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

interchanges could have occurred in a PMC simultaneously, but such configurations have not been detected so far. The disjunction of the chain quadrivalents was mostly alternate (figure 2). Interchange hybridity together with a wide range of aneuploidy in *C. gigantea* strongly indicates that its genome is undergoing some vital chromosomal repatterning, numerical and structural.

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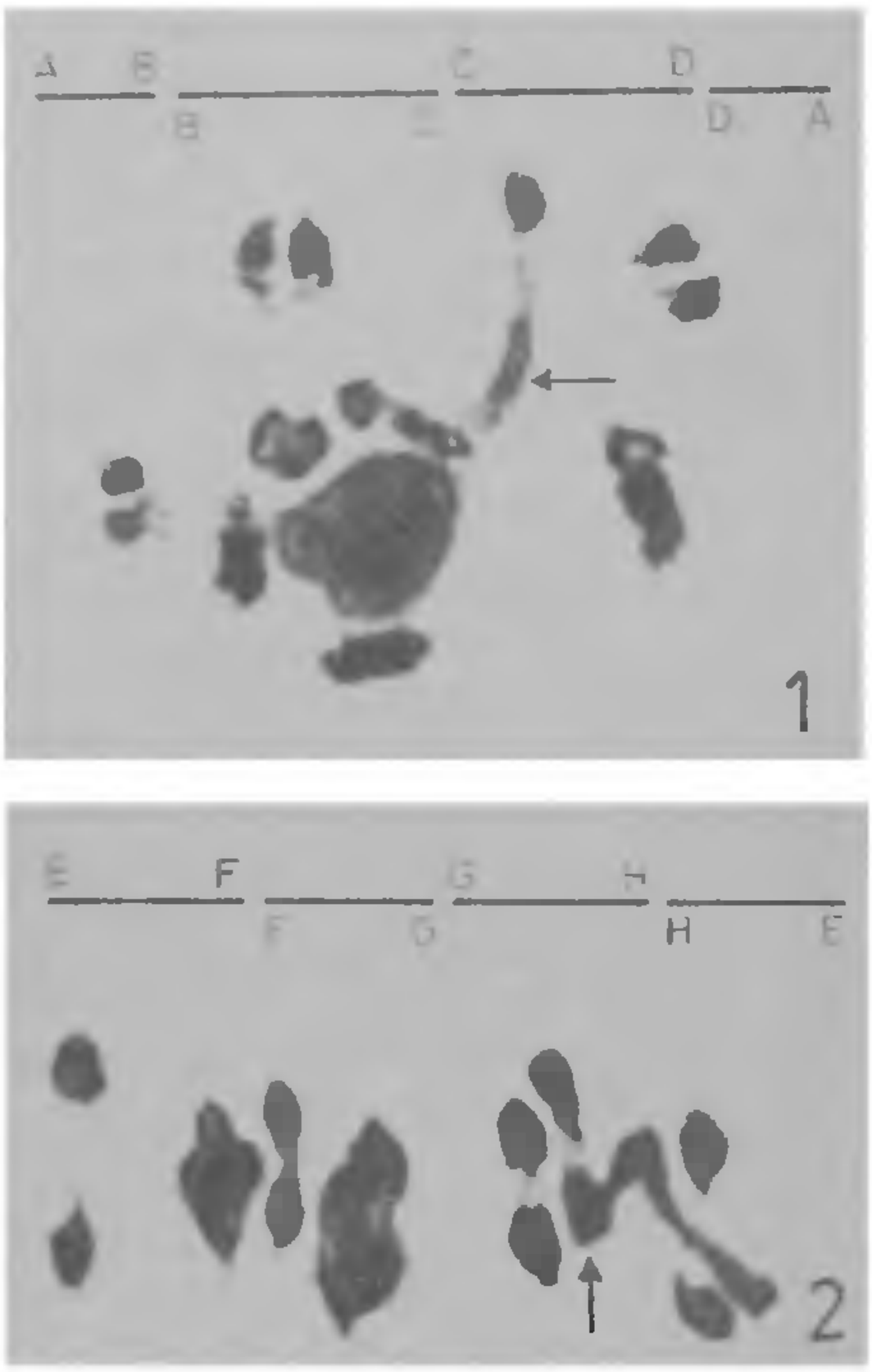


**Figures 1, 2.** Two interchanges in the nullisomic ($2n = 18$) *Coix gigantea*. **1.** Diakinesis showing seven bivalents and a chain quadrivalent. The two unequal chromosomes involved are shown diagrammatically as AB-BC-CD-DA. **2.** Metaphase-I showing seven bivalents (one overlap) and alternate disjunction of chain quadrivalent. The two nearly equal chromosomes involved are shown diagrammatically as EF-FG-GH-HE. (× 2,400)


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**Table 1** *Types and frequency of two interchanges in the nullisomic Coix gigantea*

| Stage in Meiosis | Total no. of PMCs observed | No. of PMCs showing 9II | No. of PMCs showing 7II + 1 interchange IV | | |
|---|---|---|---|---|---|
| | | | Unequal bivalents AB-BC-CD-DA (chain) | Nearly equal bivalents EF-FG-GH-HE (ring) | EF-FG-GH-HE (chain) |
| Diakinesis | 234 | 131 | 15 | 58 | 30 |