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Hybridization as a probable cause of mutations in *Coix*

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ABSTRACT

During the studies on inheritance of chromosomes in the artificial interspecific hybrids of Coix, an interesting mutant plant was recorded in the selfed progeny of a hybrid. Its complete meiotic behaviour was worked out and has been reported here. An attempt has been made to explore its probable cause.

Key words: *Coix*, mutants, interspecific hybrids.

INTRODUCTION

Genus*Coix* is a wild relative of Maize, belonging to tribe Maydeae of the family Poaceae. In India this genus is represented by 3 species, namely *C.aquatica, C.gigantea and C.lacryma-jobi.*The C.*aquatica(with 2n=10)and C.gigantea (with 2n=18)* have been shown to breed freely producing a range of interspecific hybrids from2n=10 to 2n=26 chromosomes. (Naik,1991,Ph.D. thesis) Many of these hybrids were partially fertile and surprisingly, the nullisomic, 2n=18 was found not only to be fully fertile and robust, but also to have replaced and dominated the diploid plant populations (2n=20) from which it was originated.

From among the range of interspecific hybrids, there was noted a trend of chromosome elimination of one of the parents,viz.*C.aquatica*(Sapre and Deshpande, 1987(b).A mutant Coix plant was isolated from the selfed progeny of an interspecific hybrid carrying 2n=14 chromosomes. It showed a peculiar meiotic behavior. Though it had similar chromosome number as that of one of its parent, *C.aquatica, (*2n =10), the plant was totally sterile with highly disturbed meiosis.

MATERIALS AND METHODS

Seeds of *Coix*sp. were collected from different locations like Ambaghat, Kolhapur; Shivaji University campus, Kolhapur; Mhaismal, Aurangabad and Junnar, Pune. Artificial cross pollinations were carried out between *CoixaquaticaRoxb . (2n=10) & C. giganteakoen.Roxb. (2n=18).* Next generation plants were raised (F1) from the seeds obtained from these crosses. All plants were studied for their chromosome constitutions and hybrids carrying 2n=14

chromosomes (with 5 *aquatica*and9 *gigantea* chromosomes) were obtained. They were selfed by covering with muslin cotton bags. Seed were collected to be sown in the subsequent year. Same procedure was followed to isolate the hybrid constitutions, selfing them, collecting the seeds, and raising F2, F3 and F4 generations.This method was used in order to study the chromosomal behavior and inheritance pattern of chromosomes in the hybrids. This particular mutant was isolated from the selfed progeny of hybrid 2n-14 in the F4 generation and it showed the peculiar chromosome behavior, though it carried 2n=10 all *Coixaquatica*chromosomes. For the cytological study, meiotic division was observed in detail by following method:

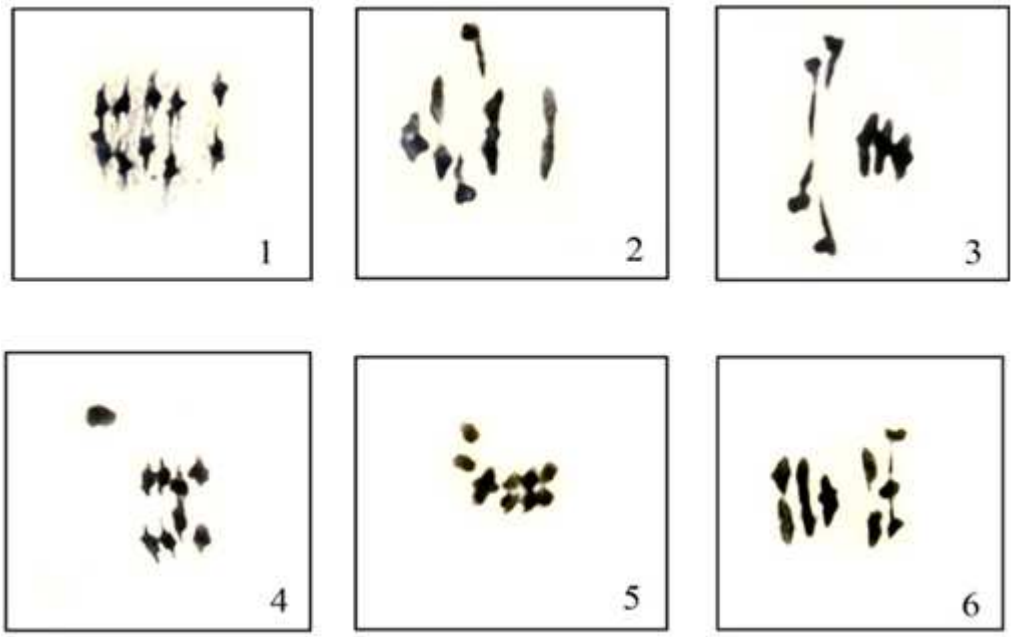
1. Young male racemes were fixed in Carnoy's fluid (1:3 acetic alcohol) for 24 hrs.
2. These were then transferred to 70% ethyl alcohol.
3. The inflorescences were treated with mordant solution (Dilute Ferric chloride) for 1 day.
4. The anthers were crushed in 1% Acetocarmine to observe various stages of meiosis.
5. The important stages were micro photographed.

RESULTS AND DISCUSSION

The mutant which is being reported here, carried 2n=10 chromosomes. At diakinesis most of the PMCs showed typical five bivalents but at anaphase, the separating bivalents showed varied degree of chromatin trailing(Fig.1-3,6,8 and 9) in all or some of the bivalents. The terminal associations between the homologues,even after the terminalization were so firm that sometimes it gave an impression of bridge (Fig. 6 and 8).In addition to this abnormality, nondisjunction of a bivalent (Fig.4) or precocious disjunction of a bivalent(Fig.4) and both the univalents passing to the same pole (Fig.5) gave n+1 and n-1 distribution at the end of meiosis-1

Meiosis in the mutant Plant carrying 2n=10 chromosomes:

Plate-I



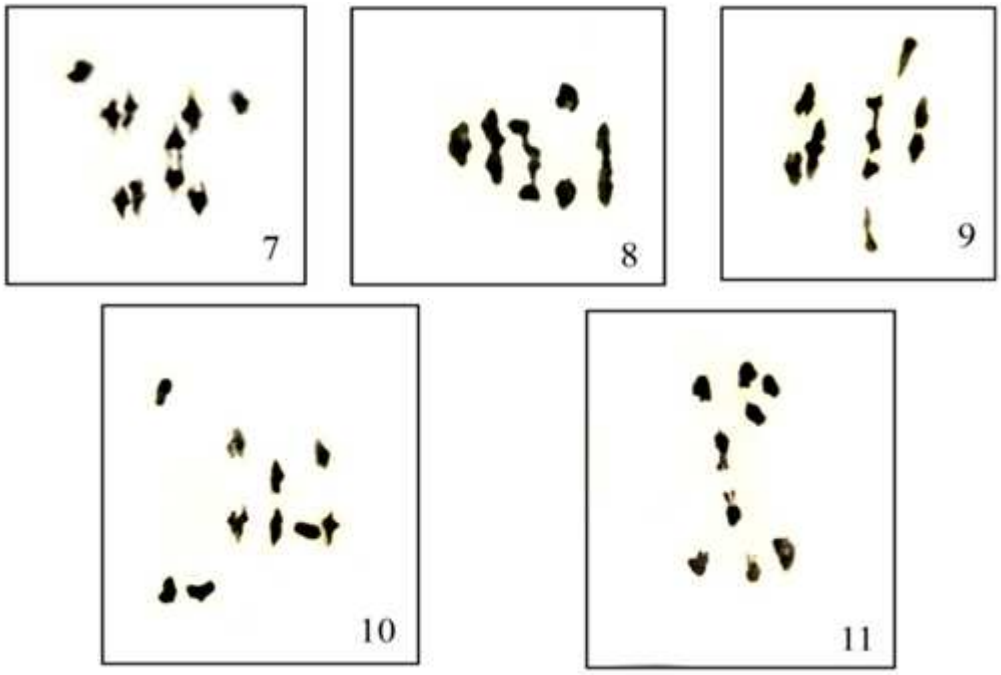
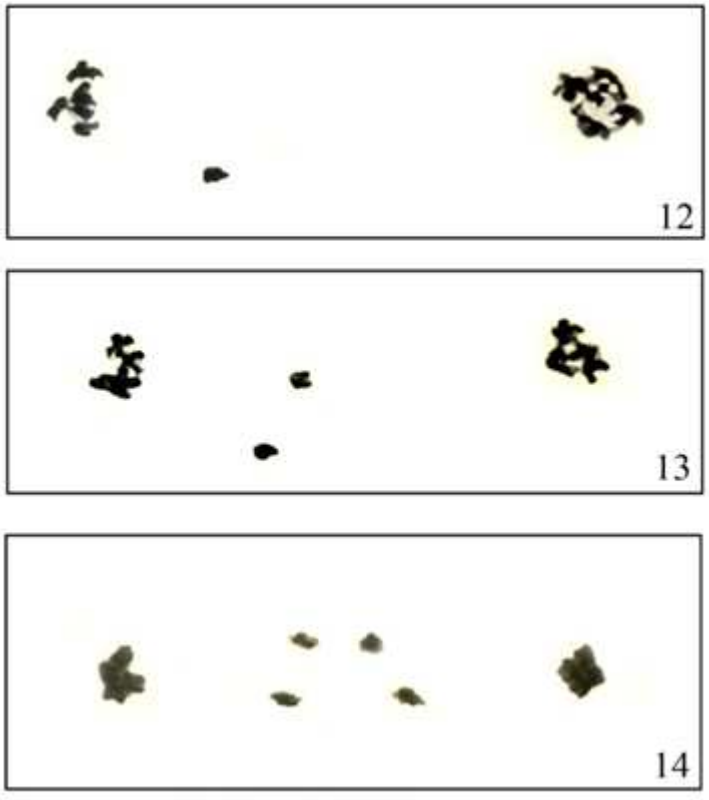
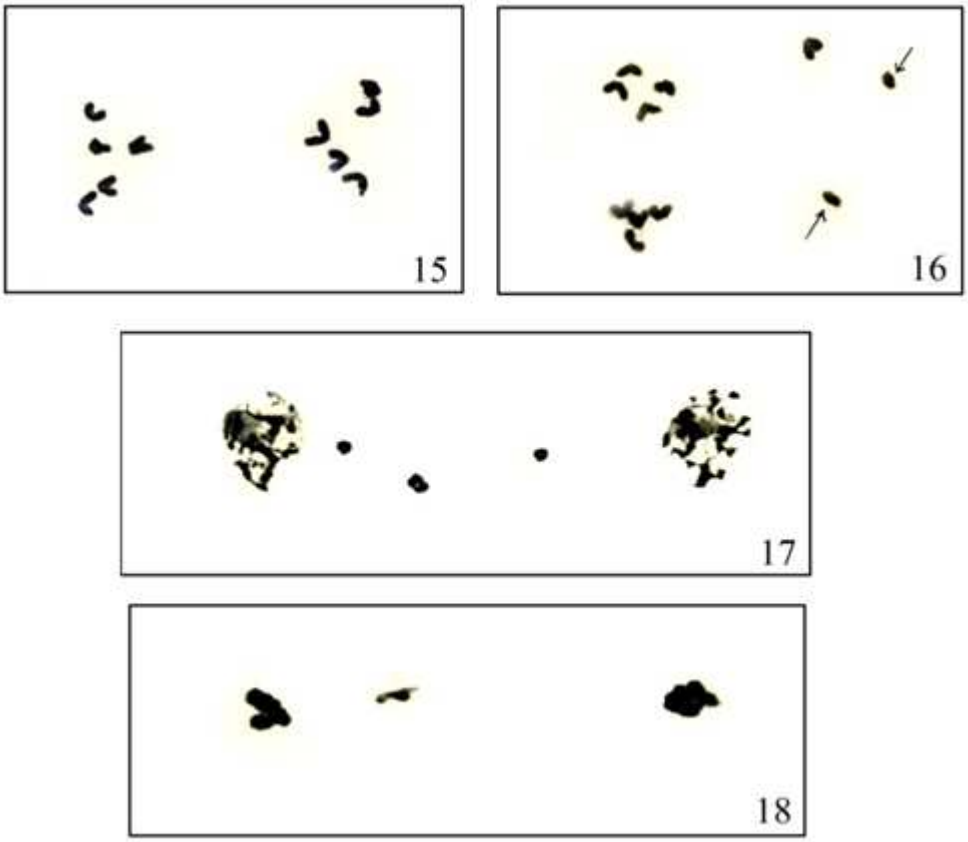


Plate: II





At times, even two bivalents dissociated precociously and the four univalents showed 3---1 distribution (instead of 2---2) at anaphase(Fig.10), again giving n+1 and n-1 distributions. At anaphase, the terminal satellites were also seen drawn out(Fig.11). Meiosis-II showed the result ofprecocious dissociation of bivalents(at first meiotic division) in the form of variable number of laggards (Figs.12-14, 17 and 18). This led to the formation of microspores with deficient number of chromosomes. Anaphase-II rarely showed misdivision of one of the chromatids resulting in the formation of two telochromosomes (Fig. 15). Microspores of sub-haploid nature were produced. This mutant plant was mostly sterile,but was of interest from cytological point of view. The chromosomal plasticity and at least partial fertility in some of the aneuploids and hybrid constitutions in *Coix*(as evident by comparatively regular and undisturbed meiotic behavior in them)made the appearance of such mutant with disturbed meiosis an unusual incidence.

CONCLUSION

It is suspected that such type of mutation might have been induced by the artificial cross pollinations followed by the selfing of this hybrid constitution, (2n=14). Such type of mutation was recorded only twice in the total duration of my research on the hybridizations in this genus. Also the mutants showed complete sterility. It is felt that further detailed cytological investigation on the terminal chromosome associations and chromatin trailing will through light on the cause of such mutations.

REFERENCES

[1] Sapre, A. B. and Barve, S. S. **1983**(b), *Curr.Sci* .**52:** 486-487
[2] Sapre, A.B and Deshpande, D.S. Jour.Hered. **1987**(b), *Jour.Hered*. **78**: 357-360

[3] Naik, A. S. (**1991**) “Cytogenetical studies In the tribe Maydeae”, Ph.D. thesis.