

# CONTENTS

	<u>Page</u>
<b>INTRODUCTION .....</b>	<b>1</b>
<b>REVIEW OF LITERATURE .....</b>	<b>3</b>
<b>1. Effect of Irrigation Regimes on Tomato Plants .....</b>	<b>3</b>
1.1. Effect of irrigation regimes on tomato vegetative growth ....	3
1.2. Effect of irrigation regimes on tomato yield and yield components .....	4
1.3. Effect of irrigation regimes on fruit quality and physical fruit characters .....	7
1.4. Effect of irrigation regimes on water use efficiency .....	8
1.5. Effect of irrigation regimes on NPK contents in tomato plants .....	9
1.6. Effect of salinity and interaction between levels of it and irrigation water on tomato plants .....	9
<b>2. Effect of Organic Manure .....</b>	<b>12</b>
2.1. Effect of organic manure on vegetative growth .....	12
2.2. Effect of organic manure on tomato yield and yield components .....	13
2.3. Effect of organic manure on fruit quality and physical fruit characters .....	15
2.4. Effect of organic manure on mineral content in tomato plants .....	16
2.5. Interaction between salinity levels and organic manure .....	16
<b>3. Effect of Nitrogen Fertilizer on Tomato Plants .....</b>	<b>17</b>
3.1. Effect of nitrogen fertilizers on vegetative growth .....	17
3.2. Effect of nitrogen fertilizers on tomato yield and yield components .....	18
3.3. Effect of nitrogen fertilizers on fruit quality and physical fruit characters .....	22
3.4. Effect of nitrogen fertilizers on mineral content in tomato plants .....	22
3.5. The interaction between salinity levels and N application levels and effect of salinity levels on tomato yield and last characters .....	23
<b>MATERIALS AND METHODS .....</b>	<b>25</b>
<b>RESULTS AND DISCUSSION .....</b>	<b>32</b>
<b>First Season Experiment .....</b>	<b>32</b>
<b>1. Vegetative Growth .....</b>	<b>32</b>
1.1. Effect of tomato varieties on fresh weight and dry weight of tomato plants .....	32
1.2. Effect of irrigation regimes on fresh weight and dry weight of tomato plants .....	34
1.3. Effect of nitrogen fertilizer levels on fresh weight and dry weight of tomato plants .....	35

	<u>Page</u>
1.4. Effect of interaction between tomato varieties (A), irrigation regimes (B) and nitrogen fertilizer levels (C) .....	36
1.4.1. On fresh weight of tomato plants .....	36
1.4.2. On dry weight of tomato plants .....	41
<b>2. Total Yield and Yield Components .....</b>	<b>41</b>
2.1. Average fruit weight (g) .....	41
2.1.1. Effect of tomato varieties on average fruit weight ...	43
2.1.2. Effect of irrigation regimes on average fruit weight	43
2.1.3. Effect of nitrogen fertilizer levels on average fruit weight .....	44
2.1.4. Effect of the interaction between tomato varieties (A), irrigation regimes (B) and nitrogen fertilizer levels (C) on average fruit weight .....	45
2.2. Number of fruits plant <sup>-1</sup> .....	45
2.2.1. Effect of tomato varieties on No. of fruits plant <sup>-1</sup> ...	48
2.2.2. Effect of irrigation regimes on No. of fruits plant <sup>-1</sup> ..	48
2.2.3. Effect of nitrogen fertilizer levels on No. of fruits plant <sup>-1</sup> .....	49
2.2.4. Effect of the interactions between tomato varieties (A), irrigation regimes (B) and nitrogen fertilizer levels (C) on No. of fruits plant <sup>-1</sup> .....	49
2.3. Average fruit yield (kg plant <sup>-1</sup> ) .....	50
2.3.1. Effect of tomato varieties on the average fruit yield (kg plant <sup>-1</sup> ) .....	50
2.3.2. Effect of irrigation regimes on the average fruit yield (kg plant <sup>-1</sup> ) .....	53
2.3.3. Effect of nitrogen fertilizer levels on the average fruit yield (kg plant <sup>-1</sup> ) .....	54
2.3.4. Effect of the interactions between tomato varieties (A), irrigation regimes (B) and nitrogen fertilizer levels (C) on the average fruit yield (kg plant <sup>-1</sup> ) .....	55
2.4. Average fruit yield (ton fed. <sup>-1</sup> ) .....	58
2.4.1. Effect of tomato varieties on the average fruit yield (ton fed. <sup>-1</sup> ) .....	58
2.4.2. Effect of irrigation regimes on the average fruit yield (ton fed. <sup>-1</sup> ) .....	59
2.4.3. Effect of nitrogen fertilizer levels on the average fruit yield (ton fed. <sup>-1</sup> ) .....	60
2.4.4. Effect of the interactions between tomato varieties (A), irrigation regimes (B) and nitrogen fertilizer levels (C) on the average fruit yield (ton fed. <sup>-1</sup> ) .....	60
<b>3. Fruit Quality and Physical Fruit Characters .....</b>	<b>61</b>
3.1. Fruit length (cm) L .....	61
3.1.1. Effect of tomato varieties on fruit length L .....	61
3.1.2. Effect of irrigation regimes on fruit length L .....	65
3.1.3. Effect of nitrogen fertilizer levels on fruit length L..	65

	<u>Page</u>
3.1.4. Effect of the interactions between tomato varieties (A), irrigation regimes (B) and nitrogen fertilizer levels (C) on fruit length L .....	66
3.2. Fruit diameter (cm) D .....	67
3.2.1. Effect of tomato varieties on fruit diameter D .....	67
3.2.2. Effect of irrigation regimes on fruit diameter D .....	70
3.2.3. Effect of nitrogen fertilizer levels on fruit diameter D .....	71
3.2.4. Effect of the interactions between tomato varieties (A), irrigation regimes (B) and nitrogen fertilizer levels (C) on fruit diameter D .....	71
3.3. Fruit shape index L/D .....	72
3.3.1. Effect of tomato varieties on fruit shape index L/D..	72
3.3.2. Effect of irrigation regimes on fruit shape index L/D .....	72
3.3.3. Effect of nitrogen fertilizer levels on fruit shape index L/D.....	75
3.3.4. Effect of the interactions between tomato varieties (A), irrigation regimes (B) and nitrogen fertilizer levels (C) on fruit shape index L/D.....	75
<b>4. Water Use Efficiency (WUE) .....</b>	<b>78</b>
4.1. Water Consumptive Use (CU) .....	78
4.2. Soil Moisture Extraction Pattern (SMEP) .....	81
4.3. Water Use Efficiency (WUE) .....	82
4.3.1. Effect of tomato varieties on WUE .....	82
4.3.2. Effect of irrigation regimes on WUE .....	82
4.3.3. Effect of nitrogen fertilizer levels on WUE .....	84
4.3.4. Effect of the interaction (AxBxC) .....	84
<b>Second Season Experiment .....</b>	<b>85</b>
<b>1. Vegetative Growth .....</b>	<b>85</b>
1.1. Effect of organic manure .....	85
1.2. Effect of irrigation regimes .....	87
1.3. Effect of nitrogen fertilizer levels .....	88
1.4. Effect of the interactions between organic manure (A), irrigation regimes (B) and nitrogen fertilizer levels (B) on vegetative growth .....	89
<b>2. Yield and Yield Components .....</b>	<b>90</b>
2.1. Average fruit weight (g) .....	95
2.1.1. Effect of organic manure .....	95
2.1.2. Effect of irrigation regimes .....	95
2.1.3. Effect of nitrogen fertilizer levels .....	97
2.1.4. Effect of the interactions .....	98

	<u>Page</u>
2.2. Number of fruits plant <sup>-1</sup> .....	101
2.2.1. Effect of organic manure .....	101
2.2.2. Effect of irrigation regimes .....	101
2.2.3. Effect of nitrogen fertilizer levels .....	102
2.2.4. Effect of the interactions .....	103
2.3. Average fruit yield (kg plant <sup>-1</sup> ) .....	104
2.3.1. Effect of organic manure .....	104
2.3.2. Effect of irrigation regimes .....	107
2.3.3. Effect of nitrogen fertilizer levels .....	107
2.3.4. Effect of the interactions .....	108
2.4. Average fruit yield (ton fed. <sup>-1</sup> ) .....	111
2.4.1. Effect of organic manure .....	111
2.4.2. Effect of irrigation regimes .....	112
2.4.3. Effect of nitrogen fertilizer levels .....	112
2.4.4. Effect of the interactions .....	113
<b>3. Fruit Quality and Physical Fruit Characters .....</b>	<b>116</b>
3.1. Fruit length L (cm) .....	116
3.1.1. Effect of organic manure .....	116
3.1.2. Effect of irrigation regimes .....	118
3.1.3. Effect of nitrogen fertilizer levels .....	118
3.1.4. Effect of the interactions .....	119
3.2. Fruit diameter D (cm) .....	119
3.2.1. Effect of organic manure .....	119
3.2.2. Effect of irrigation regimes .....	122
3.2.3. Effect of nitrogen fertilizer levels .....	122
3.2.4. Effect of the interactions .....	123
3.3. Fruit shape index L/D .....	126
3.3.1. Effect of organic manure .....	126
3.3.2. Effect of irrigation regimes .....	126
3.3.3. Effect of nitrogen fertilizer levels .....	127
3.3.4. Effect of the interactions .....	127
<b>4. Mineral Content in Tomato Plants .....</b>	<b>128</b>
4.1. N% and uptake .....	128
4.1.1. Effect of organic manure .....	128
4.1.2. Effect of irrigation regimes .....	132
4.1.3. Effect of nitrogen fertilizer levels .....	133
4.1.4. Effect of the interactions .....	134
4.2. P% and uptake .....	135
4.2.1. Effect of organic manure .....	137
4.2.2. Effect of irrigation regimes .....	137
4.2.3. Effect of nitrogen fertilizer levels .....	138
4.2.4. Effect of the interactions .....	139

	<u>Page</u>
4.3. K% and uptake .....	140
4.3.1. Effect of organic manure .....	140
4.3.2. Effect of irrigation regimes .....	142
4.3.3. Effect of nitrogen fertilizer levels .....	143
4.3.4. Effect of the interactions .....	144
4.4. Fertilizer use efficiency .....	145
4.4.1. Utilization rate (UR %) .....	146
4.4.2. Nitrogen recovery (%) .....	146
4.4.3. Nitrogen use efficiency (NUE) .....	148
<b>5. Soil Water Relationships .....</b>	<b>149</b>
5.1. Water Consumptive Use (CU) .....	149
5.2. Soil Moisture Extraction Pattern (SMEP).....	152
5.3. Water Use Efficiency (WUE) .....	153
5.3.1. Effect of organic manure .....	153
5.3.2. Effect of irrigation regimes .....	155
5.3.3. Effect of nitrogen fertilizer levels .....	155
5.3.4. Effect of the interactions .....	155
<b>SUMMARY .....</b>	<b>157</b>
<b>CONCLUSION .....</b>	<b>170</b>
<b>REFERENCES .....</b>	<b>171</b>
<b>ARABIC SUMMARY</b>	

## S U M M A R Y

This investigation aimed to evaluate the effect of tomato varieties, organic manure, irrigation regimes and nitrogen fertilizer levels on the vegetative growth, yield and yield components, fruit quality and physical fruit characters, mineral content (NPK) and water use efficiency (WUE) of tomato plants under saline soil conditions.

Two field experiments were carried out under the conditions of North Delta soils at El-Roba Village, Baltim, Kafr El-Sheikh Governorate, during the two successive growing seasons, 200/2001 and 2001/2002 seasons.

In the 1<sup>st</sup> season, the experiments were designed as split-split plot, two tomato varieties assigned to the main plots and three irrigation regimes (every 7 days, every 14 days and every 21 days) occupied the sub-plot while, the sub-sub plots were assigned to the four different nitrogen fertilizer levels (zero, 100, 150 and 200 kg N fed.<sup>-1</sup>) which were added as calcium nitrate 15%N. The total number of this trial are 24 treatments, each treatment was replicated 3 times to give a total of 72 experimental units.

While in the second season, the main plots were occupied by the organic manure (without organic manure and chicken manure at 10 m<sup>3</sup> fed.<sup>-1</sup>); meanwhile the sub-plots were assigned to the three irrigation regimes as in the first season and the sub-sub plots were split into the six different nitrogen fertilizer levels (zero, 50, 100, 150, 200 and 250 kg N fed.<sup>-1</sup>) which were added as calcium nitrate 15% N. The

total number of this trial are 36 treatments. Each treatment was replicated 3 times to give a total of 108 experimental units.

At the end of fertilization program, a random sample of two plants from each treatment was chosen after 75 days from transplanting and the end of growth season to study the differential responses of plant growth characteristics and mineral composition (NPK) of tomato plants.

Tomato fruits which obtained from two lines of each experimental plot to calculate total yield and yield components and water use efficiency by tomato plants.

**The obtained results could be summarized as follows :**

**The First Season (2000/2001) :**

**I. Vegetative Growth :**

***A. Effect of tomato varieties :***

The differences between means of each weight of tomato plants at 75 days from transplanting as affected by tomato varieties was significant. While, it of dry weight was insignificant.

Edkawy cv. surpassed hybrid variety Petopride-2 in fresh and dry weight.

***B. Effect of irrigation regimes :***

The results obtained cleared that fresh and dry weights had increased significantly by increasing soil moisture. The highest values of fresh and dry weights of tomato plants at 75 days from transplanting were obtained from tomato plants irrigated every 7 days.

**C. *Effect of nitrogen fertilizer levels :***

Fresh and dry weights of tomato plants at 75 days from transplanting were high significantly affected by nitrogen fertilizer levels. The highest means of these trials were obtained from applying 200 kg N fed.<sup>-1</sup>.

**D. *Effect of the interactions :***

Fresh and dry weights of tomato plants at 75 days from transplanting was not significantly affected by all interactions between A, B and C.

The highest value of fresh weight of tomato plants was obtained from the interaction between local cv. Edkawy, irrigation every 14 days and fertilization with 200 kg N fed.<sup>-1</sup>, while, the highest value of dry weight was obtained from hybrid variety Petopride-2 which irrigated every 7 days and fertilized with 200 kg N fed.<sup>-1</sup>.

**II. Total Yield and Yield Components :**

The average fruit weight (g), No. of fruits plant<sup>-1</sup>, average fruit yield plant<sup>-1</sup> (kg plant<sup>-1</sup>) and average fruit yield (ton fed.<sup>-1</sup>) as affected by tomato varieties, irrigation regimes, nitrogen fertilizer levels and their interactions were studied, the results were as follows :

**A. *Effect of tomato varieties :***

- 1- The average fruit weight was high significantly affected by tomato varieties. Local cv. Edkawy surpassed hybrid variety Petopride-2 in the average fruit weight by 40.8%. This increasing ascribes the varietal specific of cv. Edkawy.



- 2- No. of fruits plant<sup>-1</sup>, average fruit yield (kg plant<sup>-1</sup>) and average fruit yield (ton fed.<sup>-1</sup>) were significantly affected by tomato varieties. The highest values of all these characters were obtained from hybrid variety Petopride-2.

***B. Effect of irrigation regime :***

- 1- The average fruit weight of tomato plants was not significantly affected by irrigation regimes. The highest value of the average fruit weight was obtained from tomato plants irrigated every 7 days.
- 2- The results revealed that the number of fruits plant<sup>-1</sup> was significantly affected by irrigation regimes. The highest value of No. of fruits plant<sup>-1</sup> was resulted from tomato plants irrigated every 7 days.
- 3- The average fruit yield in kg plant<sup>-1</sup> and ton fed.<sup>-1</sup> were high significantly affected by irrigation regimes. The highest values of them were obtained from tomato plants irrigated every 7 days.

***C. Effect of nitrogen fertilizer levels :***

The results revealed that all characters under study were high significantly affected by nitrogen fertilizer levels, where, the average fruit weight, No. of fruits plant<sup>-1</sup>, average fruit yield plant<sup>-1</sup> and average fruit yield fed.<sup>-1</sup> increased as affected by increasing the nitrogen fertilizer levels.

The highest values of all last characters were obtained from tomato plants fertilized with 200 kg N fed.<sup>-1</sup>.

**D. *Effect of the interactions :***

The highest average fruit weight obtained from local cv. Edkawy which irrigated every 7 days and fertilized with 200 kg N fed.<sup>-1</sup>. While, the highest No. of fruits plant<sup>-1</sup>, average fruit yield (kg plant<sup>-1</sup>) and average fruit yield (ton fed.<sup>-1</sup>) resulted from the hybrid variety (Petopride-2) which irrigated every 7 days and fertilized with 200 kg N fed.<sup>-1</sup>.

**III. Fruit Quality and Physical Fruit Characters :**

**A. *Effect of tomato varieties :***

- 1- The fruit length of tomato plants was not significantly affected by tomato varieties, the hybrid variety (Petopride-2) obtained the higher fruit length.
- 2- The fruit diameter and fruit shape index were high significantly affected by tomato varieties. The higher fruit diameter resulted from cv. Edkawy, whereas, the higher fruit shape index obtained from Petopride-2.

**B. *Effect of irrigation regimes :***

- 1- The fruit length and fruit shape index of tomato were not significantly affected by irrigation regimes. The highest fruit length obtained from tomato plants irrigated every 7 days. Whereas, the highest fruit shape index resulted from tomato plants irrigated every 21 days.
- 2- The fruit diameter of tomato was high significantly affected by irrigation regimes. The highest fruit diameter obtained from tomato plants irrigated every 7 days.

### *C. Effect of nitrogen fertilizer levels :*

- 1- The results obtained that all characters under study were high significantly affected by nitrogen fertilizer levels. The values of all these characters increased by increasing the nitrogen fertilizer levels.
- 2- The highest values of fruit length, fruit diameter and fruit shape index resulted from tomato plants fertilized with 200 kg fed.<sup>-1</sup>.

### *D. Effect of the interactions :*

The highest values of fruit length and fruit diameter obtained from local cv. Edkawy which irrigated every 7 days and fertilized with 200 kg N fed.<sup>-1</sup>. While, the highest value of fruit shape index from hybrid variety (Petopride-2) which irrigated every 21 days and fertilized with 200 kg N fed.<sup>-1</sup>.

## **IV. Soil Water Relationships :**

- 1- Water consumptive use (cm/season) increased as a result of decreasing irrigation intervals, where the highest water consumptive use (89.329 cm) was obtained from irrigation every 7 days. Meanwhile, the lowest value of water consumptive use (68.401 cm/season) was resulted from irrigation every 21 days.
- 2- The monthly consumptive use starts small amounts of water needs for seedling at the initial growth stage. With the advance of plant age, transpiration increases as plant foliage develops and reaches its peak value in April and May where evapotranspiration increases. The highest monthly consumptive use (20.14, 16.319 and 15.672 cm) obtained during May from irrigation every 7, 14 and 21 days, respectively.

- 3- The soil moisture extraction pattern (SMEP) increased up to 47.055% from soil surface layer (0-15 cm), while, it decreased up to 6.58% from subsoil layer (30-45 cm) with irrigation every 7 days. In the other hand, SMEP decreased up to 27.04% from soil surface layer (0-15 cm) and increased up to 32.784% from subsoil layer (30-45 cm) with irrigation every 21 days.
- 4- Water use efficiency (WUE) increased by the use of hybrid variety Petopride-2 compared with cv. Edkawy.
- 5- WUE increased as a result of increasing nitrogen fertilizer levels up to 200 kg N fed.<sup>-1</sup>.
- 6- The highest value of WUE (7.728 kg fruits m<sup>-3</sup> water consumptive use) was obtained from hybrid variety Petopride-2 which irrigated every 21 days and fertilized with 200 kg N fed.<sup>-1</sup>.

## **The Second Season (2001/2002) :**

### **I. Vegetative Growth :**

#### ***A. Effect of organic manure :***

- 1- The fresh and dry weights of tomato plants at 75 days from transplanting were high significantly affected by organic manure.
- 2- The fresh and dry weights (g plant<sup>-1</sup>) which obtained from tomato plants fertilized with 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup> increased by 302.59 and 260.02%, respectively, when compared with those obtained from tomato plants without organic manure.

#### ***B. Effect of irrigation regimes :***

- 1- The fresh and dry weights of tomato plants at 75 days from transplanting were not significantly affected by irrigation regimes.

- 2- The highest fresh weight obtained from tomato plants irrigated every 7 days, while, the highest dry weight of tomato plants at 75 days from transplanting obtained from which irrigated every 21 days.

**C. Effect of nitrogen fertilizer levels :**

- 1- The fresh and dry weights of tomato plants at 75 days from transplanting were high significantly affected by nitrogen fertilizer levels, where the fresh and dry weights increased by increment of nitrogen fertilizer levels.
- 2- The highest values of fresh and dry weights obtained from tomato plants fertilized with 250 kg N fed.<sup>-1</sup>.

**D. Effect of the interactions :**

The results showed that the fresh and dry weights were not significantly affected by the interaction (AxBxC) organic manure X irrigation regimes X nitrogen fertilizer levels. The highest values of fresh and dry weights were obtained from tomato plants fertilized with 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup>, irrigated every 14 days and fertilized with 150 kg N fed.<sup>-1</sup>.

**II. Yield and Yield Components :**

**A. Effect of organic manure :**

- 1- The differences between the means of all characters under study as affected by organic manure were highly significant.
- 2- The highest average fruit weight obtained from tomato plants without organic manure, whereas, the highest values of the No. of fruits plant<sup>-1</sup>, average fruit yield (kg plant<sup>-1</sup>) and average fruit yield (ton fed.<sup>-1</sup>) were resulted from tomato plants received 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup>.

**B. Effect of irrigation regimes :**

- 1- All characters were studied, average fruit weight, No. of fruits plant<sup>-1</sup>, average fruit yield (kg plant<sup>-1</sup>) and average fruit yield (ton fed.<sup>-1</sup>) were high significantly affected by organic manure.
- 2- The highest values of last characters were resulted from tomato plants irrigated every 7days.

**C. Effect of nitrogen fertilizer levels :**

- 1- The results revealed that the differences between the means of all characters -were studied- as affected by nitrogen fertilizer levels were highly significant.
- 2- The highest average fruit weight resulted from tomato plants fertilized with 250 kg N fed.<sup>-1</sup>, while the highest values of No. of fruits plant<sup>-1</sup>, average fruit yield (kg plant<sup>-1</sup>) and average fruit yield (ton fed.<sup>-1</sup>) obtained from tomato plants fertilized with 200 kg N fed.<sup>-1</sup>.

**D. Effect of the interactions :**

- 1- The highest average fruit weight as a result of the interaction AxBxC obtained from tomato plants without organic manure, irrigated every 7 days and fertilized with 250 kg N/fed.
- 2- The highest values of No. of fruits plant<sup>-1</sup>, average fruit yield (kg plant<sup>-1</sup>) and average fruit yield (ton fed.<sup>-1</sup>) resulted from tomato plants received 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup>, irrigated every 7 days and fertilized with 200 kg N fed.<sup>-1</sup>.

### III. Fruit Quality and Physical Fruit Characters :

#### A. *Effect of organic manure :*

- 1- The fruit length of tomato was high significantly affected by the organic manure, whereas, the fruit diameter and fruit shape index were not significantly affected by organic manure.
- 2- The highest values of fruit length and fruit diameter resulted from tomato plants without organic manure. Whereas, the highest value of fruit shape index obtained from tomato plants fertilized with 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup>.

#### B. *Effect of irrigation regimes :*

- 1- The fruit length, fruit diameter and fruit shape index were high significantly affected by irrigation regimes.
- 2- The results proved that the highest values of fruit length and fruit diameter were obtained from tomato plants irrigated every 7 days, while the highest fruit shape index resulted from tomato plants irrigated every 14 days.

#### C. *Effect of nitrogen fertilizer levels :*

- 1- There were positive and high significantly effect on fruit length, fruit diameter and fruit shape index as a result of additional rates of nitrogen fertilizers.
- 2- The highest values of fruit length and fruit diameter were obtained from tomato plants fertilized with 250 kg N fed.<sup>-1</sup>, while, the highest fruit shape index resulted from tomato plants without nitrogen fertilization.

**D. Effect of the interactions :**

The highest values of fruit length and fruit diameter as a result of the effect of interaction (AxBxC) were obtained from tomato plants applying 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup>, irrigated every 7 days and fertilized with 250 kg N fed.<sup>-1</sup>, meanwhile, the highest value of fruit shape index resulted from tomato plants without or organic manure nor nitrogen fertilization and irrigated every 14 days.

**IV. Mineral Composition of Tomato Plants:**

**1- Nitrogen % and uptake :**

- a) The results indicated that the highest values of N % and uptake by tomato fruits, by tomato plants at 75 days from transplanting and tomato plants at the end of growth season were obtained when plants were fertilized with chicken manure at 10 m<sup>3</sup> fed.<sup>-1</sup> and irrigation every 21 days.
- b) The highest values of N % in tomato plants at 75 days from transplanting and in tomato fruits were obtained when plants were fertilized with 200 kg N fed.<sup>-1</sup>, while N % in tomato plants at the end of growth season was resulted from fertilization with 150 kg N fed.<sup>-1</sup>. Meanwhile, the highest values of N uptake by tomato fruits and plants at 75 days from transplanting and at the end of growth season were obtained when plants were fertilized with 250 kg N fed.<sup>-1</sup>.

**2- Phosphorus % and uptake :**

The results indicated that the highest values of P % in tomato plants at 75 days from transplanting and in tomato fruits were obtained when tomato plants fertilized with 10 m<sup>3</sup> chicken manure



fed.<sup>-1</sup>, irrigation every 7 days and fertilized with 200 kg N fed.<sup>-1</sup>, while P % in tomato plants at the end of growth season was obtained from tomato plants without organic manure, irrigated every 7 days and fertilized with 250 kg N fed.<sup>-1</sup>. Meanwhile, the highest values of P uptake by tomato plants at 75 days from transplanting and at the end of growth season were obtained from tomato plants were fertilized with 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup>, irrigated every 7 days and fertilized with 200 kg N fed.<sup>-1</sup>, while, P uptake by tomato fruits was obtained from tomato plants were fertilized with 150 kg N fed.<sup>-1</sup>.

### **3- K % and uptake :**

- a) The results indicated that the highest K % and uptake by tomato fruits, by tomato plants at 75 days from transplanting and by tomato plants at the end of growth season were obtained when plants were fertilized with 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup>.
- b) The highest values of K % and uptake by tomato plants at 75 days from transplanting and by tomato plants at the end of growth season, so, the highest value of K % in tomato fruits were obtained from irrigation every 21 days, while, the highest value of K uptake by tomato fruits was obtained from plants irrigated every 7 days.
- c) The highest values of K % and uptake by tomato plants at 75 days from transplanting and K uptake by tomato plants at the end of growth season were obtained when plants fertilized with 250 kg N fed.<sup>-1</sup>, while, the highest K % and uptake by tomato fruits and K % in tomato plants at the end of growth season were obtained from plants fertilized with 150 kg N fed.<sup>-1</sup>.

#### 4- Utilization rate (UR %) :

The results revealed that the highest value of N recovery (UR %) was obtained from tomato plants were fertilized with 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup>, irrigated every 7 days and fertilized with 50 kg N fed.<sup>-1</sup>.

#### 5- Nitrogen use efficiency (NUE) :

The highest value of NUE was obtained from tomato plants without organic manure, irrigated every 7 days and fertilized with 50 kg N fed.<sup>-1</sup>.

### V. Soil Water Relationships :

- 1- The results proved that the highest water consumptive use (88.246 cm) was obtained from irrigation every 7 days. While, the lowest value of water consumptive use (68.272 cm) resulted from irrigation every 21 days.
- 2- The highest monthly consumptive use (19.286, 16.031 and 15.438 cm) resulted during May from irrigation every 7, 14 and 21 days, respectively.
- 3- The soil moisture extraction pattern (SMEP) increased up to 47.454% from soil surface layer (0-15 cm), while, it decreased up to 6.351% from subsoil layer (30-45 cm) with irrigation every 7 days. In the other side SMEP decreased up to 26.809% from soil surface layer (0-15 cm) and increased up to 35.088% from subsoil layer (30-45 cm) with irrigation every 21 days.
- 4- Water use efficiency (WUE) from tomato plants fertilized with 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup> increased by 55.75% when compared with tomato plants without organic manure.

- 5- The highest value of WUE from tomato plants without organic manure resulted from irrigation every 7 days. Whereas, the highest value of WUE from tomato plants fertilized with 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup> obtained from irrigation every 21 days.
- 6- WUE increased by increment of nitrogen fertilizer levels up to 250 kg N fed.<sup>-1</sup> without organic manure. However, the highest WUE with applying 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup> obtained from tomato plants fertilized with 200 kg N fed.<sup>-1</sup> and irrigated every 21 days.

## CONCLUSION

The obtained results show, the possibility of producing high and good fruit yields of tomato plants under saline soil conditions of North Delta region from hybrid tomato variety by applying 10 m<sup>3</sup> chicken manure fed.<sup>-1</sup>, irrigation every 7 days and fertilized with 200 kg N fed.<sup>-1</sup>.