F. Pustahija, N. Bašić & S. Siljak-Yakovlev

Chromosome numbers and genome size data for some Balkan species

Abstract

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Chromosome numbers and metaphase plates are given for eight species, seven from Bosnia and Herzegovina (*Alnus* × *pubescens*, *Erythronium dens-canis*, *Genista tinctoria*, *Leucanthemum vulgare*, *Melittis melissophyllum*, *Orchis mascula*, *Stachys recta*), and one species from F.Y.R.O.M. (*Scorzonera austriaca*). Chromosome counts and genome sizes are discussed.

Keywords: karyology, *Alnus*, *Erythronium*, *Genista*, *Leucanthemum*, *Melittis*, *Orchis*, *Stachys*, *Scorzonera*, Bosnia and Herzegovina, F.Y.R.O.M.

1935. *Alnus* × *pubescens* Tausch. — 2*n* = 4x =28 & 2*n* = 6x = 42 (Figs 1a & 1b).

BH: Kreševo, schist, 43° 49’ 33,35’’ N, 18° 02’ 28,19’’ E, 770 m a.s.l., 10 Nov 2007, private herbarium of N.B.

Alnus × *pubescens* Tausch. is a deciduous tree from *Betulaceae* family, considered as hybrid between black [*Alnus glutinosa* (L.) Gaertn] and grey alder [*A. incana* (L.) Moench]. According to relevant literature this taxon is registered in Belarus, Bosnia and Herzegovina, Croatia, the Czech Republic, Ireland, Latvia, Poland, Serbia and Sweden.

The tetraploid chromosome number 2*n* = 28 is reported by Siljak-Yakovlev & al. (2010), and octoploid 2*n* = 56 by Helms & Jørgensen (1925). The hexaploid chromosome number 2*n* = 42 is given here for the first time. We confirm, also, a tetraploid 2*n* = 28 chromosome number in the same population. Genome size of tetraploids is 2C = 1.05pg (Siljak-Yakovlev & al. 2010).

1936. *Erythronium dens-canis* L. — 2*n* = 2x = 24 (Fig. 1c).

BH: Matinski Vis, Maglaj, serpentine, 44° 28’ 16,67’’ N, 17° 58’ 23,01’’ E, 925 m a.s.l., 10 Apr 2008, private herbarium of F.P.

Erythronium dens-canis L. is a bulbous herbaceous perennial flowering plant (*Liliaceae*), native to central and southern Europe; the only naturally occurring species of genus in Europe.

The diploid chromosome number $2n = 24$ confirms previous reports of Hrubý (1934), Delay (1947), Capineri & al. (1978), Sopova & Sekovski (1982), Rosselló & al. (1987), Krichphalushi (1989), and García Martínez (2001), but differs from $2n = 4x = 48$ (Siljak-Yakovlev & al. 2010). The measured genome sizes are for tetraploids 2C = 49.98 pg (Siljak-Yakovlev & al. 2010), then 2C = 52.91 pg (Vesely & al. 2011) and 2C = 59.80 pg (Zonneveld & al. 2005) for unknown ploidies.

1937. *Genista tinctoria* L. **—** $2n = 4x = 96$ (Fig. 1d).

BH: Katranica, MuškeVode, Kladanj, serpentine, 44° 14' 10,36'' N, 18° 34' 46,62'' E, 791 m a.s.l., 29 Sept 2016, private herbarium of F.P.

Genista tinctoria L. is a variable deciduous shrub of the family *Fabaceae*, native to Europe and western Asia, but widely cultivated as a horticultural species.

The tetraploid chromosome number $2n = 96$ established for one population growing on serpentine substrate is in accordance with previous data on this variable species (Semerenko & Blazhevich 1979; Semerenko & Shvets 1989; Siljak-Yakovlev & al. 2010; Pustahija & al. 2013), but diploids are more frequently determined (Čehov 1931; Tischler 1934; Santos 1945; Garajová 1959; Gadella & Kliphuis 1966; Krusheva 1975; Semerenko & Blazhevich 1979; Pogan & al. 1982; Van Loon & Setten 1982; Gallego Martín & al. 1988; Cubas & al. 1998). Siljak-Yakovlev & al. (2010) and Pustahija & al. (2013) estimated the genome size for tetraploids, 2C = 3.34 pg.

1938. *Leucanthemum vulgare* (Vaill.) Lam. **—** $2n = 8x = 72$ (Fig. 1e).

BH: Katranica, MuškeVode, Kladanj, serpentine, 44° 14' 11,57'' N, 18° 34' 15,64'' E, 832 m a.s.l., 14 Aug 2008, private herbarium of F.P.

Leucanthemum vulgare (Vaill.) Lam., *Asteraceae*, is a typical grassland perennial flowering plant, native to Europe and the temperate regions of Asia, introduced to North America, Australia and New Zealand.

Different chromosome numbers are given in the literature: $2n = 18$ (Žukova 1964; Polatschek 1966; Čuksanova & al. 1968; Nagl & Ehrendorfer 1974; Khandjian 1975; Morton 1977; Rostovtseva 1979; Teppner 1980; Strid & Andersson 1985; Lippert & Heubl 1989; Probatova & al. 1989; Vogt 1991; Dempsey & al. 1994; Albers & Pröbsting 1998; Dmitrieva 2000; Probatova 2000; Vogt 2000; Gregor Hand 2009), $2n = 18 + 1B$ (Khandjian 1975), $2n = 36$ (Žukova 1964; Čuksanova & al. 1968; Morton 1977, 1981; Arohonka 1982; Marchi & al. 1983; D'Ovidio 1984; Dmitrieva 1987; Parfenov & Dmitrieva 1987; Parfenov & Dmitrieva 1988b; Lippert & Heubl 1989; Lavrenko & al. 1991; Lavrenko & al. 1992; Stepanov & Muratova 1995; Lövkvist & Hultgård 1999), $2n = 36 + 1B$ (Parfenov & Dmitrieva 1988a; Dmitrieva 2000), $2n = 54$ (Parfitt 1981; Lippert & Heubl 1989), $2n = 72$ (Lippert & Heubl 1989; Siljak-Yakovlev & al. 2010; Pustahija & al. 2013), and $2n = 90$ (Favarger & Villard 1965) for this aggregate, and our chromosome

number determination of $2n = 72$ is in accordance with previous reports for octaploids. Pustahija & al. (2013) estimated genome size for diploids (2C = 10.54 pg); Nagl & Ehrendorfer (1974), Marchi & al. (1983), Band (1983) and Pustahija & al. (2013) for tetraploids (2C = 11.55, 25.35, 21.30 and 20.20 pg, respectively); and Siljak-Yakovlev & al. (2010) for octaploids (2C = 32.69 pg). Bai & al. (2012) estimated 2C = 10.20 and 17.60 pg for unknown ploidy levels.

1939. *Melittis melissophyllum* L. — $2n = 2x = 30$ (Fig. 1f).

BH: Katranica, Muške Vode, Kladanj, serpentine, 44° 14' 11,57'' N, 18° 34' 15,64'' E, 832 m a.s.l., 14 Aug 2008, private herbarium of F.P.

Melittis melissophyllum L., *Lamiaceae*, is herbaceous perennial flowering plant in the monospecific genus *Melittis*, native to central and southern Europe.

The diploid chromosome number $2n = 30$ is in accordance with the most available literature data (Bakšay 1958; Pogan 1982; Rosselló & al. 1987; Tasenkevitch & al. 1989; Siljak-Yakovlev & al. 2010). However, the $2n = 24$ was also reported by Strid and Franzen (1981) and $2n = 30 + 1\text{-}2B$ by Dobea & al. (1997). Genome size of diploids was 2C = 0.95 pg (Siljak-Yakovlev & al. 2010).

1940. *Orchis mascula* (L.) L. — $2n = 2x = 42$ (Fig. 2g).

BH: Mliništa, Glamoč, limestone, 44° 14' 08,37'' N, 16° 49' 50,43'' E, 1204 m a.s.l., 13 May 2008, private herbarium of F.P.

Orchis mascula (L.) L., *Orchidaceae*, is tuberous perennial herbaceous plant, native to Eurasia and North Africa.

The diploid chromosome number $2n = 42$ is stable for the species and coincides with data obtained by different authors (Hagerup 1938; Heusser 1938; Vermeulen 1949; Skalińska & al. 1957; Gadella & Kliphuis 1963; Kliphuis 1963; Averyanov & al. 1985; D'Emerico & al. 2002; Bernardos 2004). Genome size has not been estimated to date.

1941. *Scorzonera austriaca* Willd. — $2n = 2x = 14$ (Fig. 1h).

F.Y.R.O.M.: Pčinja canyon, near Veles, May 2009.

Scorzonera austriaca Willd., highly polymorphic complex, is a perennial plant of *Asteraceae* family, native to the central and south-east Europe and Temperate Asia.

The diploid chromosome number $2n = 14$ counted here agrees with previously reported (Tarnavschi 1938; Sosnovec 1960; Dvorak & Dadakova 1977; Brullo & al. 1978; Strid & Franzen 1983; Kuzmanov & al. 1986; Stepanov 1992; Idei 1996). Estimated genome size for this species was 2C = 10.68 pg (Siljak-Yakovlev & al. 2010).

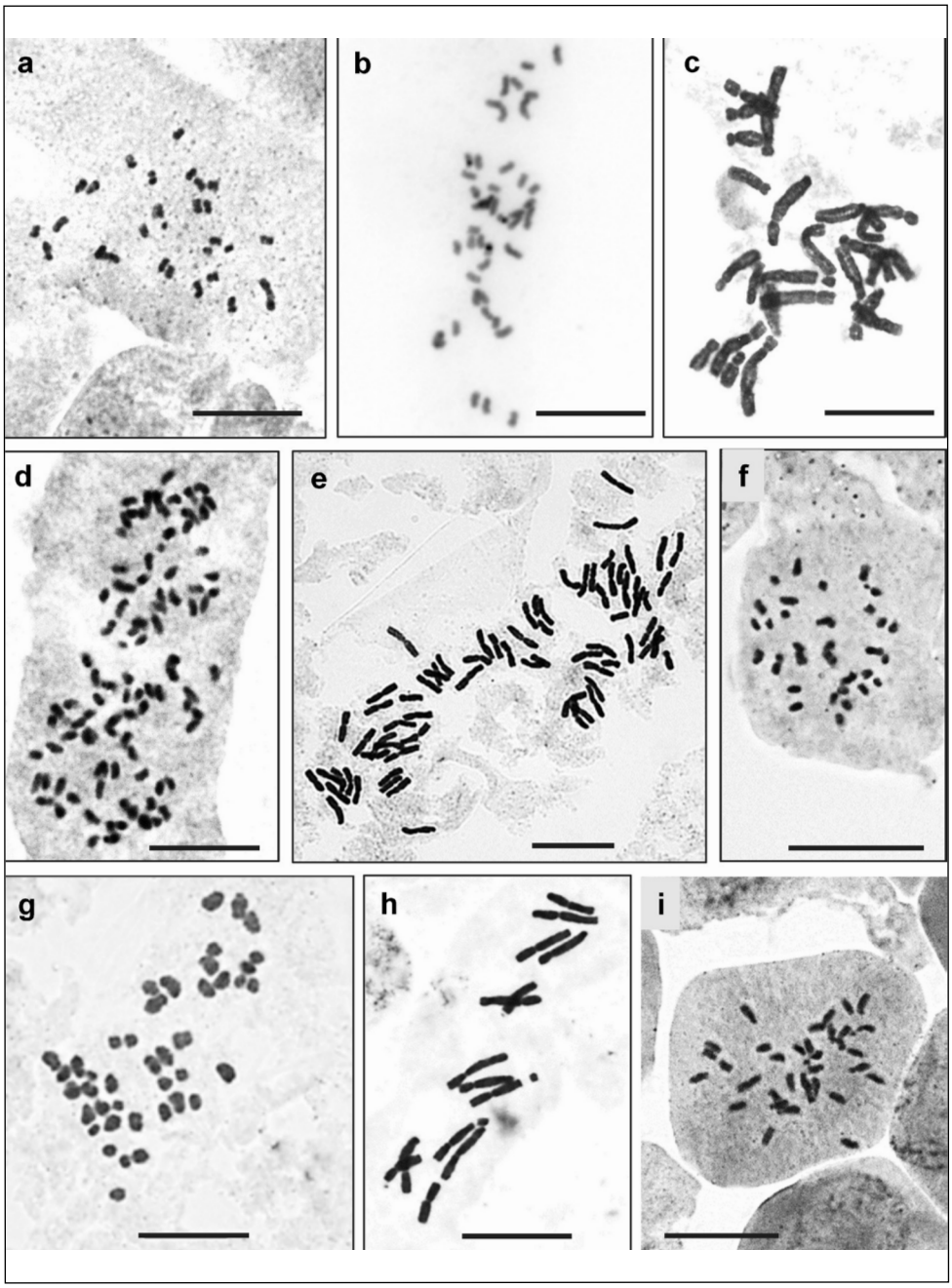

Fig. 1. Mitotic methaphase plates of: **a,** *Alnus pubescens*, 2*n* = 4x =28; **b,** *Alnus pubescens*, 2*n* = 6x = 42; **c,** *Erythronium dens-canis*, 2*n* = 2x = 24; **d,** *Genista tinctoria*, 2*n* = 4x =96; **e,** *Leucanthemum vulgare*, 2*n* = 8x =72; **f,** *Melittis melissophyllum*, 2*n* = 2x = 30; **g,** *Orchis mascula*, 2*n* = 2x = 42; **h,** *Scorzonera austriaca*, 2*n* = 2x = 14; **i,** *Stachys recta*, 2*n* = 2x = 32 + 1B. – Scale bars = 10 µm.

1942. *Stachys recta* L. **—** 2*n* = 2x = 32 + 1B (Fig. 1i).

BH: Katranica, Muške Vode, Kladanj, serpentine, 44° 14’ 10,12” N, 18° 34’ 14,01” E, 824 m a.s.l., 14 Aug 2008, private herbarium of F.P.

Stachys recta L., *Lamiaceae*, is an herbaceous perennial plant, natively widespread from Europe to the Caucasus and Asia Minor.

The diploid chromosome number 2*n* = 32 + 1B confirms previous reports for the variety *chrysophea* (Siljak-Yakovlev & al. 2010; Pustahija & al. 2013), but differs from 2*n* = 32 (Pólya 1949), 2*n* = 32-34 (Verlaque & al. 1987), 2*n* = 34 (Lang 1940; Favarger 1959; Koeva-Todorovska 1978; Kliphuis & Wieffering 1979; Cusma Velari & Lausi 1980; Pogan & al. 1982; Van Loon & Setten 1982; Baltisberger & Lenherr 1984; Baltisberger 1988; Lippert & Heubl 1989; Baltisberger 1990a, 1990b; Dobea & al. 1997; Siljak-Yakovlev & al. 2010), and 2*n* = 48 (Delay 1947). Estimated genome size for species on limestone was 2C = 1.73 pg (Siljak-Yakovlev & al. 2010), and 2C = 1.83 pg for variety *chrysophea* on serpentine (Siljak-Yakovlev & al. 2010; Pustahija & al. 2013).

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Addresses of the authors:
Fatima Pustahija[1], Neđad Bašić[1] & Sonja Siljak-Yakovlev[2],
[1]Faculty of Forestry, University of Sarajevo, Zagrebačka 20, Sarajevo, Bosnia and Herzegovina. E-mails: f.pustahija@sfsa.unsa.ba; n.basic@sfsa.unsa.ba
[2]Ecologie, Systématique et Evolution, Univ. Paris-Sud, CNRS, AgroParisTech, Université Paris-Saclay, 91405 Orsay cedex, France. E-mail: sonia.yakovlev@u-psud.fr