n., 22/7, 1990
	14	Nepal; Langtang	G. et S. MIBHE s.n., 1986
<i>P. micropetala</i> D. DON subsp. <i>byssitecta</i> (SOJÁK) MĚSÍČEK et SOJÁK	14	China, Yunnan: ad pedem orient. mt. Yulongshan prope pag. Baishui (distr. Likiang); in pratis; 3100 m; 27°05', 100°15'.	S. s.n., 25/7, 1990
<i>P. mollissima</i> LEHM.	28	Tadzhikistan, Mt. Gissarskij chr.: inter pagos Varzob et Kabuty; locis graminosis; 1200 m; 38°50', 68°50'.	H. & H. s.n., 28/8, 1992
<i>P. macrostylis</i> WALL. ex LEHM.	42	Tadzhikistan, Pamir: ad fontes riv. Aličur; in prato alpino; ca 5000 m; 37°35', 73°30'.	H. & H. s.n., 15/8, 1991
<i>P. multicaulis</i> BUNGE	14	China bor.: in pavimento plateae in centro opp. Peking; 39°55', 116°25'.	S. s.n., 14/8, 1990
<i>P. [x] omissa</i> SOJÁK	35, 56, 70	Sibiria merid.: locis graminosis in oppido Irkutsk; ca 500 m; 52°18', 104°15'.	S. s.n., 18/8, 1990
<i>P. sericea</i> L.	28	Mongolia bor.: declivia saxosa mont. Bogd-ól ad merid. versus ab opp. Ulan-Bator; 1800 m; 47°51', 106°57'.	S. s.n., 16/8, 1990
<i>P. stamjankoviczii</i> OVČZ. et KOČEK	14	Tadzhikistan, Pamir: in valle riv. Aličur; in pratis alpinis; ca 4000 m; 37°35', 73°30'.	H. & H. s.n., 18/8, 1992

DISCUSSION

P. [x] *agrimonioides* BIEB.

2n = 42

(= *P. pensylvanica* L. x *P. sericea* L.)

The chromosome number reported here provides a confirmation of our previous records found in plants from Mongolia (MĚSIČEK and SOJÁK 1992).

P. algida SOJÁK

2n = 56

Synl.: *P. sericata* WOLF non GREENE

In our opinion, *P. algida* is a rather primitive species of hybrid origin derived from the crossing of *P. asiatica* (WOLF) JUZ. (= sect. *Chrysanthae*) and *P. hololeuca* BOISS. ex LEHM. (= sect. *Pensylvanicae*). The former putative parent has yet been found to comprise two cytotypes: a hexaploid with 2n = 42 (CHEVTAJEVA 1976, Tadzhikistan) and a decaploid with 2n = 70 (GUINÓCHET and LEFRANC 1981, Tadzhikistan). The latter species is hexaploid with 2n = 42 (MĚSIČEK and SOJÁK unpubl.).

P. algida occurs rather frequently in the Central Tian-Shan, the Pamir-Alay region and the northeastern part of Afghanistan (Vakhan). In its general appearance it most resembles some members of the section *Lipskyanae* CHEVT. (especially *P. darvazica* JUZ. ex BOTSCH., 2n = 14, CHEVTAJEVA l.c.), but differs from them most distinctly by its thickened stigmas which are much broader than the apical parts of the styles.

Two other species are of a similar habit: *P. holopetala* TURCZ. emend. SOJÁK and *P. turguica* SOJÁK (*P. eremica* WOLF non COLVILLE). *P. holopetala* is derived by hybridization of *P. argentea* L. with *P. chrysantha* TREV.; it is distributed in South Siberia and the former Soviet Middle Asia. *P. turguica* occurring throughout the South Ural region seems to be a derivative from the crossing of *P. longipes* LEDEB. and *P. argentea* L. Both the species, however, are easily distinguished from *P. algida* by their rich inflorescences, smaller sepals and petals and narrow epicalyx-segments.

The octoploid number of 2n = 56 found in our two samples of *P. algida* is not in accordance with the only previous record for the species. CHEVTAJEVA (l.c.) reported the hexaploid count of 2n = 42 for her plants collected in Tadzhikistan.

P. chinensis SER. in DC.

2n = 14

This strikingly isolated species has no near relative within the section *Pensylvanicae*. It seems to be remotely related to the Japanese *P. nipponica* WOLF (2n = 28, SHIMOTOMAI 1929, MĚSIČEK and SOJÁK 1966). Its relationships to those South Siberian representatives, which resemble *P. chinensis* in their general appearance, remain obscure. The species is distributed almost throughout China (from the live Gansu-Yunnan eastwards to the Pacific and as far North as to the Amur R.), extending to the adjacent areas of eastern Mongolia and the Russian Far East, but is also found in Taiwan and Korea. *P. chinensis* is very variable but its variation is taxonomically insignificant because it is very much influenced by different environmental factors.

The chromosome number reported here provides a confirmation of two previous records (SHIMOTOMAI 1929, MĚSÍČEK and SOJÁK 1966). The diploid chromosome number has been found in no other species of the section *Pensylvanicae* as yet in the Altayan-Mongolian area which appears to be its centre of origin.

P. desertorum BUNGE var. *arnavatensis* WOLF
Syn.: *P. arnavatensis* (WOLF) JUZ.

2n = 28

P. desertorum is a distinctive and isolated species (sect. *Rivales*) which appears to cause little taxonomic difficulty. It is morphologically entirely uniform in the northern part of its range (South Siberia, Mongolia). In contrast there is more variation within its populations distributed in Tadzhikistan and Kashmir. The low and sparsely glandulose forms with smaller and more densely pilose leaves are dominant in this area. WOLF (1908) described them as *P. d.* var. *arnavatensis*. JUZEPCZUK and other Russian botanists tend to treat them as a distinct species *P. arnavatensis*. However, our field observations as well as transplantation experiments suggested that the different characters of those alpine population are very much influenced by environmental factors. In addition there occur continuously numerous intermediates between the alpine populations and the plants from lower habitats. The two taxa do not differ in their chromosome number. For that reason we follow WOLF's conception.

The same number of 2n = 28 was earlier reported by MĚSÍČEK and SOJÁK (1969) for *P. d.* var. *typica* from Mongolia and by GUINOCHE and LEFRANC (1981) for plants from Tadzhikistan: Shakhristan (= var. *arnavatensis*?).

P. festiva SOJÁK

2n = 28

The range of this recently described species extends from Nepal to Yunnan. Even though *P. festiva* is undoubtedly a close relative of *P. lineata* TREV. ex REICHENB. (2n = 14), the two are morphologically as well as karyologically distinct. With respect to some of its characters *P. festiva* may be regarded as a primitive derivative of hybridization between *P. lineata* and *P. leuconota* D. DON.

No chromosome number has yet been reported for the species.

P. flagellaris WILLD. ex SCHLECHT.

2n = 42

The northern limit of the distribution area of *P. flagellaris* extends from southwestern Siberia (ca 80° E) to Yacutia and Vladivostok; the southern boundary ranges from Gansu to Shandong. *P. flagellaris* is closely related to *P. reptans* L. (2n = 28, 42) and to the Chinese *P. hemsleyana* WOLF. Whereas the ranges of *P. flagellaris* and *P. reptans* are not in contact, those of *P. flagellaris* and *P. hemsleyana* overlap in northern China but both species are here easily to be distinguished.

Our count of 2n = 42 is not in accordance with the only previous record for the species. SOKOLOVSKAJA, PROBATOVA and RUDYKA (1985) reported the diploid number of 2n = 14 for plants collected in Primorye (Vladivostok).

P. fragarioides L.

2n = 14

This Asiatic species is morphologically uniform throughout Siberia. Only the populations from the Far East (Ussuri R., Korea, Japan) show more variation especially in their hairiness. We consider the taxon with two leaflet pairs to be a related distinct species *P. togasii* OHWI.

The section *Fragarioides* contains ca 7 species; its variation is centered in the Far East. The section has an isolated position within the genus. It seems to be more closely related to the section *Potentilla* but it is yet not clear which of them may be considered as more primitive.

The same number of 2n = 14 has been previously reported by SHIMOTOMAI (1929), KROGULFVIĆ (1978) and PROBATOVA and SOKOLOVSKAJA (1981) for plants from the Sayan Mts. and the Far East. MALIK's (1965) record of 2n = 56 seems to be doubtful.

P. griffithii HOOK. f. subsp. *beauvaisii* (CARDOT) SOJÁK

2n = 42

The Sino-Himalayan *P. griffithii* shows an extremely wide range of variation especially in Yunnan. The plants used for the present study represent a homogeneous population with two pairs of leaflets tomentose beneath and belong to subsp. *beauvaisii* (CARDOT) SOJÁK. As their leaflets are sparsely hairy on the upper surface they resemble var. *reticulata* (FRANCHET) SOJÁK but their veinlets beneath are whitish (concolor).

P. griffithii, *P. leschenaultiana* SER. in DC. (an endemic of the South-Indian mountains), and the Sino-Himalayan species *P. concolor* ROLFE, *P. gerardiana* LINDL. s.l. and *P. spodioclora* SOJÁK constitute a peculiar group within the section *Pensylvanicae* which shares some very unusual characters (e.g. not dilated stigmas, morphologically not distinguished from the apical parts of the styles as well shallowly toothed leaflets). In this respect the aggregate *P. griffithii* shows some relationships to the aggregate *P. argyrophylla* WALL. ex LEHM.

No chromosome number has previously been reported for *P. griffithii*. SUBRAMANIAN (1987) found 2n = 28 in *P. leschenaultiana* SER.

P. lineata TREV.

2n = 14

SYE.: *P. fulgens* WALL. ex HOOK. f., *P. siemensiana* LEHM., *P. splendens* WALL. ex D. DON

The Sino-Himalayan *P. lineata* is a peculiarly distinct species, and one not readily confounded with any member of the genus. It belongs undoubtedly to the most primitive representatives of the section *Pentaphylloides* TAUSCH (*Anserina* GAUDIN). *P. lineata* appears to be almost invariable. Perhaps it may be considered as an ancestor of two other primitive species, *P. polyphylla* WALL. ex LEHM., and *P. pycnophylla* SOJÁK, and also of two derived species, *P. interrupta* YÜ et LI and *P. festiva* SOJÁK (2n = 28).

The chromosome number presented here is in accordance with IKEDA's (1989) record found in plants collected in the Himalayas and published under the name *P. fulgens* WALL. ex HOOK. f. POPOV (1935, 1939) reported the number of 2n = 28 for plants of garden origin which he identified with *P. splendens* LEHM. and 2n = 56 for garden collections determined by him to be *P. fulgens*. Finally, SHARMA (1970) reported the number of n = 14 under the name *P. fulgens*.

P. micropetala D. DON subsp. *byssitecta* (SOJÁK) MĚSÍČEK et SOJÁK,
comb. et stat. nov.

2n = 14

Bas.: *Sibbaldia byssitecta* SOJÁK Preslia 42: 184, 1970

Syn. of the species: *Sibbaldia potentilloides* CAMBESS., *S. albifolia* WALL.

P. micropetala is a very primitive and taxonomically isolated species with a character combination of the genera *Potentilla* and *Sibbaldia*. It has five stamens and lateral styles like *Sibbaldia*, but bears anthers with two thecas and pinnate leaves with crispate hairs like *Potentilla*. In our opinion the anther construction is to be regarded as a more important character than the number of stamens (which is variable in the tribe *Potentilleae*). For that reason we assigned *P. micropetala* to the genus *Potentilla*.

Two geographical races may be distinguished in *P. micropetala*. The subsp. *micropetala* has light yellow-green or yellowish petals and is distributed from Pakistan to Nepal. The subsp. *byssitecta* ranges from Nepal to Yunnan and Sichuan; its petals are deeply orange in vivo and purple in the herbarium. The taxonomic position of another related taxon which has been recently described under the name *Sibbaldia phanerophlebia* YÜ et LI remains somewhat obscure. It closely resembles the subsp. *micropetala* by the colour of its petals and the hairiness of its leaflets but it cannot be reliably identified with subsp. *micropetala* till the taxonomic importance of the hairiness of petioles (long, horizontal spreading hairs) of *Sibbaldia phanerophlebia* is confirmed.

There exists no species within the genera *Potentilla* and *Sibbaldia* which could be regarded as at least remotely related to *P. micropetala*.

No chromosome number has previously been reported for the species.

P. mollissima LEHM.

2n = 28

Syn.: *P. komaroviana* WOLF, *P. lipskyana* WOLF

P. mollissima has usually been assigned to the section *Persicae* (WOLF) JUZ.; that classification is based essentially on only one character - length of styles. With respect to its narrow stigmas and crispate hairs on the lower surface of its leaflets, we think it is better to include *P. mollissima* in the section *Lipskyanae* CHEVT. This section comprises 5 species distributed in Tadzhikistan and in the adjacent regions of Turkmenistan, Iran and Afghanistan. *P. mollissima* is very closely related to *P. darvazica* JUZ. ex BOTSCH. (2n = 14, CHEVTAJEVA 1976). The specific status of both the taxa is now well supported by differences in their ploidy level.

No chromosome information has previously been published for *P. mollissima*.

P. moorcroftii WALL. ex LEHM.

2n = 42

Syn.: *P. glauca* CAMBESS., *P. orientalis* JUZ.

The *P. bifurca* complex has generally been regarded as comprising one or at most two species in the past. In his reclassification of this group, JUZEPČUK (1941) recognized it to consist of five distinct species. The plants with adpressed hairiness on petioles and stems were divided by him into a steppe species *P. orientalis* JUZ. and a mountain taxon *P. moorcroftii* WALL. ex LEHM. The second of the present authors has had chance to observe the two in Kazakhstan and found without any doubt that the high steppe individuals with

oblong bifid leaflets are connected by a continuous series of intermediates with low mountain plants bearing ovate-elliptic leaflets with entire margins. For that reason we do not recognize *P. orientalis* as a distinct species. On the contrary, our field observations in Mongolia suggested that *P. moorcroftii* with adpressed hairiness cannot be identified with *P. bifurca* L. s. str. (spreading hairs). *P. moorcroftii* is the only representative of the *P. bifurca* complex in the area ranging from Turkey to Himachal Pradesh (cf. SOJÁK 1988).

The *P. bifurca* complex constitutes a homogeneous primitive group which is regarded as a section *Bifurcae* (WOLF) GROSSH. or a subgenus within *Potentilla* L., or even a distinct genus *Schistophyllidium* (JUZ. ex FEDOROV) IKONN.

The hexaploid chromosome number of $2n = 42$ is here reported for *P. moorcroftii* for the first time. Two different numbers have been published under the name *P. orientalis* JUZ.; GUINOCHE and LEFRANC (l.c.) found $2n = 56$ in plants from Tadzhikistan and MAGULAJEV (1979) recorded $2n = 48$ in a collection from the Caucasus. Both the records are to be referred to *P. moorcroftii*. *P. bifurca* L. s. str. proved to be octoploid with $2n = 56$ (POPOV 1935, 1939; MĚSÍČEK and SOJÁK 1969, Mongolia; GUINOCHE and LEFRANC 1981, Irkutsk); however, KRASNOBOROV (1976) recorded the diploid number of $2n = 14$ in plants collected in the Western Sayan.

P. multicaulis BUNGE

$2n = 14$

This inconspicuous and polymorphic species is distributed in North China ranging from Qinghai to Liaoning and southwards to Sichuan and Henan. It has generally been overlooked in the past and is often confused even at the present time. It most closely resembles *P. sericea* L., *P. plurijuga* HAND.-MAZZ. or the low forms of *P. chinensis* SER. in habit, but it is not closely related to them and - with its nearest relative *P. phanosa* YÜ et LI (extending from Xizang to Sichuan and Gansu) - constitutes a distinct group within the section *Pensylvanicae*.

P. multicaulis exhibits a wide range of variation in hairiness on the lower surface of the leaflets and in the length or width of their lobes. Whitish tomentose leaflets with crispate hairs or, in contrast, green leaflets with straight pubescence may occur even in the same individual. In the section *Pensylvanicae* such a type of variation often indicates that the species originated by interspecific hybridization. In the diploid *P. multicaulis*, however the possibility of hybrid origin seems to be almost excluded.

No chromosomal information has yet been published for the species.

P. [x] omissa SOJÁK (= *P. argentea* L. x *P. multifida* L.)

$2n = 35, 56, 70$

P. [x] omissa appears to be a late derivative of hybridization between *P. argentea* L. (sect. *Terminales* BECK) and *P. multifida* L. s. str. (sect. *Pensylvanicae* POEVERL.). Experimental evidence for that conclusion has recently been provided by SOJÁK (1987). Unfortunately, no cytological analysis of the experimental plants was made. In general, *P. argentea* comprises predominantly four cytotypes ($2n = 14, 28, 42, 56$) and *P. multifida* s. str. proved to be tetraploid (MĚSÍČEK and SOJÁK 1992). *P. [x] omissa* originated apparently in the southern part of Central Siberia from whence it becomes often introduced along railways and transport routes ranging eastwards to Vladivostok. In the western Siberia *P. [x] omissa* may

easily be confused with *P. [x] ungarensis* M. POP. This morphologically similar species, however, has been derived by hybridization of *P. argentea* L. with *P. tergemina* SOJÁK.

No chromosome number has previously been reported for *P. [x] omissa*. The sample examined was raised from seeds collected in the wild and comprised mostly pentaploid individuals (8 plants). More detailed analysis was made in the progeny of one mother plant which produced two categories of seeds differing in their size. The "small" seeds provided seedlings with $2n = 56$, the "large" seeds were decaploid with $2n = 70$.

P. sericea L.

$2n = 28$

Tetraploid and hexaploid populations have yet been found in *P. sericea* (GUINOCHE and LEFRANC 1981, MĚŠTĚK and SOJÁK 1992). The former are distributed in northern Mongolia and southern Siberia (the Sayan Mts.) whereas the latter occur in southern Mongolia (the Gobi Altay). The plants examined here were raised from seeds collected near Ulan-Bator and represent the typical form of *P. sericea*.

P. stanjukoviczii OVCZ. ex KOČEK.

$2n = 14$

The plants examined very much resemble *P. [x] agrimonioides* BIEB. in the pubescence and shape of the leaflets, petioles and sepals. They differ morphologically only in the shape of their styles and stigmas. *P. stanjukoviczii* has very narrow styles especially in their apical parts, with stigmas ± 0.1 mm broad. In *P. [x] agrimonioides* the apical parts of the styles are rather thickened, bearing broader stigmas (± 0.15 mm). Although the morphological difference described is slender it seems to be very constant and is also well supported by the different ploidy level of the species concerned. For that reason *P. stanjukoviczii* can be regarded as a distinct species.

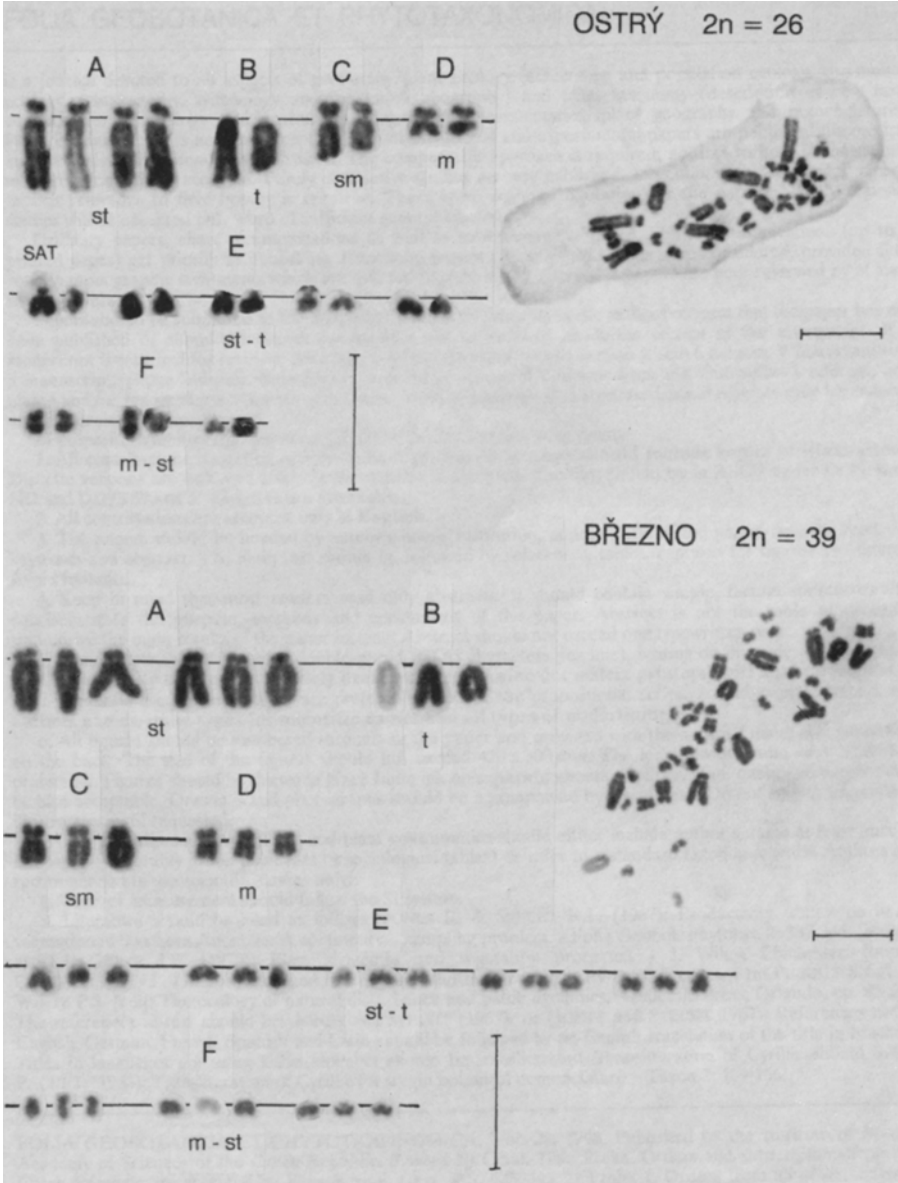
In addition, the two species differ apparently in their origin. *P. [x] agrimonioides* is undoubtedly a stable hybrid species derived from the crossing of *P. pensylvanica* L. and *P. sericea* L. *P. stanjukoviczii* also appears to be a derivative from a similar hybrid combination in which one putative parent, i.e. *P. sericea*, has been replaced by *P. soongarica* BUNGE in LEDEB. *P. sericea* and *P. soongarica* are near in their habit and morphology and their hybrid derivatives with *P. pensylvanica* are hardly to be reliably distinguished.

P. stanjukoviczii occurs exclusively in Pamir. *P. [x] agrimonioides* is widespread in South Siberia, Mongolia and in all mountain systems from Turkey to the Himalaya and South Tibet.

No chromosome information has been previously published for *P. stanjukoviczii* as well as for one of the putative parents *P. soongarica*. *P. pensylvanica* is known to be entirely tetraploid throughout Asia. However, diploid strains of *P. pensylvanica* have been recently found in New Mexico (WARD and SPELLENBERG 1988); in addition, the closely related *P. lasiodonta* RYDB. (= *P. frutitima* KOHLI et PACKER) is a further diploid representative of the *P. pensylvanica* complex in Canada and the U.S.A. As the primary evolution centre of *P. pensylvanica* is apparently to be found in Asia we suppose that diploid populations of *P. pensylvanica* have also occurred in this continent. Such primitive forms were engaged in the hybrid origin of *P. stanjukoviczii*.

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Somatic metaphases of diploid ($2n = 26$) and triploid ($2n = 39$) *Butomus umbellatus*. Six groups of chromosomes are designated A - F, their chromosome morphology is characterized according to LEVAN et al. (1964). Scales = $10 \mu\text{m}$.