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Chromosome numbers of several interesting taxa of the flora of Slovakia

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Commented information about the chromosome numbers of twenty-six taxa of the flora of Slovakia is presented. Fourteen of them (*Arenaria patula, Dianthus* × *helwigii, Elaeagnus angustifolia, Galium boreale* agg., *Morus rubra, Onosma visianii, Poa bulbosa* subsp. *vivipara, Plantago stepposa, Polygala major, Sempervivum marmoreum* agg., *Senecio doria, Silene vulgaris* subsp. *antelopum, Stratiotes aloides, Xanthoxalis corniculata*) were analysed for the first time from the territory of Slovakia and the analyses of twelve of them (*Arenaria serpyllifolia, Commelina communis, Echium maculatum, Lactuca viminea, Molinia litoralis, Persicaria maculosa, Sempervivum montanum* subsp. *heterophyllum, Senecio paludosus* var. *tomentosus, Senecio jacobaea, Scilla buekkensis, Scilla kladnii, Thlaspi improperum*) are repeated ones. Some results should have taxonomical consequences.

Key words: chromosome numbers, vascular plants, Carpathians, Slovakia.

Introduction

Ten years ago the Karyotaxonomical survey of the flora of Slovakia was published (MÁJOVSKÝ et al., 1987). The analyses of chromosome numbers of the majority of the flora of Slovakia from various phytogeographical districts are included in this book. The missing analyses and the analyses of taxonomically or karyologically problematic species are continually supplemented. This is the case of the analyses presented in the present paper. Fourteen taxa are analysed in this study for the first time from the territory of Slovakia, one of them (*Dianthus* × *helwigii*) for the first time for the whole area of this taxon. The analyses of four of them (*Morus rubra, Polygala major, Plantago stepposa, Stratiotes aloides*) represent the second chromosome numbers of these species for their distribution area. The discovery of the tetraploid chromosome number in the *Sempervivum marmoreum* agg. from the northern part of its distribution area, together with morphological differences, indicate the need for taxonomical consequences. The chromosome numbers of remaining twelve taxa were confirmed or precised.

Material and methods

The chromosome numbers were counted from the c-mitotic figures that were prepared from primary meristems of root-tips from mature plants or germinating seeds, using the squash method. The root-tips were pretreated (2–3 hours) with a saturated aqueous solution of p-dichlorbenzene (or 0.002 M hydroxychinoline – *Sempervivum*), then fixed (10 min. – 24 h.) in a freshly prepared mixture of 96% ethanol and acetic acid (3:1), stored in 75% ethanol, hydrolysed in mixture HCl and ethanol (1:1), washed in water, then squashed and stained with propionic orcein (material of *Sempervivum* with Giemsa after the short freezing

and drying). Voucher specimens are deposited in the herbarium of the Department of Botany of the Comenius University (SLO), samples of *Sempervivum* are in addition still in cultivation. Nomenclature of the taxa mostly follows MÁJOVSKÝ et al. (1987).

Results and discussion

Arenaria patula MARTRIN-DONOS
Loc.: Východoslovenská nížina Lowlands, Tarbucka Hill, coll. MÁJOVSKÝ.
2n=40 UHRÍKOVÁ
Loc.: Východoslovenská nížina Lowlands, Kráľovský Chlmec, Vysoká Hill, coll. MÁJOVSKÝ.
2n=40 UHRÍKOVÁ

This taxon from the *Arenaria serpyllifolia* group is mostly not accepted as a separate species and is usually treated as *A. serpyllifolia* var. *patula* (MARTRIN-DONOS) ROUY & FOUCAULT. Also DVOŘÁK & DADÁKOVÁ (1980) published analyses of its chromosome number from the Czech Republic under this name in the rank of variety. But later, it was accepted at the species level (cf. DVOŘÁK 1984, 1990).

The results of our analyses confirmed for this taxon the same chromosome number as in case of *A. serpyllifolia* s.str. It is the main reason why a hybridization between both species, manifested in the intermediate morphotypes, is possible (cf. DVOŘÁK, 1990: 116).

Arenaria serpyllifolia L.
Loc.: Podunajská nížina Lowlands, Bratislava – Petržalka, Draždiak, coll. MÁJOVSKÝ.
2n=40 UHRÍKOVÁ
Loc.: Podunajská nížina Lowlands, Bratislava – Petržalka, Dostihová dráha, coll. MÁJOVSKÝ.
2n=40 UHRÍKOVÁ
Loc.: Podunajská nížina Lowlands, between the villages Hroboňovo and Boheľov, coll. MÁJOVSKÝ.
2n=40 UHRÍKOVÁ

The results of our analyses supported an opinion that all Slovak populations of *A. serpyllifolia* are tetraploids which also holds for the whole Europe (cf. MÁJOVSKÝ et al., 1987). Diploids published for this species e.g. by KLIPHUIS & WIEFFERING (1979) and NATARAJAN (1981) certainly do not belong to *A. serpyllifolia* s.str.

Commelina communis L.
Loc.: Biele Karpaty Mts, Priepasné, coll. FERÁKOVÁ
2n=90 UHRÍKOVÁ

This neophyte originally coming from eastern Asia is characterized by its great karyological variability ranging from tetraploids and various aneuploids to dekaploids (cf. MÁJOVSKÝ et al., 1987). Also this second analysis from the territory of Slovakia [the first one was: 2n=90, Podunajská nížina Lowlands, Bratislava, coll. FERÁKOVÁ (MURÍN & FERÁKOVÁ, 1978)] represents dekaploid cytotype. However, because of the great karyological variability of this taxon in its whole area, further cytological study is needed to ascertain whether also the other cytotypes of different origin were introduced to Slovakia.

Dianthus × *helwigii* ASCH. (*Dianthus armeria* L. × *D. deltoides* L.)
Loc.: Slovenský kras Karst, Silická Brezová, coll. MÁJOVSKÝ & KARASOVÁ.
2n=30 UHRÍKOVÁ

This is the first chromosome number report for this hybrid. The plant analysed was diploid similarly as its parental species – *D. armeria* and *D. deltoides* (cf. MÁJOVSKÝ et al., 1987).

Echium maculatum L. = *Echium russicum* J. F. GMEL.
Loc.: Slovenský kras Karst, Domické škrapy, coll. KARASOVÁ.
2n=24 UHRÍKOVÁ

The first chromosome number report for this species from Slovakia is based on the analysis from eastern Slovakia [2n=24, Východoslovenská nížina Lowlands, Viničky, coll. MÁJOVSKÝ (HINDÁKOVÁ, 1970)]. Our second analysis confirmed the occurrence of tetraploids in this part of Slovakia as well as in the east Pannonian area (cf. PÓLYA, 1950 – Hungary) and Bulgaria (MARKOVA, 1983). The same chromosome number is reported also by LITARDIÉRE (1943) and CHUKSANOVA (1969). The plants of an unknown origin (from botanical garden) were analysed as diploids (2n=12, FRITSCH, 1973).

The name used for this taxon follows GUTERMANN & JUSTIN (1993).

Eleagnus angustifolia L.
Loc.: Devínska Kobyla Hills, Devín, cultivated tree, coll. FERÁKOVÁ.
2n=28 UHRÍKOVÁ

The result of our first analysis of this cultivated Mediterranean species agrees with the previous analyses of the other authors from the different territories (cf. MÁJOVSKÝ et al., 1987).

Galium boreale agg.
Loc.: Záhorská nížina Lowlands, Vysoká pri Morave, coll. MÁJOVSKÝ.

2n=44 UHRÍKOVÁ

Analysed material from the above mentioned meadow locality belongs to the aggregate taxon *G. boreale*. We have detected tetraploid chromosome number.

Lactuca viminea (L.) J. PRESL et C. PRESL
Loc.: Podunajská nížina Lowlands, Bratislava, rocks under the building of the Parliament above the Žižkova Street, coll. MÁJOVSKÝ.
2n=18 UHRÍKOVÁ

The present analysis agrees with the only previous report for the area of Slovakia [2n=18, Považský Inovec Mts, Jalšové, coll. FERÁKOVÁ (FERÁKOVÁ, 1970)]. The assumption of the only ploidy level (diploidy) in the whole distribution area of this taxon is supported (cf. MÁJOVSKÝ et al., 1987).

Molinia litoralis HOST
Loc.: Strážovské vrchy Mts, Rokoš, coll. MAGIC.
2n= 90 UHRÍKOVÁ

Our analysis represents the second report agreeing with the previous one from the same phytogeographical district [2n=90, Strážovské vrchy Mts, Ostrá Malenica, coll. MIČIETA (MIČIETA, 1986)]. The same chromosome number is reported also from the other parts of the species range (cf. MÁJOVSKÝ et al., 1987).

Morus rubra L.
Loc.: Východoslovenská nížina Lowlands, Ladmovce, cultivated tree, coll. MÁJOVSKÝ.
2n=28 UHRÍKOVÁ

M. rubra is the Northern-American species rarely cultivated also in Slovakia. The only previous report (2n=28, JANAKI AMMAL, 1948) was confirmed by our analysis.

Onosma visianii CLEMENTI
Loc.: Slovenský kras Karst, Drieňovec, coll. KARASOVÁ.
2n=18 UHRÍKOVÁ
Loc.: Slovenský kras Karst, Turniansky hrad Castle Hill, coll. KARASOVÁ.
2n=18 UHRÍKOVÁ

These first reports for the area of Slovakia agree with the data of GRAU (1971) and TEPPNER (1971) from Austria.

Persicaria maculosa GRAY
Loc.: Záhorská nížina Lowlands, Skalica, Zlatnícka dolina Valley, coll. ZÁBORSKÝ.
2n=40 UHRÍKOVÁ

The tetraploid population was reported from the Podunajská nížina Lowlands [2n=40, Podunajská nížina Lowlands, Bratislava – Rusovce, coll. MÁJOVSKÝ (UHRÍKOVÁ, 1978)]. It is interesting that in the neighbouring Záhorská nížina Lowlands we have found diploids. For this taxon the chromosome numbers 2n=22, 40, 44 were reported (cf. MÁJOVSKÝ et al., 1987). A more detailed study of this species complex is necessary.

Poa bulbosa subsp. *vivipara* (KOELER) ARCANG.
Loc.: Malé Karpaty Mts, Plavecké Podhradie, on the path to the Plavecký hrad Castle, coll. MÁJOVSKÝ.
2n=28 UHRÍKOVÁ

This is the first chromosome number report for this taxon from Slovakia. For this taxonomically and karyologically interesting taxon the numbers 2n=28, 42 were reported from the Daghestan (SOKOLOVSKAYA & PROBATOVA, 1979). From Turkmenia the number 2n=56 was reported (CHOPAKOV & YURTSEV, 1976).

The subspecies distinguished within *P. bulbosa* have unclear taxonomic status and the chromosome numbers reported are very variable, depending on the regional origin of the material analysed. Therefore this karyotaxonomical problem could be solved with the comparative analyses of material from the whole area of this taxon.

Plantago stepposa KUPRIAN.
≡ *Plantago media* subsp. *stepposa* (KUPRIAN.) SOÓ
Loc.: Strážovské vrchy Mts, Bojnice, coll. MÁJOVSKÝ.
2n=24 UHRÍKOVÁ

This is the first chromosome number report for this taxon from Slovakia, which is sometime included in the synonymy of *P. media* L. (cf. KMEŤOVÁ, 1997). We have detected tetraploids (2n=24) similarly as ZEMSKOVA (1977). Diploids (2n=12) are reported by BORHIDI (1968), BASSET (1969), LÖVE & LÖVE (1982) and LÖVE & KJELLQVIST (1974).

The further analyses and the comparative studies are necessary.

Polygala major JACQ.
Loc.: Slovenský kras Karst, Silická ľadnica, Vysoká, coll. KARASOVÁ.
2n=34 UHRÍKOVÁ

This is the first chromosome number report for this species from the area of Slovakia, which differs from the only previous report for this taxon (2n=32, MATTICK, 1950).

Scilla buekkensis SPETA
Loc.: Slovenský kras Karst, Koniarska planina Plateau, E of Plešivec, coll. KARASOVÁ.
2n=36 UHRÍKOVÁ

This is the second analysis indicating tetraploids in the Slovenský kras Karst, which agrees with the first report for this taxon for the same area [2n=36, Slovenský kras Karst, Plešivská planina, Dulova chata, coll. MÁJOVSKÝ (VÁCHOVÁ, 1987)]. Tetraploids are reported also from southwestern Slovakia [2n=36, Tríbeč Mts, Mt. Žibrica, coll. MÁJOVSKÝ (VÁCHOVÁ & MÁJOVSKÝ, unpubl.)]. The analyses of hexaploids (2n=54) from the Malé Karpaty Mts (VÁCHOVÁ, 1987), published under the name *S. buekkensis*, belong to another, still undescribed taxon (MÁJOVSKÝ in prep.).

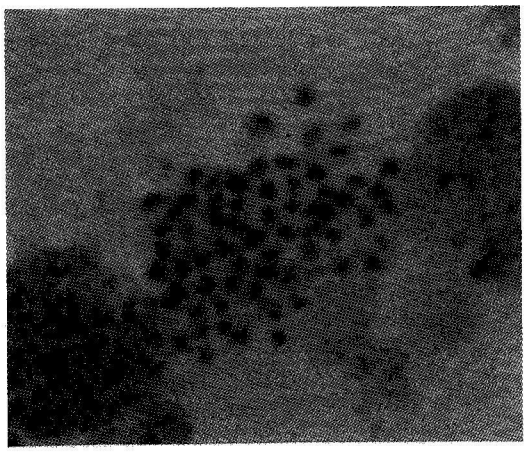
Scilla kladnii SCHUR
Loc.: Slovenský kras Karst, Brzotín, oak woods at the way to Vajkút, coll. KARASOVÁ.
2n=18 UHRÍKOVÁ

Our analysis confirmed the occurrence of diploids from *S. bifolia* agg. in the Slovenský kras Karst and adjacent areas.

Sempervivum marmoreum agg.
Sempervivum matricum LETZ, nom. prov.
– *Sempervivum assimile* auct. non SCHOTT
Loc.: Ipeľsko-rimavská brázda Mts, Cerová vrchovina Mts, Mt. Tilie, basalt rocks, coll. LETZ.
2n=68 LETZ & BOŞCAIU

The distribution area of the *S. marmoreum* agg. extends from the Balkan peninsula northwards to southern Slovakia. Its northern border of distribution leads there through the phytogeographical districts of Matricum: Burda (Kováčovské kopce Hills), Ipeľsko-rimavská brázda Mts and Slovenský kras Karst. *S. marmoreum* GRISEB. was originally described from the peninsula Athos (Greece), from an uppermost part of the Holy Mount Athos (cf. GRISEBACH, 1843). According to the original description, this name is based on the plants with the glabrous rosette leaves.

Only few chromosome number reports for *S. marmoreum* were published. The first report is based on the analysis of cultivated plants of an unknown origin [n=17, ut *S. schlehanii* SCHOTT (UHL, 1961)]. The second report is published also without locality [2n=34 (ZÉSIGER, 1982)]. The same chromosome number (2n=34) is reported also for several Balkan microspecies from the *S. marmoreum* agg.: *S. octopodes* TURRILL, *S. macedonicum* PRAEGER, *S. erythraeum* VELEN., and *S. ballsii* WALE (cf. FAVARGER & ZÉSIGER, 1964).



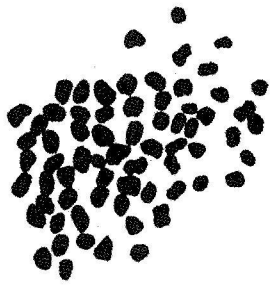


Fig. 1. Somatic metaphase in the root-tip of *Sempervivum matricum*. 2n=68, Cerová vrchovina Mts, Mt. Tilič.

Our analysed material belongs to tetraploids (2n=68 – see Fig. 1), for which we provisionally adopt the name *S. matricum* LETZ, nom. prov. *S. matricum* represents a special morphotype with the rosette leaves puberulous on the surfaces. The plants with the hairy rosette leaves are known also from the Balkan peninsula (e.g. *S. erythraeum* VELEN.; *S. reginae-amaliae* HELDR. & GUICC. ex HALÁCSY, nom. illeg.), but their indumentum is qualitatively different (densely pubescent, with very short hairs). *S. matricum* is distributed in the lower altitudes on limestone, andesite or basalt rocks in southern Slovakia, Hungary, Carpathorussia (the Ukraine) and partly also in Transylvania (Romania), where it is southwards substituted by a morphotype with the glabrous rosette leaves (*S. marmoreum* s. str.).

For a definitive conclusion, S. matricum and also the other morphotypes should be karyologically and morphologically analysed from further localities. A detailed analysis of the living material from Mt. Athos (locus classicus of S. marmoreum GRISEB.) is also very important.

Sempervivum montanum subsp. *heterophyllum* (HAZSL.) JÁV. ex SOÓ
– *Sempervivum montanum* subsp. *carpathicum* auct. non WETTST. ex BERGER
Loc.: Slovenské stredohorie Mts, Kremnické vrchy Mts, andesite rocks above Stará Kremnička, coll. LETZ & MARHOLD.
2n=42 LETZ & BOŞCAIU

This endemic taxon of the West Carpathians grows on the effusive (mainly andesite) rocks in the phytogeographical districts of Slovenské stredohorie, Slovenské rudohorie and Slánske vrchy Mts and on the granitic rocks of the Krivánska Malá Fatra Mts, in the altitudes between ca. 200 and 1300 m. Its very problematic nomenclature (cf. LETZ, 1998) and till now unclear taxonomic status is under intensive study.

The result of the analysis agrees with the count stated in both editions of the Flora Europaea (cf. FAVARGER & ZÉSIGER, 1964; PARNELL & FAVARGER, 1993 – ut *S. montanum* subsp. *carpaticum*). However, this count was published without an information about the origin of the material analysed. According to FAVARGER (pers. comm.), the published number (2n=42) is based on two unpublished analyses of ZÉSIGER: 2n=42 (1, Kremnické hory Mts, coll. CHMELAO (ZÉSIGER, unpubl.); 2n=42, Poľana Mts, coll. CHMELAO (ZÉSIGER, unpubl.). Our analysis confirmed for *S. montanum* subsp. *heterophyllum* the same diploid chromosome number (2n=42) as reported for the nominate subspecies described from Switzerland Alps (*S. montanum* L. subsp. *montanum*) as well as for the material from the alpine belt of the Carpathians – the Tatry Mts (*S. montanum* subsp. *montanum* auct. non L.) – cf. ZÉSIGER, 1961.

Tetraploids from *S. montanum* group are known only from the Austrian Eastern Alps (distributed eastwards of Mt. Großglockner). They are treated as separate taxon – *S. montanum* subsp. *stiriacum* (WETTST.) WETTST. ex HAYEK or *S. stiriacum* WETTST. The hypothesis that plants from the Carpathians could belong to this tetraploid taxon (PARNELL, 1988) is clearly incorrect.

Senecio doria L.
Loc.: Podunajská nížina Lowlands, Gbelce, Parížske močiare, coll. MAGIC.
2n=40 UHRÍKOVÁ

This first chromosome number report from Slovakia represents tetraploids and agrees with the previous reports from abroad (cf. MÁJOVSKÝ et al., 1987).

Senecio jacobea L.
Loc.: Podunajská nížina Lowlands, Bratislava – Petržalka, coll. MÁJOVSKÝ.
2n=40 UHRÍKOVÁ

The present analysis agrees with one previous report from Slovakia [2n=40, Devínska Kobyla Hills, Devín, coll. FERÁKOVÁ (MURÍN, 1986)] and also with the majority of reports from abroad (cf. MÁJOVSKÝ et al., 1987). However, from Slovakia also two reports of octoploids are known [2n=80, Slovenský kras Karst, Turňa nad Bodvou, coll. MÁJOVSKÝ (MURÍN & VÁCHOVÁ, 1970); 2n=80, Záhorská nížina Lowlands, Plavecký Štvrtok, coll. MURÍN & MÁJOVSKÝ (MURÍN, 1986)].

This very variable species is worthy of a taxonomic attention.

Senecio paludosus var. *tomentosus* (HOST) W. D. J. KOCH
≡*Senecio tomentosus* HOST
= *Senecio paludosus* subsp. *angustifolius* HOLUB
Loc.: Slovenský kras Karst, Silická Brezová, coll. KARASOVÁ.
2n=40 UHRÍKOVÁ

This taxon was already analysed from Slovakia [2n=40, Podunajská nížina Lowlands, Gabčíkovo, coll. FERÁKOVÁ (VÁCHOVÁ, 1974)]. Our second analysis confirmed the presence of tetraploid populations in Slovakia. No other reports for this taxon have been known yet.

Silene vulgaris subsp. *antelopum* sensu ŠOURKOVÁ 1990 an (VEST) HAYEK ?
≡*Cucubalus antelopum* sensu ŠOURKOVÁ an VEST ?
≡*Oberna antelopum* sensu ŠOURKOVÁ an VEST ?
Loc.: Podunajská nížina Lowlands, Bratislava – Petržalka, SW of the bridge Lafranconi, margin of *Ulmo-Fraxinetum*, on the higher gravel terrace, coll. MÁJOVSKÝ.
2n=24 UHRÍKOVÁ

The seeds for our analysis were collected from tall individuals with the strong rhizomes and the glaucous leaves with distinct cartilaginous, minutely indented him. Similar morphotypes (plants more than 1,5 m tall) have been known also from eastern Slovakia. Such plants, which have not been karyologically analysed yet, are named according to ŠOURKOVÁ (1990) as *Oberna antelopum* VEST. She refers this taxon to xerotherm woods (*Carpinion, Quercion pubescenti-petreae*) in Czechia, Slovakia, Austria, Hungary, former Yugoslavia and with certain probability also in Carpathorussia (the Ukraine) and Romania. However, the Austrian authors (cf. ADLER,

1994b) report this taxon as unclear subspecies from "Hochstaudenfluren, feuchte lichte Wälder; montan bis subalpin" [tall-herb plant communities, moist light woods; montane to subalpine belt].

Therefore we are not sure if the names based on *Oberna antelopum* VEST are suitable for our populations growing in xerotherm forests. We express our doubt also in the used nomenclature for this taxon, which seems to be better treated on subspecies level. A study of the type or original material of *O. antelopum* VEST is needed.

Stratiotes aloides L.
Loc.: Záhorská nížina Lowlands, Veľké Leváre – Rudava, coll. OŤAHELOVÁ.
2n=40 UHRÍKOVÁ

This first chromosome number report from the area of Slovakia confirmed the previous analysis of NEGODI (1929 – probably from Italy) with 2n=ca 40. The number 2n=24 is reported by SCHÜRHOFF (1926 – an unknown origin).

Thlaspi improperum JORD.
– *Thlaspi perfoliatum* auct. non L.
Loc.: Slovenský kras Karst, Zádielská dolina Valley, coll. MÁJOVSKÝ.
2n=42 UHRÍKOVÁ

The result of the present analysis agrees with the previous report from Slovakia [2n=42, Podunajská nížina Lowlands, Svätý Jur, Šúr, coll. FERÁKOVÁ (VÁCHOVÁ, 1974)]. It means that only hexaploids were confirmed for Slovakia till now.

Hexaploid plants from the *T. perfoliatum* agg. seem to be morphologically different from *T. perfoliatum* L. s.str. and the name *T. improperum* JORD. is usually adopted for them. Further karyotaxonomic analyses are needed.

Xanthoxalis corniculata (L.) SMALL
Loc.: Podunajská nížina Lowlands, Bratislava, Révová Street, coll. SCHWARZOVÁ.
2n=48 UHRÍKOVÁ

Our first analysis from Slovakia confirmed tetraploid chromosome number for this species. *X. corniculata* is a species with an unclear origin (probably Mediterranean), at present with a cosmopolitan occurrence. The tetraploid number is reported also by the other authors (cf. MÁJOVSKÝ et al., 1987), while diploids (2n=24) are known from higher altitudes of Africa [HEDBERG & HEDBERG (1977)].

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