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CHROMOSOME POLYMORPHISM IN OKRA

K.V. Suresh **Babu and O.P. Dutta**
Indian Institute of Horticultural Research, Bangalore 560 089, India

Abstract: Meiotic study was made on nine okra lines (*Abelmoschusesculentus*[L] Moench.) resistant to yellow vein mosaic virus (YVMV), evolved by introgressing the resistant genes from *A. tetraphyllus*(L.) Medic. The chromosome number of the lines varied from 2n = 120 to 144. All the lines showed regular meiosis. The study confirmed the complex polyploidy in *A. esculentus* which can sustain a considerable number of additions and deletions of chromosomes.

Key words: Meiotic studies, okra, complex polyploidy, *Abelmoschus esculentus*, chromosome polymorphism

INTRODUCTION

An attempt was made to transfer resistance to yellow vein mosaic virus (YVMV) from *A. tetraphyllus* (L.) Medic. (2n = 138). The amphidiploid synthesised by doubling the chromosome of the interspecific hybrid was back-crossed three times to the *A. esculentus* (L.) Moench. line I1HR 20-31. Further self ing repeatedly more than nine generations, many lines of okra having resistance to YVMV and stabilised their characters were screened (Dutta, 1979). The chromosome count reported for *A. esculentus* varied greatly from 2n = 66 (Ford, 1938) to 2n = 144 (Datta and Naug, 1968). It became imperative to study cytology of promising advanced generation lines to confirm their chromosome number. Considering the very small size and large number of chromosomes in the species, this study could be pursued at meiotic stages.

MATERIALS AND METHODS

Nine advanced generation lines viz., S-3, S-4, S-9, S-10, S-11, S-12, S-16, S-17 and S-18 tested for resistance to YVMV were selected for the meiotic studies. The study was conducted at the Indian Institute of Horticultural Research, Hessarghatta, Bangalore during 1983 to 1987. The plants were raised in the field, the flower buds of appropriate size were fixed in early hours between 7.30 am and 8.30 am in Carnoy's fixative consisting of six parts of ethyl alcohol, three parts of chloroform and one part of glacial acetic acid for 24 hours. Then the buds were transferred to another fixative containing three parts of ethyl alcohol and one part of acetic acid, the acetic acid component was saturated with ferric acetate, which served as a mordant. After 24 hours of fixing in the second fixative, meiotic preparations were made. The pollen mother cells (PMCs) were smeared in 1% acetocarmine. Slides were temporarily sealed with paraffin wax and could be stored for three to four days without deterioration. Photomicrographs and camera lucida diagrams were made from temporary preparations. Pollen stainability was studied using Alexander's stain (Alexander, 1980).

RESULTS AND DISCUSSION

Meiosis in the nine advanced generation lines was studied and it was confirmed that their chromosome numbers vary, two lines S-3 and S-4 had chromosome number 2n = 130 (Fig. 1) as equal to that of cultivated parents. The line S-17 possesses chromosomes 2n = 138 (Fig. 2) as in wild species. The chromosome number of S-12 and S-18 were confirmed as 2n = 134. The lines S-10 and S-ll had chromosomes 2n = 132 (Fig. 3) whereas S-9 and S-16 had chromosomes 2n = 120 (Fig. 4) and 2n = 144 respectively. Eventhough size of the chromosomes was very small as Kamalova (1977) reported, a negative

Table 1. Chromosome association at metaphase 1 in the selected YVMV resistant lines and their pollen stainability

Lines	Total No. of PMCs oberved	Range of bivalents	Range of univalents	Per cent of bivalents	Chromosome No. (2n)	Pollen Sta inability
S-3	30	64-65	0-6	83-83	130	94.95
S-4	30	62-65	0-6	80.00	130	94.73
S-9	30	57-60	0-6	86.67	120	95.21
S-10	30	63-66	0-6	83.33	132	96.36
S-11	30	63-66	0-6	80.00	132	96.18
S-12	30	64-67	0-6	76.67	134	96.26
S-16	30	69-72	0-8	80.00	144	96.72
S-17	30	66-69	0-6	83.33	138	95.57
S-18	30	63-67	0-8	86.67	134	96.33

correlation between number and size, spread and stainability of the chromosome was considerably good.

The chromosomal configuration at metaphase I consisted of bivalents in all these okra lines studied, however, a few PMCs showing univalents up to eight were also observed due to the precocious separation of some bivalents (Table 1). Subsequent stages of meiosis were regular, disjunction of chromosomes at anaphase 1 was normal without any abnormalities.

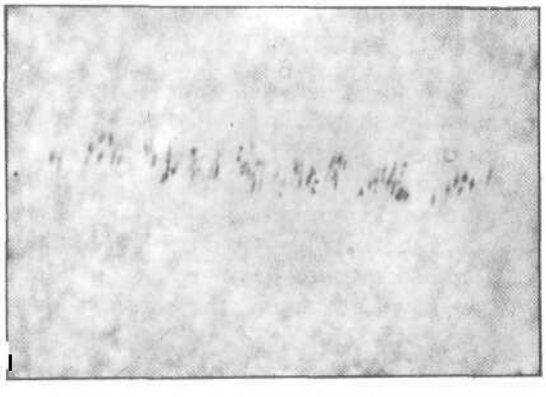

Fig.1 Metaphase I in S-3 showing 65 bivalents (x 4000)

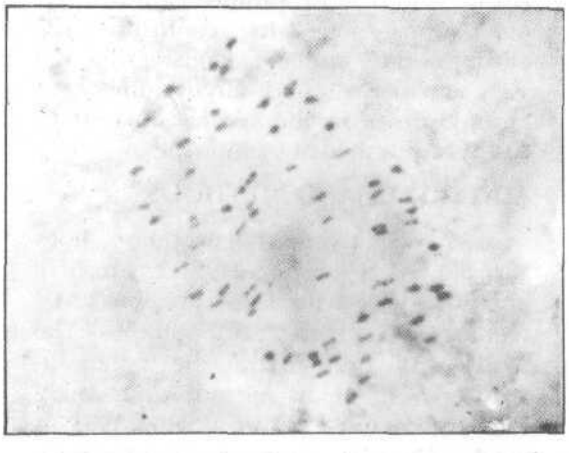

Fig.2 Metaphase I in S-17 showing 69 bivalents (x 4000)

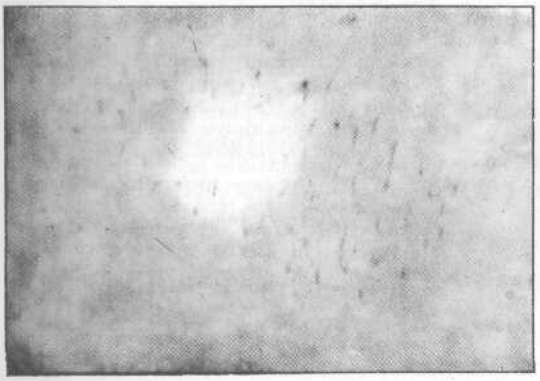

Fig.3 Metaphase 1 in S-10 showing 66 bivalents (x 4000)

Fig.4 Metaphase I in S-9 showing 60 bivalents (x 4000)

Distribution of chromosomes to the poles was equal at anaphase II, normal tetrads having four microspores were formed by all the PMCs at the end of meiosis. All the lines recorded more than 98 per cent pollen stainability.

Many species under the genus *Abelmoschus* show chromosome polymorphism. Most frequent values of somatic chromosome number of *A. esculentus* are between 108 and 144. After thorough cytological studies, Kuwada (1961, 1966) decided on 2n = 124 and Joshi and Hardas (1953) on 2n = 130 chromosomes for a large number of okra strains. Datta and Naug (1968) considered this variation of chromosome number due to existence of chromosome races originated by the addition and deletion of chromosomes during the evolutionary process.

In the YVMV resistant lines evolved, the chromosome number got stabilised in different chromosome numbers ranging from 122 to 144. This can be accountable to the irregular meiosis in the back-cross generations leading to the formation of aneuploids. In aneuploid plants, instability results in meiotic process and in the succeeding generations, the chromosomes will be gained or lost until stability is restored. In the present case meiotic stability was gained at different chromosome numbers. This justifies the complex polyploidy in *A. esculentus*, which can sustain comparatively high amount of addition and deletion of chromosomes.

All the advanced generation lines showed high level of resistance to YVMV (Dutta, 1979). Hence chromosomes of *A. tetraphylhts* are of being either substituted for *A. esculentus* chromosomes or certain gene transference has taken place between *A. esailentus* and *A. tetraphyllus* chromosomes during early hybridisation.

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