MEGACHROMOSOMES IN *PAPHIOPEDILUM VILLOSUM* (ORCHIDACEAE)

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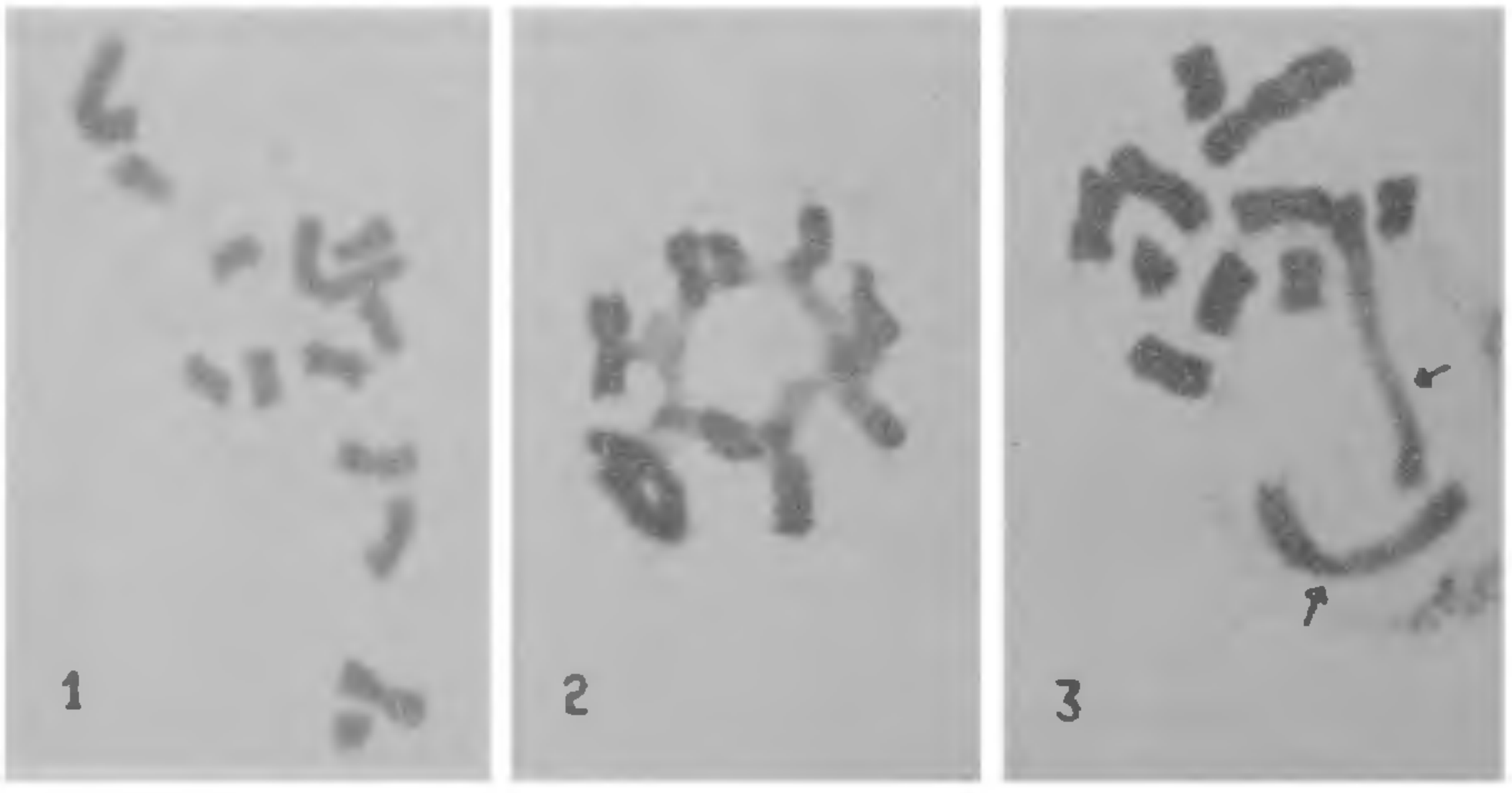
MEGACHROMOSOMES or enlarged euchromatic chromosomes have been occasionally reported in a few species and hybrids of *Nicotiana*[4], in which some cells exhibit extremely long chromosomes. Their occurrence has normally been associated with hybridisation, exposure to mutagens or in tumor or cell cultures. Megachromosomes occur in a small minority of cells—generally mitotic; are generally thrice longer than the longest member of the complement; increase is only in length; are not recognisable at interphase. In the present study, megachromosomes were observed at pollen mitotic metaphase and are being reported.

Paphiopedilum villosum (Lindl) Pfitz., a member of the lady-slipper orchids group, grows as a terrestrial in the eastern Himalayas at about 1500 m. The material was taken from plants grown in pots in National Orchidarium, Shillong. Squashes were prepared in 1% acetocarmine from floral buds fixed in 1:3 acetic-alcohol. Permanent mounts were made in euparal.

There are many reports of chromosome numbers for the species[5]. The normal complement consists of 12 metacentric and 1 acrocentric chromosomes ranging from 3 μ to 10 μ in length (figure 1). Due to chromation connections in 30% of the cells the chromosomes were seen lying in 4–5 separate groups and in about 3% extreme cases the whole haploid complement assumed a star-shaped configuration (figure 2). Approximately 15% of the total cells observed had hypo- and hyperploid chromosome numbers whereas cytomixis and presence of micronuclei was observed only in 2–3% of the cells. All these chromosomal irregularities point to the hybrid nature of the material. Aneusomaty ($2n = 19–28$) was reported in the species long back[3]. Presently only two cells out of about 530 cells scanned were found containing two megachromosomes each (figure 3).

The occurrence of megachromosomes in *P. villosum* appears to be due to the hybrid nature of the material. Since in hybrids breakage of the chromosomes is very common[2], it is probable that breakage and reunion of many acentric fragments followed by repeated replication[1,2] give rise to megachromosomes. Although natural as well as artificial hybrids are very common in orchids, the megachromosomes have been observed by us for the first time. This is also probably the first report of their occurrence during the pollen mitotic division. The present report, however, confirms the



Figures 1–3. 1. Pollen mitotic metaphase showing normal haploid complement of 13 chromosomes. **2.** The enture haploid chromosome complement is interconnected into a star-like configuration. **3.** A cell showing two megachromosomes (arrow marked) during the pollen mitosis.

earlier reports[4] of their occurrence only in mitotically dividing cells.

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DOUBLE INTERCHANGE HETEROZYGOTE AMONG THE NULLISOMICS OF *COIX GIGANTEA* KOEN EX ROXB

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INTERCHANGE, involving one or more pairs of chromosomes, is a common structural change recorded among plants and animals. Interchange heterozygotes in any population can be readily recognized by their characteristic chromosomal ring and chain configurations during meiosis at diakinesis. Some plants, like *Chelidonium majus* ($2n = 14$)[1], *Rhoeo discolor* ($2n = 12$)[2-5], *Hypericum punctatum* ($2n = 16$)[6], *Paeonia californica* ($2n = 10$)[7,8] and *Oenothera lamarckiana* ($2n = 14$)[9,10], are known to be complex interchange heterozygotes that possess chromosomes with only homologous ends and they form a ring or chain involving all the chromosomes in their complement. However, situations with two or more interchanges in a complement are rare. A double interchange heterozygote, and that too in a nullisomic constitution, is being reported for the first time in this communication.

Coix L is one of the oriental genera of the tribe Maydeae of Poaceae and is represented by three rather ill-defined species growing wild all over India[11]. Interchanges have been reported to occur in all the three species—*C. aquatica* Roxb[12], *C. lacryma-jobi* L[13], and *C. gigantea* Koen ex Roxb[14]. Furthermore, *C. gigantea* ($2n = 20$) has also been reported to show a series of aneuploids from nullisomy ($2n-2$, $2n = 18$) to hexasomy ($2n+4$, $2n = 24$)[15-18]. A high frequency of nullisomics has been reported to occur[15] among a free breeding population of *C. gigantea* originally collected from the Western Ghats of India and now being maintained at the Botanic Garden of the Marathwada University. Individual nullisomic plants were screened cytologically through acetocarmine (1%) squash preparations of young anthers fixed in acetic-alcohol (1:3). Pollen mother cells showing interchange multivalent configurations were made permanent using liquid carbon dioxide[19] and the slides are deposited with the Cytogenetics Unit of the Botany Department.

Nullisomics ($2n-2$) are reported to be weak and semi sterile[20] on account of the loss of a pair of homologous chromosomes from the diploid or polyploid constitution. However, nullisomics of *Coix gigantea* are strong, highly fertile and even more vigorous than the diploids[15]. These nullisomics, though deficient in a pair of chromosomes, are highly efficient and have even replaced disomics in the population. Normal nullisomics of *C. gigantea* showed nine clear bivalents[15] which regularly went through meiosis giving deficient ($n-1$, $n = 9$) but viable female and male gametes. These in turn produced more nullisomics in the population. One of the nullisomic plants ($2n = 18$), however, showed an interchange quadrivalent involving two small and two large chromosomes at diakinesis in some PMCs (figure 1). A few other PMCs in the same squash showed another interchange quadrivalent that involved four chromosomes of nearly equal size (figure 2). The frequency of PMCs showing these interchanges was low (nearly 44%, table 1) indicating that the chromosomal segments involved in both the chromosome pairs were small. Interchange configurations showing two unequal bivalents (AB-BC-CD-DA, figure 1, table 1) were comparatively rare and formed only chain quadrivalents. The other interchange that involved two nearly equal bivalents (EF-FG-GH-HE, figure 2, table 1) occurred more frequently and gave adjacent/alternate rings and chains, suggesting that interchange segments involved in the latter are relatively large. Both these interchanges were independent because if they were to involve a common bivalent, a ring or chain of six chromosomes (interchange hexavalent) would have resulted, at least in some PMCs. The formation of two independent quadrivalents indicates that four chromosome pairs are engaged in the double interchange heterozygote. Being independent, possibly both these