5. SUMMARY

Two field experiments were carried out at the Expt. Farm Station of the National Research Centre (NRC) at Shalakan, Kalubia during the early summer (transplanted at Feb. 15 th) and the fall seasons (transplanted at Juli 1 st) of 1988 and 1989. Studies aimed to determine the effect of irrigation level within cultivar on growth, chemical composition yield and quality of tomato fruits with special reference to fruit cracking. Therefore, each experiment included 12 treatments which are 3-levels of irrigation (low, medium and high which were irrigated at 60-70, 70-80 and 80-90% of the field capacity, respectively) within 4-cultivars of tomato (UC-97-3, Strain-B, AceVF$_{55}$ and Super Marmand). All cultivars were transplanted on ridges of 100 cm width at 25 cm apart. Treatments were arranged in the field using four replicates in a split plot design whereas, the irrigation levels surved as main plots and cultivars were randumly disterbuted as the the sub plots. The most important results were as follows:

1- **Vegetative growth**:

Results showed that increasing the irrigation level significantly increased; plant height, fresh and dry weight per plant however, number of leaves and branches per plant were not considerably affected by irrigation level, as shown in both the early summer and fall seasons. Tomato cultivars were significantly differed

in their vegetative growth; cv. Super Marmand surpassed the other tested cultivars with respect to plant height, number of leaves and branches, fresh and dry weight per plant within all levels of irrigation. However, cv. Strain-B showed the lowest plant growth reached the smallest growth at the medium irrigation level.

2. **N, P and K content (% or mg/plant) of plant foliage**:

Generally, the mineral content of plant foliage was significantly differed due to the irrigation level, cultivar and growing season as follows:

a- Total-N and K content (% and mg/plant) of leaves and/or branches were increased by increasing the irrigation level. However, P content of foliage was not considerably affected by irrigation level, as shown in both seasons.

b- Tomato cultivars were significantly differed in their mineral content. In the early summer season, cv. Super Marmand had higher N and K content (% or mg/plant) followed by cv. $AceVF_{55}$, UC-97-3 and Strain-B. However, in the fall season, cv. $AceVF_{55}$ had higher N and K content, followed by cv. UC-97-3, Strain-B and Super Marmand. Concerning P uptake of plant foliage, it was high in cvs. $AceVF_{55}$ and UC-97-3 followed by Super Marmand and Strain-B which showed the lowest P content in both seasons.

c- According to the interaction between irrigation level and cultivar, in the early summer season, cv. Super Marmand within medium and low irrigation and cv. UC-97-3 within

the high irrigation resulted the highest N and K content. However, cv. Strain-B showed the lowest N and K uptake as compared with the other cultivars within all levels of irrigation. Meanwhile, in the fall season, supplying cvs. Super Marmand and UC-97-3 with the high irrigation level gave the highest N and K uptake followed by cv. Strain-B within the high irrigation level and the lowest content was recorded by cv. Super Marmand within the low irrigation level.

3- **Fruit yield and its components**:

a- Decreasing the level of irrigation gradually and signifcantly increased fruit early yield, as shown in the early summer season. However, an opposite trend was detected in the fall season i.e. fruit early yield was increased by increasing the level of irrigation from low, medium up to the high level. Moreover, no considerable variances in yield earliness was detected between the low and the medium irrigation level, as shown in the fall season.

The marketable and total fruit yields of both seasons, were gradually and significantly increased by increasing the level of irrigation from the low up to the high level, with no significant difference in total yield between the medium and low irrigation levels. This increment in total yield was possivelly related with the increase in both of the average fruit weight (only

in the fall season) and in number of fruits per plant of both seasons.

b- Concerning the cultivars, cv. UC-97-3 produced the highest early, marketable and total fruit yield as compared with cvs. Super Marmand, Strain-B and $AceVF_{55}$. such increments reached 0.63, 3.34 and 3.91 ton/Fed. over in total yield for each cultivar and represented about 4.7, 31.2 and 38.6%, respectively, in the early summer season.

In the fall season, cvs. UC-97-3 and Strain-B gave simillar early yield and higher than that of the other tested cultivars. Moreover, cvs. Strain-B and Super Marmand produced higher total yield as compared with the other tested cultivars with an increase of 3.46-4.16 ton/Fed. represented 62-85% over in total fruit yield. However, cv. Strain-B surpassed all tested cultivars including Super Marmand with respect to fruit marketable yield, in the fall season. Furthermore, cv. AceVF55 produced the lowest early, marketable and total fruit yield as compared with the other tested cultivars, in both seasons.

c- Results of the early summer season showed that cv. UC-97-3 within the low irrigation produced the highest early, marketable and total fruit yield as compared with other treatments. Increasing level of irrigation significantly decreased fruit yield and its components of cv. UC-97-3. However, marketable and total yields of cvs. Strain-B,

$AceVF_{55}$ and Super Marmand were considerably increased by increasing the irrigation level. Therefore, it is better to irrigate the latter 3-cultivars at 80-90% of the field capacity (high irrigation level) in case of transplanting at mid Februrary for the summer season.

Respecting the fall season, results showed that cv. strain-B within the medium and high irrigation levels produced the highest early and marketable yield associated with high total yield as compared with the other tested cultivars within all levels of irrigation. Although, the highest fruit total yield (ton/Fed.) was obtained by cv. Super Marmand within low irrigation but this cultivar is not recommended for growing in the fall season due to its high unmarketable yield which reached 55.98% of the total yield. Moreover, cv. $AceVF_{55}$ within all levels of irrigation gave the lowest early, marketable and total fruit yield, in both seasons.

4- Fruit quality: Fruit cracking:

a- Increasing the level of irrigation up to the highest level (irrigation at 80-90% of the field capacity) significantly decreased fruit cracking % and cracked fruit weight (ton/Fed.) as compared with the low irrigation level (irrigation at 60-70% F.C.) in both seasons.

b- Concerning the cracked fruit weight as affected by cultivar, cv. Super Marmand produced the highest quantity of cracked

fruits (3.43-4.4 ton/Fed.) as compared with the other tested cultivars, in both seasons. Moreover, fruit cracking of cv. Super Marmand was of the concentric type and high cracking category (cracks extended more than ½ of the fruit). The quantity of the cracked fruits of cv. $AceVF_{55}$ which comes in the second rank reached 3.58-1.92 ton/Fed. and most cracks were of the slight to medium category of that radial type. On the other hand, cvs. UC-97-3 and Strain-B produced the lowest cracked fruits weight(reached 0.29-0.58 ton/Fed.), as shown in both seasons and most fruit cracks were of that slight radial type. The high resistant to fruit cracking of cvs. UC-97-3 and Strain-B is mainly due to date shape, thick flesh, low number of locules and the low juice % as compared with that of cvs. $AceVF_{55}$ and Super Marmand.

c- Generally, cvs. Super Marmand gave higher values of cracked fruits yield followed by cv. $AceVF_{55}$ as compared with cvs. UC-97-3 and Strain-B within all levels of irrigation, in both seasons. Although, no significant difference in fruit cracking percentage was detected between cvs. Strain-B and UC-97-3 in the early summer season, cv. UC-97-3 within low and medium irrigation surpassed cv. Strain-B in the fall season.

5- <u>Fruit quality: Physical characteristics of tomato fruits</u>:

a- Increasing the level of irrigation led to an increase in average fruit weight in the fall season, however, an opposite trend was found in the early summer season.

decreased the titratable acidity of tomato juice reached to its lowest value within the high irrigation level, as compared with the other irrigation levels in both seasons.

b- Concerning with the effect of cultivar, fruits of cv. Strain-B had high content of vitamin-C and total acidity associated with low content of TSS%. However, fruits of cv. $AceVF_{55}$ had high TSS% associated with medium content of vitamin-C and low titratable acidity. Other cultivars had medium values in this respect.

c- Results showed that fruits of cvs. $AceVF_{55}$ followed by UC-97-3 had higher TSS% as compared with those of cvs. Strain-B and Super Marmand within all levels of irrigation, as shown in the early summer season however, variances failed to reach the level of significancy in the fall season. Fruits of cvs. Strain-B followed by UC-97-3 had a higher titratable acidty as compared with that of cvs. $AceVF_{55}$ and Super Marmand within all levels, of irrigation, in both seasons. It seems that vitamin-C content was more affected by cultivar since it was not considerably affected by irrigation within cultivar.

Conclusion:

It could be concluded from this study that:

1- It was clear that cvs. UC-97-3 and Strain-B produced a higher marketable yield (77.77-84.01% based on total

yield) as compared with that of cvs. $AceVF_{55}$ and Super Marmand (50.44-56.46%) with all levels of irrigation in both seasons.

2- Results of both the early summer and fall season showed that cv. $AceVF_{55}$ produced the lowest early, marketable and total fruit yields as compared with the other tested cultivars within all levels of irrigation.

3- In the early summer season, growing cv. UC-97-3 within the low irrigation level (irrigation at 60-70% of the field capacity) is recommended in order to get the highest early, marketable and total yields of fruits with high quality as compared with the other tested cultivars. Moreover, fruits of cv. UC-97-3 had larger size, thicker flesh and more resistant to fruit cracking than that of cv. Strain-B.

4- In the fall season, growing cv. Strain-B within high irrigation (irrigation at 80-90% of field capacity) is recommended in order to get the highest early and marketable yields of fruits with high quality.

5- It is better to irrigate the tomato plants at 80-90% of the field capacity (high level irrigation) in order to decrease the quantity of cracked fruits (% or ton/Fed.) especially those susceptable cultivars to fruit cracking such as $AceVF_{55}$ and Super Marmand.