

# Chromosome numbers of woody plants from Bulgaria

Ana Petrova<sup>1</sup>, Jerzy Zieliński<sup>2</sup> & Rayna Natcheva<sup>1</sup>

<sup>1</sup> Institute of Botany, Bulgarian Academy of Sciences, Acad. Georgi Bonchev St., bl. 23, 1113 Sofia, Bulgaria, e-mail: petrova@bio.bas.bg; renimoss@bio.bas.bg

<sup>2</sup> Polish Academy of Sciences, Institute of Dendrology, 5 Parkowa St., 62-035 Kórnik, Poland, e-mail: jeziel@rose.man.poznan.pl

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**Abstract.** The chromosome numbers of 22 woody plants from 25 populations in the Bulgarian flora are reported: *Acer monspessulanum*, *A. tataricum*, *Alnus glutinosa*, *Betula pendula*, *Celtis glabrata*, *Euonymus europaeus*, *Ligustrum vulgare*, *Paliurus spina-christi*, *Populus nigra*, *Prunus domestica* var. *instititia*, *P. spinosa*, *Pyrus bulgarica*, *Quercus hartwissiana*, *Q. petraea*, *Rosa agrestis*, *R. canina*, *Salix alba*, *S. reticulata*, *S. rosmarinifolia*, *S. xanthicola*, *Sorbus aucuparia*, and *Tilia platyphyllos*. For seven species the results confirm earlier reports from Bulgaria and elsewhere. The chromosome numbers of *C. glabrata* ( $2n=28$ ), *P. bulgarica* ( $2n=34$ ), and *S. xanthicola* ( $2n=38$ ), and are reported for the first time. Karyological data for 12 species are published for the first time from Bulgarian accessions.

**Key words:** Bulgaria, karyology, woody plants

## Introduction

As a result of the karyological studies of phanerophyte and chamaephyte species in the Bulgarian flora, the chromosome numbers of 22 species from 10 families are reported: *Aceraceae*, *Betulaceae*, *Celastraceae*, *Fagaceae*, *Oleaceae*, *Rhamnaceae*, *Rosaceae*, *Salicaceae*, *Tiliaceae*, and *Ulmaceae*.

## Material and methods

Plant material (seeds, fruits and live specimens) was collected from natural populations in Bulgaria and cultivated in the experimental glasshouse of the Institute of Botany (BAS). Voucher specimens have been deposited in the karyological collection at SOM.

Root tips were pretreated with 0.01% Colchicine for 60 min, fixed in ethanol:glacial acetic acid (3:1) for at least 2 h at room temperature, or for 24 h in the refrigerator, and stored in 96% ethanol until required.

Hydrolyzation was conducted in 1N HCl at 60°C for 30 min. Then the root tips were transferred into HCl: ethyl ether (1:1) for 15–20 min at 60°C, washed in distilled water and stained with Haematoxylin after Gomori (Melander & Wingstrand 1953) for 45–90 min at 60°C, squashed in 45% acetic acid, and mounted in Euparal.

## Results and discussion

### *Acer monspessulanum* L. (*Aceraceae*)

$2n=26$  (Fig. 1)

Rhodopi Mts (*Eastern*): between Kazak village and the road fork to Gorni Yuroutsii village, MF-08, 41°23'03"N, 25°51'02"E, 446 m, 17.09.2003, coll. J. Zieliński & A. Petrova (AP 203–61; SOM 3972).

This report confirms the earlier counts of Natara-jan (1978) from France, Strid & Franzén (1981) from Greece, and Bottacci & al. (1991) from Italy. This is the first chromosome count for this species from Bulgaria.

***Acer tataricum* L. (Aceraceae)****2n = 26** (Fig. 2)

Rhodopi Mts (*Eastern*): near Byalgradets village, Kurdzhali district, 180 m, MF-08, 41°25'08"N, 25°54'22"E, 17.09.2003, coll. J. Zieliński & A. Petrova (AP 203-58; SOM 3975).

This is the first record for the species from Bulgaria and it confirms the earlier count of Měsíček (1992) for the Czech Republic.

***Alnus glutinosa* (L.) Gaertn. (Betulaceae)****2n = 28** (Fig. 3)

Sofia Region: south of Dolni Pasarel village, along river Iskur, 728 m, GN-10, 42°32'15.5"N, 23°30'36.3"E, 05.01.2006, coll. R. Natcheva & Z. Mitrinska (AP 206-01; SOM 3990).

Our result confirms the chromosome count reported for Bulgaria by Ivanova & al. (2006) from the Valley of Strouma River, as well as the reports from various countries by Hindáková (1974) and Javůrková-Jarolímová (1992) for Slovakia, Pogan & al. (1982) for Poland, Kovanda (1984) for the Czech Republic, Sánchez Anta & al. (1987) for Spain, etc. (see also Fedorov 1969).

***Betula pendula* Roth (Betulaceae)****2n = 28** (Fig. 4)

Vitosha Region: around Yarlovo village, along river Palakariiska, 1196 m, FN-80, 42°29'37"N, 23°16'08"E, 12.07.2004, coll. R. Natcheva & Z. Mitrinska (AP 204-134; SOM 3989).

The chromosome number  $2n = 28$  reported here confirms the result of Iliev (1992) from Bulgaria, as well as the reports for Russia by Rostovtseva (1977), Solovjeva (1977) and Krasnikov (1991), for the Czech Republic by Měsíček (1992), Drušković (1995) from Slovenia, and Lövkvist & Hultgård (1999) from Sweden. Different chromosome numbers ( $2n = 42$ ) were also reported by Magulaev (1976) and ( $2n = 56$ ) by Gill & Davy (1983).

A duplicated chromosome number (endomitosis) together with the normal number was also observed in one root (Fig. 4a).

***Celtis glabrata* Steven ex Planch. (Ulmaceae)****2n = 28** (Fig. 5)

Northeast Bulgaria: on the rocks around the Rock Monastery near Ivanovo village, Rousse district, 45 m, MJ-13, 43°42'N, 25°59'E, 25.09.2003, coll. E. Genova (AP 203-72; SOM 3984).

The chromosome number found by us is the first reported for this species from Bulgaria and is unknown in the literature.

***Euonymus europaeus* L. (Celastraceae)****2n = 32** (Fig. 6)

Rila Mts: around Belitsa village, Trustenik locality, 866 m, MJ-03, 41°56'41"N, 23°32'31"E, 15.07.2004, coll. J. Zieliński & A. Petrova (AP 204-197; SOM 3981).

Our result agrees with the results of other authors (Wentworth & al. 1991; Hollingsworth & al. 1992; Drušković 1995). Higher ploidy level ( $2n = 64$ ) have been found for this species: from Hungary, reported by Pólya (1949), from Poland by Skalińska & al. (1976), from Slovakia by Uhríková & Feráková (1978) and Javůrková (1979), from Bohemia by Měsíček (1992). There is no earlier chromosome count for this species from Bulgaria.

A duplicated chromosome number (endomitosis) together with the normal number was also observed in one root (Fig. 6a).

***Ligustrum vulgare* L. (Oleaceae)****2n = 46** (Figs 7, 8)

Balkan Range (*Western*): along the path near Skaklya waterfall, near Lakatnik village, Sofia district, 529 m, FN-96, 43°02'11"N, 23°20'12"E, 24.03.2005, coll. R. Natcheva & Z. Mitrinska (AP 205-05; SOM 3992) (Fig. 7).

Rila Mts: near Belitsa village, Trustenik locality, 866 m, MJ-03, 41°56'41"N, 23°32'31"E, 15.07.2004, coll. J. Zieliński & A. Petrova (AP 204-198; SOM 3980) (Fig. 8).

The same chromosome number was reported from Bulgaria for the Pirin Mts by Markova (1970). It coincides with the number reported by Magulaev (1976) from the Northern Caucasus, Uhríková (1976) from Slovakia, Van Den Brand & al. (1979) from Switzerland, Strid & Andersson (1985) from Greece, Pogan & al. (1987) from Poland, and Gonzáles Zapatero & al. (1988) from Spain.

***Paliurus spina-christi* Mill. (Rhamnaceae)****2n = 24** (Figs 9, 10)

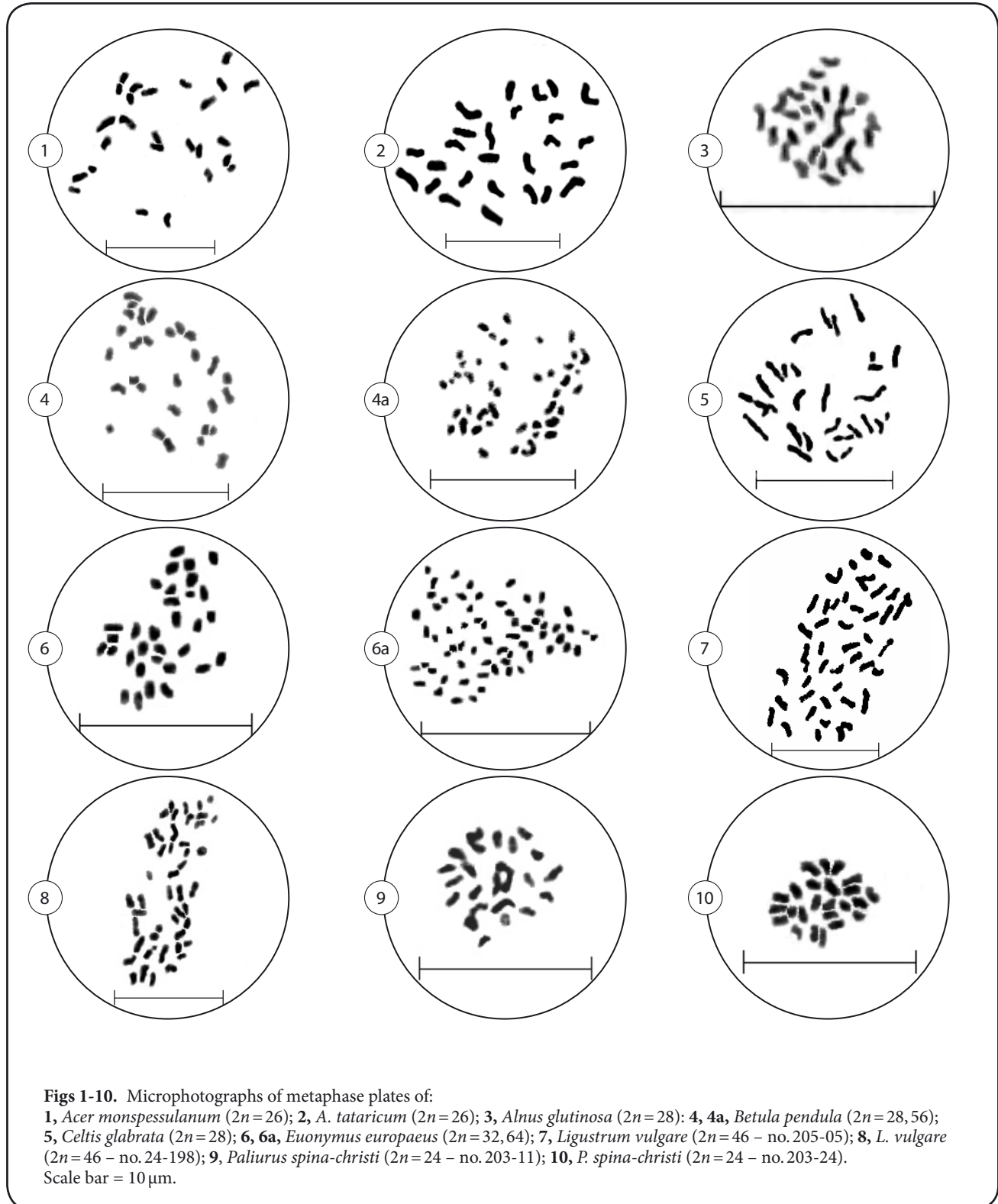
Rhodopi Mts (*Eastern*): between Madzharavo and Borislavtsi villages, at the road fork to Efrem village, Haskovo district, 91 m, MG-11, 41°39'51"N, 25°54'37"E, 16.09.2003, coll. J. Zieliński & A. Petrova (AP 203-11; SOM 3971) (Fig. 9);

— Near Belopolyane village, along the road to Mandritsa village, Kurdzhali district, 91 m, MF-28,

41°26'48"N, 26°08'43"E, 16.09.2003, coll. J. Zieliński & A. Petrova (AP 203-24; SOM 3974) (Fig. 10).

The chromosome number found by us confirms the results of Markova (1971) from the Central Rhodopes,

as well as the reports of other authors (Magulaev 1976, from the Northern Caucasus; Natarajan 1978, from France; Lessani & Chariat-Panahi 1979, from Iran; Baldini & Fiorini 1985, from Italy).



***Populus nigra* L. (Salicaceae)****2n = 38** (Fig. 11)

Rhodopi Mts (*Eastern*): along river Byala, near Mandritsa village, Kurdzhali district, 88 m, MF-28, 41°23'33.1"N, 26°07'35.2"E, 16.09.2003, coll. J. Zieliński & A. Petrova (AP 203-28; SOM 3976).

The chromosome number reported here is the first record for *P. nigra* from Bulgaria. It confirms the results of Uhríková (1978) from Slovakia, Pogan & al. (1982) from Poland, Gallego Martín & al. (1987) from Spain, etc. (see also Fedorov 1969). Some authors reported also  $2n = 57$  for this species (Pogan & al. 1982, from Poland; Ceballos Jiménez & Fernández Casas 1980, from Spain).

***Prunus domestica* L. var. *instititia* (L.) C.K. Schneider (Rosaceae)****2n = 48** (Fig. 12)

Rhodopi Mts (*Eastern*): near Byalgradets village, Kurdzhali district, 180 m, MF-08, 41°25'08"N, 25°54'22"E, 17.09.2003, coll. J. Zieliński & A. Petrova (AP 203-56; SOM 3991).

This chromosome number is in agreement with the counts published by other authors (see Fedorov 1969) for *P. instititia*. Our record is the first count from Bulgaria. A diploid chromosome number ( $2n = 16$ ) for this species is also reported by Gill & al. (1981) and Singhal & al. (1990) from India.

***Prunus spinosa* L. (Rosaceae)****2n = 32** (Fig. 13)

Rhodopi Mts (*Eastern*): near Byalgradets village, Kurdzhali district, 180 m, MF-08, 41°25'08"N, 25°54'22"E, 17.09.2003, coll. J. Zieliński & A. Petrova (AP 203-55; SOM 3993).

Our count is the first record for *P. spinosa* from Bulgaria and is in agreement with the results published by Murín (1978) from Slovakia, González Zapatero & al. (1988) and López Pacheco (2002) from Spain, etc. (see also Fedorov 1969). Baiashvili (1980) reported  $2n = 59$ , 64 for this species from Georgia.

***Pyrus bulgarica* Kuth. & Sachokia (Rosaceae)****2n = 34** (Fig. 14)

Rhodopi Mts (*Eastern*): near Ivailovgrad, along the road to Mandritsa village, Kurdzhali district, 88 m, MF-29, 41°31'05.8"N, 26°06'52.5"E, 16.09.2003, coll. J. Zieliński & A. Petrova (AP 203-37; SOM 3979).

The chromosome number found by us is the first count for Bulgaria. There are no other data available in the literature.

***Quercus hartwissiana* Steven (Fagaceae)****2n = 24** (Fig. 15)

Mt Strandzha: along the road between Izgrev and Bulgari villages, Bourgas district, 148 m, NG-66, 42°08'07"N, 27°47'52"E, 19.11.2006, coll. R. Natcheva & Z. Mitrinska (AP 206-18; SOM 3988).

This chromosome number is in agreement with the count published by Menitski (1966) for Russia (Adzharia) and is the first report for *Q. hartwissiana* from Bulgaria.

***Quercus petraea* (Matt.) Liebl. (Fagaceae)****2n = 24** (Fig. 16)

Rhodopi Mts (*Central*): along the road between Vechtino and Ardino villages, Kurdzhali district, 592 m, LG-40, 41°33'34"N, 25°02'07"E, 14.07.2004 coll. J. Zieliński & A. Petrova (AP 204-173; SOM 3973).

The chromosome number confirms our previous result for this species from Bulgaria for Mt Vitosha (Petrova & al. 2006) and from various regions reported by other authors (see Fedorov 1969).

***Rosa agrestis* Savi (Rosaceae)****2n = 35** (Fig. 17)

Rhodopi Mts (*Eastern*): near Belopolyane village, along the road to Mandritsa village, Kurdzhali district, 91 m, MF-28, 41°26'48"N, 26°08'43"E, 16.09.2003, coll. J. Zieliński & A. Petrova (AP 203-12; SOM 3978).

Our count is the first record for *R. agrestis* from Bulgaria and is in agreement with the results published by Małecká & al. (1990) from Hungary, etc. (see also Fedorov 1969).

***Rosa canina* L. (Rosaceae)****2n = 35** (Figs 18, 19)

Vitosha Region: Mt Vitosha, above Zhelezniitsa village, along the road to Yarlovo village, Sofia district, 1200 m, FN-91, 42°30'24"N, 23°21'08"E, 12.07.2004, coll. R. Natcheva & Z. Mitrinska (AP 204-126; SOM 3994) (Fig. 18).

Rhodopi Mts (*Eastern*): near Ivailovgrad, along the road to Mandritsa village, Kurdzhali district, 88 m, MF-29, 41°31'05.8"N, 26°06'52.5"E, 16.09.2003, coll. J. Zieliński & A. Petrova (AP 203-35; SOM 3982) (Fig. 19).

Our results agree with the results of other authors (Jičínská 1976; Strid & Franzén 1981, from Greece), etc. (see also Fedorov 1969). There have been no data published from Bulgaria.

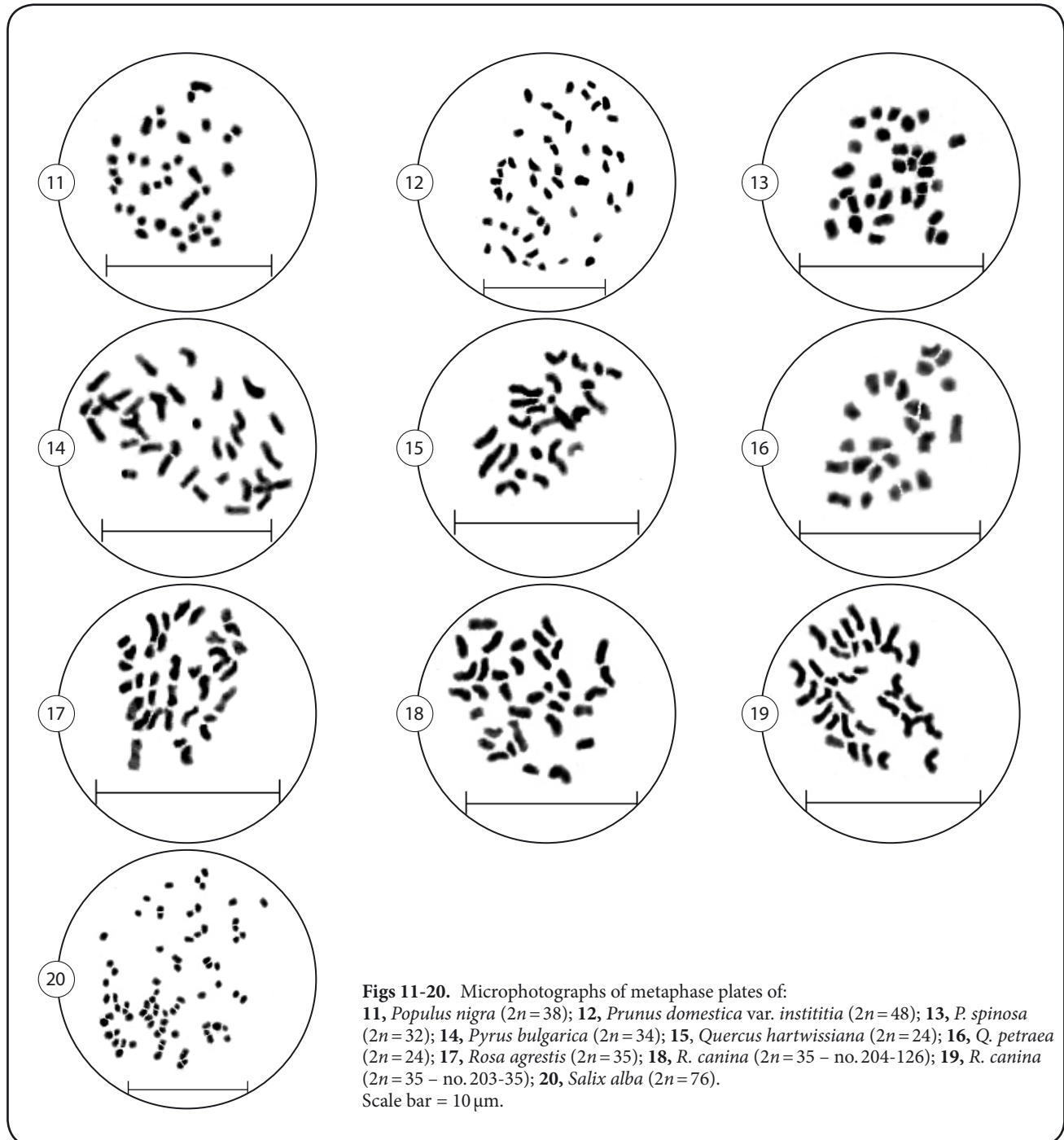
***Salix alba* L. (Salicaceae)**

**$2n = 76$**  (Fig. 20)

Rhodopi Mts (Eastern): along river Byala, near Mandritsa village, Kurdzhali district, 88 m, MF-28,

41°23'33"N, 26°07'35"E, 16.09.2003, coll. J. Zieliński & A. Petrova (AP 203-29; SOM 3977).

This is the first report of the chromosome number of *S. alba* from Bulgaria and it confirms the data of Feráková (1974) and Váchová (1978) from Slovakia, Krichfalushij & Golyshkin (1985) from Ukraine, Drušković (1995) from Slovenia, etc. (see also Fedorov 1969). Mehra (1976) reported a diploid chromosome number  $2n = 38$  for this species.



***Salix reticulata* L. (Salicaceae)****2n = 38** (Fig. 21)

Rila Mts: Mramoretski Preslap, above Ribni lakes, in rocky places, 2620 m, GM-06, 42°06'14"N, 23°28'43"E, 22.09.2006, coll. A. Petrova & R. Natcheva (AP 206-11; SOM 3986).

This chromosome number is in agreement with the counts published from Bulgaria for the Pirin Mts, by Andreev (1982) and confirms the results published by Váchová & Chmelař (1976) from Slovakia (Western Tetry Mt), Zhukova & Petrovsky (1976) and Zhukova (1980) from Chukotka, Izmailow (1980) from Poland, Löve & Löve (1982a) from Canada, Petrovsky & Zhukova (1983) from Northeast of Asia, Drušković (1995) from Slovenia, etc. (see also Fedorov 1969).

***Salix rosmarinifolia* L. (Salicaceae)****2n = 38** (Fig. 22)

Sofia Region: SE of Tsruklevtsi village, 800 m, FN-75, 42°56'42"N, 23°08'07"E, 21.09.2006, coll. J. Zieliński & A. Petrova (AP 206-09; SOM; SOM 3987).

Our count is the first record from Bulgaria for *S. rosmarinifolia*, known as extinct for the country but recently rediscovered by Hájek & al. (2006). It is in agreement with the result published by Drušković (1995) from Slovenia.

***Salix xanthicola* K.I. Chr. (Salicaceae)****2n = 38** (Fig. 23)

Rhodopi Mts (Eastern): around Gougoutka village, Kurdzhali district, along river Byala, 155 m, MF-28, 41°23'33"N, 26°07'35"E, 17.09.2003, coll. J. Zieliński & A. Petrova (AP 203-41; SOM 3983).

The species is a Balkan endemic and the chromosome count is the first not only from Bulgaria but for the entire region of its distribution.

***Sorbus aucuparia* L. (Rosaceae)****2n = 34** (Fig. 24)

Vitosha Region: Mt Vitosha, above Zheleznița village, along the road to Yarlovo village, Sofia district, 1200 m, FN-91, 42°30'24"N,

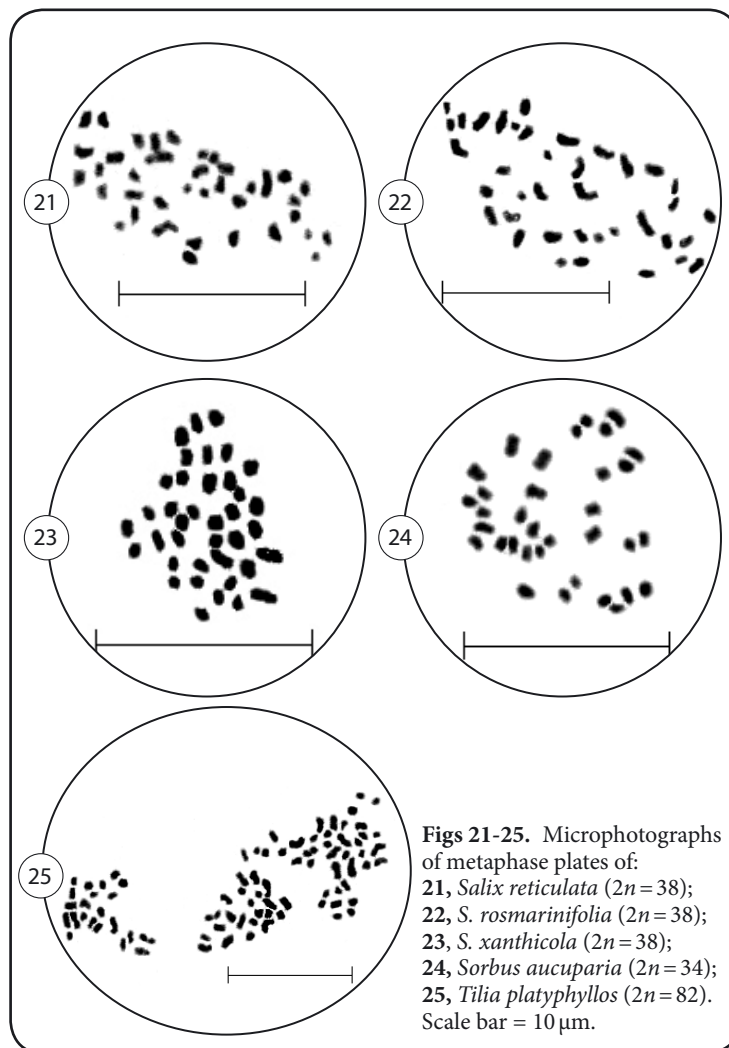
23°21'08"E, 12.07.2004, R. Natcheva & Z. Mitrinska (AP 204-129; SOM 3985).

The counted chromosome number is in agreement with that published by Skalińska & al. (1974) from Poland, Löve & Löve (1982b) from Italy, Májovský & Uhríková (1990) and Měsíček (1992) from Slovakia, Semerenko (1990) from Byelorussia, etc. (see also Fedorov 1969). It confirms our earlier reports from Bulgaria for the Pirin Mts (Petrova & al. 2006) and Rila Mts (Goranova & al. 2006).

***Tilia platyphyllos* Scop. (Tiliaceae)****2n = 82** (Fig. 25)

Balkan Range (Western): along the path around Skaklya waterfall, near Lakatnik village, Sofia district, 529 m, FN-96, 43°02'11.8"N, 23°20'12.9"E, 24.03.2005, coll. R. Natcheva & Z. Mitrinska (AP 205-09; SOM 3995).

The chromosome number found by us confirms the result of other authors (see Fedorov 1969) for *T. platyphyllos* and is the first count from Bulgaria.



**Figs 21-25.** Microphotographs of metaphase plates of: 21, *Salix reticulata* ( $2n = 38$ ); 22, *S. rosmarinifolia* ( $2n = 38$ ); 23, *S. xanthicola* ( $2n = 38$ ); 24, *Sorbus aucuparia* ( $2n = 34$ ); 25, *Tilia platyphyllos* ( $2n = 82$ ). Scale bar = 10  $\mu\text{m}$ .

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