# Chromosome number variation in the genus *Rubus* in the Czech Republic. I.

**Proměnlivost počtu chromozómů u rodu *Rubus* v České republice. I.**

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Krahulcová A. et Holub J. (1997): Chromosome number variation in the genus *Rubus* in the Czech Republic. I. – Preslia, Praha, 68(1996):241–255.

Chromosome numbers are presented in 20 species of the genus *Rubus* subgenus *Rubus*, originating from 65 localities in the Czech Republic (Bohemia and Moravia). The species studied include two diploids, one triploid, sixteen tetraploids and one pentaploid. New reports are given for the following seven tetraploid species (2n = 28): *R. tabanimontanus* Figert, *R. salisburgensis* Caflisch, *R. koehleri* Weihe, *R. hadracanthos* G. Braun, *R. franconicus* H. E. Weber, *R. wessbergii* Pedersen et Walsemann and *R. mollis* J. Presl et C. Presl. A new pentaploid cytotype (2n = 35), different from the tetraploid reported previously in Poland (2n = 28), was found in *R. dollnensis* Spribille. Brief data on the geographical distribution of the species studied are given; *R. wessbergii* is reported as a new plant for the flora of the Czech Republic.

K e y w o r d s : Chromosome numbers, *Rubus*, distribution, Czech Republic

## Introduction

The polyploid complex of the genus *Rubus* (especially of the subgenus *Rubus*) belongs to the most complicated taxonomic groups of flowering plants in the flora of Central Europe. In recent years, its taxonomy has been studied in detail, mainly in northwestern and Central Europe, based on a new critical approach to the classification of individual species (e.g. Weber 1995, Holub 1993, 1995). For this reason, only some of the chromosome numbers published previously for this genus can be accepted, principally for those species which have been clearly defined for a long time and which have an unchanged taxonomic status.

This taxonomic group can be characterized as follows:

(1) Polyploid complex with prevailing facultative agamospermy (pseudogamy, occurring especially in subgenus *Rubus*) and extensive hybridization.

(2) The euploid series (x = 7) with ploidy levels ranging in European species from 2x to 8x. Tetraploids prevail in the most extensive subgenus *Rubus*, in addition to pentaploid and triploid types. Diploids are sexuals, polyploids facultative apomicts. The different ploidy levels of parental species do not prevent hybridization.

(3) Influence of ploidy level (besides other factors) on the mode of reproduction, i. e. on the degree of sexuality.

(4) The richness of species in the studied area: approximately 100 species are currently distinguished in the Czech Republic, 11 of them having been described during the last 5 years. The description of several new species is in preparation, some additional species described from other regions were found to be new for the country.

Until recently, the knowledge about chromosome numbers was poor in most of the Central European *Rubus* species. During the last few years, research focused on karyology in *Rubus* was started in Poland (Boratyńska 1994, 1995a, b) and in Germany (Iwatsubo, Naruhashi et Weber 1995). This paper is the first of projected contributions dealing with chromosome numbers found in the representatives of the genus *Rubus* in the Czech Republic.

## Material for karyological examination

In most cases, somatic mitoses were examined in root-tips, because most species of the subgenus *Rubus* are able to form stems with rooting apices towards the end of the growing season. These rooting uppermost parts of the stems were collected in the field from September to November, cultivated during winter in unheated glasshouse and then in the open in the garden. Somatic mitoses from young flower buds or meioses in pollen mother cells were used for chromosome counts in two species (*R. salisburgensis* and *R. canescens*). The herbarium specimens collected both from plants in the field and from transplants in the garden are deposited in the Institute of Botany, Průhonice.

## Methods

For root-tips, a method of Končalová et Klášterský (1978), adapted originally for chromosomes of the genus *Rosa*, was used with modifications. Root-tips were pretreated with a saturated solution of para-dichlorbenzene for 4.5 hours at room temperature, rinsed in water and fixed overnight in Carnoy solution (96 % ethanol : 99% acetic acid : chlorophorm in volume ratio 1:2:1). They were kept in 70 % ethanol at 4° C until used. The maceration was carried out in 2N HCl at 60° C for 8 min, the root-tips were then rinsed in water and the meristematic tissue was cut off and squashed in a drop of acetic carmine.

Young flower buds were fixed in a mixture of ethanol-acetic acid (3:1) without pretreatment and stained in alcoholic hydrochloric acid-carmine (Snow 1963) for several weeks. The anthers were squashed in a drop of 45 % acetic acid. All observations of chromosomes were made using a phase-contrast microscope.

## Results and discussion

Note: All localities given below refer to the area of the Czech Republic. Geographical data are given as follows: the land (province) (Bohemia, Moravia – incl. Moravian Silesia) with designation of the part (C, S, N, W and E), sometimes the mountain range or landscape area when useful; the district, and the locality, with its altitude above see level. The concluding data contain the name of the collector(s) (and at the same time the author who determinated the material) and the date of collection. The localities are ordered from west to east and from north to south.

Subgen. *Rubus*

Sect. *Rubus* L.

## Ser. *Discolores* (P. J. Mueller) Focke

1. *Rubus bifrons* Vest 2n = 28 (Fig. 1a)
Vest, Steierm. Z. 3:163, 1821.

Localities:

1. C Bohemia; distr. Praha-západ; Radlík village, along the road to Psáry village, 410 m a.s.l. Coll. J. Holub and A. Krahulcová 20. 10. 1995.
2. C Bohemia; distr. Kolín; Kostelec nad Černými lesy, slopes NW of the village, 370 m a.s.l. Coll. J. Holub 14. 10. 1995.
3. C Bohemia; distr. Benešov; Bělčice village, Vrážský vrch hill 1–1.5 km N of the village, 430 m a.s.l. Coll. J. Holub and A. Krahulcová 13. 10. 1995.
4. N Moravia; distr. Olomouc; Lazníky village, at the margin of the wood 1.4 km NE of the village, 320 m a.s.l. Coll. B. Trávníček 26. 10. 1995.
5. S Moravia; Chřiby hills; distr. Kroměříž; in the wood near the E edge of Střílky village, 380 m a.s.l. Coll. B. Trávníček 22. 9. 1995.

The tetraploid level, reported for the first time by Christen (1950) from Switzerland, was confirmed in all plants studied. The number 2n = 48 given by Weber (1995: 371) in Hegi is certainly a printing error (= 2n = 28).

The species is widely distributed in Central Europe. In the Czech Republic it is dispersed both in Bohemia and Moravia, with some gaps in the distribution. It is absent in northern and western parts of Bohemia. In southern Bohemia it reaches elevations up to 800 m a.s.l.; the highest known locality is on the eastern slope of Mt. Kleť – 875 m a.s.l.

2. *Rubus montanus* Lej. 2n = 21 (Fig. 1b, c)
Libbert ex Lejeune Fl. Spa 2:317, 1813.

Localities:

1. C Bohemia; distr. Mladá Boleslav; Skorkov village, wood margin WNW of the village, 220 m a.s.l. Coll. J. Holub 21. 10. 1994.
2. C Bohemia; distr. Benešov; Bělčice village, near the Praha – Brno highway, 460 m a.s.l. Coll. J. Holub and A. Krahulcová 13. 10. 1995.
3. C Bohemia; distr. Benešov; Měřín village near Slapská přehrada reservoir, 350 m a.s.l. Coll. J. Holub 5. 11. 1994.
4. C Bohemia; Brdy hills; distr. Příbram; between the villages of Křešín and Felbabka ca 5 km SE of Hořovice town, 460 m a.s.l. Coll. J. Holub 19. 11. 1994.

All plants studied, including one specimen of var. *macromontanus* (H. E. Weber) Holub (locality no. 2 – Bělčice), proved to be triploids. This corresponds to a previous count given by Gustafsson (1943): his plants, named as *R. candicans* Weihe et Nees, were of unknown garden origin. The report about triploid *R. candicans* from Austria, given by Polatschek in Gilli (1969), can be also related to *R. montanus*. Recently, the same triploid level was revealed in *R. montanus* from Germany, Lower Saxony (Iwatsubo, Naruhashi et Weber 1995).

A Central European species with a wide distribution from France to southeastern Poland and Romania. In the Czech Republic it is widely dispersed throughout Bohemia and Moravia, mostly at altitudes between 200–500 m a.s.l. Var. *macromontanus* (H. E. Weber)

Holub [= *R. macromontanus* (H. E. Weber) Vannerom], described from Bohemia, is not uncommon in the Czech Republic and requires further taxonomic study.

## Ser. *Rhamnifolii* (Bab.) Focke

3. *Rubus gracilis* J. Presl et C. Presl 2n = 28 (Fig. 2a)
J. Presl et C. Presl Del. Prag. 1:220, 1822.

Localities:

1. C Bohemia; distr. Mladá Boleslav; Bezděčín village, in the wood SW of the village, 230 m a.s.l. Coll. J. Holub 12. 11. 1994.
2. C Bohemia; distr. Mladá Boleslav; Předměřice nad Jizerou village, in the wood SE of the village, 220 m a.s.l. Coll. J. Holub 21. 10. 1994.
3. C Bohemia; distr. Praha-východ; Strašín village near Říčany town, in the wood between the village and the settlement of Vojkov, 420 m a.s.l. Coll. J. Holub and A. Krahulcová 6. 10. 1995.

This tetraploid chromosome number was given by Maude (1939) in plants from Great Britain, reported under the name *R. villicaulis* Koehler; this record probably refers to another *Rubus* species, as *R. gracilis* (s. str.) does not occur in the British Isles. The same chromosome number was, however, recently reported from Poland (Boratyńska 1994).

*R. gracilis* belongs to Central European species (s. str.); in the Czech Republic it is widely dispersed, mostly in Bohemia, from where the studied material originates (all localities being situated in Central Bohemia). The species was described from the Czech Republic – Central Bohemia (Hluboš near Příbram; Štiřín SE of Praha).

## Ser. *Canescentes* H. E. Weber

4. *Rubus canescens* DC. n = 7, 2n = 14 (Fig. 1d)
De Candolle Cat. Pl. Horti Monsp. 139, 1813.

Localities:

1. C Bohemia; the protected landscape area Křivoklátsko; distr. Rakovník; Nezabudice village, along the margin of the wood NW of the village, 360 m a.s.l. Coll. J. Holub and A. Krahulcová 27. 10. 1995. (2n = 14).
2. C Bohemia; the protected landscape area Křivoklátsko; distr. Rakovník; Karlova Ves village, along the road on the SE slope of the hills Špička and Zadní Hrobce 2 km S of the village, 400 m a.s.l. Coll. J. Holub and A. Krahulcová 12. 7. 1995. (n = 7, 2n = 14).

This diploid chromosome number is in agreement with data published by Gustafsson (1943), who examined plants of unknown garden origin under the name *R. tomentosus* Borkh. Later, the diploid level was also found in material originating from Bulgaria (Markova 1968, plants under the name *R. tomentosus* Borkh. var *glabratus* Godr.) and from former Yugoslavia (Thompson 1995).

A widely distributed submeridional (or submediterranean) species, reaching the northern limit of its distribution in the Czech Republic. It occurs scattered in warmer regions of both Bohemia and Moravia. Its distribution map is given by Jäger (in Weber 1995: 439) in Hegi; in the Czech Republic and Poland the northern limit is shown somewhat north of the species' actual occurrence (for the Czech Republic see the data in Holub 1995: 134).

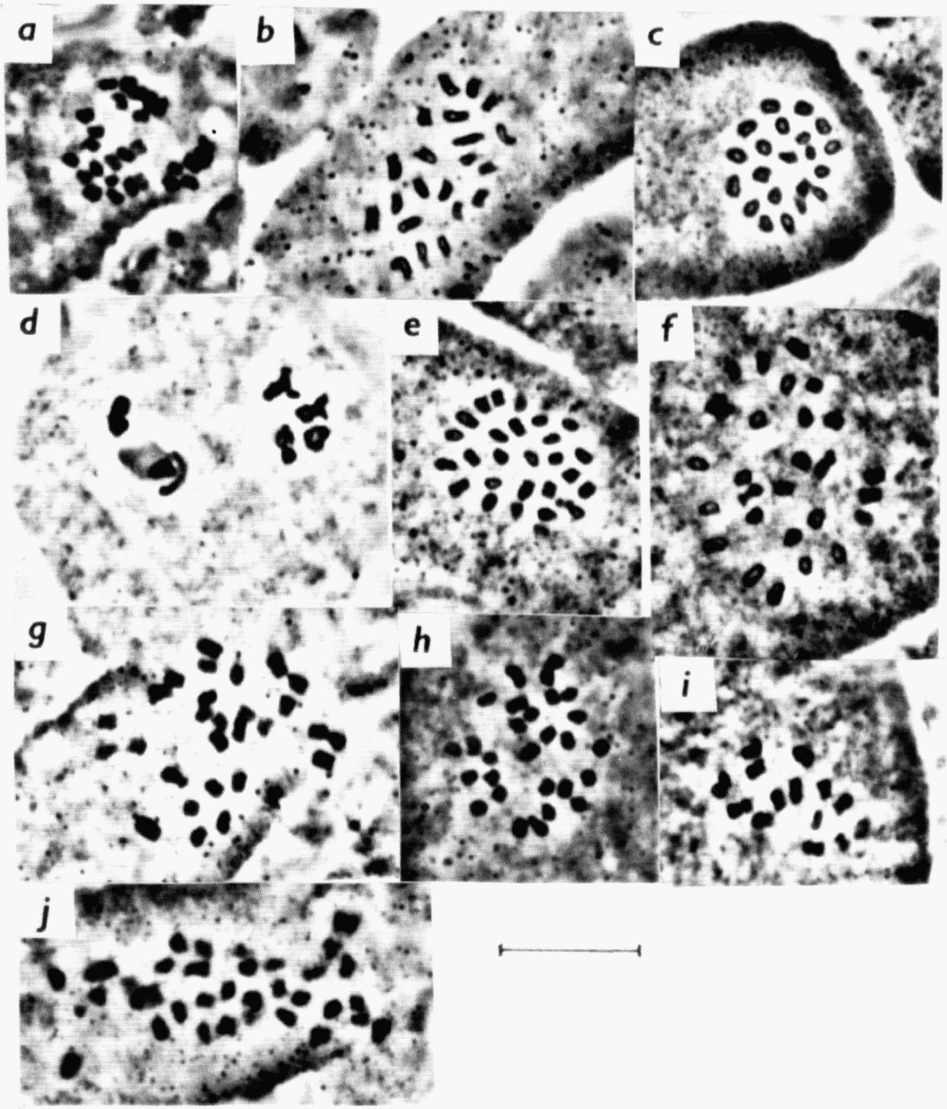


Fig. 1. – Somatic mitoses (a–c, e–j) and meiosis in pollen mother cell (d) in the genus *Rubus*; – a: *Rubus bifrons* Vest, 2n = 28; b: *Rubus montanus* Lej., 2n = 21; c: *Rubus montanus* Lej. var. *macromontanus* (H. E. Weber) Holub, 2n = 21; d: *Rubus canescens* DC., n = 7 (7 bivalents); e: *Rubus clusii* Borbás, 2n = 28; f: *Rubus radula* Weihe, 2n = 28; g: *Rubus koehleri* Weihe, 2n = 28; h: *Rubus schleicheri* Tratt., 2n = 28; i: *Rubus moschus* Juz., 2n = 14; j: *Rubus dollnensis* Spribille, 2n = 35. [Scale bar = 10 μm].

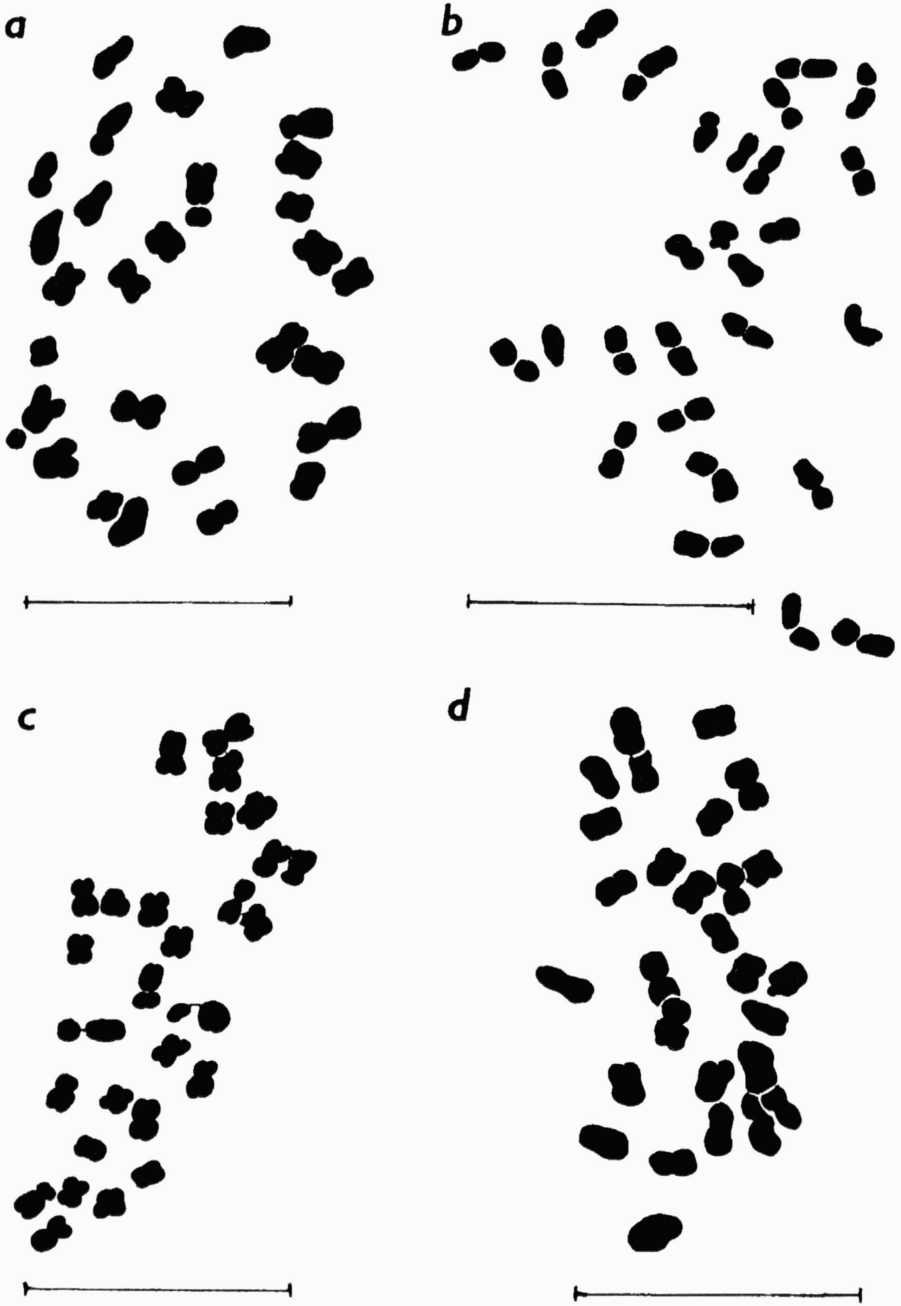


Fig. 2. – Somatic mitoses in four tetraploid species of the genus *Rubus* (all species 2n = 28); – a: *Rubus gracilis* J. Presl et C. Presl; b: *Rubus tabanimontanus* Figert; c: *Rubus orthostachys* G. Braun; d: *Rubus franconicus* H. E. Weber. [Scale bars = 10 μm].

## Ser. *Micantes* Sudre

5. *Rubus tabanimontanus* Figert 2n = 28 (Fig. 2b)
Figert, Allg. Bot. Z. 11:178, 1905.

Localities:

1. C. Bohemia; Brdy hills; distr. Příbram; former village of Kolvín along the way to the former Padrť village in the military area, 635 m a.s.l. Coll. J. Holub 27. 10. 1994.
2. C Bohemia; Brdy hills; distr. Příbram; Obecnice, on the W margin of the village, in the direction of the fishpond Octárna, 560 m a.s.l. Coll. J. Holub 15. 10. 1994.
3. C Bohemia; distr. Benešov; Bělčice village, Vrážský vrch hill 1–1.5 km N of the village, 430 m a.s.l. Coll. J. Holub and A. Krahulcová 13. 10. 1995.
4. C Bohemia; distr. Kolín; in the wood 1 km E of the settlement of Hradec between the villages of Stříbrná Skalice and Jevany, 415 m a.s.l. Coll. J. Holub and A. Krahulcová 6. 10. 1995.

All plants studied were tetraploids. This is the first certain report on chromosome numbers relating to this taxon, with respect to the frequent confusion of this species with *R. silesiacus* Weihe in the past. However, there are no old karyological data concerning *R. silesiacus* from Central Europe. Recently, *R. silesiacus* was studied in Poland and reported as tetraploid (Boratyńska 1995b).

A Central European species with a wide distribution, occurring mostly in the eastern part of Central Europe (from Saxony to SW Slovakia, and from Polish Silesia to northernmost parts of Lower Austria). In the Czech Republic dispersed, with some gaps in its distribution, locally more frequent. It is absent in northern, western and southeastern parts of Bohemia. Until recently the species was generally designated by Central European botanists as *R. silesiacus* Weihe.

6. *Rubus clusii* Borbás 2n = 28 (Fig. 1e)
Borbás, Erdész. Lap. 1885:104, 1885.

Localities:

1. C Bohemia; Brdy hills; distr. Příbram; Jince village, by the brook Pstruhový potok in the northwestern part of the village, 385 m a.s.l. Coll. J. Holub 19. 11. 1994.
2. S Bohemia; distr. Jindřichův Hradec; Staňkov village, in the wood Maluškov N of the village, 470 m a.s.l. Coll. J. Holub 29. 9. 1994.
3. S Moravia; distr. Znojmo; Hradiště village near Znojmo town, along the path in the wood 2 km WSW of the village, 360 m a.s.l. Coll. B. Trávníček and J. Holub 19. 9. 1995.

The plants originating from all three localities were tetraploids. The tetraploid chromosome number has also been found in plants from Austria (Polatschek in Gilli 1969), at that time determined as *R. gremlii* Focke. With respect to morphological characters of this material from Austria and present knowledge about the distribution of *R. clusii* and *R. gremlii* (Weber 1995), this first report from Austria can be related to *R. clusii*.

For a long time this species was erroneously identified as *R. gremlii* Focke, which is confined to Bavaria and Switzerland. *R. clusii* occurs in the eastern part of Central Europe, its eastward limit being western Slovakia and western Hungary; the northern limit of its distribution is in the Czech Republic, the southern limit in Slovenia. In the Czech Republic it is locally frequent; the northern limit is in Central Bohemia and Central Moravia; the species is absent in western and northern Bohemia and in northern Moravia.

## Ser. *Radula* (Focke) Focke

7. *Rubus radula* Weihe 2n = 28 (Fig. 1f)
Weihe in Boenninghausen Prodr. Fl. Monast. 152, 1824

Localities:

1. C Bohemia; distr. Mladá Boleslav; Bezděčín village, in the wood SW of the village, 230 m a.s.l. Coll. J. Holub 12. 11. 1994.
2. C Bohemia; distr. Mladá Boleslav; Skorkov village, woods WNW of the village, 220 m a.s.l. Coll. J. Holub 21. 10. 1994.
3. S Moravia; distr. Znojmo; Hradiště village near Znojmo town, along the path in the wood 2 km WSW of the village, 360 m a.s.l. Coll. B. Trávníček and J. Holub 19. 9. 1995.

This tetraploid chromosome number has also been found in plants originating from Scandinavia (Gustafsson 1943), Great Britain (Maude 1939, Heslop-Harrison 1953), Bulgaria (Markova 1968) and Poland (Boratyńska 1994).

A species with a wide distribution occurring from the British Isles to Poland and Romania, and from southern Scandinavia to northern Spain and northern Italy. For its distribution maps see Hultén et Fries (1986:530, no. 1060) and Weber (1995:478). In the Czech Republic it occurs from the lowlands to the submontane belt, the highest known locality being situated in the Krušné hory Mts (Pavlovský Špičák, 680 m a.s.l.).

8. *Rubus salisburgensis* Caflisch 2n = 28
Focke ex Caflisch Excursionsfl. Südostl. Deutschl. 93, 1878

Localities:

1. C Bohemia; distr. Praha-východ; Zvánovice village near Říčany town, in the wood Borka at the north margin of the village, 465 m a.s.l. Coll. J. Holub and A. Krahulcová 11. 7. 1995.
2. C Moravia; distr. Svitavy; Jaroměřice village, at the foothill of Kalvárie hill at the SW margin of the village, ca 390 m a.s.l. Coll. B. Trávníček 19. 10. 1995.
3. S Moravia; distr. Třebíč; along the road in the wood 1 km W of Kladeruby nad Oslavou village, 435 m a.s.l. Coll. J. Holub and B. Trávníček 18. 9. 1995.

The chromosome number of this species is here reported for the first time. All plants were shown to be tetraploids.

A very easily distinguished Central European species with its area of distribution being between Bavaria and Salisburgia in the South and southwestern Poland in the North (here only on the border with the Czech Republic). The greatest part of its distribution lies within the Czech Republic, where its western and eastern limits occur. *R. salisburgensis* is widely dispersed, but with many gaps in its distribution and it is missing in western and northwestern parts of Bohemia. Locality no. 3 (Kladeruby) represents its first known occurrence in southern Moravia (found in 1995); a further isolated locality of *R. salisburgensis* was also found recently in southern Bohemia in the vicinity of Týn nad Vltavou town; these two localities substantially enlarge the knowledge of the distribution of this species and could not have been included in Holub (1995).

## Ser. *Hystrix* Focke

9. *Rubus koehleri* Weihe 2n = 28 (Fig. 1g)
Weihe in Bluff et Fingerhuth Compend. Fl. Germ. 1:681, 1825.

Localities:

1. C Bohemia; distr. Mladá Boleslav; Bezděčín village, in the wood SW of the village, 230 m a.s.l. Coll. J. Holub 12. 11. 1994.
2. C Bohemia; distr. Mladá Boleslav; Předměřice nad Jizerou village, in the wood near "Bonrepos" castle at the settlement Čihadla, SE of the village, 235 m a.s.l. Coll. J. Holub 21. 10. 1994.
3. C Bohemia; distr. Praha-východ; Strašín village near Říčany town, in the wood between the village and the settlement Vojkov, 420 m a.s.l. Coll. J. Holub and A. Krahulcová 6. 10. 1995.

This is probably the first report concerning chromosome numbers in *R. koehleri*. The tetraploid number published by Harrison in Maude (1939) and cited by Löve and Löve (1961) can hardly relate to *R. koehleri* with respect to its distribution area (see below). The report of a pentaploid *R. koehleri* given by Marks (1952) is dubious because of the garden origin of the plants studied.

An easily distinguished Central European species with the main part of its distribution area being in Germany, extending eastwards to Polish southern Silesia and Bohemia. According to present knowledge, the species is unknown from Moravia. In Bohemia, where its occurrence is dispersed, the species is absent in southern and southeastern parts of the land.

10. *Rubus schleicheri* Tratt. 2n = 28 (Fig. 1h)
Weihe ex Trattinick Ros. Monogr. 3:22, 1823.

Localities:

1. C Bohemia; Brdy hills; distr. Příbram; Strašice village, damp wood E of the village, 505 m a.s.l. Coll. J. Holub 27. 10. 1994.
2. C Bohemia; distr. Příbram; in the wood between the villages Křešín and Felbabka, ca 5 km SE of Hořovice town, 465 m a.s.l. Coll. J. Holub 19. 11. 1994.
3. C Bohemia; distr. Mladá Boleslav; Brodce nad Jizerou village, in the wood Strašnovský les N of the village, 250 m a.s.l. Coll. J. Holub 12. 11. 1994.

All plants studied were tetraploids. The tetraploid level in this species was reported by Gustafsson (1943), using Maude's data from Great Britain. As *R. schleicheri* does not occur in the British Isles, this report most probably refers to another bramble. Boratyńska (1995b) presents the same chromosome number for material from Poland.

A Central European species with the main part of its distribution being in Germany, extending eastwards to western Polish Silesia and Bohemia. According to present knowledge, the species is absent from Moravia. In Bohemia, where the species reaches the eastern limit of its distribution, *R. schleicheri* is dispersed but locally frequent. The map of its distribution area is given in Weber (1995:584, state 1992), where the limit of its occurrence in Bohemia lies to the north of the data given in Holub (1995:168).

11. *Rubus apricus* Wimmer 2n = 28
Wimmer, Jahresber. Schles. Ges. Vaterl. Cult. 33:87, 1856.

Localities:

1. C Bohemia; distr. Kolín; in the wood 1 km E of the settlement of Hradec between the villages of Stříbrná Skalice and Jevany, ca 415 m a.s.l. Coll. J. Holub and A. Krahulcová 6. 10. 1995.
2. C Bohemia; distr. Benešov; in the wood 1 km W of Radošovice village, ca 4 km NW of Vlašim town, 450 m a.s.l. Coll. J. Holub and A. Krahulcová 6. 10. 1995.
3. S Bohemia; distr. Písek; between the villages Hosty and Doubrava near Týn nad Vltavou town, Kamenný vrch hill, 475 m a.s.l. Coll. J. Holub 9. 9. 1994.
4. S Moravia; distr. Znojmo; Vranov nad Dyjí village, in the woods Braitava S of the village, 430 m a.s.l. Coll. B. Trávníček and J. Holub 19. 9. 1995.

The same chromosome number (i.e. tetraploid level) was recently found in this species in Poland (Boratyńska 1995a), from where the species was described.

A Central European species occurring mostly in Germany, Poland and the Czech Republic (from the Harz Mts and northern Bavaria to Moravia and from western Polish Silesia to northernmost Lower Austria). In the Czech Republic dispersed; according to present knowledge both the northern and southern limits of its distribution are partly situated in this country.

## Ser. *Glandulosi* (Wimmer et Grab.) Focke

12. *Rubus moschus* Juz. 2n = 14 (Fig. 1i)
Juzepczuk, Tr. Prikl. Bot. Selekc. 14/3:163, 1925.

Locality:

1. C Bohemia; distr. Praha-západ; Průhonice village, in the area of the castle park (in the part "Chotobuz"), 300 m a.s.l. Coll. J. Holub and A. Krahulcová 7. 4. 1995.

This diploid species is autochthonous in the Caucasus. It is sometimes cultivated in parks (also under the name *R. platyphyllos* hort., non C. Koch) and is occasionally naturalized there. The diploid chromosome number was also presented by Rozanova (1938) under the name *R. caucasicus* Focke. For the illustration of the stem leaf of this species see Holub (1995: 181).

Sect. *Corylifolii* Lindley

## Ser. *Suberectigeni* H. E. Weber

13. *Rubus orthostachys* G. Braun 2n = 28 (Fig. 2c)
G. Braun Herb. Rub. Germ., fasc. 10, Übersicht, 1881.

Localities:

1. C Moravia; distr. Kroměříž; Chropyně town, along the railway in the wood Rasina, 1.5 km NE of the railway station, 190 m a.s.l. Coll. B. Trávníček 29. 10. 1995.
2. C Moravia; Chřiby hills; distr. Kroměříž; Kostelany village, 2 km E of the village, 370 m a.s.l. Coll. B. Trávníček 22. 9. 1995.
3. E Moravia; distr. Zlín; Jasenná village, 0.5 km NE of Sirákov settlement, 490 m a.s.l. Coll. B. Trávníček 26. 10. 1995.

Our finding confirms the tetraploid level in *R. orthostachys*, reported recently by Boratyńska (1994) from two localities in Poland.

A Central European species with a wide distribution area. In the Czech Republic rare in Bohemia and more frequent in Moravia. All material studied here originates from Moravia. The map of its distribution is given by Weber (1995:533, state 1992), where its occurrence in the Czech Republic has to be complemented by the data from Holub (1995) and further new localities found in this country during the period 1994–1996.

## Ser. *Sepincoli* (Focke) E. H. L. Krause

14. *Rubus hadracanthos* G. Braun 2n = 28

G. Braun Herb. Rub. Germ., Übersicht, 1881 ["hadroacanthos"].

Locality:

1. C Bohemia; distr. Příbram; Felbabka village 4 km SE of Hořovice town, at the E edge of the wood, W of the village, 440 m a.s.l. Coll. J. Holub and A. Krahulcová 27. 10. 1995.

The tetraploid chromosome number found in *R. hadracanthos* is presented here for the first time.

A species confined to the western part of Central Europe, with the main part of its distribution being in Germany. Its occurrence in Bohemia is isolated and the species is known there only from three localities situated fairly close to one another in the western part of Central Bohemia. The locality, from where the studied material originated, was found by Professor H. E. Weber during a symposium excursion (Apomixis and Taxonomy) in 1995. This locality is the richest known place for the occurrence of brambles in the Czech Republic (25 species within the area of 200 × 30 m).

15. *Rubus franconicus* H. E. Weber 2n = 28 (Fig. 2d)

H. E. Weber, Ber. Bayer. Bot. Ges. 50: 6, 1979.

Localities:

1. C Bohemia; distr. Mladá Boleslav; Bezděčín village, in the wood SW of the village, 230 m a.s.l. Coll. J. Holub 12. 11. 1994.
2. C Bohemia; distr. Praha (Prague); the N edge of the capital, in the E part of Čimický háj wood, 320 m a.s.l. Coll. J. Holub 29. 10. 1994.
3. S Bohemia; distr. Tábor; Sudoměřice village near Bechyně town, along the way 1 km W of the village, 430 m a.s.l. Coll. J. Holub 9. 9. 1994.

No information was known previously about the chromosome number in *R. franconicus*. This species appears to be tetraploid as are most representatives of the section *Corylifolii*.

A Central European species reaching the eastern limit of its distribution in Bohemia in the Czech Republic. In Moravia the species is surprisingly absent (or unknown at present?). In some regions of Bohemia it is one of the most common brambles (usually with *R. dollnensis* in first places of representation). The species was described by H. E. Weber relatively recently – in 1979; prior to then it was completely omitted. The eastern limit of its distribution in the Czech Republic is given by Holub (1995: 188).

16. *Rubus wessbergii* Pedersen et Walsemann 2n = 28
A. Pedersen et Walsemann, Flora & Fauna (Copenhagen) 93:3, 1987.

Locality:

1. C Bohemia; distr. Mělník, along the track in the river port in the town of Mělník, 155 m a.s.l. Coll. J. Holub and A. Krahulcová 3. 11. 1995.

This is the first report concerning chromosome numbers in *R. wessbergii*. The plant studied is tetraploid.

A recently described species from Denmark and Slesvig, known mostly from the northern half of Germany, extending southwards to Saxony and now to Bohemia. In the Czech Republic the species was found by the second author in 3–4 localities in the northwestern quadrant of Bohemia in 1994–1995 but not yet published: it is therefore absent in the monographic study of brambles in the Flora of the Czech Republic (Holub 1995). The material was determined by Professor H. E. Weber. The locality in the river port of Mělník is the southernmost site of the known distribution of this species.

## Ser. *Subcanescentes* H. E. Weber

17. *Rubus fasciculatus* P. J. Mueller 2n = 28
P. J. Mueller, Flora 41:182, 1858.

Localities:

1. C Bohemia; distr. Mladá Boleslav; Písková Lhota village, 230 m a.s.l. Coll. J. Holub 12. 11. 1994.
2. C Bohemia; distr. Benešov; the E edge of Měřín village, 1 km E of Slapská přehrada reservoir, 350 m a.s.l. Coll. J. Holub 5. 11. 1994.
3. N Moravia; distr. Prostějov; in the disused quarry 1.3 km WNW of Želeč village, 260 m a.s.l. Coll. B. Trávníček VIII. 1995.
4. N Moravia; distr. Kroměříž; Nětčice village, at the edge of the wood by the army building, 1.4 km NEN of the village, 300 m a.s.l. Coll. B. Trávníček 28. 10. 1995.

The tetraploid chromosome number (2n = 28) was reported by Gustafsson (1943) in five collections of this taxon from Scandinavia (under the name *R. ambifarius* P. J. Mueller). In addition to this, one pentaploid (2n = 35) and one hexaploid (2n = 42) counts were presented from Scandinavia by the same author. Our plants, from all four localities, proved to be tetraploids only.

A Central European species with a wide distribution. In the Czech Republic it occurs dispersed mostly in warmer regions at lower altitudes. The distribution map is given by Weber (1995: 570, state 1992), but many new localities found more recently in the Czech Republic have to be added. They are partially given in Holub (1995).

18. *Rubus mollis* J. Presl et C. Presl 2n = 28
J. Presl et C. Presl Del. Prag. 1:218, 1822.

Localities:

1. C Bohemia; Brdy hills; distr. Příbram; the former village Zadní Zaběhla near the former village of Padrť in the military area, 660 m a.s.l. Coll. J. Holub 27. 10. 1994.
2. S Bohemia; distr. Tábor; along the road between the villages of Tučapy and Dírná near Nová Ves village, 465 m a.s.l. Coll. J. Holub 29. 9. 1994.

3. S Moravia; distr. Znojmo; between the villages of Střelice and Rozkoš, at the edge of the wood along the road, 390 m a.s.l. Coll. B. Trávníček and J. Holub 20. 9. 1995.

*R. mollis* was found to be tetraploid. No information, concerning the chromosome number in this species, was known previously.

A species with a wide distribution in Central Europe. In the Czech Republic, where it occurs principally in Bohemia (with the exception of its northeastern part), it is one of the most frequent representatives of the section *Corylifolii*. In Moravia it occurs more rarely, and it is confined to the western part where it perhaps reaches the eastern limit of its total distribution: locality no. 3 (Střelice) of the studied material lies just on this border. The species was described from the territory of Bohemia (vicinity of Tučapy village near Tábor town in southern Bohemia). Material from locality no. 2 originates from the area of the type locality of *R. mollis*.

## Ser. *Hystricopses* H. E. Weber

19. *Rubus dollnensis* Spribille 2n = 35 (Fig. 1j)
Spribille Verh. Bot. Ver. Prov. Brandenburg 42:170, 1900.

Localities:

1. C Bohemia; distr. Mladá Boleslav; Bezděčín village, in the wood SW of the village, 230 m a.s.l. Coll. J. Holub 12.11.1994.
2. C Bohemia; distr. Praha (Prague); the N edge of the capital, in the wood "Čimický háj" (eastern part), ca 320 m a.s.l. Coll. J. Holub 29.10.1994.
3. C Bohemia; distr. Kolín; in the wood 1 km E of the settlement of Hradec between the villages of Stříbrná Skalice and Jevany, ca 415 m a.s.l. Coll. J. Holub and A. Krahulcová 6.10.1995.
4. C Bohemia; distr. Benešov; Třemošnice village, along the road in the wood 0.5 km S of the village, 410 m a.s.l. Coll. J. Holub and A. Krahulcová 6.10.1995.
5. S Bohemia; distr. Tábor; Dráchov village, N margin of the wood Karvánky between the village and the railway station Řípec, 405 m a.s.l. Coll. J. Holub 27.9.1994.
6. S Moravia; distr. Žďár nad Sázavou; Košíkov village near Velká Bíteš town, at the N margin of the wood along the road 1 km W of the village, 535 m a.s.l. Coll. J. Holub 18.9.1995.
7. C Moravia; distr. Blansko; Šebetov village, at the woodland path 1.3 km ENE of the village, 570 m a.s.l. Coll. B. Trávníček 19.10.1995.
8. N Moravia; distr. Frýdek-Místek; Třinec town, at the margin of the wood in the protected area Jahodná 2 km ESE of the railway station, 410 m a.s.l. Coll. B. Trávníček 5.10.1995.

Plants from all eight localities studied had the pentaploid chromosome number (2n = 35). This is the first finding of this ploidy level in *R. dollnensis*. In contrast, examination of plants from two localities in SW Poland revealed tetraploids in both cases (Boratyńska 1994).

A Central European species occurring in the eastern part of Central Europe, in Germany (more eastern territories), Poland (especially in Silesia), the Czech Republic and Austria (only on the border along the Thaya river in Lower Austria close to Moravia). In the Czech Republic one of the most frequently occurring species of *Rubus*. Somewhat rare in western and northern Bohemia. It often occurs in secondary habitats or in areas subject to human disturbance (especially along roads and ways). The pentaploid chromosome number, found in our plants and documented in material from a great number of localities, is rare in the section *Corylifolii*, where tetraploid species dominate.

Sect. *Caesii* Lej. et Court.

20. *Rubus caesius* L. 2n = 28
Linnaeus Sp. Pl. 706, 1753.

Localities:

1. C Bohemia; Brdy hills; distr. Příbram; former village of Kolvín in the military area, 670 m a.s.l. Coll. J. Holub 27. 10. 1994.
2. C Bohemia; distr. Benešov; in the wood between Mžížovice and Bělčice villages, 465 m a.s.l. Coll. J. Holub and A. Krahulcová 13. 10. 1995.
3. C Bohemia; distr. Kolín; at the road in the centre of Stříbrná Skalice village, 300 m a.s.l. Coll. J. Holub and A. Krahulcová 6. 10. 1995.
4. N Moravia; distr. Kroměříž; Kojetín town, along the railway 1.3 km WSW of the railway station, 190 m a.s.l. Coll. B. Trávníček 29. 10. 1995.

The same tetraploid level has been found several times in plants from various places throughout parts of the wide area of distribution of this species in Europe (e.g. Gustafsson 1943), recently being confirmed from Poland (Czapik 1978, Boratyńska 1995a).

A very widely distributed species extending from the British Isles to the Altai Mts and Central Asia mountain ranges (for distribution map see e.g. Jäger in Weber 1995:565). In the Czech Republic it occurs in the whole territory, although its distribution is uneven. Sporadically it extends into the mountains (Krkonoše Mts – 900 m a.s.l., Hrubý Jeseník Mts – 1330 m a.s.l.).

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## Souhrn

Tato práce je prvním příspěvkem z plánované série, zabývající se studiem chromozómových počtů rodu *Rubus* v České republice. Tato taxonomická skupina (zvláště pak podrod *Rubus*) se vyznačuje neúplnou apomixí a značným stupněm hybridizace a patří k taxonomicky nejkritičtějším ve střední Evropě. V rodu *Rubus* je známo několik úrovní ploidie (od diploidů po oktoploidy), tetraploidi jsou zastoupeni nejčastěji. Stupeň ploidie přitom ovlivňuje (jako jeden z faktorů) reprodukční systém, tj. míru sexuality, resp. apomixe.

Sdělení přináší údaje o chromozómových počtech 20 druhů podrodu *Rubus*, pocházejících z 65 lokalit rozmístěných na území Čech a Moravy. Ve studovaném souboru bylo zjištěno šestnáct tetraploidních druhů (2n = 28), dva diploidní (2n = 14), jeden triploidní (2n = 21) a jeden pentaploidní (2n = 35). Chromozómový počet je zde uveden poprvé pro následujících sedm tetraploidních druhů: *R. sabanimontanus* Figert, *R. salisburgensis* Caflisch, *R. koehleri* Weihe, *R. hadracanthos* G. Braun, *R. franconicus* H. E. Weber, *R. wessbegii* Pedersen et Walsemann a *R. mollis* J. Presl et C. Presl. Pro *R. dollnensis* Spribille byl zjištěn nový pentaploidní chromozómový počet (2n = 35), a to u rostlin pocházejících ze všech osmi studovaných lokalit. Toto zjištění se liší od jediného dosud známého údaje z Polska, odkud byl publikován tetraploidní *R. dollnensis* ze dvou lokalit. U zbývajících 12 druhů byl potvrzen chromozómový počet uváděný již dříve z jiných částí jejich areálů.

Chromozómové počty jsou doplněny stručnými údaji o rozšíření jednotlivých druhů. Podle současných znalostí prochází hranice rozšíření sedmi druhů zde zpracovaných územím České republiky (*R. canescens*, *R. clusii*, *R. koehleri*, *R. schleicheri*, *R. apricus*, *R. franconicus*, *R. mollis*), *R. hadracanthos* a *R. wessbergii*

se v ČR vyskytují na izolovaných lokalitách. Z tohoto hlediska může být tato práce přínosem k obecnější problematice proměnlivosti na okrajích areálu. *R. wessbergii* je zde uveden jako nový druh pro flóru České republiky, další tři taxony zde studované karyologicky byly dříve popsány právě z území ČR: *R. gracilis*, *R. mollis a R. montanus* var. *macromontanus*.

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