Chromosome Constitution of Species in the Plant Genus *Chaenomeles*

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SUMMARY

The chromosome number was studied in plants, derived from seeds collected in the wild, of all four species (*C. cathayensis*, *C. japonica*, *C. speciosa* and *C. thibetica*) presently recognised in the genus *Chaenomeles* Lindl. (Maloideae, Rosaceae). For the first time the chromosome number of *C. thibetica* was also determined.

Chaenomeles thibetica was diploid and had a chromosome number of $2n = 34$. The results of chromosome counting in the three other species were in agreement with the literature. Thus, all species within the genus *Chaenomeles* were confirmed to be diploid and to have the same chromosome number, $2n = 34$.

INTRODUCTION

The genus *Chaenomeles* Lindl. of the family Rosaceae has four species according to the most recent checklist of the subfamily Maloideae (Phipps *et al*. 1990). The three species *C. cathayensis* (Hemsl.) Schneider (Chinese quince), *C. japonica* (Thunb.) Lindl. (Japanese quince) and *C. speciosa* (Sweet) Nakai (flowering quince), and their interspecific hybrids, have been recognised as ornamentals for over 400 years (Weber 1964). In 1963, a fourth species, *C. thibetica* Yü (Tibetan quince), was described by Yü and Kuan, and was later included in the Chinese flora (Yü 1974). *Chaenomeles thibetica* has only recently been introduced into cultivation in Europe (Rumpunen & Bartish 2002).

The chromosome number of the three first introduced species, *C. cathayensis*, *C. japonica* and *C. speciosa*, was reported to be $2n = 34$ by Moffett (1931). These counts were later confirmed by Weber (1964), Saito and Kaneko (1975), Singhal (1990) and others. The chromosome number of *C. thibetica* has, however, not been reported.

The aim of this study was to investigate the ploidy and chromosome number of *C. thibetica*. We also reinvestigated the chromosome number in the other species belonging to the genus *Chaenomeles*.

MATERIALS AND METHODS

Plant material

One- and two-year old seedlings of all four species in the genus *Chaenomeles* were obtained from Balsgård–Department of Horticultural Plant Breeding, Swedish University of Agricultural Sciences, Sweden. The seeds had been collected in the wild in different areas of Japan (*C. japonica*), China (*C. speciosa* and *C. cathayensis*) and Tibet (*C. thibetica*) (Table 1). The material evaluated consisted of three accessions of each species and one seedling of each accession.

Table 1. Origin of species and genotypes studied. For co-ordinates and altitudes, see Rumpunen & Bartish (2002).

Species	Accession code	Origin
C. japonica	9702-1	Noguchi, Nikko, Tochigi, Japan
C. japonica	9703-2	Izumi, Nikko, Tochigi, Japan
C. japonica	9707-6	Hiragasaki, Imaichi, Tochigi, Japan
C. speciosa	9801-12	Zheyuan, Yunnan, China
C. speciosa	9802-12	Hutiaoxia, Zhongdian, Yunnan, China
C. speciosa	9805-9	Dali, Yunnan, China
C. cathayensis	9804-1	Caojian, Yunlong, Yunnan, China
C. cathayensis	9804-7	Caojian, Yunlong, Yunnan, China
C. cathayensis	9804-17	Caojian, Yunlong, Yunnan, China
C. thibetica	9806-5	Yi'ong, Bomi, Tibet
C. thibetica	9806-13	Yi'ong, Bomi, Tibet
C. thibetica	9806-14	Yi'ong, Bomi, Tibet

Sample preparation and chromosome counting

Fresh, white root tips were detached by forceps from the root systems of plants growing in pots in a greenhouse. Root tips were immediately soaked in water at 20 °C for four hours and then soaked in 75 mM KCl for 10 minutes (Bukhari 1997). Then, root tips were fixed in a solution of absolute ethanol, chloroform and glacial acetic acid mixture (6:3:1) for 24 hours. Fixation was followed by the Feulgen-Giemsa double staining procedure (Anamthawat-Jonsson *et al.* 1986), with one exception: after air drying the squeezed root tips were rinsed in Sorensen phosphate buffer for 5 min before staining with 4% Giemsa (Merck) in Sorensen phosphate buffer for 15 min. Permanent preparations were made by mounting the samples in Entellan (Merck). Chromosomes were examined by light microscopy (1000x) and well spread metaphases were photographed using Kodak EPT 160 T film. At least 30 mitotic plates were counted for each *C. thibetica* accession and at least 10 for each of the other species.

RESULTS AND DISCUSSION

Chaenomeles thibetica was shown to have a chromosome number of $2n = 34$ (Figure 1). The results of the counting of chromosomes in the three other species were in agreement with published information (Moffett 1931, Sax 1931, Sax 1932, Darlington & Wylie 1956, Weber 1964, Saito & Kaneko 1975, Singhal 1990). Thus, all species within the genus *Chaenomeles* were confirmed to have the same chromosome number, $2n = 34$.

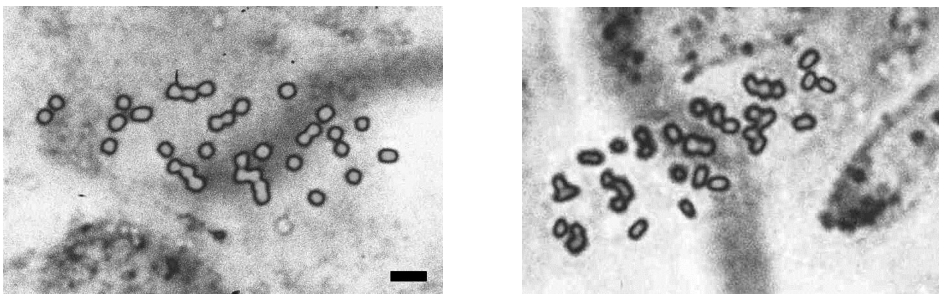

Figure 1. Two pictures showing mitotic chromosomes of *C. thibetica*, $2n = 34$. The bar indicates 1 μm.

LITERATURE

Anamthawat-Jonsson K., Atipanumpai L., Tigerstedt P.M.A., Tomasson T. 1986. The Feulgen-Giemsa method for chromosomes of *Betula* species. Hereditas 104: 321–322.

Bukhari Y.M. 1997. A simple method of chromosome preparation for *Acacia* and *Prosopis* (Mimosaceae). Hereditas 126: 195–197.

Darlington C.D., Wylie A.P. 1956. Chromosome Atlas of Flowering Plants. London.

Moffett A.A. 1931. The chromosome constitution of the Pomoideae. Proceedings of the Royal Society of London 108: 423–446.

Phipps J.B., Robertson K.R., Smith P.G., Rohrer J.R. 1990. A checklist of the subfamily Maloideae (Rosaceae). Canadian Journal of Botany 68: 2209–2269.

Rumpunen K., Bartish I.V. 2002. Comparison of differentiation estimates based on morphometric and molecular data, exemplified by various leaf shape descriptors and RAPDs in the genus *Chaenomeles* (Rosaceae). Taxon 51: 69–82.

Saito K., Kaneko Y. 1975. Cytological observations on sterility of flowering quince. Japanese Journal of Breeding 25: 101–108. (in Japanese)

Singhal V.K. 1990. Cytology of woody members of Rosaceae. Proceedings of the Indian Academy of Sciences, Plant Science 100: 17–21.

Sax K. 1931. The origin and relationship of the Pomoideae. Journal of the Arnold Arboretum 12: 3–21.

Sax K. 1932. Chromosome relationship in the Pomoideae. Journal of the Arnold Arboretum 13: 363–367.

Weber C. 1964. The genus *Chaenomeles* (Rosaceae). Journal of the Arnold Arboretum 45: 161–205, 302–345.

Yü T.T., Kuan K.C. 1963. Taxa nova Rosacearum sinicarum I. Acta Phytotaxonomica Sinica 8: 214–220.

Yü T.T. 1974. Maloideae. In: Rosaceae (1). Spiraoideae – Maloideae. Flora Republicae Popularis Sinicae. Vol. 36. Institutum Botanicum Pekinense Academiae Sinicae.