VI - SUMMARY

1. The present investigations represent an attempt to study the genetic behaviour of the reaction to Fusarium wilt, as well as some other qualitative and quantitative characters in some Tomato crosses grown in the three successive years (1964,1965,1966).

2. The study was based on the data of F_1 , F_2 and Bc_1 progenies of fourteen crosses including seven varieties of tomatoes; Red Cherry, San Marzano, Pearl Harbor, American, Genome, Pearson 107 and Orange.

3. The inheritance of Fusarium wilt was studied in eight crosses including the resistant varieties Red Cherry, San Marzano and American. The F_1 plants showed dominance of resistance in all crosses including the variety American, and dominance of susceptibility in crosses including the varieties Red Cherry and San Marzano. The F_2 and Bc_1 generations showed that this character was controlled by four dominant genes for resistance and two dominant genes for susceptibility. The genes suggested for resistance were (R) in the variety American and was epistatic to gene (S_1) for susceptibility in Orange, gene(R_1) in Red Cherry and the two complementary genes (R_2, R_3)

for resistance in San Marzano, which were hypostatic to either genes (S_1 or S_2) for susceptibility carried by the varieties Orange and Pearson 107. The recessive genes (r, r_1, r_2 , s_1 , s_2) for susceptibility were carried by Pearl Harbor.

4. The genetic behaviour of fruit shape was studied as a qualitative character in ten crosses including three fruit shapes; roundish oblate, round, and oval. The F_1 plants showed the dominance of roundish oblate over oval shape. It appeared from the F_2 and backcrosses segregations that fruit shape character was governed by three pairs of genes, where gene (E) controlled equatorial expansion of fruit, (P) polar expansion, and (Lc) few locule number, and these genes interacted together to give different fruit shapes. The recessive gene (lc) for many locules modified fruit shape to be oblate when present with either genes (E or P). The round fruit shape appeared in genotypes (E P lc) as in the variety American or (e p lc) as in the variety Orange, the roundish oblate shape was developed in the presence of the three dominant genes (E P Lc) as in Red Cherry and Genome or in the presence of two dominant genes (E Lc p) as in Pearl Harbor and Pearson 107. The oval fruit shape was found in the presence of two dominant genes (e P Lc)

as in the variety San Marzano.

5. Association studies between fruit shape and number of locules per fruit showed significant associations in five crosses. These associations might be probably due to the presence of a linkage between one of the gene or genes for locule number and one of the fruit shape genes, being on the same chromosome.

6. The inheritance of fruit colour was studied in eleven crosses including red and orange fruited varieties. Red flesh colour showed to be dominant to orange flesh colour in F_1. It appeared from F_2 and Bc_1 progenies that this character was controlled by five pairs of genes, where the two complementary genes (R_1 , R_2) for red flesh colour located in the variety American and were epistatic over gene (T) for orange flesh colour in the variety orange. The genes (R_3) in Genome, (R_4 and R_5) in Pearl Harbor, were all duplicate genes for red fruit flesh colour epistatic to gene (T) for orange flesh colour. The recessive alleles for all these genes caused yellow flesh colour.

7. Fruit size showed to be quantitatively inherited character in eight crosses. The F_1 plants were intermediate between parenal fruit sizes, showing partial dominance of small fruit size. The F_2 distribution covered

the ranges of both parents or beyond the range of the large fruited parent. The number of genes for fruit size varied greatly from (1-12) pairs of genes with multiplicative gene action. However, this value reached (25-33) pairs of genes in the cross Red Cherry x Genome. Heritability values were high in all cases ranging from (62.12% - 96.91%), showing effectiveness of selection for fruit weight.

8. In the crosses belonging to the large x large fruit group including the two crosses, San Marzano x (Pearl Harbor and Genome), there was a characteristic shift in fruit size. The mean fruit weight of F_1 plants was very much lower than the comparatively smaller fruited parent. This phenomenon continued in F_2 of the cross San Marzano x Pearl Harbor only. This phenomenon was suggested to be related either to negative heterosis or to effect of accumulation of dominant genes for small fruited size existed in both large fruited parents.

9. Plant height was inherited as a quantitative character in two crosses. The F_1 plants represented the dominance of long stem accompanied by heterosis in the cross Pearl Harbor x Orange and showed partial dominance for long stalked plant in the cross American x San Marzano.

Number of genes governing plant height showed to be limited ranging from (1-2) pairs. The heritability for this character was high enough (ranging from 62.95% - 92.89%) to indicate the effectiveness of selection for this character.

10. The inheritance of ascorbic acid content in fruits was studied in the cross Pearson 107 x San Marzano. The F_1 plant showed intermediate values between parents, and F_2 plants showed partial dominance of high vitamin C in the variety Pearson 107. Simple monogenic inheritance. was observed in F_2 distribution with some modifiers having additive effect. The heritability for this character was very high ranging (92.71% - 93.43%), indicating effectiveness of selection for high vitamin C contents.