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# Karyological study of some Mediterranean species from Bosnia and Herzegovina, Croatia and Lebanon

**Abstract**

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Chromosome numbers and metaphase plates are given for seven species from Bosnia and Herzegovina (*Anacamptis morio*, *Asphodelus albus*, *Dactylorhiza maculata*, *Digitalis grandiflora*, *Narcissus poeticus*, *Platanthera bifolia*, *Polygonatum multiflorum*), and one species from Croatia (*Narcissus obsoletus*) and Lebanon (*Narcissus tazetta*). Chromosome counts and genome sizes are discussed.

**1926.** ***Anacamptis morio*** (L.) R. M. Bateman, Pridgeon & M. W. Chase — 2*n* = 36 (Fig. 1a).

**BH:** Mliništa, Glamoč, limestones, 44° 14’ 04,65’’ N, 16° 50’ 00,72’’ E, 1220 m a.s.l., 10 May 2008, private herbarium of F.P.

*Anacamptis morio* (L.) R. M. Bateman, Pridgeon & M. W. Chase is a bulbous herbaceous perennial plant, native to western Eurasia, ranging from Europe to Iran.

The chromosome number 2*n* = 36 counted here agrees with some previous reports, since this species has a variable number of chromosome counts 2*n* = 20, 32, 36 and 38 (Fedorov 1969; IPCN 1979). Siljak-Yakovlev & al. (2010) published the genome size of 2C = 19.27 pg for this species as *Orchis morio* L. from other BH population.

**1927.** ***Asphodelus albus*** Mill. — 2*n* = 28 (Fig. 1b).

**BH:** Galečić, Livno, limestones, 43° 47’ 18,55’’ N, 17° 10’ 14,86’’ E, 1071 m a.s.l., 19 May 2008, private herbarium of F.P.

*Asphodelus albus* Mill. is a herbaceous perennial plant, native to the Mediterranean area.

The diploid chromosome number 2*n* = 28 confirms previous reports of Capineri & al. (1978), Díaz Lifante (1996) and Siljak-Yakovlev & al. (2010), but differs from 2*n* = 26 (Fedorov 1969), *2n* = 56 (Fedorov 1969; Guillén & Laínz 1997) and 2*n* = 84 (Guillén & Laínz 1997). The measured genome size for 2*n* = 28 is 2C = 7.25 pg (Siljak-Yakovlev & al. 2010).

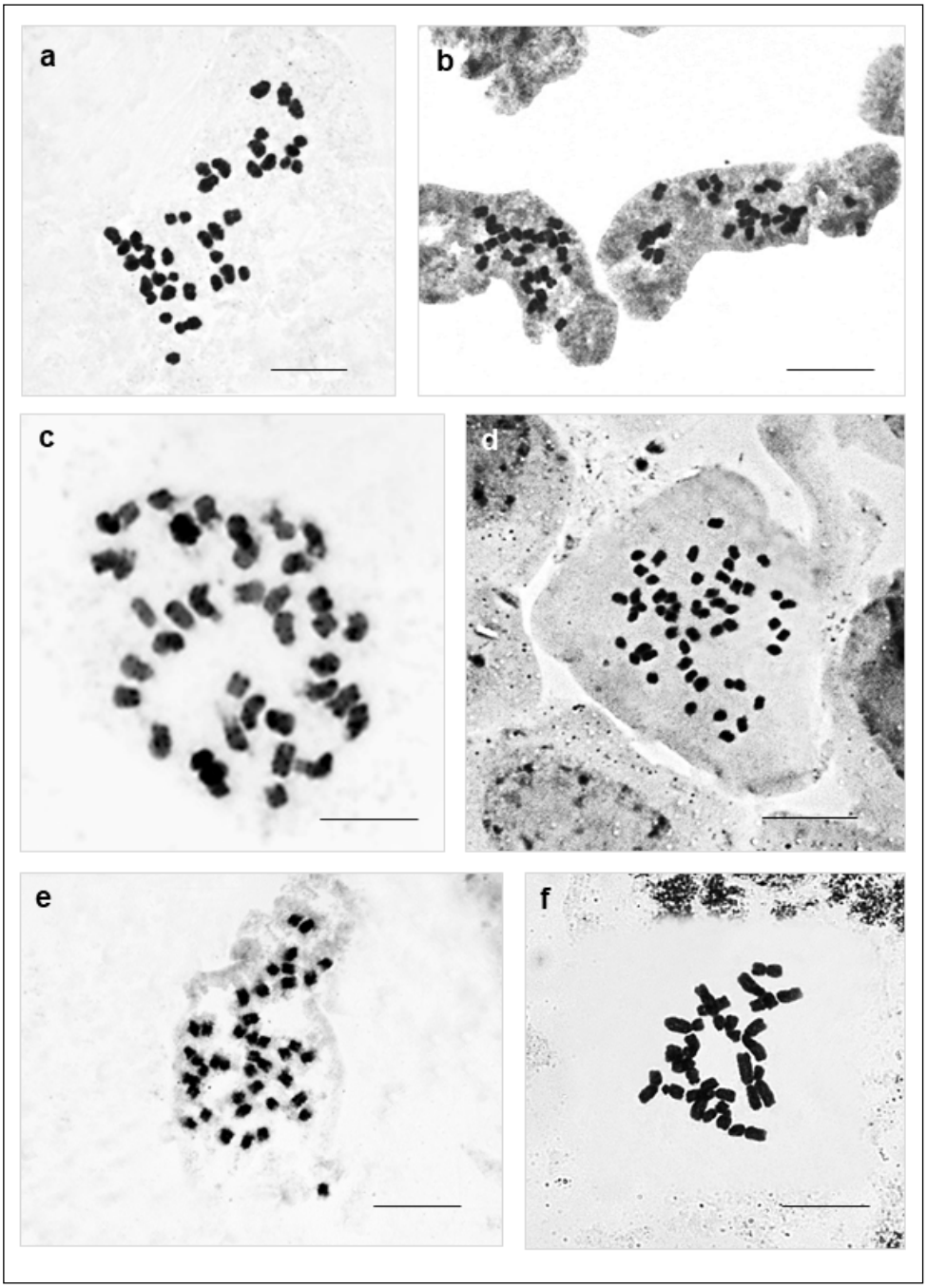


Fig. 1. Mitotic methaphase plates of: **a,** *Anacamptis morio*, 2*n* = 36; **b,** *Asphodelus albus*, 2*n* = 28; **c,** *Dactylorhiza maculata*, 2*n* = 40; **d,** *Digitalis grandiflora*, 2*n* = 56; **e,** *Platanthera bifolia*, 2*n* = 42; **f,** *Polygonatum odoratum*, 2*n* = 20. – Scale bars = 10 µm.

**1928. *Dactylorhiza maculata*** (L.) Soó — 2*n* = 40 (Fig. 1c).

**BH:** Katranica, Muške Vode, Kladanj, serpentine, 44° 14' 11,64'' N, 18° 34' 17,87'' E, 825 m a.s.l., 06 May 2008, private herbarium of F.P.

*Dactylorhiza maculata* (L.) Soó is a herbaceous perennial plant, native to Europe, but also found in Algeria, Morocco, western Siberia and Canada.

Different chromosome numbers (2*n* = 40, 40-41, 60, 78 and 80) are given in the literature for this species (IPCN 1979; Bertolini & al. 2000; Aagaard & al. 2005; Siljak-Yakovlev & al. 2010), and our count of 2*n* = 40 is in accordance with previous reports for diploids. Siljak-Yakovlev & al. (2010) estimated the genome size for diploids (2C = 6.80 pg) and Aagaard & al. (2005) for tetraploids (2C = 11.32 pg).

**1929. *Digitalis grandiflora*** Mill. — 2*n* = 56 (Fig. 1d).

**BH** Papratnica, Žepče, serpentine, 44° 26' 13,33'' N, 17° 58' 39,33'' E, 333 m a.s.l., 29 Jun 2008, private herbarium of F.P.

*Digitalis grandiflora* Mill. is a herbaceous biennial or perennial plant, native to southern Europe and Asia.

The diploid chromosome number 2*n* = 56 is stable for the species and coincides with data obtained by different authors (Fedorov 1969; IPCN 1979; Vidic & al. 2009; Temsch & al. 2010; Pustahija & al. 2013). Estimated genome sizes for the species are 2C = 2.30 pg (Temsch & al. 2010), 2.56 pg (Pustahija & al. 2013) and 2.60 pg (Vidic & al. 2009).

**1930. *Narcissus obsoletus*** (Haw.) Spach — 2*n* = 30 (Fig. 2a).

**Ct:** Lovište, Pelješac Peninsula, limestones, 43° 02' 47,32'' N, 17° 00' 10,33'' E, 12 m a.s.l., 19 Oct 2008, private herbarium of E.M.Š.

*Narcissus obsoletus* (Haw.) Spach is a bulbous herbaceous perennial plant, native to the Mediterranean littoral with geographical distribution from northern Africa and the Iberian Peninsula to Israel on east.

This is the first finding of this species for the Croatian flora identified also thanks to count of chromosome number 2*n* = 30 and analysis of chromosome complement, which is in agreement with data obtained by Díaz Lifante & al. (2009). Siljak-Yakovlev & al. (2010) published its genome size but as *N. serotinus* L. 2C = 43.85 pg.

**1931. *Narcissus poeticus*** L. — 2*n* = 14, 14+1-2Bs & 21+0-3Bs (Figs 2b, c & d).

**BH:** Katranica, Muške Vode, Kladanj, serpentine, 44° 14' 11,64'' N, 18° 34' 17,87'' E, 825 m a.s.l., 06 May 2008, private herbarium of F.P.

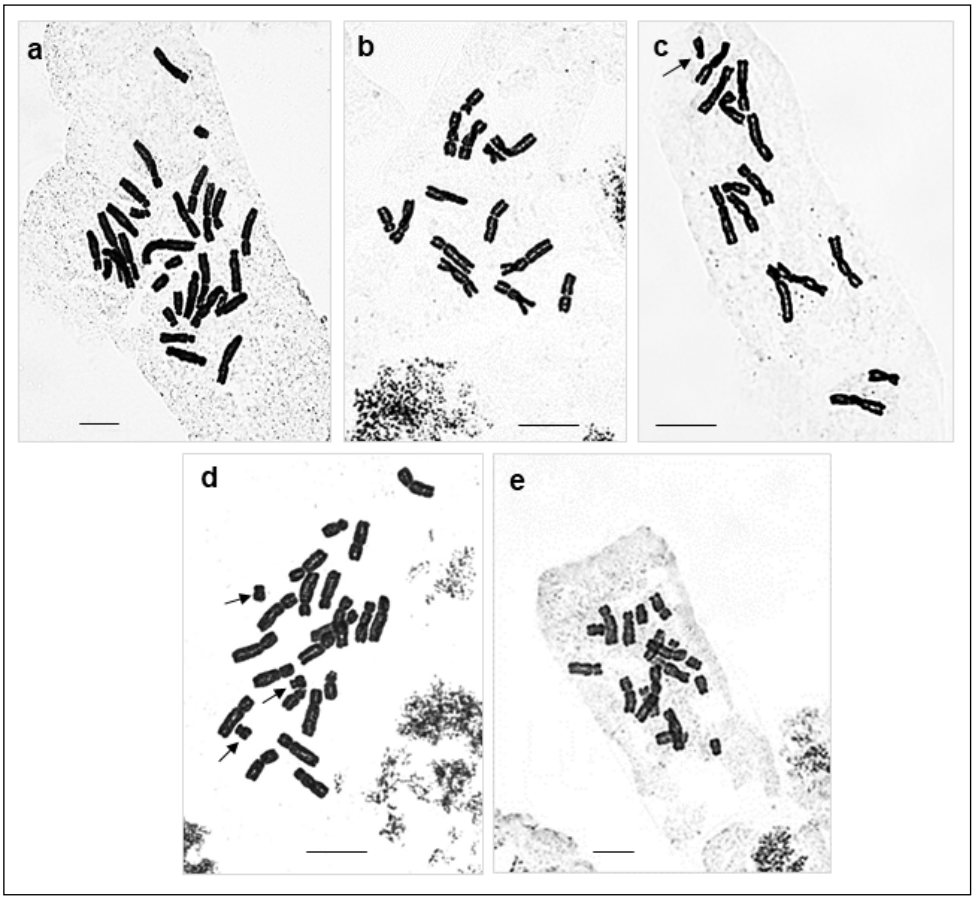


Fig. 2. Mitotic methaphase plates of *Narcissus:* **a,** *N. obsoletus*, 2*n* = 30; **b,** *N. poeticus*, 2*n* = 14 (population Katranica); **c,** *N. poeticus*, 2*n* = 14+1B (population Donje Peulje); **d,** *N. poeticus*, 2*n* = 21+3Bs (population Avtovac); **e,** *N. tazetta*, 2*n* = 18. – Arrows indicate the B chromosomes. Scale bars = 10 µm.

— Donje Peulje, Bosansko Grahovo, limestone, 44° 08’ 42,81’’ N, 16° 27’ 48,12’’ E, 810 m a.s.l., 10 May 2008, private herbarium of F.P.
— Avtovac, Gatačko Polje, Gacko, limestones, 43° 07’ 49,40’’ N, 18° 34’ 01,46’’ E, 949 m a.s.l., 13 May 2008, private herbarium of F.P.

*Narcissus poeticus* L. is a bulbous herbaceous perennial plant, native to central and southern Europe and cultivated, as a horticultural species, throughout the world.

The diploid chromosome number 2*n* = 14+0-2Bs is reported by several authors (Fedorov 1969; IPCN 1979; Zonneveld 2008; Siljak-Yakovlev & al. 2010; Pustahija & al. 2013) as well as triploid chromosome number 2*n* = 21 (Fedorov 1969; IPCN 1979;

Brandham & Kirton 1987; Siljak-Yakovlev & al. 2010). Here we confirm chromosome numbers of diploids $2n = 14 + 0\text{-}2Bs$ and triploids $2n = 21 + 0\text{-}3Bs$. Genome sizes of diploids were 24.33 (Siljak-Yakovlev & al. 2010), 26.00 (Zonneveld 2008), 27.50 pg (Olszewska & Osiecka 1982), and for triploids 2C = 34.55 pg (Siljak-Yakovlev & al. 2010).

**1932.** ***Narcissus tazetta*** L. — $2n = 18$ (Fig. 2e).

**Le:** El Aleli, limestones, 30 m a.s.l., 13 Apr 2012, leg. *M. Bou Dagher-Kharrat s.n*.

*Narcissus tazetta* L. is a bulbous herbaceous perennial and ornamental plant, native to the Mediterranean region from Portugal to Turkey, but widespread all over the world.

In the literature, very diverse reports are present for this species in relation to its chromosome number: $2n = 14, 20, 21, 22, 24, 28, 30$ and 32 (Fedorov 1969; IPCN 1979; Brandham & Kirton 1987; Zonneveld 2008; Bennett & Leitch 2012; Boukhenane & al. 2015). Here we present, for the first time, the chromosome number $2n = 18$ that we found in one Lebanon population. This finding merites to be deepened. Three different genome sizes are published for this species 2C = 25 pg (Bou Dagher-Kharrat & al. 2013), 2C = 30.30 (Zonneveld 2008), 39.54 pg (Vesely & al. 2011).

**1933.** ***Platanthera bifolia*** (L.) Rich. — $2n = 42$ (Fig. 1e).

**BH:** Katranica, Muške Vode, Kladanj, serpentine, 44° 14’ 11,64’’ N, 18° 34’ 17,87’’ E, 825 m a.s.l., 06 May 2008, private herbarium of F.P.

*Platanthera bifolia* (L.) Rich. is a tuberculous herbaceous perennial plant, native to Europe, Asia-Temperate, Algeria and Tunisia.

The diploid chromosome number $2n = 42$ is in accordance with the most aviable literature data (Fedorov 1969; IPCN 1979; Siljak-Yakovlev & al. 2010) but not with $2n = 16$ and 40 (IPCN 1979). Estimated amounts of nuclear DNA were 2C = 13.74 and 19.89 pg by Siljak-Yakovlev & al. 2010 and Vesely & al. 2011, respectively.

**1934.** ***Polygonatum odoratum*** (Mill.) Druce — $2n = 20$ (Fig. 1f).

**BH:** Katranica, Muške Vode, Kladanj, serpentine, 44° 14’ 11,64’’ N, 18° 34’ 17,87’’ E, 825 m a.s.l., 06 May 2008, private herbarium of F.P.

*Polygonatum odoratum* (Mill.) Druce is a rhizomatous herbaceous perennial plant, native to Europe, Caucasus, Siberia, Russian Far East, China, Mongolia, Korea and Japan.

A very diverse chromosome number for the species can be found in the literature $2n = 16, 18, 20, 20+0\text{-}2Bs, 22, 24, 30$ and 40 (Fedorov 1969; IPCN 1979; Siljak-Yakovlev & al. 2010), where the $2n = 20$ that we found is the most common. Measured genome sizes are

2C = 19.66 (Siljak-Yakovlev & al. 2010), 20.04 (Vesely & al. 2011) and 23.10 pg (Zonneveld & al. 2005).

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