New taxa of *Sorbus* from Bohemia (Czech Republic)

Miloslav KOVANDA

Three species of *Sorbus* are described as new: *S. rhodanthera* (one station in W Bohemia) and *S. gemella* (one station in W Central Bohemia) belonging to the *S. latifolia* agg. and *S. quernea* (two stations in Central Bohemia) of the *S. hybrida* agg. Basic data on their karyology, morphology, variation, relationships, geographical distribution, ecology and ecobiology are provided. Also described is one primary hybrid, *S. × abscondita* (*S. aucuparia* L. × *S. danubialis* [JÁv.] PRODAN) of the *S. hybrida* agg.

**Introduction**

Interspecific hybridization with concomitant polyploidy and apomixis is an acknowledged vehicle of speciation in *Sorbus* (e.g. LILJEFORS 1953, 1955, KOVANDA 1961, CHALLICE & KOVANDA 1978, JANKUN & KOVANDA 1986, 1987, 1988, KUTZELNIGG 1994). Of the five subgenera of *Sorbus* (*Aria* PERS., *Torminaria* [DC.] K. KOCH, *Chamaemespilus* [MED.] K. KOCH, *Cormus* [SPACH] DUCHARTRE, *Sorbus* s. str.), all except *Cormus* are known to produce hybrids. The remaining four subgenera do not, however, interbreed freely. While *Torminaria*, *Chamaemespilus* and *Sorbus* s. str. hybridize with *Aria*, they are apparently isolated by a strong genetic barrier from each other. In other words, in every *Sorbus* hybrid so far on record, a member of subg. *Aria* is involved.
Two kinds of hybrids can be distinguished:

(1) Primary hybrids, often highly sterile, occurring rarely as single individuals scattered among parent species. These are of little importance in terms of evolution but add to the phenotypic diversity of *Sorbus* populations. Segregation occurs in the progeny.

(2) Hybrid species, as a rule fertile (often prolifically so), forming morphologically clear-cut populations with their own sets of characters and little internal variation. These are neoendemics usually confined to small, sharply defined geographical areas replacing each other. They are amenable to taxonomic treatment. No segregation occurs in the progeny.

While the parent species are generally sexual and diploid, the resulting hybrid species are apomictic and polyploid (tetraploid or rarely triploid) or, exceptionally, diploid (Liljefors 1953, 1955, Jankun & Kovanda 1986, 1987, 1988, 1992, Kutzelnigg 1994).

It is now generally adopted practice to treat the hybrid species as microspecies, components of three species aggregates grouped according to their origin and named using the oldest epithet available: *S. latifolia* agg. (hybrids *Aria x Torminaria*), *S. hybrida* agg. (hybrids *Aria x Sorbus s. str.*) and *S. sudetica* agg. (hybrids *Aria x Chamaemespilus*). The aggregates also accommodate primary hybrids.

In addition to *S. sudetica* (Tausch) Frisch belonging to *S. sudetica* agg., only two hybrid species have been known to occur in Bohemia until recently: *S. bohemica* (Kovanda 1961) and *S. eximia* (Kovanda 1984). There was a strong feeling, however, that this number was not necessarily final. Work on the Czech Flora (Květena České republiky) provided a stimulus to take up again the present author’s study of the early 1960s and to conduct a detailed survey aimed at new records of hybrids and hybrid species in lesser known parts of the country (as far as *Sorbus* is concerned). This revealed the presence of three new hybrid species and one primary hybrid in Bohemia that are described here. Of these, *S. rhodanthera* and *S. gemella* belong to *S. latifolia* agg., while *S. quernea* and *S. x abscondita* belong to *S. hybrida* agg. It was technically not possible to incorporate these taxa into my account of *Sorbus* for the Czech Flora (Kovanda 1992).

Herbarium material (except holotypes) will be deposited in PR (Herbarium of the National Museum, Prague).
**Sorbus rhodanthera** KOVANDA, sp. nova (Fig. 1, 2, 3)

Arbores (raro frutices) usque 14 m alti; foliis simplicibus, laminis ambitu late ovatis usque fere rhombeis, pinnato-lobatis (lobis acutis vel acuminatis, serratis), in parte superiore tantum irregulariter duplicato-serratis, (7.2-)8.0-9.2(-10.6) cm longis et (5.8-)6.2-7.6(-8.5) cm latis, ad basin late cuneatis, remote serratis vel subintegris, subtus griseo-viride tomentosis, nervis utroque latere (8-)9-11(-12); petiolis (18-)21-29 mm longis; corymbothyrsis multifloris, compactis, convexis, ramis tomentosis; hypanthio turbinato, tomentoso, postea vix glabrescente; dentibus calycinis triangularibus, acutis, 2.5-3.2 mm longis, patentibus, post anthesin reclinatis, glabrescentibus, subtus tomentosis, tempore fructificationis siccis, persistentibus; petalis late ovatis usque rotundatis, breviter unguiculatis, (5.5-)6.5-8.7(-9.1) mm longis, albis, superne ad basin sparse villosis, patentibus; staminibus 20, antheris rosaceis; ovario semi-infero; stylis 2 (rarissime 3) ad 1/5 usque 2/5 coalescentibus, ad basin villosis, stigmatibus planis; fructibus subglobosis usque globosis, (8-)9-11(-13) mm in diametro, maturitate rubris, glabris, nitidis, lenticellis parvis, fuscis, numerosis; mesocarpio heterogeneo; endocarpio cartillagineo; seminibus atro-castaneis, 5.8-6.4 mm longis.

Chromosomatum numerus: 2n = 68.


Etymology: Greek rhodos = rose, rosy; anthera = anther.

Morphology, variation and relationships: *S. rhodanthera* exhibits characters of two distinct species, *S. torminalis* (L.) CRANTZ and a member of subg. *Aria*, mixed together, testifying to its hybrid nature. In leaf shape and indumentum, *S. rhodanthera* more closely resembles the latter species but differs distinctly in its fused styles, the absence of indumentum on the fruits and the hard endocarp, all these characters being typical of *S. torminalis* (L.) CRANTZ and aberrant in *S. aria* (L.) CRANTZ s.l.

While the involvement of *S. torminalis* (L.) CRANTZ is evident on morphological grounds, the other parent can only be inferred from circumstantial evidence. Both *S. aria* (L.) CRANTZ and *S. danubialis* (JÁV.) PRODAN qualify, but both are missing from Chlumská hora hill at the present time.
The participation of the latter species is more likely on both morphological and phytogeographical grounds. Firstly, the leaves of *S. rhodanthera* are rather small and cuneate at their base, more reminiscent of *S. danubialis* (JÁV.) PRODAN than of *S. aria* (L.) CRANTZ. Second, the distribution area of *S. danubialis* (JÁV.) PRODAN in Bohemia is distinctly western and north-western, where the species replaces *S. aria* (L.) CRANTZ which is missing or rare, being centered in Bohemian Karst, Central Bohemia. *S. rhodanthera* is characteristic of W Bohemia. *S. danubialis* (JÁV.) PRODAN has not been found on Chlumská hora hill, but since its characters are present, it probably occurred there in the past. Characteristic of *S. danubialis* (JÁV.) PRODAN is its occurrence on isolated, often volcanic hills which comprise small islands of suitable habitats in otherwise unsuitable areas. An example of one of these is the basaltic Vlčí hora hill (704 m), near Černošín, about 30 km away from Chlumská hora hill, where *S. danubialis* (JÁV.) PRODAN thrives but no trace of *S. rhodanthera* is found. *S. danubialis* (JÁV.) PRODAN extends as far as the Krušné hory Mts., where a solitary tree occurs on Mt. Plešivec near Abertamy at 940 m.

*S. rhodanthera* should not be confused with *S. intermedia* (EHRH.) PERS. which is commonly grown for ornament and often escapes. It also occurs on Chlumská hora hill.

The most distinctive character of *S. rhodanthera* is the colour of the anthers, which are violet-rose in the flower buds, flesh-rose at the beginning of flowering before dehiscence, and ochraceous to rusty brown after dehiscence. Their hue varies considerably even within an individual or inflorescence, but no pale yellow anthers, characteristic of both the parent species, were noted. In European *Sorbus*, rose anthers are only encountered in *S. chamaemespilus* (L.) CRANTZ and some of its hybrids with *S. aria* (L.) CRANTZ s.l. This parental combination cannot, however, be considered as the source from which *S. rhodanthera* evolved. Morphological, ecological and phytogeographical evidence is contrary to this conjecture. The deviating colour of anthers can perhaps be attributed to a gene mutation in the early phases of origin and establishment of *S. rhodanthera*.

Outside Europe, rose anthers are reported for some Asian species of subg. *Aria*, e.g. *S. subfusca* (LEDEB.) BOISS. and *S. hajastana* GABRIELJAN from the Caucasus and *S. cuspidata* (SPACH) HEDL. and *S. hedlundii* C. K. SCHNEIDER from the Himalayas (GABRIELJAN 1978).

It is interesting to note that the degree of fusion of the styles is variable even within an individual. In this feature *S. rhodanthera* follows *S. tormina-
Fig. 1: *Sorbus rhodanthera*, variation in the leaf shape. Scale: 5 cm. — *Sorbus rhodanthera*, Variabilität der Blattform. Maßstab: 5 cm.
lis (L.) CRANTZ, whose styles coalesce generally to about half way, but deviations are not uncommon. The same kind of variation is found in S. eximia (KOVARNA 1984, JANKUN & KOVARNA 1988), S. bohemica (JANKUN & KOVARNA 1987) and S. austriaca (BECK) PRAIN et al. (KOVARNA 1961, in press).

Two species described from Germany, S. franconica BORNM. ex DÜLL and S. badensis DÜLL, come close to S. rhodanthera but differ, inter alia, in having larger fruits, shorter petioles and fleshy calyx teeth in fruit; in addition, the former has orange to yellowish brown, the latter rusty-garnet red fruits (see DÜLL 1961).

Geographical distribution: S. rhodanthera is confined to the basaltic Chlumská hora hill (elevation, 651 m), near Manětín, Tepelské vrchy hill country, W Bohemia. This is a relatively cool area (average annual temperature, 7°C) underlain by acid rocks and strewn with massive outcrops of basalt that are refuges of thermophilous flora more characteristic of areas further NE. The hill itself is a typical table mountain about 4 km in length from NW to SE and 1.4 km in width. Natural plant cover is only preserved on parts of the SW facing side; elsewhere, including the plateau, it has been replaced by plantations of spruce (Picea abies [L.] KARSTEN), pine (Pinus sylvestris L.) and larch (Larix decidua MILL.). A small part of the SW side with basaltic cliffs and scree has been a state nature reserve but was recently reclassified as a natural monument. S. rhodanthera is distributed more or less continuously along the middle and N part of this side of the hill and in a narrow stripe on the adjoining plateau. The altitudinal range extends from about 570 m to the summit. The vast majority of specimens occur outside the protected area.

In an attempt to find further stations for S. rhodanthera, a systematic survey of suitable habitats in the vicinity was carried out in 1991-1994, but the result was nil in all cases. S. rhodanthera is missing even from the nearby basaltic Doubravická hora hill, 659 m, near Doubravice, from Spičák hill, 587 m, near Mezi, from Zbraslavský vrch hill, 675 m, near Zbraslav, from Vladař hill, 693 m, near Vladořice and from Nevdek hill, 630 m, near Žlutice, all of which support an otherwise similar flora.

Ecology and phytocenology: Besides S. intermedia (EHRH.) PERS., which forms stands in Småland, Sweden (KUTZELNIGG 1994) and S. aucuparia L., which does so locally at lower altitudes of the Polish Tatra Mts. (KOVARNA, unpublished), S. rhodanthera is perhaps the only European Sorbus able to act as a dominant in a plant community. On Chlumská hora hill it is domi-
Fig. 2: Distribution in the Czech Republic of *Sorbus rhodantha*ra (1), *S. gemella* (2), and *S. querna* (3). — Verbreitung von *Sorbus rhodanthera* (1), *S. gemella* (2) und *S. querna* (3) in der Tschechischen Republik.

*S. rhodanthera* is also frequent in a scree forest, where it is accompanied by *Crataegus laevigata* (POIRET) DC., *Lonicera xylosteum* L., *Prunus spinosa* L. s.l., *Quercus robur* L., *Sorbus aucuparia* L., *S. torminalis* (L.) CRANTZ, *Swida sanguinea* (L.) OPIZ, and *Tilia cordata* MILL.

On the summit plateau *S. rhodanthera* occurs in an open oak-pine forest with *Brachypodium pinnatum* (L.) P B. dominant in the herb layer, as documented by the following relevé:

Chlumská hora hill, summit plateau near the 651 m point, 100 m², 24.8. 1995:


E₂ (5 %): *Corylus avellana* L. 1, *Crataegus laevigata* (POIRET) DC. +.


*S. rhodanthera* manages to invade plantations of conifers (pine, larch). In situations where oak-hornbeam forest would be the natural climax, it thrives
Fig. 3: Detailed distribution of *Sorbus rhodanthera*. Scale = 1 km. — Kleinräumige Verbreitung von *Sorbus rhodanthera*. Maßstab = 1 km.
(with individuals up to 7 m tall) in pine woodland dominated by *Calamagrostis arundinacea* (L.) ROTH in the herb layer; also present are some acidophilous plants such as *Deschampsia flexuosa* (L.) TRIN., *Dryopteris carthusiana* (VILL.) H. P. FUCHS, *Pleurozium schreberi* (BRID.) MITT. and *Senecio ovatus* (GAERTN., MEYER et SCHERB.) WILDL.

Analysis of soil samples from all three main types of habitat (Carpinion alliance, rocky slope, summit plateau) gave the following results: soils, in terms of acidity, slightly acid in A horizon but acid below (range of pH$_{KCl}$ 4.8-5.8), sorption complex almost fully saturated with exchangeable bases, considerable range of Ca$^{2+}$ (from low to very high values).

Ecobiology: The onset of flowering varies considerably, depending primarily on the weather, but generally no flowers open before mid-May. The flowering time often extends into early June. Flowering is rather irregular, as in *S. torminalis* (L.) CRANTZ. In 1990-1992 the trees flowered every year, but in two successive years, 1993 and 1994, none flowered. Once it occurs, as it did again in 1995, flowering is prolific and so is the fruit set. Fruits ripe in early October. They are initially yellow to orange red, becoming blood-red when fully ripe, a colour suggestive of *S. aria* (L.) CRANTZ s.l. and rarely encountered among its hybrids with *S. torminalis* (L.) CRANTZ.

The percentage of morphologically good seed seems to vary greatly from one year to another. For instance, in 1991 it was virtually nil but in the following year it was up to 70% good seed per individual. In another fruiting year, 1995, the fertility again oscillated between 70% and 80% per individual. As seedlings abound, it seems likely that the 1991 failure was only accidental.

On steep but not necessarily rocky slopes, rarely however on gentler slopes or on the plateau, *S. rhodanthera* commonly grows into a tall tree, with a characteristic many-stemmed (up to 9-stemmed) growth form. It is unclear whether these particular individuals (abounding especially in the N part of the SW side) are arborescent shrubs (however rare the shrub habit may be in *S. rhodanthera*), or whether the additional stems arose as secondary shoots from the root. No cases of dead main trunks surrounded by substitutes have been noted.

Past and present: I came across the first specimens of *S. rhodanthera* quite casually on a field trip to Chlumská hora hill made jointly with Dr. Z. POUZAR, then a staff member of the Institute of Botany, Academy of Sciences, in June 1968. The occurrence of *S. torminalis* (L.) CRANTZ and
an additional taxon in that locality was quite unexpected and came as a major surprise. The hybrid nature of the latter was apparent at first sight. It was not until twenty years later, however, that I was able to visit the hill again and initiate a detailed survey. A 1992 census revealed about 140 individuals not counting hundreds of seedlings of all sizes. There are no records of *S. rhodanthera* from Chlumská hora hill in the main herbaria and only a passing notice in a floristic report (as *S. latifolia* LAMK. [PERS.]) in the available literature (see ŠEDO 1983). In the Czech flora (KOVANDA 1992) only a brief note could be added in the proofs.

A collection of *S. rhodanthera* was made by Dr. M. DEYL "ad arcem Nečtiny prope oppidum Mančtin" on 9 September 1959 (PR). It is unclear how to interpret the locality "ad arcem Nečtiny" There is a castle with a small park in the village of Nečtiny, 6 km SW of Chlumská hora hill, and also the ruin of a castle on a low hill above the village commonly called Nečtiny but whose name is actually Preitenštejn. A search of both these localities and their surroundings for the source of the material was in vain. Dr. DEYL visited, in addition to Nečtiny, Chlumská hora hill (on the evidence of a collection of *S. torminalis* but not *S. rhodanthera*) and the vicinity of Lipí (on the evidence of a collection of introduced *S. intermedia* with deeply cut leaves) on the same day, 9 September 1959. Perhaps the collection of *S. rhodanthera* was ascribed to Nečtiny by a labelling error.

**Sorbus gemella** KOVANDA sp. nova (Fig. 2, 4, 5)

Arbores usque 10 m alti; foliis simplicibus, laminis ambitu ovatis usque rhombeis, pinnato-lobatis (lobis ambitu acutis vel acuminatis, serratis), in parte superiore tantum duplicato-serratis, (5.5-)7.2 - 8.6(-9.2) cm longis et (4.2-)5.5 - 6.8(-7.2) cm latis, ad basin late cuneatis, remote serratis vel subintegris, subtus griseo-viride tomentosis, nervis utroque latere 8-10(-11), petiolis 13-21 mm longis; corymbothyrsis multifloris, compactis, convexis, ramis tomentosis, postea vix glabrescentibus; hypanthio turbinato, tomentoso; dentibus calycinis triangularibus, acutis, tantum 1.8-2.1(-2.6) mm longis, patentibus, post anthesin reclinatis, supra pilosis, subtus tomentosis, persistentibus, tempore fructificationis siccis; petalis late obovatis usque late ellipticis, breviter unguiculatis, (5.9-)6.4- 6.8(-7.2) mm longis, albis, superne ad basin sparse villosis, patentibus; staminibus 20, antheris pallide luteis; ovario semi-infero; stilis 2 ad $\frac{1}{4}$ - $\frac{1}{2}$ coalescentibus, ad basin lanuginosis, stigmatibus planis; fructibus subglobosis usque globosis, (9-)10- 13(-14) mm in diametro; maturitate aurantiacis, glabris, nitidis, lenticellis parvis, ochraceis, sat densis; mesocarpio heterogeneo; endocarpio cartillagineo; seminibus atro-fuscis, 5.0-5.7 mm longis.

Chromosomatum numerus: 2n = 68.

Etymology: Latin gemellus, -a, -um = twin, pair.

Morphology, variation and relationships: In its general appearance, S. gemella is a true copy (or, rather, a miniature) of S. rhodanthera and could be easily mistaken for it. On closer examination, however, clear-cut differences come to light. First, S. gemella has pale yellow anthers, a character it shares with S. torminalis (L.) CRANTZ and S. danubialis ( Jáv.) PRODAN and their hybrids except for S. rhodanthera. Other distinguishing characters include smaller leaves with fewer veins, shorter petiole, larger orange fruits with pale brown lenticels, shorter calyx teeth and smaller petals (see the Latin diagnosis). Again, this combination of characters is unique and not repeated elsewhere in the genus. The orange fruits are characteristic of most S. aria s.l. × S. torminalis hybrids. As in S. rhodanthera, the partly fused styles and flat stigmas reveal the parentage of S. torminalis (L.) CRANTZ. Unlike the situation on Chlumská hora hill, both S. torminalis (L.) CRANTZ and S. danubialis ( Jáv.) PRODAN are present and abundant in the locality of S. gemella, but no F₁ hybrids are formed. One individual in the population requires some comment. In its leaf shape it clearly approaches S. torminalis (L.) CRANTZ but in other characters it agrees with the rest of the population. Further study is required to decide whether this is a back-cross with S. torminalis (L.) CRANTZ. Otherwise the topodeme is remarkably uniform in terms of morphology. The degree of coalescence of the styles varies in the same way as in S. rhodanthera, but on the whole there is a lesser degree of fusion. There are also important differences in the ecology and phytocenological characteristics of S. rhodanthera and S. gemella (see below).

Geographical distribution: The sole station of S. gemella is the W margin of an unnamed plateau, the site of a pre-historic fortification (possibly Celtic, remnants of Celtic colonization abounding in the area) in the valley of the Hasina stream E of the village Konětopy, Džbán hill country, distr. Louny, W Central Bohemia. A sharply defined topodeme occurs along a c. 200 m long section of the margin of the plateau. Attempts to find specimens outside this site or to find any other locality were unsuccessful, even though
Fig. 4: *Sorbus gemella*, variation in the leaf shape. Scale: 5 cm. — *Sorbus gemella*, Variabilität der Blattform. Maßstab: 5 cm.
similar habitats are present in the vicinity (e.g. Okrouhlík hill, 440 m, near Konětopy, Výrov hill, 509 m, near Třeskonice, Pravda hill, 484 m, near Pnětluky, Džbán hill, 536 m, and Babí hora hill, 492 m, near Třeboc.

The locality lies in the centre of the Cretaceous Džbán hill country (highest elevation, Džbán hill, 536 m), formed of marly limestone; here, the predominating xerothermous flora intermingles with some submontane elements penetrating from the immediate west, such as *Arnica montana* L., *Petasites albus* (L.) Gaertn., *Pleurospermum austriacum* (L.) Hoffm. and *Prenanthes purpurea* L.

Characteristic of the area are extensive plateaus with abrupt edges interrupted by rather deeply cut stream valleys. The annual average temperature is 8°C.

Ecology and phytocenology: *S. gemella* is, in the Czech Republic, exceptional in being confined to a man-made habitat. The edge of the plateau with natural low rock cliffs was modified by the building of mounds (remnants of which are still visible) by prehistoric people. In the more recent past, several minor quarries were worked by the villagers to obtain convenient and easily worked building material. (Until about 1950, all the village houses in the area were built of this particular variety of limestone, using no plaster.) The quarries are now abandoned and have become overgrown with secondary pine woodland, as are the remnants of the mounds. This disturbed part of the edge is the habitat of *S. gemella*.


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Fig. 5: Detailed distribution of *Sorbus gemella* (1) and *S. × abscondita* (2) in the Džbán hill country. Scale = 1 km. — Kleinräumige Verbreitung von *Sorbus gemella* (1) und *S. × abscondita* (2) im Džbán-Hügelland. Maßstab = 1 km.
DUM., Salvia pratensis L., Sanguisorba minor L., Scabiosa ochroleuca L., Tanacetum corymbosum (L.) SCHULTZ-BIP., Viola hirta L., V. riviniana REICHENB., and low seedlings of Euonymus europaea L., Ligustrum vulgare L., Lonicera xylosteum L., Sorbus gemella, Viburnum lantana L., and V. opulus L. Most S. gemella individuals occur in a pine plantation (Pinus sylvestris L.) with some Quercus robur L., Sorbus terminalis (L.) CRANTZ and S. danubialis (JÁv.) PRODAN. The following were noted in the herb layer: Ajuga genevensis L., Arabis hirsuta L., Asperula cynanchica L., Euphorbia cyparissias L., Galeopsis angustifolia (EHRH.) HOFFM., Inula conyza DC., Melica nutans L., Melittis melissophyllum L., Senecio ovatus (GAERTN., MEYER et SCHERB.) WILLD., Teucrium chamaedrys L., Vincetoxicum hirundinaria MED., and low seedlings of Lonicera xylosteum L., Prunus spinosa L. s.l., and Viburnum lantana L. S. gemella manages to invade stands of the Corsican pine (Pinus nigra ARNOLD), but only a few individuals grow directly at the edge of the plateau.

Ecobiology: S. gemella starts to flower about one week earlier than S. rhodanthera, obviously because it occurs in a warmer region. It seems to follow the same flowering rhythm as S. rhodanthera: prolific flowering in 1990, 1991, 1992 and 1995, but none in 1993 and 1994. Flowering was regularly followed by prolific seed set, but the majority of seed failed to reach maturity and were stunted. It remains to be decided whether the low production of morphologically good seed (not exceeding 15% per individual) is only accidental and temporary or whether it is a permanent feature of the species. The latter possibility would account for the apparent scarcity of seedlings.

In order to assess the extent of apomixis and the possible presence of pseudogamy, isolating and emasculating experiments were carried out in 1995. Of 100 isolated flowers, 14 set fruit; of 12 emasculated flowers, eight did so, but the development of the fruits was soon arrested and they contained no vestiges of seed. Similar results were obtained with S. rhodanthera.

Unlike S. rhodanthera, only a few specimens show a tendency towards a many-stemmed growth form; this may be due to the lack of such extreme conditions as on Chlumská hora hill.

Past and present: I discovered the Konětopy population by chance in 1980 when studying the distribution of S. danubialis (JÁv.) PRODAN in the Džbán hill country. No previous records or literature data are available.

At present (counted in 1993), 45 individuals of varying ages (disregarding seedlings) are on record.
**Sorbus quernea** KOVANDA sp. nova (Fig. 2, 6)

Frutices vel arbores usque 9 m alti; foliis simplicibus, laminis ambitu ovatis usque (rarissime) ellipticis, in parte inferiore pinnato-lobatis usque fere pinnato-fissis (lobis ambitu rotundatis, obtusis, serratis, 5-6[-7] utroque latere), in parte superiore tantum irregulariter duplicato-serratis, (7.2-)7.8 - 9.2(-10.2) cm longis et (4.5-)5.1 - 6.0(-6.5) cm latis, ad basin cuneatis vel arcuatis, remote serratis, subtus griseo-tomentosis, nervis utroque latere (8-)9 - 10(-11), petiolis (13-)16 - 20(-22) mm longis; corymbothyrsis multi-floris, compactis, planis, ramis tomentosis; hypanthio turbinato, tomentoso; dentibus calycinis triangularibus, acutis, 1.8-2.2 mm longis, patentibus, supra pilosis, subtus tomentosis, persistentibus, tempore fructificationis basi carnosi; petalis late ellipticis usque rotundatis, brevissime unguiculatis, (5.5-7.2) mm longis, albis, superne ad basin sparse villosi, patentibus; staminibus 20, antheris luteis; ovario semi-inferro; pistillis (2-)3, ad 1/4-3/4 coalescentibus, stylis ad basin villosi; fructibus globosis, (8-)9 - 10(-11) mm in diametro, maturitate sanguineo-rubris, glabris, nitidis, lenticellibus minutis, fuscis, sparsis; mesocarpio heterogeneo; endocarpio cartilagineo; seminibus ellipsoidis, fuscis, 5.2-5.8 mm longis.


Etymology: Latin querneus, -a, -um = oaken, of oak.

Morphology, variation and relationships: In terms of morphology, *S. quernea* fits within the group of *S. aria* s.l. × *S. aucuparia* hybrids (*S. hybrida* agg.) in having the same type of leaf lobing, the lobes occurring in the lower part of the blade which is merely remotely serrate in *S. aria* × *S. torminalis* hybrids. The length of the petiole is intermediate between *S. aria* (L.) CRANTZ and *S. aucuparia* L. The influence of *S. aucuparia* L. is also apparent in the lenticels of the fruit: whereas in *S. aria* (L.) CRANTZ they are distinct and plentiful, in *S. quernea* they are indistinct and sparse. Also, when in fruit, the calyx is completely dry in *S. aria* (L.) CRANTZ, fleshy at the very base in *S. quernea* and fleshy throughout in *S. aucuparia* L. Variation in the height of fusion of the styles seems to be a common feature of
Fig. 6: *Sorbus quernea*, variation in the leaf shape. Scale: 5 cm. — *Sorbus quernea*, Variabilität der Blattform. Maßstab: 5 cm.
Sorbus hybrids. Both parent species of *S. quernea* have free styles, the pistils being coalescent only at the base (*S. aucuparia* L.) or to $\frac{2}{3}$ (*S. aria* [L.] CRANTZ). *S. quernea* is intermediate in this respect, but the degree of fusion varies considerably even within an individual. Several cases of fusion up to the base of the styles have been recorded.

The parent combination *S. aria* s.l. $\times$ *S. aucuparia* is frequent in Scandinavia as well as in the British Isles (SW England, Wales, Arran) but is poorly represented in Central Europe (see KÁRPÁTI 1960, DÜLL 1961, KOVANDA 1961, WARBURG & KÁRPÁTI 1968). Thus, *S. quernea* is an important discovery.

Apart from the parent species, *S. quernea* has no relationships in the autochthonous flora of the Czech Republic. The primary hybrid *S. $\times$ pinnatifida* (SMITH) DÜLL nm. *thuringiaca* (ILSE) KÁRPÁTI is rare in cultivation and has never been recorded in the wild. This is surprising because e.g. in Bavaria and Thuringia all three nothomorphs, nm. *pinnatifida*, nm. *thuringiaca* (ILSE) KÁRPÁTI and nm. *decurrens* (KOEHNE) KÁRPÁTI have been reported (DÜLL 1961). One explanation may be that in the Czech Republic *S. aria* (L.) CRANTZ and *S. aucuparia* L. rather rarely occur together and their flowering times overlap only to a small degree. Nm. *thuringiaca* approaches *S. quernea* to some extent but differs in having leathery leaves which are more deeply cut with 11-12 veins on each side. The type nothomorph, nm. *pinnatidida* (with 1-3 pairs of separate leaflets at the base of the leaf blade), is only known, in the Czech Republic, from two old herbarium collections made in N Bohemia (Milešovka and Ústí nad Labem) and is only rarely cultivated for ornament.

*S. pseudothuringiaca* DÜLL, an endemic of the Fränkischer Jura, Bavaria, so far the only hybrid species of the *S. aria $\times$ S. aucuparia* parentage in Central Europe, differs markedly in having the leaves deeply cut (sometimes, especially on sterile shoots, as far as the midrib, a feature never seen in *S. quernea*) and larger fruits (9-11 mm in diameter). In contrast to *S. quernea*, its fruit set is extremely poor (cf. DÜLL 1961, KUTZELNIGG 1994). DÜLL (l.c.) interprets this species as a back-cross of the primary hybrid *S. $\times$ pinnatifida* (SMITH) DÜLL with *S. aria* (L.) CRANTZ or as the result of a segregation in the progeny of *S. $\times$ pinnatifida* (SMITH) DÜLL.

Geographical distribution: *S. quernea* is only known from two low hills lying 1 km apart in the valley of the river Vltava in N Prague: Jabloňka hill (260 m), Prague 7 — Troja (N slope, plentiful occurrence) and Bílá skála hill (230 m), Prague 8 — Libeň (summit plateau, twenty-one specimens).
Both the hills (or, rather, their rocky southern sides, where S. quernea does not occur) are protected as natural monuments. S. aria (L.) CRANTZ and S. aucuparia L. are present in both localities, the former species only rarely.

One can only wonder why S. quernea originated just here, under such adverse conditions where the ubiquitous and undemanding S. aucuparia L. can thrive but S. aria (L.) CRANTZ is poorly represented. It should, however, be borne in mind that S. aria (L.) CRANTZ can be unpredictable in its distribution in relation to the underlying rock. As mentioned above, in Bohemia it is centered in the Bohemian Karst, where it is fairly uniform morphologically and ecologically. Nevertheless, an extremely variable population of S. aria s.l. (with S. aria (L.) CRANTZ s. str., S. danubialis [JÁV.] PRODAN and all possible intermediates present) occurs on acid conglomerates of Žďár hill, near Rokycany, W Bohemia.

Ecology and phytocenology: The sites of S. quernea are found in the warmest part of Bohemia (average annual temperature, 9°C) but are underlain by extremely acid Ordovician quartzites that hinder the development of a xerothermic flora. On Jabloněňka hill, S. quernea occurs in a species-poor plant community with a tree and shrub layer corresponding to an oak-hornbeam woodland and with a decidedly acidophilous herb layer where Deschampsia flexuosa (L.) TRIN. predominates, as evidenced by the following relevé:

Jabloněňka hill, N slope, 30°, 240 m above sea level, 100 m², 9.8.1995:

E₃ (100 %): Carpinus betulus L. 3, Quercus petraea (MATTUSCHKA) LIEBL. 3, Acer platanoides L. 2, Fraxinus excelsior L. 2, Sorbus quernea 2, Tilia cordata MILL. 2, Pyrus communis L. em. GAERTN. +, Robinia pseudoacacia L. +.

E₂ (7 %): Corylus avellana L. r, Cotoneaster integerrimus MED. r, Crataegus laevigata (POIRET) DC. r, Rubus fruticosus L. coll. r, Sorbus aria (L.) CRANTZ r, Sorbus aucuparia L. r, S. quernea r.

E₁ (70 %): Deschampsia flexuosa (L.) TRIN. 4, Hieracium umbellatum L. 1, Hypericum perforatum L. 1, Fragaria vesca L. +, Hieracium lachenalii C. C. GMELIN +, Lembotropis nigricans (L.) GRISEB. +, Rumex acetosella L. +, Sedum maximum (L.) HOFFM. +, Silene nutans L.+ , Tanacetum corymbosum (L.) SCHULTZ-BIP. +, Vicia sepium L. +, Campanula rotundifolia L. s. str. r, Dianthus carthusianorum L. r.

On the other hill, S. quernea occurs in the shrub stage of succession to an acidophilous oak-hornbeam woodland:

E₂ (70 %): Crataegus laevigata (POIRET) DC. 2, C. monogyna JACQ. 2, Prunus spinosa L. s.l. 2, Swida sanguinea (L.) OPIZ 2, Ligustrum vulgare L. 1, Acer platanoides L. +, Fraxinus excelsior L. +, Rhamnus catharticus L. +, Rosa canina L. +, Sorbus aria (L.) CRANTZ +, Cerasus vulgaris MILL. r.
New taxa of Sorbus

Ecobiology: *S. quernea* starts to flower in the first half of May, usually between the 10th and 15th. In the years of this investigation (1992-1995), flowering and fruit set took place profusely every year. The production of normally developed seed oscillated greatly: while in 1991-1994 there were only a few, in 1995 they were produced in abundance. Flowering starts very early, at the age of 6-8 years, as it does also in *S. aucuparia* L. Seedlings abound on Jabloňka hill but are absent from the other site.

Past and present: Surprisingly, there are no records of *S. quernea* in Prague herbaria or in the literature even though the hills are conspicuous. An explanation may be the poor substratum, which has made them unattractive to botanists (including the present author), who have paid attention instead to the Algonkian schists only a few kilometres downstream in the Vltava valley; these are locally pervaded by minute beds of calcium carbonate and support an interesting flora. As chance would have it, I lit upon the first shrub of *S. quernea* on Bílá skála hill when attempting to check a 19th century record of *Dianthus gratianopolitanus* VILL. marked vaguely "Troja bey Prag" in 1980. As it was hitherto unrecorded, I first took it to be a primary hybrid *S. aria* × *S. aucuparia*. It was not until 1992 that (again quite accidentally) I discovered two more small trees there and, in the same year, the population on the N side of Jabloňka hill.

In the latter locality, 44 individuals (disregarding seedlings) of *S. quernea* were counted in 1994, mostly trees of various ages, but none very old. Twenty-one more specimens occurred on Bílá skála hill.

*Sorbus × abscondita* KOVANDA, hybr. nova (Fig. 5, 7, 8)

(S. *aucuparia* L. × *S. danubialis* [JÁV.] PRODAN)

Differt a *S. quernea* praecipeque lobis laminarum ambitu triangularibus, acutis usque acuminatis 6-8 utroque latere, nervis (10-)12-14(-15) utroque latere; dentibus calycinis fructificationis tempore carnosis.


Etymology: Latin absconditus = hidden, concealed, secret.
Fig. 7: *Sorbus × abscondita*, variation in the leaf shape. Scale: 5 cm. — *Sorbus × abscondita*, Variabilität der Blattform. Maßstab: 5 cm.
Fig. 8: Distribution in the Czech Republic of *Sorbus × abscondita*. — Verbreitung von *Sorbus × abscondita* in der Tschechischen Republik.
This hybrid is extremely rare in the Czech Republic, being known from only two sites in Bohemia. These include the summit area of the basaltic Sedlo hill, near Liběšice, České středohoří Mts., N Bohemia, where I sampled it 27 years ago (KOVAŇ 1969 PR) but have never found it since, despite repeated efforts, and the station reported here, where I have been observing it since 1991. In both sites solitary old trees occur accompanied by the parent species.

The geomorphology of the type locality is similar to that of S. gemella: the sharply modelled edge of a Cretaceous plateau, but, unlike Konětopy, largely natural, only locally disturbed by quarrying, and without traces of ancient civilization. The steep rocky slope (W facing, marly limestone) is overgrown with beechwood with some maples (Acer pseudoplatanus L., A. platanoides L.), small leaved lime (Tilia cordata MILL.) and wych elm (Ulmus glabra HUDS.) admixed (alliance Tilio-Acerion). The herb layer is extremely poor (but includes one rare species, Arctostaphyllos uva-ursi [L.] SPRENG.) and the shrub layer is virtually non-existent. The following were recorded along the edge: Betula pendula ROTH, Fagus sylvatica L., Pinus sylvestris L., Quercus petraea (MATTUSCHKA) LIEBL., Q. robur L., Sorbus aucuparia L., S. danubialis (JÁV.) PRODAN, S. torminalis (L.) CRANTZ. S. abscondita grows at the very edge. S. aria (L.) CRANTZ is missing from the site, as it is from much of the Džbán hills. The slope, including the plateau edge, has recently been made a national nature reserve. The plateau is covered by semi-natural mixed woodland. A narrow tract adjoining the edge has recently been cleared and re-planted with pine (Pinus sylvestris L.), so that S. abscondita temporarily receives more sunshine from the east. For a general characterisation of the Džbán area, see under S. gemella.

Oddly enough, there are no records or literature reports of S. aucuparia × S. danubialis hybrids from other countries.

S. quernea, the only species in Bohemia which could possibly be confused with this hybrid, differs in having the leaf lobes (5-7 in number) rounded and obtuse, (8-)9-10(-11) veins on each side of the blade and calyx teeth fleshy only at the base when in fruit.

Acknowledgements

Grateful thanks are due to Dr. Z. NEUHÄUSLOVÁ-NOVOTNÁ for helpful advice on phytosociology and for making the soil analyses and to Dr. J. SOJÁK for the line drawings.
The study was supported by a grant of the ČSAV no. 60548 and of the GAČR no. 206/93/1178.

Appendix

List of German topographical names (in current use before 1945):

Abertamy  Abertham
Černošín  Tschernoschin
České Středohoří  Böhmisches Mittelgebirge
Chlum  Klum
Chlumská hora  Klum-Berg, Klumberg
Doubravice  Deutsch-Daubrawitz
Doubravický vrch  Daubrawitzer Berg
Krušné hory  Erzgebirge
Liběšice  Liebeschitz
Manětín  Manetin
Mezí  Mösing
Milešovka  Milleschauer
Nečtiny  Netschetin
Nevděk  Schlossberg
Plešivec  Plessberg
Preitenštejn  Preitenstein
Sedlo  Geltschberg
Špičák  Spitzberg
Tepelské vrchy  Tepler Hochland
Ústí nad Labem  Aussig
Vladař  Wladarzberg
Vladořice  Wladarz
Vlčí hora  Wolfsberg
Zbraslav  Prassles
Zbraslavský vrch  Prassleser Berg
Žlutice  Luditz

References


1 The author's translation. The Russian title reads "Zapadnoj Azii", i.e. "of Western Asia".
New taxa of *Sorbus*


Manuscript received: 1996 02 20

Author’s address: Dr. Miloslav KOVANDA, Academy of Sciences of the Czech Republic, Institute of Botany, CZ-252 43 Průhonice, Czech Republic.

Jahr/Year: 1996

Band/Volume: 133

Autor(en)/Author(s): Kovanda Miloslav

Artikel/Article: Neue Sorbus-Taxa aus Böhmen (Tschechische Republik) 319-345