

# Genetic Parameters and Character Association for Yield and Anthracnose Resistance in Chilli (*Capsicum annuum* L.)

P. M. Ajith and P. Manju

**Abstract** – Seventy six chilli genotypes were evaluated simultaneously for anthracnose resistance and yield traits as two parallel experiments. Three genotypes showed less than 10 per cent disease incidence at 30 DAT, 45 DAT and 60 DAT (Days After Transplanting). Fruit weight per plant recorded the maximum values of PCV, GCV, heritability and genetic advance. Per cent disease incidence and disease intensity were negatively associated with capsaicin content and harvest index. Fruit yield displayed positive correlation with number of branches, number of fruits per plant, average green fruit weight, fruit length, fruit girth, 100-seed weight, crop duration, harvest index and capsaicin content.

**Keywords** – *Capsicum Annuum*, Coefficient of Variation, Correlation, Heritability.

## I. INTRODUCTION

Chilli is an important spice cum vegetable crop grown on a commercial scale in India. Though India is the largest producer, consumer and exporter of chillies in the world, productivity of chilli in India has remained low compared to the world average. One of the reasons for low productivity is the damage due to various diseases among which anthracnose or die-back and fruit rot is a serious one. Hence it is essential to evolve varieties resistant to anthracnose disease. The present investigation was undertaken to study the genetic parameters and character association for yield and anthracnose resistance in chilli (*Capsicum annuum* L.).

## II. MATERIALS AND METHODS

Two parallel experiments using 76 genotypes of chilli were conducted during rabi 2011 to screen for anthracnose disease resistance and yield evaluation. Randomized block design with two replications, at a spacing of 45 x 45 cm and ten plants per treatment per replication was adopted. Cultural and manurial practices were followed as per [1]. Plant protection measures were not adopted while screening for anthracnose resistance. Scoring for disease incidence was done following the standard procedures by [2] and [3] during three stages of the crop viz. 30, 45 and 60 DAT (Days After Transplanting). From the experiment on yield evaluation, observations on days to first flowering, number of branches, number of fruit per plant, average green fruit weight (g), fruit weight per plant (g), fruit length (cm), fruit girth (cm), number of seeds per fruit, hundred seed weight (g), plant height (cm), duration of the crop, harvest index, capsaicin content and oleoresin content were recorded. For each genotype, five plants per replication were selected at random as observational plants

and the mean recorded. Phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were estimated according to [4] and genotypic correlation coefficients worked out.

## III. RESULTS AND DISCUSSION

Anthracnose disease intensity gradually increased from 30 DAT to 60 DAT. At 30 DAT, 45 DAT and 60 DAT, majority of the genotypes showed anthracnose disease incidence varying between 20 and 30 percent. At 30 DAT, most of the genotypes were found to be slightly susceptible while a few were severely affected by the disease. But three genotypes viz. T<sub>20</sub> (Kidangoor Local-1), T<sub>42</sub> (Ujwala) and T<sub>76</sub> (Pant C1) were found moderately resistant. The same trend continued during 45 DAT and 60 DAT with the number of slightly susceptible genotypes increasing as the number of days after transplanting increased. T<sub>20</sub>, T<sub>42</sub> and T<sub>76</sub> remained moderately resistant throughout the crop period. Hence these three genotypes could be used as sources of resistance to anthracnose. Moderate resistance to anthracnose has been reported in [5] and [6].

PCV, GCV, heritability and genetic advance for various characters are presented in Table I. High PCV and GCV were observed for most of the traits including green fruit yield and its components. There was close association between the estimates of PCV and GCV. Similar result has been reported in [7], [8], [9], [10] and [11] where the highest values of PCV and GCV were observed for fruit weight per plant.

High heritability was recorded for all the characters studied. Very high heritability was shown by fruit weight per plant, fruit length, hundred seed weight, number of seeds per fruit and capsaicin content. High heritability for yield per plant indicates the additive gene action involved in this trait, which makes its selection highly effective. This is in conformity with the opinion expressed in [12]. High genetic advance was observed for fruit weight per plant, per cent disease incidence, number of fruit per plant, disease intensity, average green fruit weight and number of seeds per fruit. For duration of the crop, genetic advance was moderate. High heritability coupled with high genetic advance (as % of mean) was shown by all the characters studied except duration of the crop. Predominance of additive genetic effects for these characters is revealed suggesting selection to be rewarding.

Genotypic correlation coefficients are presented in Table II. Per cent disease incidence and disease intensity were negatively associated with capsaicin content and

harvest index. Green fruit weight per plant (yield) exhibited positively significant association with number of branches per plant, number of fruits per plant, average green fruit weight, fruit length, fruit girth, hundred seed weight, duration of the crop, harvest index, capsaicin content, disease intensity and per cent disease incidence. Yield showed desirable negatively significant association with days to first flowering. Hence selection based on the above traits would lead to improvement in yield.

It can be concluded that in breeding programmes for high yield and anthracnose resistance in chilli, the genotypes T<sub>20</sub>, T<sub>42</sub> and T<sub>76</sub> can be used as sources of resistance. In selection for high yield and anthracnose resistance, high capsaicin content and early flowering of genotypes can be used for indirect selection along with high fruit weight per plant and its correlated traits.

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Table I: Genetic parameters of chilli

|    | Characters                     | PCV   | GCV   | H <sup>2</sup> (%) | GA (% of mean) |
|----|--------------------------------|-------|-------|--------------------|----------------|
| 1  | Days to first flowering        | 16.12 | 15.21 | 89.01              | 29.56          |
| 2  | Number of branches             | 32.86 | 31.56 | 92.30              | 62.56          |
| 3  | Number of fruits per plant     | 39.15 | 38.10 | 94.70              | 76.39          |
| 4  | Average green fruit weight (g) | 35.02 | 34.24 | 95.62              | 69.14          |
| 5  | Fruit weight per plant (g)     | 45.93 | 45.68 | 96.90              | 93.59          |
| 6  | Fruit length (cm)              | 32.76 | 32.21 | 96.68              | 65.19          |
| 7  | Fruit girth (cm)               | 25.04 | 24.30 | 94.21              | 48.38          |
| 8  | No. of seeds per fruit         | 27.79 | 26.30 | 96.40              | 72.43          |
| 9  | Hundred seed weight (g)        | 28.82 | 28.30 | 96.08              | 55.23          |
| 10 | Plant height (cm)              | 6.37  | 5.63  | 79.68              | 57.62          |
| 11 | Duration of the crop           | 16.41 | 15.22 | 86.12              | 10.46          |
| 12 | Harvest index (HI)             | 41.48 | 38.41 | 85.75              | 29.11          |
| 13 | Capsaicin content (%)          | 32.47 | 31.88 | 96.39              | 64.48          |
| 14 | Oleoresin content (%)          | 13.63 | 13.31 | 95.26              | 26.75          |
| 15 | Percent disease incidence      | 40.78 | 40.05 | 96.46              | 80.64          |
| 16 | Disease intensity (%)          | 41.48 | 38.41 | 85.75              | 72.63          |

H<sup>2</sup> = Heritability, GA = Genetic advance

**Table II: Genotypic correlations for 16 characters in chilli**

|     | X1       | X2       | X3       | X4       | X5       | X6       | X7       | X8       | X9       | X10      | X11     | X12       | X13       | X14    | X15      | X16    |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------|-----------|-----------|--------|----------|--------|
| X1  | 1.0000   |          |          |          |          |          |          |          |          |          |         |           |           |        |          |        |
| X2  | -0.1109  | 1.0000   |          |          |          |          |          |          |          |          |         |           |           |        |          |        |
| X3  | -0.2008  | 0.5309** | 1.0000   |          |          |          |          |          |          |          |         |           |           |        |          |        |
| X4  | -0.2850* | 0.1162   | 0.2433*  | 1.0000   |          |          |          |          |          |          |         |           |           |        |          |        |
| X5  | -0.2529* | 0.3548** | 0.7340** | 0.4867** | 1.0000   |          |          |          |          |          |         |           |           |        |          |        |
| X6  | 0.0683   | 0.2041   | 0.2068   | 0.1285   | 0.2790*  | 1.0000   |          |          |          |          |         |           |           |        |          |        |
| X7  | -0.1043  | 0.0566   | 0.3269** | 0.2205*  | 0.3861** | 0.2017   | 1.0000   |          |          |          |         |           |           |        |          |        |
| X8  | -0.0219  | 0.2367*  | -0.0257  | -0.0678  | -0.1957  | -0.0114  | -0.1023  | 1.0000   |          |          |         |           |           |        |          |        |
| X9  | -0.1601  | 0.1020   | 0.2182   | 0.0309   | 0.2274*  | 0.2093   | 0.0841   | 0.1217   | 1.0000   |          |         |           |           |        |          |        |
| X10 | -0.0680  | -0.0571  | 0.0591   | 0.2275*  | 0.1520   | 0.3581** | -0.2005  | 0.1476   | 0.0471   | 1.0000   |         |           |           |        |          |        |
| X11 | -0.0307  | 0.2277*  | 0.4506** | 0.1869   | 0.4984** | 0.0165   | 0.1558   | -0.1182  | 0.1283   | -0.0417  | 1.0000  |           |           |        |          |        |
| X12 | -0.1570  | 0.2338*  | 0.3865** | 0.4432** | 0.6567** | 0.0490   | 0.2795*  | -0.1612  | 0.2147   | 0.1392   | 0.2270* | 1.0000    |           |        |          |        |
| X13 | 0.0839   | 0.2562*  | 0.3908** | 0.4231** | 0.5411** | 0.3188** | 0.1497   | 0.4342** | 0.0122   | 0.4012** | 0.2527* | 0.4184**  | 1.0000    |        |          |        |
| X14 | -0.1416  | -0.1213  | 0.2527*  | -0.1867  | -0.0592  | -0.1497  | -0.1052  | 0.1899   | 0.4142** | -0.0625  | 0.1568  | -0.1891   | -0.0529   | 1.0000 |          |        |
| X15 | -0.3020  | 0.4588** | 0.6883** | 0.3649** | 0.6677** | 0.1891   | 0.4777** | -0.1162  | 0.1974   | -0.1274  | 0.4446  | -0.2832*  | -0.4297** | 0.0071 | 1.0000   |        |
| X16 | -0.2065  | 0.4105** | 0.6416** | 0.3967** | 0.6617** | 0.2867*  | 0.4465** | -0.0569  | 0.2390   | -0.0195  | 0.4144  | -0.3426** | -0.3841** | 0.0098 | 0.9140** | 1.0000 |

\*Significant at 5% level

\*\*Significant at 1% level

X1=Days to first flowering

X2=Number of branches

X3=Number of fruits per plant

X4=Average green fruit weight

X9= Hundred seed weight

X10= Plant height

X11= Duration of the crop

X12= Harvest index

X5= Fruit weight per plant

X6= Fruit length

X7= Fruit girth

X8= Number of seeds per fruit

X13=Capsaicin content

X14=Oleoresin content

X15= Disease intensity

X16=Percent disease incidence