

## GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE IN HOT CHILLI (*CAPSICUM CHINENSE* JACQ.)

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Abstract: Thirty-two accessions of hot chilli (*Capsicum chinense* Jacq.) were evaluated to estimate the variability, heritability and genetic advance in randomized block design with three replications. Higher phenotypic and genotypic coefficients of variation were observed for fruits per plant, yield per plant, seeds per fruit and fruit weight. High estimates of heritability coupled with high genetic advance were also observed for these characters, indicating that they can be effectively improved through selection.

Key words: *Capsicum chinense*, genetic advance, heritability, variability

### INTRODUCTION

Hot chilli (*Capsicum chinense* Jacq.) is a traditional crop grown in the homesteads of Kerala for domestic and export purposes. Characterized by its typical flavour and aroma, it is noted for its high oleoresin content and pungency. Systematic breeding efforts on this crop have so far been neglected. For starting any improvement work, information about the genetic variability in the population is a prerequisite. Presence of high variability in this crop offers much scope for its improvement. Hence, an attempt was made to estimate genetic variability, heritability and genetic advance in the available germplasm of hot chilli (*Capsicum chinense*).

### MATERIALS AND METHODS

Thirty-two accessions of hot chilli (*Capsicum chinense*) collected from different sources were evaluated at the College of Agriculture, Vellayani, Trivandrum during September 2000 to May 2001. The accessions were raised in randomized block design with three replications in plots of size 6.75 m, planted at a spacing of 0.75 x 0.60 m. The crop received timely management practices as per the package of practices recommendations of the Kerala Agricultural University (KAU, 1996). Five plants were randomly selected per accession and observations recorded on plant height, primary branches per plant, plant spread, days to first flowering, pollen viability, days to maturity, fruits per plant, fruit length, pedicel length, fruit girth, fruit weight, seeds per fruit, 1000-seed weight, number of harvests and yield per plant. Analysis of variance in respect of various characters was done (Panse and Sukhatme,

1967). Genetic variability for the different characters was estimated as suggested by Singh and Choudhary (1985). Heritability (broad sense) and genetic advance as percentage of mean were calculated as per Hanson *et al.* (1956) and Johnson *et al.* (1955) respectively.

### RESULTS AND DISCUSSION

Analysis of variance showed significant differences among the accessions for all the characters studied. The extent of variability in respect of range, mean, phenotypic and genotypic coefficients of variation, heritability and genetic advance is given in Table 1.

The present investigation revealed considerable amount of variation for all the characters studied. Such wide variation indicated the scope for improving the population for these characters as suggested earlier by Cherian (2000).

High coefficients of phenotypic (PCV) and genotypic (GCV) variation were observed for several characters, the highest being for fruits per plant, followed by yield per plant, seeds per fruit and fruit weight. Similar results were also reported by Cherian (2000). The high PCV and GCV observed are evident from their high variability that in turn offers good scope for selection. The lowest PCV and GCV were for days to first flowering, which was in conformity with the findings of Cherian (2000). The GCV was near to PCV for most of the characters, indicating a highly significant effect of genotype on phenotypic expression with very little effect of environment. Heritability estimates observed for most of the characters ranged from 39.35 (primary branches per plant) to 99.38 per cent (yield per plant). Higher magnitude of heritability (>90 per cent) resulting from

Table 1. Range, mean, coefficients of variation, heritability and genetic advance for different characters in *C. chinense*

| Sl. No. | Character                              | Range         | Mean $\pm$ SEM     | PCV % | GCV % | Heritability % | Genetic advance % |
|---------|--|---------------|--------------------|-------|-------|----------------|-------------------|
| 1       | Plant height (cm)                      | 61.33-133.33  | 98.69 $\pm$ 4.00   | 20.09 | 18.82 | 87.77          | 36.32             |
| 2       | Primary branches per plant             | 3.33-8.67     | 5.44 $\pm$ 0.75    | 30.56 | 19.17 | 39.35          | 24.77             |
| 3       | Plant spread (cm)                      | 248.71-454.48 | 315.39 $\pm$ 15.13 | 15.66 | 13.28 | 71.87          | 23.18             |
| 4       | Days to first flowering                | 54.67-83.00   | 70.18 $\pm$ 1.54   | 8.85  | 7.99  | 81.60          | 14.87             |
| 5       | Pollen viability (%)                   | 33.27-86.93   | 62.81 $\pm$ 10.94  | 26.72 | 26.60 | 99.07          | 54.53             |
| 6       | Days to maturity                       | 22.00-37.33   | 31.04 $\pm$ 0.66   | 12.44 | 11.89 | 91.32          | 23.41             |
| 7       | Fruits per plant                       | 18.99-637.44  | 168.85 $\pm$ 9.54  | 90.08 | 89.54 | 98.82          | 183.37            |
| 8       | Fruit length (cm)                      | 3.60-8.33     | 5.75 $\pm$ 0.15    | 18.07 | 17.51 | 93.95          | 34.97             |
| 9       | Pedicle length (cm)                    | 2.50-5.50     | 3.53 $\pm$ 0.07    | 20.37 | 20.07 | 97.04          | 40.72             |
| 10      | Fruit girth (cm)                       | 5.27-10.37    | 8.45 $\pm$ 10.099  | 17.79 | 17.67 | 98.68          | 36.17             |
| 11      | Fruit weight (g)                       | 1.22-8.63     | 5.02 $\pm$ 0.15    | 33.41 | 33.03 | 97.75          | 67.28             |
| 12      | Seeds per fruit                        | 5.67-57.67    | 32.14 $\pm$ 11.21  | 38.01 | 37.44 | 97.04          | 75.99             |
| 13      | 1000-seedweight (g)                    | 2.83-5.21     | 4.12 $\pm$ 0.09    | 14.74 | 14.23 | 93.16          | 28.29             |
| 14      | Yield per plant (g)                    | 51.31-1649.72 | 445.96 $\pm$ 18.14 | 89.39 | 89.12 | 99.38          | 183.01            |
| 15      | Yield per harvest (g)                  | 19.78-278.31  | 95.78 $\pm$ 14.76  | 68.82 | 68.28 | 98.44          | 139.55            |
| 16      | Number of harvests                     | 2.03-6.94     | 4.18 $\pm$ 0.08    | 32.48 | 32.30 | 98.89          | 66.16             |
| 17      | Capsaicin (%)                          | 1.20-3.74     | 2.49 $\pm$ 10.02   | 27.57 | 27.52 | 99.62          | 56.58             |
| 18      | Oleoresin (%)                          | 4.92-24.25    | 12.44 $\pm$ 0.47   | 36.07 | 35.46 | 96.65          | 71.81             |
| 19      | Ascorbic acid (mg / 100 g)             | 61.83-136.33  | 98.07 $\pm$ 0.52   | 17.07 | 17.04 | 99.71          | 35.05             |
| 20      | Mosaic incidence (vulnerability index) | 40.63-67.90   | 55.18 $\pm$ 12.30  | 11.88 | 9.44  | 63.15          | 15.45             |

high GCV was also registered for fruits per plant, fruit length, fruit girth, fruit weight, seeds per fruit, 1000-seed weight, pollen viability, days to maturity and number of harvests. Similar findings were also reported in chilli (*Capsicum annuum*) by Rajput *et al.* (1981) for fruits per plant and yield per plant and Singh *et al.* (1994) for fruit characters. High heritability estimates indicate the presence of large number of fixable additive factors and hence these traits may be improved by selection.

The effectiveness of selection depends upon genetic advance of the character selected along with heritability. The study revealed high heritability coupled with high genetic advance for several biometric characters including yield per plant, fruit per plant, fruit weight, fruit girth and fruit length. Jabeen *et al.* (1998) also observed high heritability and genetic advance for several yield characters in chilli (*C. annuum*). High heritability along with low genetic advance attributable to non-additive gene action was noticed for days to first flowering, as reported earlier by Vijayalakshmi *et al.* (1989).

High GCV along with high heritability and genetic advance provide better information than other parameters alone. On the basis of the present study, yield per plant, fruit per plant, fruit length, fruit girth, fruit weight and seeds per fruit are the most important quantitative characters to be taken into consideration for effective selection in *C. chinense*.

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