Occurrence of Octosomic Plant among Selfed Progeny of Tetrasomic *Coix gigantea* Roxb.

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Among aneuploid constitutions, polysomics above tetrasomic level occur very rarely for varied reasons (Khush 1973). However, a series of aneuploids from nullisomics ($2n-2$, $2n=18$) to hexasomics ($2n+4$, $2n=24$) was isolated (Sapre and Barve 1983–85b) from a population of *Coix gigantea* as a result of nondisjunction of a bivalent both during micro- and megasporogenesis in a diploid plant (Sapre and Barve 1985a, Mashalkar 1983). An octosomic plant ($2n+6$, $2n=26$) has now been obtained among the selfed progeny of a tetrasomic ($2n+2$, $2n=22$), thereby taking the series of higher polysomics in *C. gigantea* a step further. This is a first report of an octosomic constitution among plants as also animals.

Materials and methods

Coix L., with unisexual flowers, is an open-pollinated genus belonging to the tribe Maydeae of family Poaceae. Tetrasomics of *C. gigantea* were selfed by completely covering the plant with a muslin cloth bag immediately with the onset of flowering. Selfed seeds were germinated and the individual plants were screened cytologically by fixing young male racemes in acetic-alcohol followed by routine aceto-carmin squashes. Slides were made permanent using liquid carbon dioxide (Conger and Fairchild 1953).

Results and discussion

Among the various aneuploids that appeared in the progeny of this tetrasomic, only one plant carrying $2n=26$ chromosomes was detected. At diakinesis, several chromosome associations viz., nine bivalents and two quadrivalents (Fig. 1), ten bivalents and a hexavalent (Fig. 2), ten bivalents and two trivalents (Fig. 3) etc. indicated its octosomic nature. Some PMCs, however, showed 13 regular bivalents (Fig. 4).

Selfing tetrasomics involving chromosome-8 of *Datura* have yielded disomics, trisomics and tetrasomics in the progeny (Blakeslee and Avery 1938). However, detailed meiotic analysis in the tetrasomic *C. gigantea* (Sapre and Barve 1987) has suggested a gametic range between $n=9$ to $n=13$ ($n-1$ to $n+3$) chromosomes due to varied associations of the four homologues and their unequal segregations at anaphase-I. Chance mating of gametes each with 13 chromosomes is, therefore, the likely origin of the present octosomic plant. Competition for pairing and the spatial limitations in the formation of chiasmata between the eight homologues more often yielded IV+IV, VI+II and III+III+II (Figs. 1–3) configurations. There is probably lot of pairing interference to bring all the eight homologues together into an octavalent complex. Tendency to form 13 bivalents has been noted in several PMCs (Fig. 4) and this is a positive step towards meiotic normalcy that is likely to lead to stable and fertile chromosomal variants in the future generations (Bor 1960, Koul and Paliwal 1964, Christopher and Mini 1988). In *C. gigantea*, an aneuploid series from nullisomy ($2n-2$) to octosomy

($2n+6$) was expected on theoretical grounds (Sapre and Barve 1985a) and all of them have now been obtained practically (Sapre and Barve 1984) except the one carrying $2n=25$ chromosomes. Having obtained an octosomic plant ($2n=26$), the chance of filling this gap in future is not remote.

Figs. 1-4. Chromosome associations in an octosomic *C. gigantea* ($2n+6$, $2n=26$). PMCs in Diakinesis showing $9^{II}+2^{IV}$, $10^{II}+1^{VI}$, $10^{II}+2^{III}$ and 13^{II} . (Multivalents arrowed, $\times 1,500$).

Summary

Among aneuploid constitutions, higher polysomics occur only rarely, but constitutions above tetrasomics hardly survive in Nature. However, *Coix gigantea* ($2n=20$, Tribe-Maydeae, Family-Poaceae) is chromosomally highly plastic. While a series of aneuploids from nullisomy ($2n-2$, $2n=18$) to hexasomy ($2n+4$, $2n=24$) has been isolated and studied cytologically earlier, a higher polysomic of the order of octosomic ($2n+6$, $2n=26$) has been isolated from among the selfed progeny of a tetrasomic plant ($2n+2$, $2n=22$). Important cytological configurations are reported.

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References

- Blakeslee, A. F. and Avery, A. G. 1938. Fifteen-year breeding records of $2n+1$ types in *Datura stramonium*. Coop. in Res. Carnegie Inst. Wash. Publ. **501**: 315-351.
- Bor, N. L. 1960. Grasses of Burma, Ceylon, India and Pakistan. Pergamon Press, N. Y.
- Christopher, J. and Mini, L. S. 1988. New Cytotype of *Coix lacryma-jobi*. J. Cytol. and Genet. **23**: 113-114.
- Conger, A. D. and Fairchild, L. M. 1953. A quick freeze method for making smear slides permanent. Stain Techn. **28**: 281-283.
- Khush, G. S. 1973. Cytogenetics of Aneuploids. Acad. Press, N. Y.
- Koul, A. K. and Paliwal, R. G. 1964. Morphology and cytology of a new species of *Coix* with $2n=32$ chromosomes. Cytologia, **29**: 375-386.
- Mashalkar, S. G. 1983. Cytological studies in the tribe Maydeae: Studies in the aneuploids of *Coix gigantea*. Ph. D. Thesis, Marathwada University, Aurangabad, India.
- Sapre, A. B. and Barve, S. S. 1983. Occurrence of pentasomic and hexasomic plants in the wild population of *Coix gigantea*. Curr. Sci. **52**: 614-615.
- and — 1984. Nullisomy to hexasomy in *Coix gigantea*. Cytologia. **49**: 345-349.
- and — 1985a. Typical meiotic nondisjunction and its consequences in *Coix gigantea*. Jour. Hered. **76**: 387-389.
- and — 1985b. Cytology of higher polysomics in *Coix gigantea* (Poaceae): Pentasomy and hexasomy Genetica **66**: 73-80.
- and — 1987. Cytological studies in the tetrasomics of *Coix gigantea*. Cytologia **52**: 323-330.
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