Chromosome Studies in Species and Hybrids of *Petrorhagia* sect. *Kohlrauschia* (Caryophyllaceae)

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(Received November 24, 1981)

Key Words: Angiosperms, Caryophyllaceae, *Petrorhagia prolifera*, *P. velutina*, *P. glumacea*, *P. nanteuilii*.—Chromosome numbers, karyotype, meiotic behaviour, polyploidy.

Abstract: Cytogenetic investigations have been made in the four *Petrorhagia* species and hybrids of the section *Kohlrauschia*. The three diploid species show close similarities in chromosome number, size and morphology, with the exception of *P. velutina*, where one pair of metacentric chromosomes is represented by a pair of telocentrics. Meiotic studies in hybrids indicate close genomic homology between the diploid species and also between the two floral forms of *P. prolifera*. The tetraploid *P. nanteuilii* behaves as an allotetraploid forming only bivalents at meiosis and results suggest that *P. velutina* and *P. prolifera* are the diploid progenitors of this species. Since meiosis in diploid and triploid hybrids results in extensive intergenomic pairing it is concluded that the natural tetraploid has a bivalent promoting mechanism that prevents pairing between the genomes of its diploid progenitors.

The section *Kohlrauschia* (KUNTH) BALL & HEYWOOD of the genus *Petrorhagia* (SER.) LINK (Caryophyllaceae) comprises four annual, self-compatible species. Breeding systems, hybridization and geographical distribution have been recently investigated in this group (THOMAS & MURRAY 1981). One of the species, *P. prolifera* (L.) BALL & HEYWOOD, consists of two distinct floral forms which appear to be reproductively isolated and which will be classified as separate species in a taxonomic revision of the section (THOMAS in prep.). Breeding systems range from facultative xenogamy in *P. glumacea* (BORY & CHAUB.) BALL & HEYWOOD and large flowered *P. prolifera* to autogamy in *P. velutina* (Guss.) BALL & HEYWOOD.
Previous reports on the cytology of the section *Kohlruschia* have been mainly confined to counts of chromosome number (Blackburn 1933, Favarger 1946, Böcher & al. 1953, Løve & Løve 1961, Ball & Heywood 1962, Gadelia & Kliphuis 1970, Holub & al. 1972). However, Böcher & al. (1953) have recorded the presence of a distinctive karyotype in *P. velutina*. The tetraploid member of the section, *P. nanteuilii* (Bunat) Ball & Heywood was considered to be a cytological race of the diploid *P. prolifera* by Blackburn (1933) and Böcher & al. (1953). Ball & Heywood (1962), on the other hand, have suggested that *P. nanteuilii* is an allotetraploid derived from the diploid species *P. prolifera* and *P. velutina*.

This study deals with chromosome numbers, karyotypes and meiotic behaviour in the species and artificially produced hybrids of the section *Kohlruschia*.

**Materials and Methods**

The plants used in this study were obtained from seed of naturally growing populations or from botanic gardens. Details of the original location and code for each population studied are given in Table 1. Voucher specimens are deposited at the British Museum (Natural History), London (BM).

For cytological examination of somatic chromosomes, actively growing root tips were pre-treated with a saturated solution of para-dichlorobenzene for 18-20 hours at 4°C, fixed in 1:3 acetic alcohol for 24 hours and stained in Feulgen for 2 hours after 9 minutes hydrolysis in NHC1 at 60°C.

Meiosis was studied in pollen mother cells of immature flowers that had been fixed in a modified Carnoy’s fluid (absolute ethanol, chloroform, acetic acid 6:3:1) and squashed in lactopropionic orcein.

For the synthesis of artificial tetraploids an 0.5% aqueous solution of colchicine, stabilized with the addition of 1% agar, was pipetted onto the stem apex of young seedlings. Successful induction of polyploidy was indicated by the production of dark green, swollen leaves a few weeks later. Confirmation of polyploidy was obtained by subsequent meiotic analysis.

Hybrids were produced and their pollen viability tested using previously described techniques (Thomas & Murray 1981).

**Results**

**Chromosome Numbers and Karyotypes.** All chromosomes counts for the species of the section *Kohlruschia* are given in Table 1. Where possible, counts of chromosome number were made from populations drawn from a wide area of the species range. The results of this investigation confirm earlier counts and show that the base number for the section *Kohlruschia* is *x = 15*. 