

Chromosome numbers of *Allium scorodoprasum* and *A. vineale* from SW Finland and W Ukraine

Helena Åström & Carl-Adam Hæggström

Department of Ecology and Systematics, P.O. Box 65, FIN-00014 University of Helsinki, Finland

Received 26 Apr. 2002, revised version received 17 Sep. 2002, accepted 17 Sep. 2002

Åström, H. & Hæggström, C.-A. 2003: Chromosome numbers of *Allium scorodoprasum* and *A. vineale* from SW Finland and W Ukraine. — *Ann. Bot. Fennici* 40: 1–3.

The chromosome numbers of six diploid ($2n = 16$) and two triploid ($2n = 24$) populations of *Allium scorodoprasum* and eight tetraploid ($2n = 32$) populations of *A. vineale* were studied in Finland and western Ukraine. Triploid *A. scorodoprasum* has not previously been found in Finland. These are the first chromosome counts of *A. vineale* from Finland.

Key words: *Allium scorodoprasum*, *A. vineale*, chromosome numbers, cytotaxonomy

Background and methods

During studies on chromosome numbers of *Allium oleraceum* (H. Åström & C.-A. Hæggström unpubl.), we collected samples also of the two other bulbiferous *Allium* species found in Finland, viz. *A. scorodoprasum* and *A. vineale*. The specimens are cited in the Results-section.

Living plants were collected in nature with their bulbs intact and cultivated for roots in tap water. Bulbils were put in small holes made in the plastic lids of plastic containers filled with tap water. Put with their base down into the holes, the bulbils developed excellent roots in a week or even less. Seeds of *Allium vineale* from one locality were germinated on moist paper in a refrigerator at +7 °C in darkness. For chromosome counts the root tips were processed according to a procedure modified from Jong (1997). The material was pretreated with 0.002 M 8-hydroxykinolin (Merck) for 30 minutes to 2 hours at room temperature and further for 18–22 hours at +7 °C. The root tips

were rinsed and fixed with Carnoy's fixative for 30 minutes and stained with the Feulgen/Schiff reagent for 2–3 hours in dark. The chromosome counts were made from squash preparations from several root tips.

Results

Allium scorodoprasum

SPECIMENS EXAMINED: **Finland.** *Al*: Lemland, Nätö, meadow between Nätö Biological Station and the seashore, 24.VIII.2000 C.-A. Hæggström & H. Åström, $2n = 16$ (bulbils); Jomala, Jomala by, roadside meadow about 50 m S of Jans at the road to Överby, 24.VIII.2000 C.-A. Hæggström & H. Åström, $2n = 16$ (bulbs); Kökar, Hammö, meadow at the church, 24.VIII.2000 C.-A. Hæggström & H. Åström, $2n = 24$ (bulbs); Kökar, Överboda, rock meadow at the house of Åström, 24.VIII.2000 C.-A. Hæggström & H. Åström, $2n = 16$ (bulbs). *N*: Hanko/Hangö, Tvärminne, Storängsberget at Tvärminne Zoological Station, 29.IX.2000 H. Åström, $2n = 16$ (bulbils). *Ta*: Tyrvântö, Lepaa, Horticultural School, in the rock garden by Lepaanvirta stream, 30.VIII.2001 C.-A. Hæggström 8391 & H. Åström (H), $2n = 16$ (bulbs).

Ukraine. *Chernivtsi Region:* Storozhinets District, meadow slopes about 0.5 km N of the village of Spaska, alt. 370 m a.s.l., 19.VII.2001 C.-A. Hægström 8309 (H), $2n = 24$ (bulbs and bulbils); Kelmentsi District, in mixed broad-leaved deciduous wood about 2 km SSW of the village of Mihajlovka, about 200 m a.s.l., 1.V.2001 C.-A. Hægström 8235, $2n = 16$ (bulbs).

Most of our plants were diploid ($2n = 16$), but two triploid ($2n = 24$) populations were found, one in the Kökar in Åland Islands, the other in Ukraine. The triploid chromosome number has not been previously recognised in Finland; only diploid plants have been found before (Arohonka 1982, Halkka 1985, Uotila & Pellinen 1985, Hämet-Ahti *et al.* 1998).

Allium vineale

SPECIMENS EXAMINED: **Finland.** *Al:* Lemland, Nätö, Nätö Biological Station, at the old stable, 24.V.2000 C.-A. Hægström & H. Åström, $2n = 32$ (bulbs); Lemland, Nätö, at the nature trail about 70 m SE of Nätö Biological Station, 24.V.2000 C.-A. Hægström & H. Åström, $2n = 32$ (bulbs); Lemland, Nätö, deciduous stand at Harskatan, 26.V.2000 C.-A. Hægström & H. Åström, $2n = 32$ (bulbs); Jomala, meadow at the Viking Age Museum next to the church, 24.VIII.2000 C.-A. Hægström & H. Åström, $2n = 32$ (bulbs); Saltvik, Liby, at roadside about 20–30 m S of the old manor, 13.VI.2001 C.-A. Hægström 8258 & E. Hægström (H), $2n = 32$ (bulbs); Sund, Bomarsund, meadow immediately S of the main road about 1 km W of the fortress ruin, 25.V.2000 C.-A. Hægström & H. Åström, $2n = 32$ (bulbs). *N:* Ekenäs, rock outcrop at the end of Ystadsgatan next to the railway, 29.IX.2000 H. Åström, $2n = 32$ (bulbs, bulbils and seeds). **Ukraine.** *Chernivtsi Region:* Kelmentsi District, in mixed broad-leaved deciduous wood about 2 km SSW of the village of Mihajlovka, about 200 m a.s.l., 1.V.2001 C.-A. Hægström 8236 (H), $2n = 32$ (bulbs).

All plants studied were tetraploid ($2n = 32$). The chromosome number of *Allium vineale* has not previously been reported from Finland.

Discussion

Allium scorodoprasum has been treated as a polymorphic species, comprising four taxa at the subspecies level (Stearn 1978, 1980). Later, Mathew (1996) included the three non-bulbiliferous taxa in *A. rotundum* as subspecies, leaving the bulbiliferous plant as *A. scorodoprasum*. All

the plants found in Finland, as well as the two collections from Ukraine, have bulbils and thus they belong to *A. scorodoprasum s. stricto*.

Diploid ($2n = 16$), triploid ($2n = 24$) and tetraploid ($2n = 32$) chromosome numbers have been reported for this taxon (e.g. Katayama 1928, Tschermak-Woess 1947, Linder & Brun 1956, Löve & Löve 1961, Stearn 1978, 1980, Özhatay 1984). Mathew (1996) mentions diploid and tetraploid numbers only. Lövkvist and Hultgård (1999) mention also diploid plants with 0–2 B-chromosomes.

Diploid specimens of *Allium scorodoprasum* seem to be the most common, being reported from several localities throughout its range. Triploid plants have, however, previously been reported only from one population in Austria (Sophienalm at Vienna; Tschermak-Woess 1947), from more than 20 populations in Slovakia (Májovský & Murín 1987, Murín & Feráková 1988) and from Bohemia in the Czech Republic (Bílé stráňe near Litoměřice; Murín & Feráková 1988). Murín and Feráková (1988) found that diploid and triploid plants occurred approximately in equal proportions in Slovakia, with a concentration of triploid plants in the western part of the country.

Tetraploid plants seem also to be rare, being reported from France (Alsace; Linder & Brun 1956), the Netherlands (Overijssel, Zalkerbos near Zalk; Gadella & Kliphuis 1973; Noord-Holland, Texel; van Loon 1982), Italy (Trieste, Civico Orto Botanico; Jacobsen & Ownbey 1977) and Turkey (Edirne, Saraylı and Tavuk ormani; Özhatay 1984; Kirklareli, İğneada near Kocagöl; Özhatay 1984).

Two chromosome determinations of *Allium scorodoprasum* have previously been published from Finland: Ab, Nauvo, Seili ($n = 8$; Arohonka 1982) and N, Hangö/Hanko, Tvärminne ($n = 8$; Halkka 1985). Our study material at Tvärminne comes from the same population of *A. scorodoprasum* as Halkka's.

The plants of our two triploid populations differ morphologically from the diploids in being larger; the height of the majority of the plants in both the Kökar and the Spaska populations were more than one metre, whereas the 'normal' height of this species is 30–90 cm (Hämet-Ahti *et al.* 1998). Our studies on *Allium oleraceum*

have revealed that pentaploid plants in this species are much taller than tetraploid ones in populations where both chromosome numbers occur (C.-A. Hægström & H. Åström unpubl.). Murín & Feráková (1988) reported that the number of flowers per inflorescence was much higher in diploid plants than in triploid ones (mean 32.2 and 2.6), the size of stomata was smaller in the diploid plants (15.5 μm and 19.5 μm), and the percentage of abortive pollen was much lower in the diploid plants (11% and 72%). We did not study these characters, but two specimens from Ukraine (Hægström 8309) have 8 and 13 flowers, respectively.

Diploid ($2n = 16$), tetraploid ($2n = 32$), pentaploid ($2n = 40$) and hexaploid ($2n = 48$) chromosome numbers have been reported in *Allium vineale* (e.g. Levan 1931, Fernandes *et al.* 1948, Löve & Löve 1961, Stearn 1980, Pastor 1982, Özhatay 1984, Tzanoudakis 1985, Mathew 1996). Pentaploids and hexaploids have been found in the Iberian peninsula only (Fernandes *et al.* 1948, Pastor 1982). Tetraploid plants with 1–4 B-chromosomes have also been found (Měsíček & Javůrková-Jarolímová 1992). All our plants were tetraploid which is by far the most common chromosome number found in *A. vineale*.

References

- Arohonka, T. 1982: Kromosomilukumääriytyksiä Nauvon Seilin saaren putkilokasveista — *Turun yliopiston biologian laitoksen julkaisuja* 3: 1–12.
- Fernandes, A., Garcia, J. & Fernandes, R. 1948: Herborizações nos domínios da Fundação da Casa de Bragança. — *Memórias Soc. Broteriana* 4: 1–89.
- Gadella, T. W. J. & Kliphuis, E. 1973: Chromosome numbers of flowering plants in the Netherlands. VI. — *Proc. Kon. Ned. Acad. Wet.*, Ser. C 76: 303–311.
- Halkka, L. 1985: Chromosome counts of Finnish vascular plants. — *Ann. Bot. Fennici* 22: 315–317.
- Hämet-Ahti, L., Suominen, J., Ulvinen, T. & Uotila, P. (eds.) 1998: *Retkeilykasvio*, ed. 4. — Finnish Mus. Nat. Hist., Bot. Mus., Helsinki. 656 pp.
- Jacobsen, T. D. & Ownbey, M. 1977: — In: Löve, Á. (ed.), IOPB chromosome number reports LVI. — *Taxon* 26: 271.
- Jong, K. 1997: *Laboratory manual of plant cytological techniques*. — Royal Bot. Garden, Edinburgh. 87 pp.
- Katayama, Y. 1928: The cerosome [= chromosome] number in *Phaseolus* and *Allium*, and an observation on the size of stomata in different species of *Triticum*. — *Trans. Tōtōri Soc. Agric. Sci. (Nōgaku Kwaihô)* 1928: 52–54.
- Levan, A. 1931: Cytological studies in *Allium*. A preliminary note. — *Hereditas* 15: 347–356.
- Linder, R. & Brun, J. 1956: Graines récoltées en Alsace. — *Jardin Bot. Strasbourg, Index seminum* 1956: 28–34.
- Löve, Á. & Löve, D. 1961: Chromosome numbers of Central and Northwest European plant species. — *Opera Bot.* 5: 1–581.
- Lökvist, B. & Hultgård, U.-M. 1999: Chromosome numbers in South Swedish vascular plants. — *Opera Bot.* 137: 1–42.
- Májovský, J. & Murín, A. (eds.) 1987: *Karyotaxonomický prehľad flóry Slovenska*. — Veda, Bratislava. 436 pp.
- Mathew, B. 1996: *A review of Allium sect. Allium*. — Internat. Board Plant Gen. Resources & Royal Bot. Gardens, Kew. IX + 176 pp.
- Měsíček, J. & Javůrková-Jarolímová, V. 1992: *List of chromosome numbers of the Czech vascular plants*. — Academia, Praha. 144 pp.
- Murín, A. & Feráková, V. 1988: Karyological variability of the species *Allium scorodoprasum* L. — *Acta Fac. Rerum Nat. Univ. Comenianae, Bot.* 36: 65–77.
- Özhatay, N. 1984: Cytotaxonomic studies on the genus *Allium* in European Turkey and around Istanbul III. Sect *Allium* and sect. *Melanocrommyum*. — *J. Fac. Pharm. Istanbul* 20: 43–65.
- Pastor, J. 1982: Karyology of *Allium* species from the Iberian Peninsula. — *Phyton (Austria)* 22: 171–200.
- Stearn, W. T. 1978: European species of *Allium* and allied genera of Alliaceae: a synonymic enumeration. — *Ann. Musei Goulandris* 4: 83–198.
- Stearn, W. T. 1980: *Allium* L. — In: Tutin, T. G. *et al.* (eds.), *Flora Europaea* 5: 49–69. Cambridge Univ. Press, Cambridge etc.
- Tschermak-Woess, E. 1947: Über chromosomale Plastizität bei Wildformen von *Allium carinatum* und andere *Allium*-Arten aus den Ostalpen. — *Chromosoma* 3: 66–87.
- Tzanoudakis, D. 1985: Chromosome studies in some species of *Allium* sect. *Allium* in Greece. — *Ann. Musei Goulandris* 7: 233–247.
- Uotila, P. & Pellinen, K. 1985: Chromosome numbers in vascular plants from Finland. — *Acta Bot. Fennica* 130: 1–37.
- Van Loon, J. C. 1982: — In: Löve, Á. (ed.), IOPB chromosome number reports LXXVII. — *Taxon* 31: 763–764.