would be worthwhile to systematically investigate the rare mineral potential of small as well as large complex pegmatites of India.

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HETEROSIS IN CHROMOSOME BEHAVIOUR OF EGG-PLANT

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ABSTRACT

Chiasma frequency in 6 varieties of egg-plant (*Solanum melongena* L.) and their 10 hybrids, 5 highest yielding and 5 lowest yielding, out of possible 30 has been studied. Varieties and hybrids differed from each other with regard to mean chiasma frequency. The chiasma frequency is reported to be genetic and probably under the control of polygenes. Four hybrids showed heterosis in chiasma frequency over their better parent, the maximum being 30·8%.

INTRODUCTION

THE study of heterosis in chromosome behaviour and the genetics of chiasma frequency is a new line of work in the history of cytogenetics. Consequently, not much work has been done on this aspect. In 1936 Lamm's work on rye for the first time showed the effects of inbreeding on chromosome behaviour at meiosis where the inbred lines showed a reduction in chiasma frequency which, in many cases, was accompanied by considerable asynapsis[2]. Inbred lines varied from one to the other just as would be expected from a segregation of genes controlling chiasma formation. Associated with differences in chiasma frequency was a difference in the size of bivalents between some lines. This was comparable to the genotypically controlled variation in chromosome size reported in Lolium by Thomas[8]. Thereafter, a few more studies on the behaviour of chromosome of rye were reported in detail[3-7]. The present paper is first of its kind on egg-plant.

MATERIALS AND METHODS

Six egg-plant varieties-purple slender, green long, Type 4, Purple Round, 9LO and K. 6312– and their 5 highest yielding and 5 lowest yielding crosses out of a 6 × 6 diallel set constituted the material for the present investigation. While chiasma frequency in parents was scored in flower buds collected in the month of June 1967 and 1968, in the hybrids the same was done in buds collected only in June, 1968. Flower buds of suitable size were fixed in 1 : 3 acetoalcohol for 24 hours and thereafter transferred to 70% alcohol. Meiotic slides were prepared in 1·5% propiono-carmine by the usual method of Darlington and La Cour[1]. Chiasma frequencies were scored at diakinesis and expressed in terms of number of chiasmata per cell and per bivalent.

RESULTS AND DISCUSSION

Chiasma frequency as observed in 6 varieties during 1967 and 1968 are given in Table I. Chiasma frequency of the hybrids and heterosis in them in regard to this character are presented in Table II.

It appears from Table I that varietal differences with regard to chiasma frequency during 1967 and 1968 are not much. Similarly the hybrids (Table II) excepting one also do not differ much from each other. But the distribution of chiasma frequency in parents as well as in hybrids, however, appears to be continuous. Thus it is probably under the control of polygenes like that reported in rye by Rees[3-5]. This observation is supported by the fact that the amount of heterosis with regard to this character is different in different hybrids as one expects in case of a polygenic trait.

TABLE I

Chiasma frequency per cell and per bivalent in different varieties. The latter is given in parenthesis

Varieties with abbreviations	Chiasma frequency	
	June, 1967	June, 1968
Purple Slender (PS)	21·60 (1·77)	21·02 (1·75)
Green Long (GL)	22·36 (1·87)	20·35 (1·70)
Type 4 (TF)	24·83 (2·07)	21·08 (1·76)
Purple Round (PR)	21·87 (1·82)	21·91 (1·83)
9LO (NL)	22·62 (1·89)	22·32 (1·86)
K. 6312 (KS)	22·65 (1·89)	20·39 (1·70)
Mean	22·60 (1·88)	21·18 (1·77)

TABLE II

Chiasma frequency in hybrids and heterosis in them

Hybrids	Chiasma frequency per cell (per bivalent)	Heterosis in % over	
		Mid-parent	Better parent
GL × PS	21·78 (1·82)	5·32	3·63
NL × PS	21·42 (1·79)	−1·16	−4·05
NL × GL	29·20 (2·43)	36·86	30·80
PR × TF	21·86 (1·82)	1·68	−0·24
KS × GL	21·24 (1·77)	4·28	4·15
TF × KS	21·39 (1·78)	3·12	1·45
PS × TF	20·98 (1·75)	−0·35	−0·49
GL × PR	21·48 (1·79)	1·67	−1·96
PR × KS	21·06 (1·76)	−0·43	−3·88
NL × KS	21·44 (1·79)	0·38	−3·96
Mean	22·18 (1·85)	5·15	2·58

The magnitude of difference in chiasma frequency observed in 1967 and 1968 in each variety is not similar (Table I). Purple Slender, Purple Round and 9LO are more stable while Green Long, Type 4 and K. 6312 are prone to the seasonal variations. Similar result in rye has been reported[5].

The chiasma frequency in Purple Slender × Type 4 which is 20·98 is lesser than that of either of the parents; it shows that genes for low chiasma frequency in this cross show overdominance while in Purple Round × K. 6312 and 9LO × Purple Slender, the chiasma frequency being between poor parent and mid-parent, dominance of these genes is partial only. On the other hand in Green Long × Purple Slender, 9LO × Green Long, K. 6312 × Green Long and Type 4 × K. 6312 genes for higher chiasma frequency show overdominance. However, the dominance of genes responsible for higher chiasma frequency in Purple Round × Type 4, Green Long × Purple Round and 9LO × K. 6312 is partial only because the Chiasma frequency in these crosses is between mid-parent and superior parent value. The heterosis in chiasma frequency positive or negative, might also be due to inter-allelic interaction. To establish exact nature of the genes controlling chiasma frequency in egg-plant, a more detailed study like that of diallel cross study of chiasma frequency as has been done in rye[7] is required.

Cross 9LO × Green Long showing the highest heterosis of 30·8% over better parent and also giving the highest yield is expected to produce largest number of segregants with various character combinations in F_2. Therefore, there is maximum possibility of getting a desired recombinant in F_2 of this cross.

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