

Biometrical Studies of Certain Inter Varietal Crosses of Tomato (*Lycopersicon esculentum* Mill)*

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In tomato, three intervarietal F_3 crosses, namely, Co 2 x Pusa Ruby, Co 2 x SL. 120 and SL. 120 x Pusa Ruby were investigated for two seasons (December to April, 1976-77 and June to October, 1977) taking into account seven quantitative characters: Plant height, earliness, number of fruiting clusters per plant, fruit weight, number of locules per fruit, number of fruits per plant and yield per plant. The study revealed that the cross SL. 120 x Pusa Ruby and the Sibs C.4, C.6, C.8 and C. 10 to be the most desirable based on the mean and variability.

Exploitation of the available variability is the key for any crop improvement. In tomato, the work on the assessment of variability in advanced generations is rather limited and in the present paper, the results of such an evaluation in the F_3 generation of certain inter varietal tomato crosses have been reported. Allard and Hansche (1964) have pointed out that the reasons for the slow progress in any crop improvement are either the haphazard sampling of total available variability or small population size and high intensity of selection or non understanding of the procedures of exploitation of the existing variability. In such a situation, the step ladder breeding procedure involving choice of desirable parents and crosses for exploitation, extensive screening of selected crosses and utilization of genetic knowledge on the component characters have been suggested for breeding for yield per se.

MATERIAL AND METHODS

The progenies (Sibs) obtained from three F_2 Crosses, namely Co 2 x Pusa Ruby, Co 2 x SL. 120 and SL. 120 x Pusa Ruby were raised in randomized progeny row design with two replications. The plot consisted of two rows of 10 plants each at a spacing of 60 x 60 cm. The trial was conducted for two seasons during December to April, 1976-77 and June to October, 1977. Forty plants were maintained under each progeny of the F_3 family. A similar number of plants was also maintained in their parents for comparison. The characters studied were: 1) Plant height (cm), 2) earliness (days) 3) number of fruiting clusters, 4) fruit weight (g) 5) number of locules 6) number of fruits per plant and 7) yield per plant (g).

The mean, standard error, variance and coefficient of variation (CV) were

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calculated within the F_3 families and between the families as per the standard methods of Goulden (1952).

RESULTS AND DISCUSSION

Plant height :

It was found that all the three crosses, exhibited a relatively high mean and low variability for plant height in the second season (1977). High means were observed in crosses SD. 120 x Pusa Ruby and Co 2 x SL. 120 in both the seasons. The Crosses Co 2 X SL. 120 and Co 2 X Pusa Ruby registered high variability in the first (1976 — 77) and second (1977) seasons. Among the sibs of the cross Co 2 X Pusa Ruby, high mean and high variability were observed consistently only in Sib A. 8. Forty five per cent of sibs in first season and 82.5 per cent in the second season, exceeded the cross general mean. In the cross Co.2 X SL. 120, Sibs B. 3, B. 10 and B.14 exhibited high mean consistently in both the seasons. Fifteen per cent of the sibs in first season (1976—77) and 24 per cent in the second season (1977) exceeded the cross mean. Among the sibs of cross SL. 120 x Pusa Ruby, high mean and high variability were observed consistently in C.7 whereas C 9 exhibited high mean alone in both the seasons. Sibs which exceeded the cross general mean accounted for 32.5 per cent in first season (1976—77) and 32 per cent in the second season.

Earliness :

It was found that in all the three crosses, the second season (1977)

exhibited relatively high mean. However, variability was inconsistent with the seasons. In the second season (1977) Crosses Co 2 X Pusa Ruby and Co 2 X SL. 120 registered lower C. V. The cross Co 2 X Pusa Ruby registered consistently a high mean and a high variability only in the first season (1976-77). Among the sibs of crosses A. 8, A. 11, A. 12, B. 8, B. 12 and C. 3 registered consistently high mean while sib C. 6 recorded high variability.

Number of fruiting clusters per plant :

It was observed that the first season (1976-77) was favourable for higher mean for number of fruiting clusters. However, variability was higher in the second season (1977) than in first season. Cross Co 2 X Pusa Ruby in the first season and cross SL. 120 X Pusa Ruby in the second season registered high mean and high variability. While considering the sibs of the crosses, sibs A. 8 registered high mean and high variability consistently and sib C. 4 and C. 13 registered high variability on both the seasons.

Fruit Weight ;

High mean and high variability for fruit weight were observed in all the three crosses during the second season (1977). Cross Co 2 X SL. 120 registered high mean in both the seasons with high variability in first season (1976 — 77) whereas, in the second season (1977) cross Co 2 X Pusa

Ruby registered more variability than cross Co 2 x SL. 120. Among the sibs, sib A.7, B.4, B. 12 and C. 13 registered high mean and low variability in both the seasons.

Number of locules per fruit :

It was observed that all the three crosses in second season (1976-77) exhibited relatively a higher mean for number of locules per fruit. Coefficient of variability was in consistent between the seasons. Crosses Co 2 x Pusa Ruby and SL. 120 x Pusa Ruby registered high mean, while crosses Co 2 x SL. 120, Co 2 x Pusa Ruby were observed to have high variability consistently in both the seasons. Among the sibs studied sibs B. 15, C. 4 and C. 11 registered high mean and low variability.

Number of fruits per plant :

All the three crosses exhibited relatively high mean and low variability during the second season (1977). The cross SL. 120 x Pusa Ruby registered high mean values consistently while the crosses Co. 2 X Pusa Ruby and Co. 2 X SL. 120 registered high variability. Among the sibs of cross Co. 2 X SL. 120 high mean and high variability were observed consistently in A. 13. There were about 30 per cent sibs in the first season and 40 per cent in the second season which exceeded the cross general mean. In the cross Co. 2 X SL. 120 consistent higher mean value was observed in the sib B. 9

while B. 2 and B. 6 exhibited consistent high variability. Thirty eight per cent of the sibs in the first season and 24 per cent in the second season exceeded the cross general mean. In the cross SL. 120 X Pusa Ruby consistent high mean and high variability were observed in sib C. 1. Thirty per cent of sibs in the first season and 48 per cent in the second season exceeded the cross general mean.

Yield per plant :

High mean and low variability were observed in all the three crosses during the second season (1977). The cross SL. 120 X Pusa Ruby registered high mean high variability during the first season (1976-77), while the crosses SL. 120 X Pusa Ruby and Co. 2 X Pusa Ruby, consistent high mean recorded in sibs A. 3 and A. 6, while A. 13 exhibited consistent high variability. Sixty four per cent of sibs in the second season and 37.5 per cent in the first season exceeded the cross general mean. In the cross Co. 2 X SL. 120 Sib B. 11 registered high mean and high variability consistently in both the seasons. Thirty eight per cent of the sibs in the first season and 48 per cent in the second season exceeded the cross general mean. Consistent high mean was exhibited by the sibs C. 4 and C. 6, while C. 8 and C. 10 registered consistent high variability among the various sibs of the cross SL. 120 X Pusa Ruby. The cross general mean was exceeded by 37.5 per cent of

the sibs in the first season and by 40.0 per cent of the sibs in second season.

In any pedigree breeding programme, selection normally commences in F_2/F_3 generations, based on the progeny performance. The basic aim of the breeder here is perpetuate the best progeny of the best family. This involves the choice of the desirable cross and then the selection of the best progenies of the selected cross based on their positive value above the cross mean. The two stage selection applied thus, effectively, capitalise the transgressive variability within the cross as suggested by Lerner (1958). The selection is generally limited to individual plant values in the early generation and to the desirable family in the later generation when they reach the homozygosity. In order to eliminate the poor hybrids and undesirable individual plants, the mean performance is taken as the primary criterion. In the present study, when mean is considered as an index of selection, the cross SL. 120 X Pusa Ruby has registered a high expression of mean for number of fruits per plant and yield per plant consistently in both the seasons. The performance of this cross was relatively the highest of the three crosses in respect of number of fruiting clusters per plant and locule number in either one of the seasons tested. When the performance of the sibs are considered, a high expression for yield and number of fruits per plant was evident in the sibs of this cross as

compared to the sibs of the other two crosses. Further more the mean performance of the cross SL. 120 X Pusa Ruby for fruit weight and number of fruits per plant was also consistent in both the seasons. The coefficient of variability was considerably low in this cross and this showed the stability of performance over the seasons for the important yield components like number of fruits per plant and fruit weight.

The potentiality of a cross is measured both by the mean and extent of variability. While mean serves as a basis for eliminating undesirable crosses, variability is considered as a dependable criterion for effective selection. Selection will be effective only when the segregating generation possesses the potential variability. Considering the variability among the crosses, the cross SL. 120 x Pusa Ruby registered high variability for earliness in both the seasons and for yield per plant, number of fruiting clusters per plant, number of locules per fruit and number of fruiting clusters per plant either in the first or in the second season. When mean and variability were considered together the cross SL. 120 x Pusa Ruby has registered high mean and high variability for earliness, yield per plant and number of fruiting clusters per plant in either one of the seasons. Such a combination could not be observed in any of the sibs of this cross. However the sibs C.4 and C.6 recorded high mean for yield, whereas sib C. 8 and C. 10 recorded high variability for yield per plant.

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