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# INTERRELATIONSHIP BETWEEN *SOLANUM INCANUM* AND *SOLANUM MELONGENA* ALONG WITH THEIR INTERSPECIFIC HYBRID

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Interrelationship between *solanum incanum S. melongena* and their $F_1$ hybrids based on morphological and chramosome configuration was studied in the present investigation. The diploid hybrids obtained were vigorous and high-yielding. cytological studies of $F_1$ hybrid revealed normal course of meiosis with the exception of a small proportion of cells showing various meiotic irregularities in a low frequency. The hybrids exhibited field resistance to leafy fruit rot, brinjal shoot and root borers.

**Key Words :** *Solanum incanum*, *S. melongena* F1 hybrid, meiotic irregularities, shoot borers, root borers.

*Solanum melongena* L. or eggplant is a predominently self-pollinated crop. Indo-Burma being the home of brinjal probably grows and consumes its largest quantity in the world. A substantial quantity is however, damaged because of its susceptibility to various diseases and insect pests (Krishnaiah and Vijay, 1975). Use of pesticides has resulted in adverse side effects on crop plants (Rana and Murty, 1971). Therefore, a better approach to avoid fungicidal or insecticidal hazards in cultivation of crop plants seems to be breeding of resistant varieties through interspecifie hybridization.

The germplasm of *S. incanum* is found to be resistant to bacterial canker and *Verticillium* wilt diseases (Rajeskaran, 1970a, b). The species is also found to be resistant, under field conditions, to diseases like leaky fruit rot and insect/pest like brinjal fruit borer and shoot borer. Therefore, it appears that S. *incanum* could be used in breeding egglants resistant to these diseases and the present investigation is a part of this endeavour. The results obtained in the interspecific hybridization and the karyo-morphological studies of $F_1$ hybrids are presented in this paper.

## MATERIALS AND METHODS

The species used in the present investigation were *S. incanum* and *S melongena* Var. '*Pusa purple Long*'. The seeds were obtained from the collections maintained by Rtd. Professor Reayat Khan, Deptt. of Botany, A.M.U. Aligarh.

The seeds were sown in pots of 30 cm. diameter. The seedlings were transplanted in rows when they were 35 days old, the distance between the rows and between the seedlings in the rows being 90 cms. The flower buds were gently emasculated and followed by interspecific pollination.

For cytological studies, flower buds of parents and $F_1$ hybrids were fixed in Carnoy's fluid (Absolute Alcohol 6 parts, chloroform 3 parts and Glacial acetic acid 1 part) for 30 minutes. They were transferred to propionic alcohol saturated with ferric acetate. Pollen mother cells were squashed in propiono-carmine for studying meiosis (Swaminathan *et al.*, 1954) slides were made permanent by butyl alcohol series (Bhaduri and Ghosh, 1954).

## OBSERVATIONS

*S. incanum* differs from *S. melongena* var. *Pusa Purple Long (PPL)* in several morphological characters (Table 1). Several cross pollinations were attempted between *S. incanum* and *S. melongena* var. 'PPL' using the former as a female parent. 33 percent cross pollinations were successful and 54 percent seeds germinated. The $F_1$ offsprings showed morphological features indicative of hybrid origin and plants were at diploid level. The diploid hybrids were quite vigorous in growth, taller than the parents and profusly branched. The hybrids were spiny and bore dark green leaves. They produced flowers in clusters. The percentage of fertility of the hybrids was as high as 67.80. The hybrids produced fruits in clausters of 2 or 3 on an average and each hybrid plant produced 59 fruits whereas the parents *S.*

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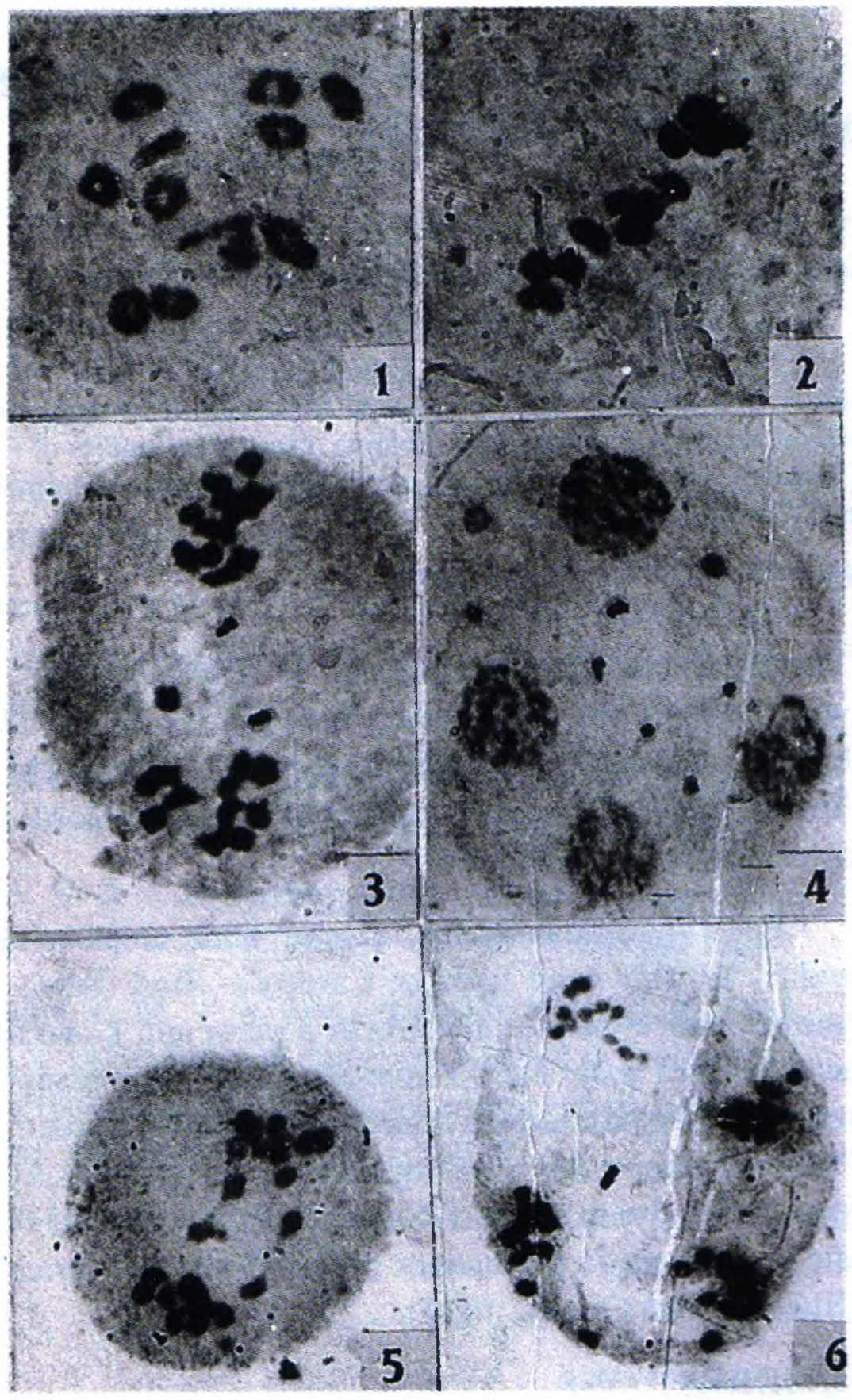


Figure 1-6 Meiosis in FI hybrids Diakinesis (10 ring & 2 rod bivalents). Fig. 2. Metaphase I showing one univalent. Fig. 3. Anaphase I with a lagging chromosome. Fig. 4. Telophase II with micronuclei. Fig. 5. Anaphase I with chromosome bridges. Fig. 6. Anaphase II with chromosomal stickiness.

*melongena* L. var. 'PPL' and *S. incanum* produced 17 and 42 fruits respectively.

The disease resistant characteristics of *S. incanum* was observed in hybrids when they exhibited field resistance to leafy fruit rot, brinjal shoot borer and brinjal fruit borer thereby confirming the transfer of this desirable trait in the hybrid.

*Cytology of the parents and their* $F_1$ *hybrids :*

Meiosis in pollen mother cells of the parents *S. incanum* and *S. melongena* var. 'PPL' was normal with 12 bivalents at diakinesis and metaphase I. The frequency of chiasmata per bivalent at metaphase i was *1.37*. The percentage of pollen fertility in *S.*

Table: Comparison of morphological characters of *S. incanum, S. melongena* var. *'PPL'* and their $F_1$ hybrids.

| Parameters | *S.incanum* | *S.melongena* | $F_1$ hybrid var. *'PPL'* |
|---|---|---|---|
| Habit | Erect and spiny | Prostrate and spiny | Erect and spiny |
| Height | 92.20 | 30.00 | 104.30 |
| Flowering period (days) | 66 | 70 | 61 |
| Maturity of fruit (days) | 156 | 190 | 140 |
| No. of flowers per cluster (Inflorescence) | 07 | 03 | 09 |
| Percentage of pollen fertility | 82.70 | 92.75 | 65.80 |
| Chromosome no. (2n) | 24 | 24 | 24 |
| No. of fruits/cluster | 4-6 | 1-2 | 4-5 |
| [1]No. of fruits/plant (Average of 10 plants) | 42 | 17 | 60 |
| [2]Fruit shape | Ovoid or sub-globose | Globose | Eggshaped |
| [3]Fruit colour | Green | Dark purple | Purplish green |
| [4]Fruit length (cm) | 1.50 | 14.26 | 6.16 |
| [5]Fruit diameter | 2.07 | 05.25 | 3.94 |
| [6]Fruit weight (gm) | 4.50 | 80.50 | 33.00 |

Parameters 1-6. Average of 10 randomly selected plants.

*incanum* was 82.70, in comparison to 92.73 in *S. melongena* var. *PPL.*

The cytological studies of pollen mother cells in F1 hybrids revealed the normal course of meiosis, mostly ring bivalents were observed at diakinesis stage (Fig Ia). However, in as many as 84% of PMC'S with 12 bivalents were of rod type. In 16% of PMC'S, univalents were observed at metaphase I and the range was 2 to 4 (Fig. 2). The mean number of bivalents and univalents recorded per cell was 11.69 and 0.62 respectively.

Anaphase I was normal in 76% of PMC'S with 12:12 distribution of chromosomes at each pole. However, lagging chromosomes were observed in 24% cells, the range being 1-4 (Fig. 3). The mean number of lagging chromosomes observed at anaphase I was 0.71. At $A^I$ chromosomal bridges were noticed (Fig. 5). $A^{II}$ showed stickiness in the chromosomes (Fig. 6). Micronuclei were not recorded at telephase I but at telophase II (Fig. 4). Tetrad was normal.

## DISCUSSION

The crossability between *S. incanum* and *S. melongena* var. PPL is discussed in the present study.

From the results obtained, it is obvious that $F_1$ hybrids had well manifested hybrid vigour in earliness of blooming and maturity of fruits, number of fruits per plant and total yield. The yield was determined by number and size of fruits.

Chromosome pairing in the $F_1$ hybrid of *S. incanum* and *S. melongena* var 'PPL' showed a high degree of bivalent formation. At $A^I$, the separation of chromosomes and later stages of meiosis were normal. The occurrance of vigorous hybrids with a high degree of regular meiosis and pollen fertility indicates a close genetic relationship between the two species. This is in agreement with Bhaduri's hypothesis, 1951. Cytological behaviour of the hybrid in addition to the significant differences of morphological characters of the parental species shows minor differences, thereby indicating that cryptic structural differences of chromosomes have played an important role in genetic differentiation and morphological diversification of the two species.

The hybrids showed some degree of sterility inspite of good chromosome pairing and normal anaphase I separation. A similar type of sterility with normal meiosis has been reported in hybrids between *S melongena* as one of the parents and S. trilobatum *S indicum* and *S. xanthocarpum* as the other parent (Rajeskaran, 1969).

The existance of structural differences or reduction in structural homology cannot be ruled out due to the occurrence of a few univalents at metaphase I in some of the pollen mother cells of the hybrids.

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