CHAPTER I

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It is needless to emphasize the importance of tomatoes and its uses as vegetables and its nutritional qualities looking to its commercial and diversified culinary uses in food preparations. A large number of varieties have been evolved and are being cultivated, but it is unfortunate that the varieties under cultivation do not possess both traits i.e. quantity and quality at the same time. A number of genotypes are available with high yield potentials but these varieties are not resistant to cracking/rotting. This cracking and rotting is one of the major components which limits the production and net income of tomato growers and poses a great challenge to the agricultural scientists to solve this menace.

The possibility of improving varieties have been reported by many workers. Sugars and organic acids are important constituents of flavour and the edible quality of tomato fruits (Lower and Thompson, 1967). The fruit firmness and shape are dependent upon the locule number and the thickness of pericarp in tomato (Yeager, 1937; Dennett and Larson, 1953). The possibility of manipulation
of these characters by breeding and selection have been clearly demonstrated by Thompson et al. (1964) and Ahuja (1968). Mac Ferran and Goode (1982) reported good resistance to fruit cracking and fruit rot by breeding.

At the practical level, the mating flexibility of the crop will also determine the most useful procedure. Tomato is self-pollinated crop and, as such, only the flexible components of genetic variation can be utilized. Therefore, the present study was taken up to obtain some of the needed information, basic to the formulation of a rational programme for the genetic amelioration of tomato with special reference to cracking/rotting of fruits on the following lines:

1. Analysis of genetical architecture of yield and yield components, quality parameters viz. vitamin C, reducing sugar contents and resistance to fruit cracking and fruit rot following the generation means approach proposed by Hayman (1958).

2. Estimation of heterosis over midparent and better parent as well as inbreeding depression percentage in F₂ and F₃.

Genetic differentiation is not directly measurable, however, it can be measured by external expression of
genetic values as modified by environmental interactions. Therefore, in order to have a clear understanding of genetic properties, the measurable (phenotypic) values must be partitioned into its component genotypes due to particular assemblage of genes or gene systems inherent in the population and environmental caused by all the factors external to the genotype. The genotypic variance needs to be further partitioned into its components, if it is to be useful.

Meaningful genetic analyses of continuously varying traits have been initiated by Fisher's (1918) partitioning of the hereditary variance for metric traits into three components.

1. An additive portion resulting from average effects of the genes.

2. A dominance component arising from the intra-
   allelic interactions, and

3. An epistatic part related with non-allelic
   interactions.

In the present investigation on the elite varieties of tomato and their $F_4$, $F_2$ and $F_3$'s were grown and the data recorded on different traits were subjected to statisti-
cal analyses with regard to yield, cracking/rotting and quality components. The analyses were designed to provide the estimates of gene effect viz. additive, dominance and relative importance of digenic epistasis employing generation means using Hayman's (1958) model as well as to obtain information on the extent of heterosis and inbreeding depressions and to determine environmental effect if any. The following pages embody the results of such a study.