INTRODUCTION

Tomato is one of the most important vegetable crops grown throughout the world under field and greenhouse conditions. It is said to be native of tropical America (Thompson and Kelly, 1957), from where it spread to other part of the world in the 16th century and became commercially popular in India within the last six decades. The annual production of tomatoes in the world is 5.4 million metric tonnes (FAO, 1983), while in India it was 7.5 lakh tonnes with an area of about 80,000 hectares (Singh, 1988). According to F.A.O. estimates average yield in India was about 94.31 q. per hectare as against the world yield of 198.56 q. per hectare (Anonymous, 1971). It appears, from the above statistics, that average yield of this crop in India is almost half in comparison to the average world yield.

Tomato tops among the vegetables as processing crop in world. It is cooked alone or mixed with other vegetables too. It is preserved in the form of concentrated juice, purees, ketchup, soup, paste and canned tomatoes. According to Gould (1974) in U.S.A., Canada, Australia and in several European and Latin American countries, processed tomatoes are consumed more than the fresh. In U.S.A. average per capita consumption of processed tomato is 23 lb as against 54 lb of all the processed vegetables. There has been progressive increase in total area and net returns through processing and canning tomatoes during the last decade in U.S.A (Gould, 1974). The area under the processing tomato is
also increasing considerably in other countries. On the other hand, in India very little emphasis was given on processing and canning of tomatoes. The products like juice, purees, ketchup, soup and paste etc. are being made using available fresh market tomatoes. According to Statistics of Fruit and Vegetable Processing Industry in India (1967), the total quantity of tomato products in the country was reported to be 4843 tonnes valued for Rs. 46.3 million.

Tomato being most important to growers, consumers and to the industry and a good material for genetical and breeding work, has been given little attention towards its genetic improvement. Systematic improvement work on tomato in the country was started in 1940 and it was primarily restricted to selection and introduction. The introduced varieties do lack to a certain extent, in adoption, but several of them proved to be a successful cultivar (Sioux, Marglobe, Roma, Money Maker, Best of all).

Wellington (1912) reported the presence of increased vigour in the hybrids for yield and earliness in tomato. Since then, extensive work on heterosis for yield, its components and quality characters have been reported by a number of workers. In developed countries mostly hybrid tomatoes are in cultivation under controlled as well as field conditions. However, in India only few cultivars of hybrid tomatoes are being grown commercially on the farmers field under a very limited area.
The knowledge of nature and magnitude of gene action controlling the characters under consideration, combining ability of the parents and degree of heterosis and inbreeding depression are helpful in determining the most efficient breeding procedure. The genetic diversity of the parents influence the performance of the hybrids and segregating generations and increase the chance of recovering desirable transgressive segregants and thus enhancing the effectiveness of selection. How best would the parents transmit their requisite traits would depend not only on their own genetic architecture, but also on genotype interactions with the environments. It is clear that a particular genotype will not exhibit the same performance in different environments. The genotype x environment interaction alters the expression of the genotype, which in turn, reduces the confidence in inferences drawn, if the G x E effect has not been accounted for.

Complex characters, like yield potential of a crop depends upon its component characters. Selection programme can be made effective by having an adequate information on association of component characters. An understanding of the nature and magnitude of character associations in segregating and non-segregating generations is useful in achieving desired improvement through selection and also in determining the criteria of selection for developing most productive genotype.

Considering the importance of tomato in vegetable farming, diet and industry, its yield and quality characters, the
present experiment, were undertaken with the following objectives:

1. To estimate components of variation and their different ratios along with graphical analysis of variances and co-variances.

2. To estimate the general and specific combining ability effects and variances in respect of different traits.

3. To estimate the heterosis in $F_1$ hybrids and inbreeding depression in $F_2$ population.

4. To determine the heritability and expected genetic advance among developmental and component traits related to productivity.

5. To estimate association among different characters.