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Chromosome numbers of Polish vascular plants (Part 4)

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Abstract

The authors give results of karyological studies carried out on 20 species of vascular plants from Poland. Most of the results are reported for the first time for this country. The chromosome number of *Gnaphalium hoppeanum* 2n=28 was established for the first time.

Key words: chromosome numbers, Polish plants.

INTRODUCTION

The present paper concerns the chromosome numbers of twenty vascular plants of the Polish flora. The present is the fourth consecutive paper and it is a continuation of our previous studies on chromosome numbers (Frey et al. 1977, Mizianty et al. 1981, Frey et al. 1981).

MATERIAL AND METHODS

Most of the mentioned species are relatively rare or very rare ones in our country, e. g. *Barbarea intermedia, Echinops sphaerocephalus, Geranium pyrenaicum, Iva xanthifolia, Malva moschata, Spergula maxima*. That is why the material for study has been collected from single localities only.

All the investigated plants were collected exclusively in natural habitats. Determinations of chromosome numbers were made in root-tip metaphases of adult plants as well as seedlings. Materials were pretreated with a saturated solution of 1-bromonaphthalene or with 0.3% colchicine solution. They were then fixed in glacial acetic acid-alcohol (1:3) and squashed in 2-3% acetocarmine.

Chromosome numbers were established by M. Mizianty and L. Frey. Plant collection, taxonomic comments and determination were made by Z. Mirek.

RESULTS

POLYGONACEAE

Rumex alpinus L., 2n = 20 (Fig. 1)

Widespread usually in lower and upper mountain zone. The plants examined in the course of the present paper were collected in Niżnia Polana Kominiarska (Western Tatra Mts.), 1180 m a.s.l. In the specimens studied the chromosome number 2n = 20 was established. Prior to the present investigations the same chromosome number was found from various areas (data summarized by Bolkhovskikh et al. 1969, Májovský et al. 1970a).

Rumex confertus Willd., 2n = 60 (Fig. 2)

Ruderal species occuring mainly along roadsides and railways; spreading westwards. The studied material was collected in Skomielna Biała (roadside). This species is varied as regards karyology. The number 2n = 60 was found in the studied material; it is in accordance with data given by Menšikova (1964, cit. acc. Bolkhovskikh et al. 1969). On the other hand, 2n = 38 (Tschermak-Woess and Doležal 1953) and 2n = 40 (Löve and Löve 1961, Menšikova l.c.) were found. The highest number 2n = 100 was reported by Mulligan (in Löve 1969) from Rumania — Botanical Garden, Cluj.

CHENOPODIACEAE

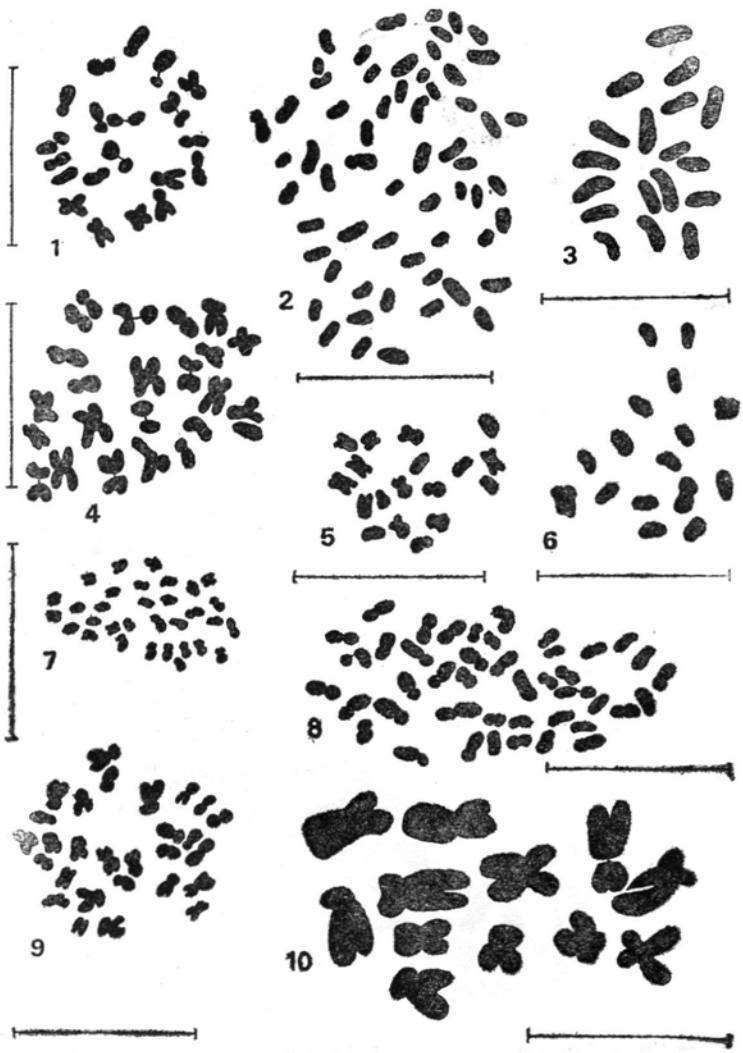
Atriplex nitens Schrk., 2n = 18 (Fig. 3)

Widespread in lowland but sporadic at lower altitudes, on ruderal places. Investigated material was collected in Warszawa, Kinowa street, on disturbed ground. The chromosome number 2n = 18 agrees with previous results from various areas (data summarized by Bolkhovskikh et al. 1969, Májovský et al. 1970a).

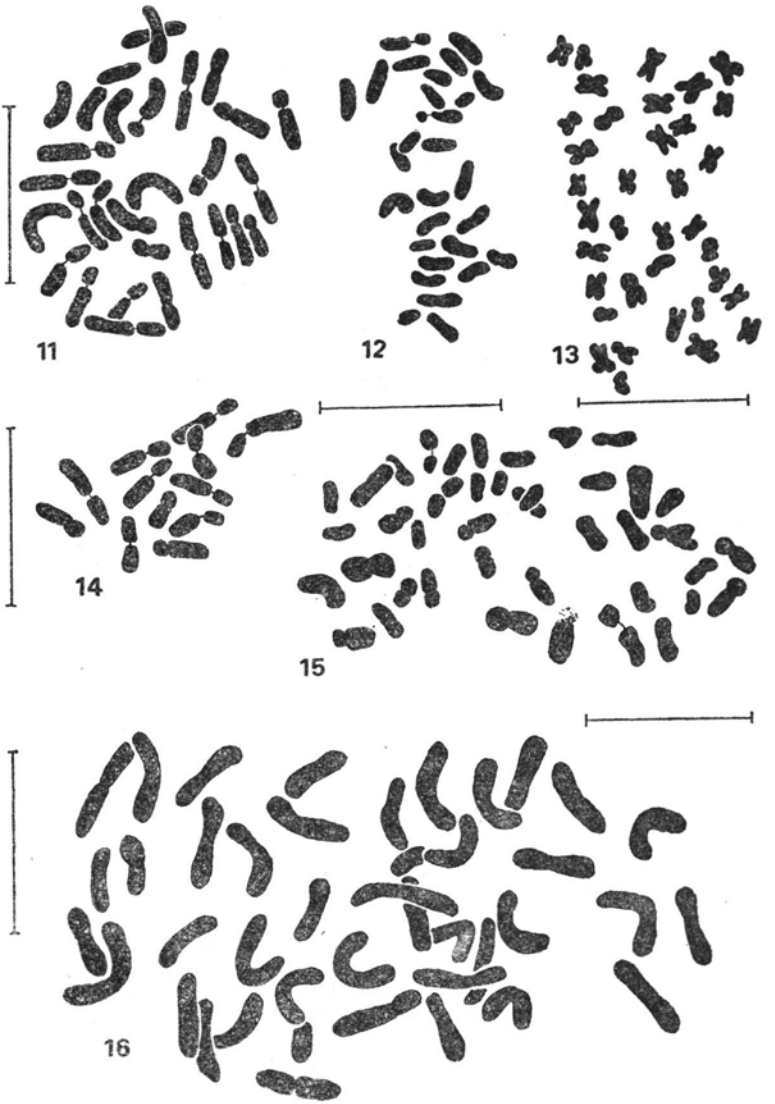
CARYOPHYLLACEAE

Silene dichotoma Ehrh., 2n = 24 (Fig. 4)

Here and there on lowland and at lower mountain altitudes up to 1000 m a.s.l., mainly as weed in clover fields. Specimens for study were collected in Kościelisko-Wojdyłówka (Subtatric Region), 970 m a.s.l. in clover field. The chromosome number 2n = 24 was established. The



Figs. 1-10. Root-tip metaphases of: 1 — *Rumex alpinus* 2n = 20, 2 — *Rumex confertus* 2n = 60, 3 — *Atriplex nitens* 2n = 18, 4 — *Silene dichotoma* 2n = 24, 5 — *Spergula maxima* 2n = 18, 6 — *Barbarea intermedia* 2n = 16, 7 — *Rorippa amphibia* 2n = 32, 8 — *Malva moschata* 2n = 42. 9 — *Geranium pyrenaicum* 2n = = 28, 10 — *Crepis paludosa* 2n = 12. Scale — 10 μm



Figs. 11-16. Root-tip metaphases of: 11 — *Echinops sphaerocephalus* 2n = 30, 12 — *Gnaphalium hoppeanum* 2n = 28, 13 — *Iva xanthifolia* 2n = 36, 14 — *Leontodon autumnalis* 2n = 12, 15 — *Festuca arundinacea* 2n = 42, 16 — *Avena fatua* 2n = = 42. Scale — 10 μm

same number was reported by many authors from other areas (data summarized by Bolkhovskikh et al. 1969, Májovský et al. 1970a — from Slovakia, Dvořak and Dadáková 1976 — from Moravia, as well as Kożuharov and Petrova in Löve 1974b — from Bulgaria).

Spergula maxima Weihe (= *S. arvensis* L. *ssp. maxima* (Weihe) M. K. em. Pawł.), 2n = 18 (Fig. 5)

All over Poland as a flax-weed, in the mountains up to 1000 m a.s.l. Recently becoming very rare because of its rapid extinction connected with cleaning of flax seed material. This taxon has been included into *S. arvensis* s. lato by many authors. The studied specimens were collected from two localities: as a weed in crop fields, village Poronin-Frąckówka, near Zakopane (Subtatric Region) 820 m a.s.l., and Zakopane-Guty 800 m a.s.l. Differences between *S. maxima* and typical *S. arvensis s. str.* are presented in Table 1. The chromosome number 2n = 18 was found. In available literature the present authors did not find any mention of chromosome numbers of *S. maxima*. In all probability part of the data dealing with chromosome numbers of *S. arvensis* (data summarized by Bolkhovskikh et al. 1969, Gadella and Kliphuis 1973) concern *S. maxima*.

Table 1

Differences between *Spergula maxima* and *S. arvensis* s. str.

Characters	*S. maxima*	*S. arvensis*
Diameter of seeds	1.5-2.0 mm	0.8-1.2 mm
Height of stem	40-100 cm	10-40(50) cm
Glandularity	no glands or sparcely glandular	densely glandular
Length of lower and median leaves	4-8 cm	2-4 cm

CRUCIFERAE

Barbarea intermedia Boreau, 2n = 16 (Fig. 6)

This species has been recently found in Poland in some localities at lower altitudes in the Western Carpathians (Mirek 1983). Mostly on wet open places and roadsides. The plants for the present studies were collected in Kościelisko-Wojdyłówka near Zakopane (Subtatric Region), 970 m a.s.l. on disturbed ground. The chromosome number confirms the count of Manton (1932).

Rorippa amphibia (L.) Bess., 2n = 32 (Fig. 7)

Very common on lowland along rivers, streams and near ponds. The plant material originated from two localities: Miechów-Pińczów district,

village Chotel Czerwony, pond banks, and Wiślica, riverside. In the specimens studied the chromosome number 2n = 32 was established. The same number was reported by Löve and Löve (1942), Gadella and Kliphuis (1968), Javůrková-Kratochvilová and Tomšovic (1972), Májovský et al. (1974b). Howard (1947) and Queiros (1973b) give the number 2n = 16, whereas Howard (1953) and Jonsell (1968) reported two chromosome numbers 2n = = 16 and 32.

MALVACEAE

Malva moschata L., 2n = 42 (Fig. 8)

Naturalized from gardens, especially in Northern Poland, Lower Silesia, and locally at lower altitudes in the Carpathians, already well established. The plant specimens originated from Zakopane, 925 m a.s.l., disturbed places, near railway station. Davie (1933) and Delay (1947, cit. acc. Bolkhovskikh et al. 1969) found 2n = 40-44, while Svensson-Stenar (1925), Skovsted (1935), Murin and Májovský (in Löve 1978b) and Loon (in Löve 1980b) reported 2n = = 40. In Polish material 2n = 40 was also established.

GERANIACEAE

Geranium pyrenaicum Burm. fil. 2n = 28 (Fig. 9)

Throughout most of Poland, but more frequent only in the South-West and South of Poland. Probably only adventive, but well established. It occurs in the Carpathians and in the Sudetes. Usually up to 600 m a.s.l. The investigated specimens originated from Zakopane, 805 m a.s.l., city dump. In the present work the chromosome number 2n = 28 was established. It is in accordance with some former results (Warburg 1938, cit. acc. Bolkhovskikh et al. 1969, Loon et al. 1971 from France). However, different numbers were found by Chatterjee and Sharma (in Moore 1973) — 2n = 20, and Májovský et al. (1974b) — 2n = 26 from Slovakia. The latter number was previously reported in Polish material from two localities by Skalińska et al. (1978).

LABIATAE

Ballota nigra L. ssp. *nigra*, 2n = 22

Widespread on lowland, but rare and only at lower altitudes in the mountains. In ruderal, nitrophilous communities of the *Eu-Arction* alliance, mainly *Leonuro-Arctietum* and *Balloto-Chenopodietum*. The plant material originated from the village Szczepanowice near Miechów

(among tall herbs and on roadside). In respect of chromosome number it is a rather uniform species. 2n = 22 was reported in previous studies from Bulgaria (Markova and Thu, in Löve 1974a), from Corsica (Hassal, in Löve 1978a) and from British Isles (Morton 1973) for ssp. *foetida*. On the other hand, 2n = 20 is mentioned by Strid and Franzén (in Löve 1981) from Greece.

COMPOSITAE

Anthemis cotula L., 2n = 18

Not rare on various ruderal habitats on lowland and at lower altitudes in the mountains. The studied material was collected in Słomniki near Kraków, on a ruderal site. The number 2n = 18 agrees with that reported previously from other territories (data summarized by Bolkhovskikh et al. 1969, Strid 1971 from Albania, Queiros 1973a from Portugal, Löve and Kjellqvist 1974 from Spain, Kuzmanov and Thin in Löve 1980a from Bulgaria).

Crepis paludosa (L.) Mnch., 2n = 12 (Fig. 10)

Widespread all over Poland, but less frequent on lowland. In the Tatra Mts. up to 1750 m a.s.l. Especially abundant in moist tall herb communities and in the associations: *Valeriano-Caricetum flavae* and *Caltho-Alnetum*. The plant material originated from wet meadow growing on calcareous ground between. Działoszyce and Chmielów (Miechów-Pińczów district). In the specimens studied the chromosome number 2n = 12 was established. It is in accordance with the previous results of many authors (Bolkhovskikh et al. 1969, Májovský et al. 1970b, Dvořák and Dadáková 1977).

Echinops sphaerocephalus L., 2n = 30 (Fig. 11)

Sometimes cultivated as a honey-yielding plant and locally naturalized in ruderal habitats. The species is said to be characteristic of the alliance *Onopordion*. Material for the study was collected on a grassy slope at roadside between Wesoła and Słomniki, near Kraków. In the Polish material 2n = 30 was found. This number confirms the counts of Moore and Frankton (1962). On the other hand, the chromosome number 2n = 32 was reported by Hindáková and Činčura (1967).

Erigeron acer L., 2n = 18

Widespread all over Poland. Common on rocky and stony places, dry slopes, roadsides and pastures. The karyologically studied species were collected in Zakopane, 860 m a.s.l. on a stony site, at Bulwary Słowackiego. The chromosome number 2n = 18 confirms the previous data reported by many authors from various areas (Bolkhovskikh et al. 1969, Fernandes and Queiros 1971, Fritisch, in Löve 1973,

Queiros 1973a, Morton 1977). Šiljak-Yakovlev (in Löve 1981) established for *E. acer* diploid and tetraploid numbers (2n = 18 and 36) for specimens from Yugoslavia. By contrast Tischler (1934) found a different chromosome number 2n = 27 for the plants from Schleswig-Holstein.

Gnaphalium hoppeanum Koch 2n = 28 (Fig. 12)

High-montane species. On territory of Poland only in the Tatra Mts. (calcareous rocks and crevices); from lower mountain zone up to alpine zone (1150-2130 m a.s.l.). The investigated material was collected in Mała Łąka Valley (Western Tatra Mts.), 1280 m a.s.l., on calcareous rocks. The number 2n = 28 was established in plants from Poland probably for the first time. In the available literature the present authors did not find any mention of chromosome numbers for this species.

Iva xanthifolia Nutt., 2n = 36 (Fig. 13)

On lowland not rare, lacking in the mountains. Usually in various ruderal habitats, largely along railways, and open disturbed places. Plant specimens for karyological studies were collected in Warszawa, Kinowa street, on a disturbed, ruderal place. In this species two chromosome numbers 2n = 28 and 36 are known. The first number was hitherto reported only by Mulligan (1959) from Canada, the latter established also in the present paper is in accordance with the previous results obtained by several authors (Mulligan 1959, Feráková 1966, 1968, 1972, Májovský et al. 1974a).

Leontodon autumnalis L., 2n = 12 (Fig. 14)

Very common species all over Poland largely on meadow, pastures and trampled places. In Tatra Mts. up to 1830 m a.s.l. The material originated from Szczepanowice (Miechow-Pińczów district), fresh meadow near Szreniawa river. In plants from Poland the chromosome number 2n = 12 was established. The same chromosome number was found by many authors (data sumarized by Bolkhovskikh et al. 1969, as well as Gadella and Kliphuis 1970, Laane 1969, 1971, Rousi 1973, Edmonds et al. 1974, Löve and Kjellqvist 1974). On the other hand, Vaarama (in Löve and Löve 1948) reported 2n = = 24. The number n = 16 given for *L. autumnalis* var. *autumnalis* (Powell et al. 1974) seems doubtful.

GRAMINEAE

Festuca arundinacea Schreb., 2n = 42 (Fig. 15)

Alluvial meadows, margins and roadsides on lowland; less frequent at lower altitudes in the mountains. The specimens studied were collected in Szczepanowice (Miechów-Pińczów district), on railway tracks. In plants from Poland the chromosome number 2n = 42 was found. The

same number was established by Polýa (1950), Löve and Löve (1956), Uhríková and Májovský (in Löve 1977). Karyological studies hitherto carried out within the species revealed its great differentiation in this respect. Several chromosome numbers were reported in previous studies: 2n = 28, 42 (Stählin 1929, Chandrasekharan et al. 1972), 2n = 28, 42, 70 (Malik and Thomas 1966), 2n = 42, 56, 63, 70 (Borril et al. 1971), however, the number 2n = 42 seems to be most frequent. Accesory chromosomes were also observed in this species (data summarized by Bolkhovskikh et al. 1969, Chandrasekharan and Thomas 1971).

Avena sativa L., 2n = 42

Cultivated on lowland as well as in lower mountain zone. Sometimes as a weed on ruderal places. Specimens for the present studies were collected from four habitats: Jerzmanowice near Kraków, Biała Góra reservation near Miechów, Rózino near Włocławek, Mikołajki (Masuria). This species is uniform as regards karyology; the hexaploid number was found by many authors from various areas (data summarized by Bolkhovskikh et al. 1969, as well as Rajhathy and Thomas 1974, cit. acc. Baum 1977). The same number was established in the present work.

A. fatua L., 2n = 42 (Fig. 16)

Widespread as a weed in cultures of wheat, oat, rye as well as on ruderal places. In mountains (Gorce Mts.) up to 900 m a.s.l. The plants originated from four habitats: Słomniki near Kraków, Rabsztyn near Olkusz, Biała Góra reservation near Miechów, Mikołajki (Masuria). In this species only one chromosome number was hitherto found, 2n = 42 (data summarized by Bolkhovskikh et al. 1969, Rajhathy and Thomas 1974, cit. acc. Baum 1977). The same number was found in the examined material from Poland.

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Liczby chromosomów polskich roślin naczyniowych

Streszczenie

W pracy zostały podane liczby chromosów 20 gatunków roślin naczyniowych. Są to przeważnie dane nowe dla Polski, a liczba chromosomów 2n=28 u *Gnaphalium hoppeanum* Koch. jest podana prawdopodobnie po raz pierwszy. Większość badanych roślin jest rzadka lub bardzo rzadka na terenie kraju np. *Barbarea intermedia, Echinops sphaerocephalus, Geranium pyrenaicum, Iva xanthifolia, Malva moschata, Spergula maxima*. Dlatego materiał do badań zbierano tylko z jednego stanowiska.