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Chromosome numbers of 20 flowering plants from ex-Yugoslav countries

Abstract

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Twenty angiosperms were collected from several Croatian and Bosnian localities, aiming to make karyological studies. The results are reported in the present work: *Allium commutatum* Guss., 2*n* = 16; *A. roseum* L., 2*n* = 32+0-2B; A*quilegia kitaibelii* Schott, 2*n* = 34; *Artemisia alba* Turra s. l., 2*n* = 18; *Colchicum autumnale* L., 2*n* = 36; *Doronicum columnae* Ten., 2*n* = 60; *Euphorbia gregersenii* K. Maly ex G. Beck, 2*n* = 14; *E. montenegrina* (Bald.) Rohlena, 2*n* = 22; *Fritillaria montana* Hoppe, 2*n* = 18+2B; *Galanthus nivalis* L., 2n = 24; *Moltkia petraea* (Tratt.) Griseb., 2*n* = 16; *Narcissus tazetta* L. subsp. *tazetta*, 2*n* = 20; *Ornithogalum comosum* L., 2*n* = 18, *O. televrinum* Speta, 2*n* = 72; *Plantago media* L. s. l., 2*n* = 12, 24; *P. reniformis* G. Beck, 2*n* = 12; *P. serpentina* All., 2*n* = 12; *Potentilla erecta* (L.) Räuschel, 2*n* = 28; *Ranunculus fontanus* J. et C. Presl, 2*n* = 40; *Silene armeria* L., 2*n* = 24. For *Euphorbia montenegrina* is reported the first counting, while data for *Allium roseum, Aquilegia kitaibelii* and *Ranunculus fontanus* do not agree with those resulting in literature from other provenances.

Introduction

In July 1990 one of the authors (Cesca) collected in Dalmatia several bulbs of *A. commutatum* and *Narcissus tazetta* subsp. *tazetta*; subsequently, during the Third International Balkan Botanical Congress (May 2003, Sarajevo, Bosnia & Hercegovina), Peruzzi collected other live plants from several Croatian and Bosnian localities, aiming to make karyological studies. The results are reported in the present work.

Material and methods

The living plants (Tab. 1), herbarium vouchers and/or photographic documentation of the studied plants are conserved at CLU.

Chromosome analysis

The squash preparations were made from root tips or young ovules, according to the following schedule: pretreatment in 0,5% colchicine solution for 4 hours; Carnoy fixing for at least 1 hour; hydrolysis in HCl 1 N for 7 minutes at 60°C; staining with leuco-basic

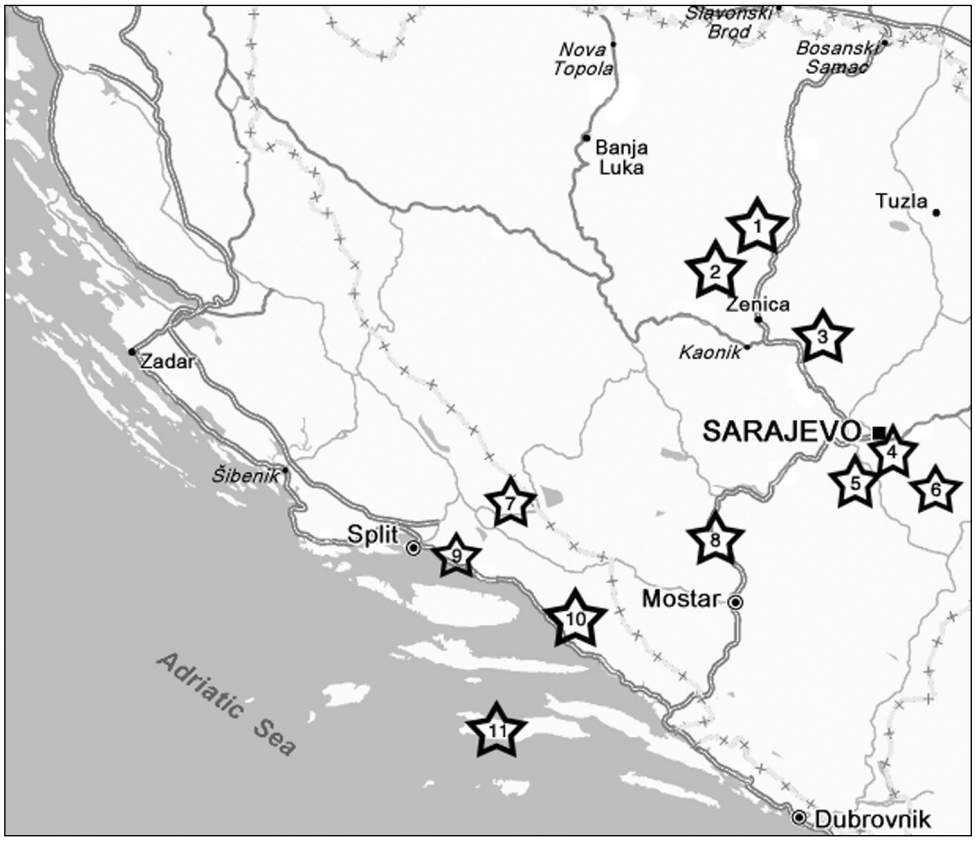


Fig. 1. The collection localities. Bosnia and Hercegovina: 1 Zavidovići, 2 Vranduk (serpentines), 3 Zvijezda Mt., 4 Trebević (hill near Sarajevo), 5 Igman Mt., 6 Jahorina Mt. (top), 8 Neretva r.: between Jablanica and Grabovica; Croatia (Dalmatia): 7 Aržano, 9 Omiš, 10 Biokovo, 11 Korčula island: Lukovac islet, Obljak islet.

fuchsine for 3 hours. Chromosomes were observed often under Phase Contrast. Karyotype formulas and chromosome terminology are used according to Levan & al. (1964). At least five plates were measured in order to build the idiograms.

Results and Discussion

Allium commutatum (*Alliaceae*) – $2n = 16$ (Fig. 2).

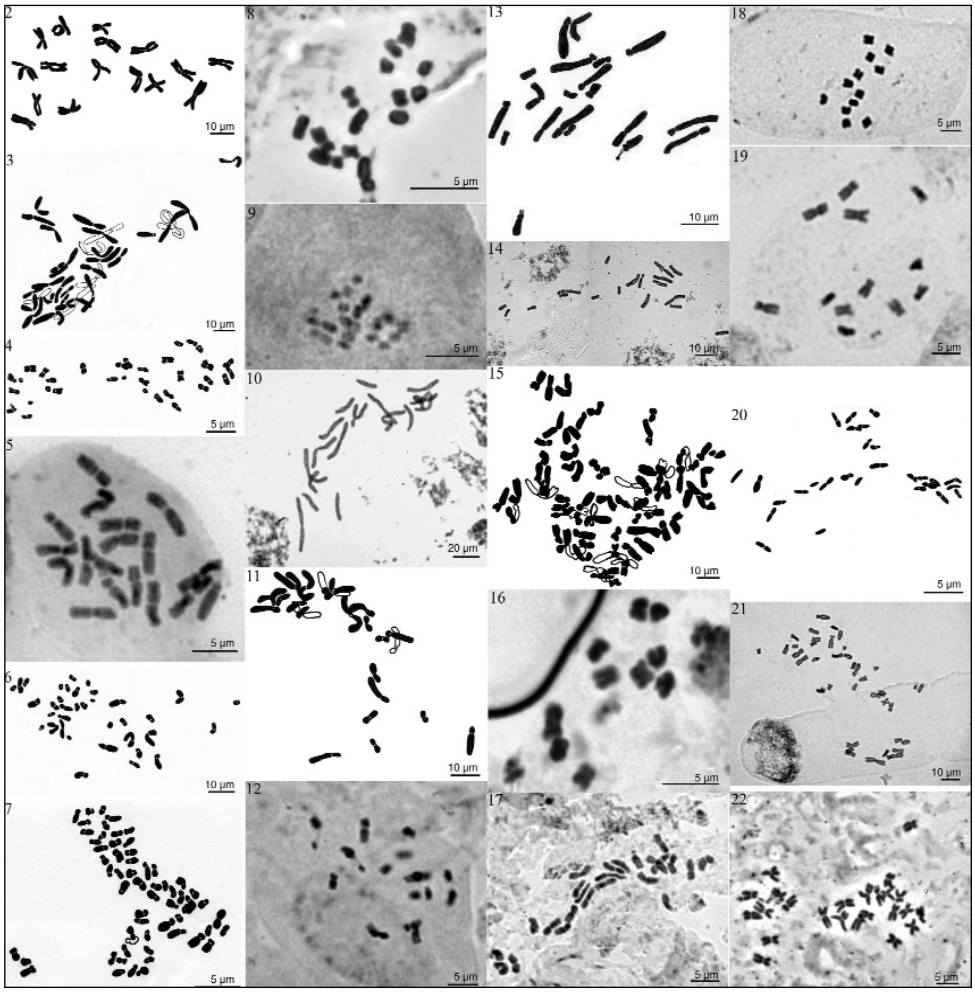
Several samplings, collected at different distances from the sea, did not revealed any relevant karyotype variation.

Previous data: $2n = 16$ from Italy (Garbari & Cela Renzoni 1974; Brullo & al. 1997); $2n = 16, 24$ from France (Guern & al. 1991); $2n = 16, 24, 32$ (Bothmer 1982);

$2n$ = 24+1B from Italy (Marcucci & Tornadore 1997); $2n$ = 32 from Greece (Karavokyrou & Tzanoudakis 1991).

Table 1. Source of the studied plant materials and their chromosome numbers.

Taxon	Provenance	Hort. Bot. Calabria University Accession numbers	Chromosome number
Allium commutatum Guss.	Lukovac	18-m, 127-m, 152-m, 160-m, 240-m, 345-m, 361-m, 379-m, 473-m, 571-m, 642-m; Fig. 1, star 11	$2n$ = 16
A. roseum L.	Omiš	132-1; Fig. 1, star 9	$2n$ = 32+0-2B
Aquilegia kitaibelii Schott	Zavidovići	109-1; Fig. 1, star 1	$2n$ = 34
Artemisia alba Turra s. l. (incl. *A. alba* subsp. *chitachensis* Maire)	Jablanica - Grabovica	687-m; Fig. 1, star 8	$2n$ = 18
Colchicum autumnale L.	Igman	105-1; Fig. 1, star 5	$2n$ = 36
Doronicum columnae Ten.	Jahorina	n. 1-s; Fig. 1, star 6	$2n$ = 60
Euphorbia gregersenii K. Maly ex G. Beck	Zavidovići	531-m; Fig. 1, star 1	$2n$ = 14
E. montenegrina (Bald.) Rohlena	Zavidovići	5-m; Fig. 1, star 1	$2n$ = 22
Fritillaria montana Hoppe	Aržano	146-2; Fig. 1, star 7	$2n$ = 18+2B
Galanthus nivalis L.	Igman	129-1; Fig. 1, star 5	$2n$ = 24
Moltkia petraea (Tratt.) Griseb.	Jablanica - Grabovica	560-m; Fig. 1, star 8	$2n$ = 16
Narcissus tazetta L. subsp. *tazetta*	Obljak	559-1; Fig. 1, star 11	$2n$ = 20
Ornithogalum comosum L.	Aržano	138-s; Fig. 1 – star 7	$2n$ = 18
O. televrinum Speta	Aržano	142-s; Fig. 1, star 7	$2n$ = 72
	Biokovo	335-s; Fig. 1, star 10	
Plantago media L. s. l.	Trebević	583-3; Fig. 1, star 4	$2n$ = 24
	Aržano	358-3; Fig. 1, star 7	$2n$ = 12
P. reniformis G. Beck	Jahorina	n. 35-3, 495-3; Fig. 1, star 6	$2n$ = 12
P. serpentina All.	Aržano	104-3; Fig. 1 – star 7	$2n$ = 12
Potentilla erecta (L.) Räuschel	Zvijezda	135-f; Fig. 1, star 3	$2n$ = 28
Ranunculus fontanus J. et C. Presl	Zvijezda	39-f; Fig. 1, star 3	$2n$ = 40
Silene armeria L.	Vranduk	n. 530-3; Fig. 1, star 2	$2n$ = 24



Figs. 2-22. Drawings: *Allium commutatum* 2*n* = 16 (2), *A. roseum* 2*n* = 32+2B (3), *Aquilegia kitaibelii* 2*n* = 34 (4), *Colchicum autumnale* 2*n* = 36 (6), *Doronicum columnae* 2*n* = 60 (7), *Galanthus nivalis* 2*n* = 24 (11), *Narcissus tazetta* subsp. *tazetta* 2*n* = 20 (13), *Ornithogalum televrinum* 2*n* = 72 (15), *Potentilla erecta* 2*n* = 28 (20). Microphotographs: *Artemisia alba* s. l. 2*n* = 18 (5), *Euphorbia gregersenii* 2*n* = 14 (8), *E. montenegrina* 2*n* = 22 (9), *Fritillaria montana* 2*n* = 18+2B (10), *Moltkia petraea* 2*n* = 16 (12), *Ornithogalum comosum* 2*n* = 18 (14), *Plantago media* from Croatia 2*n* = 12 (16), *P. media* from Bosnia & Hercegovina 2*n* = 24 (17), *P. reniformis* 2*n* = 12 (18), *P. serpentina* 2*n* = 12 (19), *Ranunculus fontanus* 2*n* = 40 (21), *Silene armeria* 2*n* = 24 (22).

A. roseum (*Alliaceae*) – 2*n* = 32 + 0-2B (Fig. 3).

Previous data: 2*n* = 16 from Italy (Marcucci & al. 1992); 2*n* = 16, 24, 32, 40, 48 also from Italy (Marcucci & Tornadore 1997a); 2*n* = 16 (from Montenegro), 32, 48 (from Croatia) and 40 (from Slovenia) (Lovka 1995); 2*n* = 16, 24 from Egypt (Hamoud & al.

1990); 2*n* = 24 from Italy (Messeri 1930, 1931); 2*n* = 32 from Spain (Castroviejo & Feliner 1986) and Greece (Tzanoudakis & Vosa 1988); 2*n* = 40 from Turkey (Özhatay 1990).

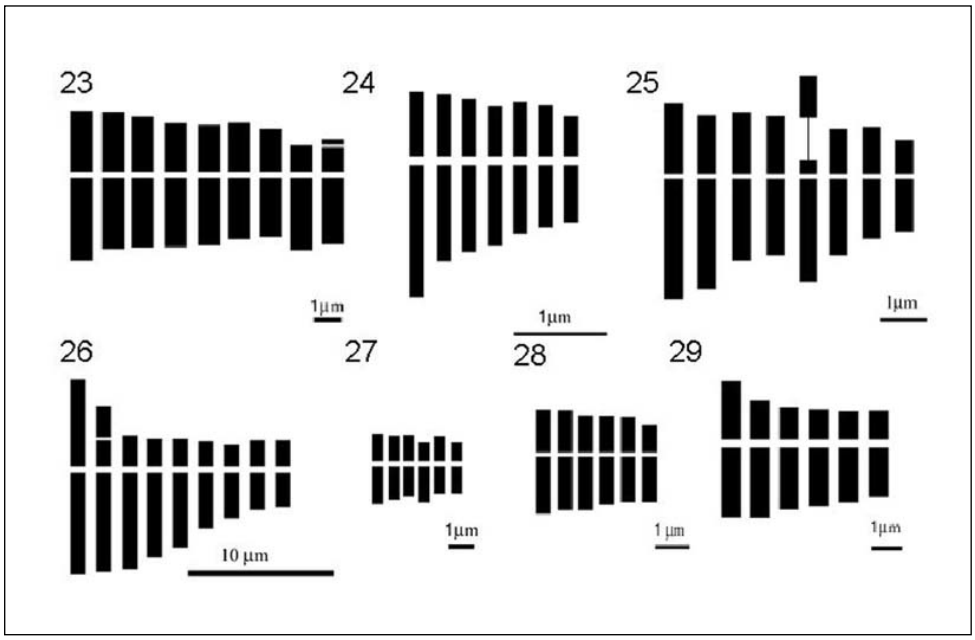
Aquilegia kitaibelii (*Ranunculaceae*) – 2*n* = 34 (Fig. 4).
Previous data: 2*n* = 14 from Croatia (Skalińska 1964).

Artemisia alba s. l. (*Asteraceae*) – 2*n* = 18 (Fig. 5, 23).
Previous data: 2*n* = 18+0-1B, 36+0-4B, 54 (Peruzzi & al. 2005 and literature cited therein).

Colchicum autumnale (*Colchicaceae*) – 2*n* = 36 (Fig. 6).
Previous data: 2*n* = 36 (Sveshnikova & Krichphalushij 1985; Krichphalushi 1989; Dobeš & Hahn 1997); 2*n* = 38 from Italy (D'Amato 1955).

Doronicum columnae (*Asteraceae*) – 2*n* = 60 (Fig. 7).
Previous data: 2*n* = 60 from Italy (Garbari & al. 1980; Baltisberger 1990), from Alps (Lippert & Heubl 1988) and from Greece (Baltisberger 1991).

Euphorbia gregersenii (*Euphorbiaceae*) – 2*n* = 14 (Fig. 8, 24).
Previous data: 2*n* = 14 (Hurusawa & Shimoyama 1976).



Figs. 23-29. Haploid idiograms of *Artemisia alba* s. l. *x* = 9 (23), *Euphorbia gregersenii x* = 7 (24), *Moltkia petraea x* = 8 (25), *Ornithogalum comosum x* = 9 (26), *Plantago media* from Croatia *x* = 6 (27), *P. reniformis x* = 6 (28), *P. serpentina x* = 6 (29).

E. montenegrina (*Euphorbiaceae*) – 2*n* = 22 (Fig. 9).
No previous data available.

Fritillaria montana (*Liliaceae*) – 2*n* = 18+2B (Fig. 10).
Previous data: 2*n* = 18 from Italy (Honsell 1961; Altamura & al. 1984; Cesca 1984) and Balkans (Šopova & Sekovski 1989; Lovka 1995); 2*n* = 27 from Italy (Cesca 1984).

Galanthus nivalis (*Amaryllidaceae*) – 2*n* = 24 (Fig. 11).
Previous data: 2*n* = 18 from Serbia (Sušnik & Lovka 1973); 2*n* = 24 from Czech Republic (Javurkova 1980), Serbia (Drušković & Lovka 1995) and Italy (Miceli & Garbari 1976; D'Amato & Bianchi 1999).

Moltkia petraea (*Boraginaceae*) – 2*n* = 16 (Fig. 12, 25).
Previous data: 2*n* = 16 (Strey 1931; Britton 1951; Grau 1966; Drušković & Lovka 1995; Baltisberger & Baltisberger 1995).

Narcissus tazetta subsp. ***tazetta*** (*Amaryllidaceae*) – 2*n* = 20 (Fig. 13).
Previous data: 2*n* = 14, 20, 21, 22, 24, 28, 30, 32 (Fedorov 1969); 2*n* = 14 (Tseng & Chen 1984); 2*n* = 20 (Baldini 1990), 2*n* = 20+1B (Baldini 1995) from Italy; 2*n* = 20, 22 (Brandham & Kirton 1987; Lü 1990).

Ornithogalum comosum (*Hyacinthaceae*) – 2*n* = 18 (Fig. 14, 26).
Previous data: 2*n* = 18 from Italy (Garbari & Tornadore 1972; Tornadore & Garbari 1979; Tornadore & Marcucci 1988), Serbia (Raamsdonk 1986; Lovka 1995), Greece (Moret & Couderc 1986) and Turkey (Özhatay & Johnson 1996; 2*n* = 14, 16 also; Dalgic & Özhatay, 1997; 2*n* = 14, 20 also), Kieft & Loon (1978). The polyploid plants from Morocco quoted by Moret & Couderc (1986) are very likely to refer to *O. algeriense* Jord. & Fourr.

O. televrinum (*Hyacinthaceae*) – 2*n* = 72 (Fig. 15).
Previous data: 2*n* = 72 (Speta 1990), 2*n* = 70+2B, 72, 73, 76 (Lovka 1995).

Plantago media s. l. (*Plantaginaceae*) – 2*n* = 12, 24 (Fig. 16-17, 27).
Previous data: 2*n* = 12, 24 (Peruzzi & Gargano 2006 and literature cited therein).

P. reniformis (*Plantaginaceae*) – 2*n* = 12 (Fig. 18, 28).
Previous data: 2*n* = 12 from Bosnia: Mount Treskavica (Šiljak-Yakovlev 1981), Mount Treskavica, Jahorina and Maglić (Šiljak-Yakovlev & al. 1992).

P. serpentina (*Plantaginaceae*) – 2*n* = 12 (Fig. 19, 29).
Previous data: 2*n* = 12 from Serbia (Baltisberger 1992) and Italy (Capineri & al. 1978).

Potentilla erecta (*Rosaceae*) – 2*n* = 28 (Fig. 20).
Previous data: 2*n* = 18 (Davlianidze, 1985); 2*n* = 28 (Popoff 1935; Dmitrieva & Parfenov 1985; Parfenov & Dmitrieva 1987).

Ranunculus fontanus (*Ranunculaceae*) – 2*n* = 40 (Fig. 21).
Previous data: 2*n* = 48 from Italy (Peruzzi & Cesca 2004 and literature cited therein).

Silene armeria (*Caryophyllaceae*) – 2*n* = 24 (Fig. 22).
Previous data: 2*n* = 24 (Degraeve 1980; Loon & Setten 1982; Strid 1983).

Conclusions

Most of the studied species show chromosome complements agreeing with data reported in literature (*Allium commutatum*, *Artemisia alba*, *Colchicum autumnale*, *Doronicum columnae*, *Euphorbia gregersenii*, *Fritillaria montana*, *Galanthus nivalis*, *Moltkia petraea*, *Narcissus tazetta* subsp. *tazetta*, *Ornithogalum comosum*, *O. televrinum*, *Plantago media* s. l., *P. reniformis*, *P. serpentina*, *Potentilla erecta*, *Silene armeria*). Among these species, it is noteworthy to evidence the first documentation of a diploid cytotype of *Artemisia alba* for Balkan Peninsula, previously known only for Iberian Peninsula, N Africa and S Italy. *Allium roseum* shows the presence of up to two B-chromosomes in tetraploids, never quoted before in literature. *Aquilegia kitaibelii* shows a new, polyploid/aneuploid chromosome complement. The first counting for *Euphorbia montenegrina* is reported. Finally, *Ranunculus fontanus* shows a singular 2*n* = 40 complement, which perhaps can derive from hybridizations phenomena between *R. flammula* subsp. *flammula* (2*n* = 32) and the typical *R. fontanus* (2*n* = 48). Further investigation on this matter is required.

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