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CYTOLOGICAL STUDIES ON FOUR INTER VARIETAL CROSSES OF *CAPSICUM ANNUUM*

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Capsicum annuum var. local blue received from the Agricultural College, Coimbatore, was crossed with other varieties of chillies viz. Russian, Indian long red, Chinese giant and Oskosh, the variety local blue being the common female parent. Cytological studies of the parents and hybrids were undertaken and results are presented in this paper.

Materials and Methods

The time of flower opening and dehiscence of anthers under Vellayani conditions were found to be between 7 A.M. and 9A.M. The crossing work was done between 8 A.M. and 8.30 AM The flower buds of suitable size were fixed in acetic alcohol (1:3), between 9.45 A.M. and 10.30 A.M. and preserved in 70 per cent alcohol. Meiosis was studied from acetocarmine smears of pollen mother cells. Chiasma frequency was studied at Diakinesis stage. The pollen size and sterility were studied from the glycerine-acetocarmine stained pollen grains.

Results and Discussion

The chiasma frequency per cell of parents as well as hybrids are given in Table 1. It is seen that among the parents maximum number of chiasmata per cell was exhibited by Indian long red and the common seed parent local blue. The minimum number of chiasmata was observed in the variety Russian (18.23).

Table 2 presents the abnormal behaviour of meiotic chromosomes at diakinesis, anaphase 1 and telophase 1. The maximum amonut of abnormal behaviour of chromosome was noticed in the hybrid localblue x Indian long red, closely followed by local blue X Russian. All the hybrids showed the presence of ring quadrivalents (Fig 1) chain quadrivalents and trivalents (Fig 2) while the hybrid local blue X Indian long red contained univalents pycnotic behaviour, unequal distribution and anaphase bridge. In the hybrids local blue x Inian long red and local blue x Chinese giant there were few fragments.

Variety Russian had the largest sized pollen grain (31.62μ) while the common seed parent local blue produced the smallest pollen grain (26.34μ). The hybrids local blue Indian long red recorded an increase of 20 24 per cent

Table 1

Chiasma frequency per cell of parents and hybrids of *C annuum* in inter varietal crosses

Sl. No.	Treatments	Mean	Percentage of deviation of f_1 mean over	
			Parent with higher frequency	Parental mean
1	Local blue	22.87	3.67 (—)	7.201 (—)
2	Local blue ,< Russian	22.03		
3	Russian	18.23		
4	Local blue X Indian long red	22.8!	0.56 (—)	0.39 (—)
5	Indian long red	22 94		
6	Local blue x Chinese giant	20 70	9,48 (— }	2.72 (—)
7	Chinese giant	19.70		
S	Local blue x Oskosh	23.10	1 01 (+)	4.52 (+)
9	Oskosh	21.33		

Table 2

Behaviour of meiotic chromosomes in inter varietal crosses of C. *annuum*

Hybrids	No. of microspo-rocytes studied	Ring quadri valent	Chain quadri-valent	Tri-valents	Uni-valents	Frag-ments	Pycnotic pigments	Uuequal distri-bution	Anaphase bridge
Local × Russian	50	22	52	5	—	—	—	—	—
Local blue *x* Indian long red	50	53	10	15	18	21	13	20	5
Local blue *x* Chinese giant	50	27	35	18	—	69	—	—	—
Local blue *x* Oskosh	Hi	45	20	9	—	—	—	—	—

over its better parent while the hybrids local blue X Russian and local blue X Oskosh recorded a decrease over their better parents.

The common seed parent local blue exhibited minimum pollen sterility. The maximum pollen sterility among parents was observed in the variety Russian (28.31 %) A high degree of pollen sterility was recorded in all the four hybrids

Cytological observation conducted in the microsporocytes of hybrids in the present study reveals a difinite correlation of meiotic abnormalities with hybrid fertility. The percentage of pollen sterility was obviously higher in all the hybrids which had a direct bearing on fruit set and number of seeds per capsule. The cytological studies of parents and hybrids unfolded many interesting phenomena. All the four crosses made pronounced heterosis as regards the size of pollen grain which is in conformity with the findings of Viswanathan (1961) in Brinjal. The hybrid fertility appears to be correlated with the number of bivalents and regular separation during meiosis of hybrids, Meiotic disturbances like formation of multivalents, at metaphase and bridges and fragments at anaphase 1 reflected on the pollen sterility and percentage of fruit set.

The meiotic abnormalities included a high requency of the occurrence of ring and chain quadrivalents, heteropycnotic behaviour, univalents and fragments. The multivalent association including ring and chain quadrivalents suggests the possibility of the presence of the translocations. The structural variations were observed as anaphase bridges in one cross, which can be attributed to the formation of diccentric chromosomes and univalents. The high frequency of fragment? in the cross local blue X Chinese giant showed a positive correlation to the pollen sterilities which ultimately affected the fruit set.

Molhova (1965) recorded complete or partial sterility in the F_1 and f_2 owing to the disturbed meiotic behaviour of the microsporocytes. The reduction in pollen stainabilities and number of seed set per capsule in hybrids are generally correlated to the formation of quadrivalents at anaphase 1 as noticed by Yermmos and Gill (1967) This observation is in full agreement to the findings of the present study. Although the five varieties of *Capsicum annuum* studied viz. local blue, Russian, Indian long red, chinese giant and Oskosh expressed common varietal characters, the cytologicai studies revealed structural differences in chrmosomes which provides scope for further classification of the varieties bassed on chromosomal differences.

Summary

Cytological studies of microsporocytes in four hybrids and five parents of the varieties of *Capsicum annuum* were conducted. Variety local blue was taken as the seed parent. The pollen parents Included varieties, Russian, Indian long red, Chinese

giant and Oskosh. All the four crosses revealed pronounced heterosis as regards pollen size. Further, all the hybrids manifested the presence of ring quadrivalents, chain quadrivalents, and trivalents while the hybrid local blue × Indian long red contained univalents, pycnotic behaviour, unequal distribution and anaphase bridges. The abnormal meiotic behaviour of microsporocytes had a positive correlation on the pollen sterility and affected the ultimate fruit set.

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സംഗ്രഹം

നാല് സങ്കരയിനം മുളകുചെടികളുടെയും അവയുടെ അഞ്ചു മാതൃപിതൃഇനങ്ങളുടെയും മൈക്രോസ്പോറോസൈറ്റ്സിന്റെ സൈറ്റോളജീയ പഠനങ്ങൾ നടത്തുകയുണ്ടായി. "നാടൻ നീല" എന്നഇനമായിരുന്ന മാതൃചെടി. റഷ്യൻ, ഇൻഡ്യൻ ലോങ്ങ്റെഡ്, ചൈനീസ് ജയൻറ്, ഓസ്കോഷ് എന്നിവയായിരുന്ന പിതൃഇനങ്ങളും. നാല് സങ്കരങ്ങളും പരാഗത്തിന്റെ വലുപ്പത്തിൽ പ്രകടമായ സങ്കരവീര്യം പ്രദർശിപ്പിക്കുകയുണ്ടായി. കൂടാതെ എല്ലാ സങ്കരസന്തതികളും വളയ ചതുർവാലൻറുകളും, (Ring Quadrivalents) ത്രൈവാലൻറുകളും ചങ്ങല ചതുർവാലൻറുകളും (Chain Quadrivalents) എന്നിവയുള്ളവയായി കാണപ്പെട്ടു. നാടൻനീലയും ഇൻഡ്യൻ ലോങ്ങ്റെഡും തമ്മിലുള്ള സങ്കരസന്തതിയിൽ ഏകവാലൻറുകളും പിക്നോട്ടിക സ്വഭാവം, അസമമായ വിതരണം. അനഫേസ് ബ്രിഡ്ജ് എന്നിവയുള്ളതായി കണ്ടു. മൈക്രോസ്പോറോ ffi6icTV'OO"oru1ff>aJo അസാധാരണ മിയോട്ടിക സ്വഭാവവും, പരാഗവന്ധ്യതയും തമ്മിൽ അടുത്തബന്ധമുള്ളതായും തന്മൂലം കായ്പിടുത്തത്തെ ബാധിക്കുന്നതായും തെളിഞ്ഞു.

REFERENCES

Molhova, E. 1965. A study of the female gametophyte in relation to the nature of sterility in the inter-specific hybrids of *C. pendulam X C. annuum.* Rasten Naik P. I. *Grow Sofia 2,* 41-46 (Bulgaria)

Yermanos, D. M. and Gill, K. S. 1967. induction of polyploidy in Linum species. *Crop Science* 7, 423-427.

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