Original Article

Influence of Magnetically Treated Saline Water on Growth and Tomato Production.

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Abstract

Salinity is one of the major environmental stresses that can inhibit plant growth, development and decreased the crop production. The aim of this study was to assess some growth parameters, yield and irrigation water use efficiency for tomato under different saline water levels. Thus; a plot experiment designed to contain three factors, First factor is dripper discharge which divided into two treatments (4Lph and 8Lph for Q1 and Q2 respectively). The second is saline water which have three treatments (S1= 2000, S2=4000 and S3=6000 ppm). Finally, the third factor is magnetic device which divide into two treatments [magnetic (M) and nonmagnetic treatments (NM)]. Results reflected that (M) magnetic treatment has a significant influence on plant length (PL) compare with (NM) non magnetic treatment where, (PL) value with (M) treatment obtained (111.27cm) but with (NM) treatment the value was (101.5cm). Saline water treatments had significant influence on Number of leaves (NL) where the highest value was obtained under S1 by (53.08) but with S3 value was (31.84). Furthermore; Magnetic water treatment (M) influence on (NL) significantly where the highest value for NL under (M) treatment was 47.6 however under (NM) was (41.21). Highest yield value corresponded with magnetic water treatment (M) by (7 Ton.Fed^{-1}) and the lowest value was (4.4 Ton.Fed^{-1}) with (NM) treatment. In addition, with saline water treatment data observed with highest yield value by (10.4 Ton.Fed^{-1}) under (2000PPM) but the low significant value was recorded with (6000PPM) by average (1.9 Ton.Fed^{-1}). On the other hand, yield obtained (6.2 Ton.Fed^{-1}) as an average with dripper discharge (4Lph); however, the lowest yield value recorded under (8Lph) by (5.1 Ton.Fed^{-1}). There are a positive effect for Magnetic water treatment compare with non magnetic treatment; where, the irrigation water use efficiency (IWUE) was recorded (3.28 Kg.m^{-3}) under magnetic treatment (M) but with non magnetic treatment the value was (2.07 Kg.m^{-3}). However; by increasing water salinity from 2000 to 4000 to 6000 PPM the IWUE decreased significantly from (5.0 to 2.13 to 0.9 Kg.m^{-3}) respectively. Finally, Results reveal that the magnetically treated saline water has the potential to enhance yield and growth parameter under different saline water levels.

Keywords: Irrigation water use efficiency; magnetic treatment; saline water; and Tomato production.

INTRODUCTION

Numerous of countries have suffering from water scarcity and impairment management for water resources, thus; they focusing to deal with this problematic by more rationalized and efficient manner than ever before. Agricultural production is strongly associated with water resources and quality, which are limiting factors for agricultural development (Gao et al., 2016). Thus; Low-quality water such as saline water is a potentially valuable source of water that could be used to alleviate the scarce water resources that affect crop output in arid and semiarid regions. However, using saline water to meet crop requirements varies according to crop species, irrigation frequency and regime, and/or availability of soil water. In addition; utilize saline water as a source of water affect negatively on soil and crop yield. This because saline water contains solutes, long-term irrigation with saline water can lead to an accumulation of saline ions, i.e., Na^+, $Cl^-$and $SO_4{}^{-2}$ in plant tissues and in the soil. (Talebnejad and Sepaskhah, 2015)

Some studies on crop irrigation with saline water have revealed negative influences on plant growth and yields, and some have even reported reductions in soil quality (Carmassi et al., 2013). and caused salinization damage in Pakistan, Japan, China and other Asian countries (Youssef et al., 2006), the negative effect of salinity on plant growth have been attributed to disturbance in protein assimilation, enzymes activity (Hussein and Oraby, 2008), activity of growth hormones (Kaya et al., 2009) and mineral and water uptake (Hussein et al., 2012).Thus, Growth inhibition is the most sensitive physiological response of plants to salinity stress, and this effect is reflected mainly by slow plant growth and reduced biomass (Yu et al., 2016). Salinity negatively influences plant growth which decreases plant water potential and causes ion toxicity, leading to physiological metabolic disorders and nutritional imbalances. Therefore, identification and development of new technologies for promoting the adaptive capacity of plants are of great interest, and practices that promote plant growth and development can decrease the negative impact of saline water used for irrigation (Talebnejad and Sepaskhah, 2015).

On the other hand, among new technologies, magnetized irrigation water is a useful tool to reduce the negative effects of drought and maximize crop plant productivity. The magnetic field (MF) changes physico-chemical characteristics of natural water, including solubility, pH, melting temperature, viscosity, conductivity, the refractive index and reduction of surface tension (Grewal and Maheshwari, 2011). Moreover, (Sheng and Zhang, 2019) Found that the plant height increased the most in the treatment of magnetized water at the seedling stage of cotton. further Proved that magnetized water has a significant role in promoting crop growth. Further, magnetic water treatment can help to promote crop quality. Thus, Yield and quality of strawberry were shown to increase when the plants were irrigated with magnetized water, as were the numbers of both flowers and fruits and the overall production for export (Taimourya et al., 2018). The mode of action of magnetic water is through its partially broken hydrogen bonds. Moreover, some water molecules become like free monomer molecules that can easily penetrate the biological cell walls, thus promoting leaf growth (Toledo et al., 2008). (Selim et al., 2009) stated that the increased cell division and enlargement may be attributed to the increment in enzyme activities, gibberellic acid, indole acetic acid (IAA) and cytokine synthesis and reduced abscise acid (ABA). Thus, magnetized water treatments can promote the growth of leaf numbers and leaf area index, which further promotes photosynthesis and increases crop yield. In addition, (Maheshwari and Grewal, 2009) reported that magnetically treated saline water promoted the yield and water production of celery (Apium graveolens L.) and snow pea (P. sativum L.). thus (Whab-Allah and Al-Omran, 2012) with tomato, pepper (Semiz et al., 2014), cucumber (Alsaeedi et al., 2018) which clearly proved that saline water irrigation reflected negative significant effect on both early and total yields. Moreover, the yield improvement of tomato irrigated with magnetic water may related to changes in the transport of assimilates, enzyme activity, growth regulators, ions and water uptake (Leelapriya et al., 2003), and/or to an energetic excitement of one or more parameters of the cellular substratum such as proteins and carbohydrates. Magnetic field treatment significantly increased early and total yield may related to that magnetic field attributed to improved capacity for nutrients and water uptake, better shoot and root growth (De Souza et al., 2005), which led to an increase in growth and consequently yield. Contrary, tomato production was almost 16.4% lower with the highest discharge rate than with the lowest rate. (AL-OMRAN et al., 2010). Further; (D. D. Nangare et al.,2013) reported that the average tomato yield decreased significantly when the discharge rate of emitters increased from 1.2 to 2.4 lph. And the WUE reduced as salinity in nutrient solution increased (Reina-Sa´nchez et al., 2005).In theory, the magnetic effect depends on characteristics of magnetized water and the orientation of the movements of paramagnetic substances when exposed to a MF. Moreover, a MF can influence the photosynthesis properties and partly reflect the interaction of MFs with intermediate ionic pairs (Atak et al., 2007; Çelik et al., 2008).

Magnetic water treatment plays an important role in cation uptake capacity and has a positive effect on immobile plant nutrients uptake, and leaching of soil salts (Estiken and Turan, 2004) as well as increases the yield of tomato (De Souza et al., 2005), cowpea and eggplant (Surendran et al., 2016). Hence, use magnetic field may overcome the deleterious effect of agricultural saline water particularly on vegetable crops (Selim et al., 2013). Moreover, magnetic treatment produce some positive effects in plants, such as a need for less irrigation, improved nutrient absorption, higher production (Mousa et al., 2013).

Cleary, influence of magnetic field on plant development is studied rather intensively but still not enough deeply. Therefore, the aim of this study was to evaluate the effects of magnetic treatment for saline water on growth parameters as well as irrigation water use efficiency and tomato production which irrigated with different saline water concentrations under different dripper discharges.

MATERIALS AND METHODS

The experiment was carried out over the 2021 growing seasons in farm at Basos, Al - Qanater El Khayreya, Al-Qalyubia governorate. The study site, established in late of August (2021), (30° 10' 48"N - 31° 12'36"E). The site is about 19 m above sea level with an annual rainfall of (21 mm.year^{-1}). The average climate characteristics for temperatures, relative humidity, wind speed and evapotranspiration (ETo) represented at table (1).The Penman-Monteith equation was used to calculate reference crop evapotranspiration (ETo) Equation (1).

$$ETo = \frac{0.408\Delta(R_n - G) + \gamma \frac{900}{T+273} U_2 (e_s - e_a)}{\Delta + \gamma(1 + 0.34U_2)} \qquad (1)$$

Where;
ETo Reference evapotranspiration (mm.d^{-1}),
Δ Slope vapor pressure curve (kPa.°C^{-1}),
Rn Net radiation at the crop surface (MJ.m^{-2}.d^{-1}),
G Soil heat flux density (MJ.m^{-2}.d^{-1}),
T Air temperature at 2 m height (°C),
e_s Saturation vapor pressure (kPa),
e_a Actual vapor pressure (kPa),
e_s _ e_a Saturation vapour pressure deficit (kPa),
U_2 Wind speed at 2 m height (m.s^{-1}), and Psychometric constant (kPa.°C^{-1}).

Table 1: Climatic characteristics at Al-Qalyubia governorate (FAO AQUASTAT 2021)

Month	Prc.	Tem. Max	Tem min.	Hum.	Sun shine	Wind (2m)	Eto

	mm/m	°C	°C	%	%	m.s^{-1}	mm.d^{-1}
Jan	5	19.2	8.3	61.8	67.5	2.5	2.5
Feb	3	21	9.1	57.4	67.9	2.8	3.3
March	2	24	11	54.2	71.3	3.1	4.4
April	1	28.8	14.2	47	72.6	3	5.9
May	1	32.5	17.2	45	75.9	3.1	7.1
June	0	34.9	19.8	48.2	85.3	3.1	7.8
July	0	35	21.4	56.6	82.3	2.8	7.2
Aug.	0	34.6	21.2	60.2	83.9	2.6	6.6
Sep.	0	33.1	20	59.4	77.9	2.7	5.7
Oct.	1	30.1	17.6	58.7	81.3	2.8	4.8
Nov.	3	25.1	13.6	62	75.5	2.4	3.2
Dec.	5	20.5	9.9	62.3	63.9	2.4	2.5

(*Prc*. = Precipitation; *Tmp*. *Min*/*max* = minimum/maximum temperature; *hum*. = relative humidity; *Sunshine* = Sun shine as percentage of day length; *Wind* (*2m*) = wind speed at 2m; *Eto*= Reference evapotranspiration).

The soil of an experimental site is sandy clay loam texture, none calcareous and with soil conductivity 1.01dS.m^{-1}. Silt and clay content are presented at table (2).Water samples were analyzed by standard analytical methods for pH, electrical conductivity and ion composition. Average values of the analyzed parameters in irrigation water are given in table (3).

Table 2: soil texture at different soil depths.

Depth, cm	Clay, %	Silt , %	Sand coarse	Sand fine	Texture class
0-30	22.37	29.88	14.59	33.26	Sand clay loam
30-60	22.41	26.06	18.39	33.15	Sand clay loam
60-90	21.49	25.28	18.56	34.69	Sand clay loam

Table 3. Some chemical characteristic for irrigation water before mixed with NaCl solution.

Ph	EC (dS.m^{-1})	Soluble Cations (meq.L^{-1})				Soluble Anions(meq.L^{-1})				SAR*
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO$^{-2}_{3}$	HCO^{-3}	CL^{-1}	SO$^{-2}_{4}$	
6.7	0.63	3.9	1.5	1.03	0.13	0	1.23	1.19	4.14	0.62

*The Sodium adsorption ratio (SAR)

Crop water requirement and total water applied were calculated using an average Reference Evapotranspiration (ETo) and the Crop coefficients (Kc) [table (4).] by the following equations.

$$ETc = ETo * KC \qquad (2)$$

Where;
ETc Crop Evapotranspiration, (mm.day^{-1}).
ETo Reference Evapotranspiration, (mm.day^{-1}).
Kc Crop coefficients.

$$WR = ETc - Peff \qquad (3)$$

where;
WR Net irrigation requirement, (mm.day^{-1}).
ETc Crop evapotranspiration, (mm.day^{-1}).
Peff Effective rainfall, (mm.day^{-1}).

$$IR = WR/Ea \qquad (4)$$

where; IR Irrigation Requirement (mm. day^{-}
WR Net irrigation requirement, (mm.day^{-1}).

Ea Overall irrigation efficiency for modern irrigation system (drip. Approximately (90%). [Phocaides, 2007)].

Table 4. The average crop coefficients (Kc) for tomato.

Item	Init.	Dev.	Mid.	Late.	Total.
Days	20	40	40	15	115
KC	0.6	0.7	1.15	0.7	

Init=initial; Dev. =crop development; Mid. = mid-season; Late = late season.; Kc = Crop coefficients

Subsequently; the total water applied for tomato is 506 mm. The experiment design depends on three factors. First factor is dripper discharge which divided into two treatments (4Lph and 8Lph for Q1 and Q2 respectively). The second is saline water which have three treatments (S1= 2000, S2=4000 and S3=6000 ppm) prepared using Three different concentrations of NaCl solutions. Finally, the third factor is magnetic device which divide into two treatments [magnetic (M) and nonmagnetic treatments (NM)]. Experiment treatments distribution presented at fig.1. Magnetic device is 1 inch connected to the main pipe, with average discharge (12 $m^3.h^{-1}$) under pressure up to (7 bars) and capability: 14500 Gauss. In addition, Tomato was cultivated in 20th August with distance is 0.5 m, and 1.2 m. (fig.2.)

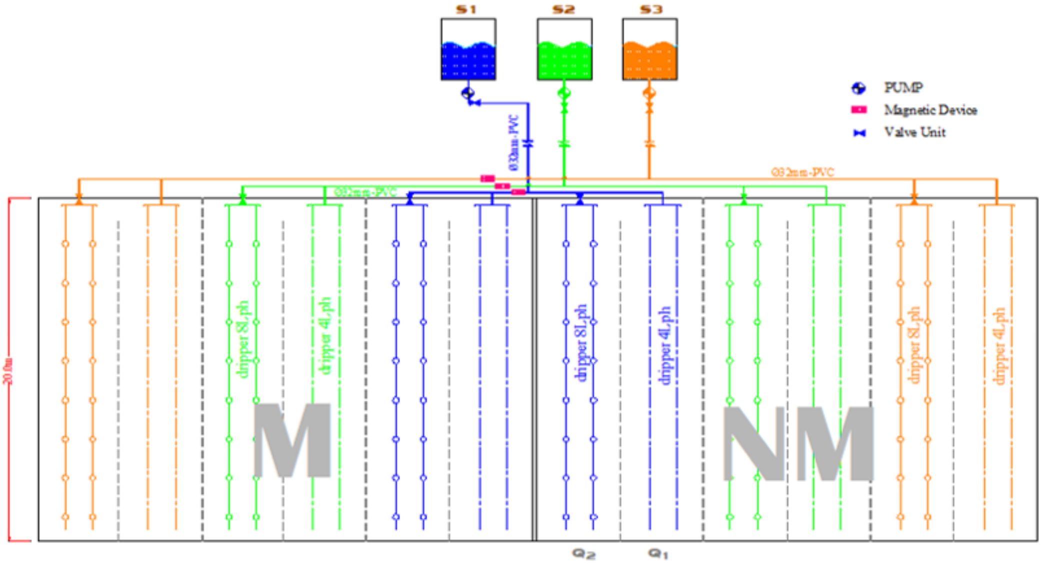


Fig. 1. Layout for experiment and treatments distribution where Q1 = 4Lph, Q2 = 8Lph, M = Magnetic device, NM = without Magnetic device, S1=saline water with (2000 PPM), S2= saline water with (4000 PPM), S3= saline water with (6000 PPM).

Fig.2. Installing magnetic devices on main lines for network irrigation system.

Irrigation water use efficiency equation (5).

$$IWUE = Y / IR \qquad (5)$$

Where:

IWUE = Irrigation water use efficiency (kg. m^{-3}).
Y = The yield (kg.fed^{-1}).
IR = The irrigation water applied (m^3. fed^{-1})

STATISTICAL ANALYSIS FOR MODELLING:

The data were analyzed using the three way ANOVA split split plot procedure with Duncan's HSD test at p<0.05 using the COSTAT 3.03 System software. The simple regression models with predictor variables $X_1; \ldots\ldots ;X_p$ can be describe by equation (6).

$$y = B_0 + B_1X_1 + \ldots\ldots\ldots\ldots\ldots + B_pX_p + k \qquad (6)$$

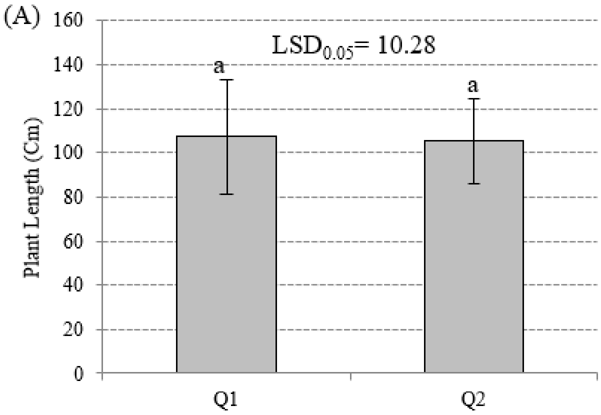
Where:

Variable y, called a response or dependent variable, depends on another variables $X_{(1..p)}$ which is called the independent or predictor variable (also called the regress or variable), B_0 is intercept, $B_{1\text{-}P}$is the slope parameters and the variability of the error (*k*) is constant for all values of the repressor.

RESULT DISCUSSION

Effect of magnetized saline water on Tomato growth parameters:-

Data presented in fig (3) show that the plant length (PL) for tomato did not affect by dripper discharge treatments; the dripper treatments did not have any significant influence on (PL).However; the highest value recoded with Q1 by (107.0cm). On the other hand, (M) magnetic treatment has a significant influence on (PL) compare with (NM) non magnetic treatment where, (PL) value with (M) treatment obtained (111.27cm) but with (NM) treatment the value was (101.5cm). In addition; Saline water treatments had significant influence on PL where, highest value observed with S1 by (131.6 cm) however, lowest value was (85.4cm) with S3 treatment. May this related that the negative effect of salinity on plant growth have been attributed to disturbance in protein assimilation, enzymes activity, that results agree with (Grewal and Maheshwari, 2011), (Zhang et al., 2022), (Hussein and Oraby, 2008), (Kaya et al., 2009), (Hussein et al., 2012), and (Yu et al., 2016).



Plant length

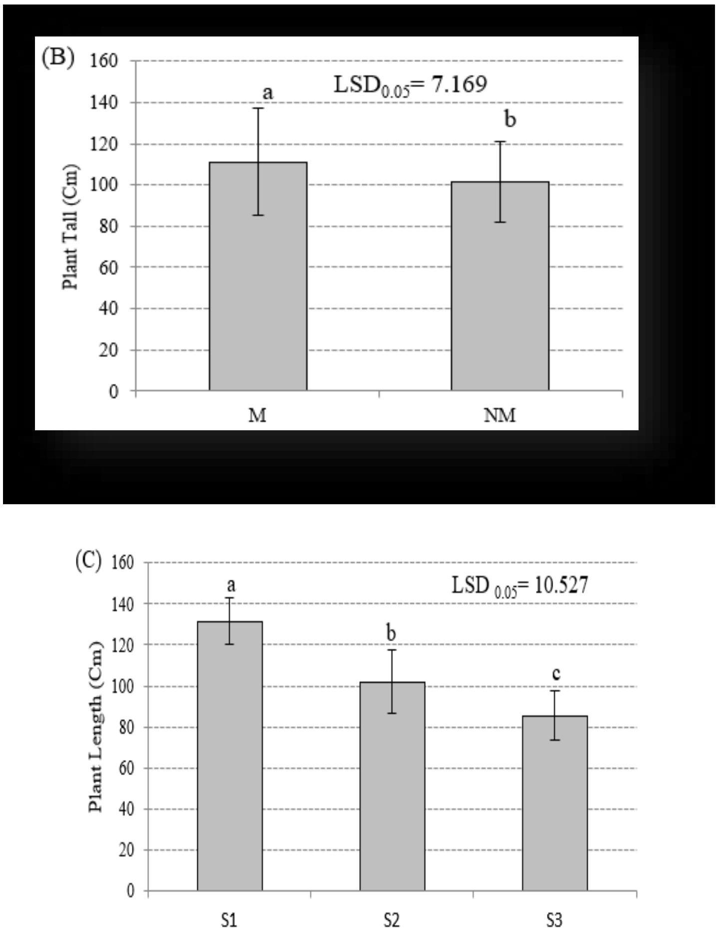


Fig. 3 The effect of Dripper treatment; Magnetic treatment; and saline water treatment on tomato mean plant length.

where lowercase letters above columns indicate significant differences at $p < 0.05$, LSD0.05 = least significant difference , error bar = ±SD, Q1 = 4Lph, Q2 = 8Lph, M = Magnetic device , NM = without Magnetic device, S1=saline water with (2000 PPM), S2= saline water with (4000 PPM), S3= saline water with (6000 PPM).

Influence of magnetic saline water treatments on crop growth parameters progression and three ways ANOVA are given in Table (5). Saline water treatments had significant influence on number of leaves (NL) where the highest value was obtained under S1 by (53.08) but with S3 value was (31.84). Furthermore; magnetic water treatment (M) influence on (NL) significantly where the highest value for NL under (M) treatment was 47.6 however under (NM) was (41.21). In a contrary, the dripper treatments had not significant influence on (NL), meaning under (Q1) the value on NL was (45.5) and with (Q2) the value was (43.2).

Further. The magnetic and dripper treatments did not have any significant influence on leaf area (LA). However, the saline water treatment effect significantly on (LA) especially between S1 and S3 treatments. Where the highest value obtained with S1 by ($58.5 cm^2$), but; under S3 the value was ($38.05 cm^2$). The improvement of leaf growth may be attributed to the stimulatory effect of magnetic water on photosynthetic pigments and protein biosynthesis. The results Compatible with (Toledo et al., 2008), and (Selim et al., 2009).

Table 5. Influence of magnetic saline water treatments on some crop growth parameters

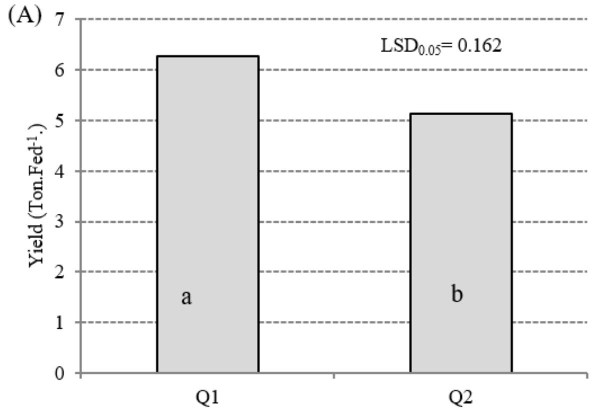
ITEMS	Treatments						
	S1	S2	S3	Q1	Q2	M	NM
number of leaves	$53.08^a \pm 4.21$	$48.29^b \pm 8.41$	$31.84^c \pm 7.56$	$45.5^a \pm 10.56$	$43.2^a \pm 12.44$	$47.6^a \pm 8.79$	$41.21^b \pm 13.06$
$LSD_{0.05}$	4.646			2.777		0.596	
Leaf area (cm^2)	$58.5^a \pm 8.93$	$46.02^{ab} \pm 10.84$	$38.05^b \pm 16.70$	$50.5^a \pm 15.15$	$44.5^a \pm 14.45$	$47^a \pm 15.59$	$48^a \pm 14.63$
$LSD_{0.05}$	13.46			8.09		6.77	

$LSD_{0.05}$ = least significant difference, Values (mean ±SD) followed by the same lowercase superscript are not significantly different ($p < 0.05$), Q1 = 4Lph, Q2 = 8Lph, M = Magnetic device, NM = without Magnetic device, S1=saline water with (2000 PPM), S2= saline water with (4000 PPM), S3= saline water with (6000 PPM).

Effect of magnetized saline water on Tomato yield and irrigation water use efficiency (IWUE).

Data presented in Fig.(4)show that yield of tomato effected significantly by magnetized saline water, dripper discharge and saline water treatments; whereas the highest value corresponded with magnetic water treatment (M) by (7 $Ton.Fed^{-1}$) and the lowest value was (4.4 $Ton.Fed^{-1}$) with (NM) treatment. In addition, saline water treatment data observed with highest yield value by (10.4 $Ton.Fed^{-1}$) under S1 but the low significant value was recorded with S3 by average (1.9 $Ton.Fed^{-1}$).on the other hand, yield obtained (6.2 $Ton.Fed^{-1}$) as an average with dripper treatment (Q1) however the lowest yield value recorded under Q2 treatment by (5.1 $Ton.Fed^{-1}$). This indicates that the salt stress in a certain range had a high effect on tomato yield. When water had high saline level, the tomato yield was inhibited. further, effect of magnetization treatments on tomato yield in three saline water , it could find that the increase of tomato yield when irrigated with magnetized water was much higher than that irrigated with non magnetized water , which indicates that irrigating with magnetized water has a greater effect on increasing tomato yield under experiment saline conditions.

Thus, results were in the same line with previously study specially (Whab-Allah and Al-Omran, 2012) , (Leelapriya et al., 2003), (De Souza et al., 2005), (AL-OMRAN et al., 2010) ,and (D. D. Nangare et al.,2013).



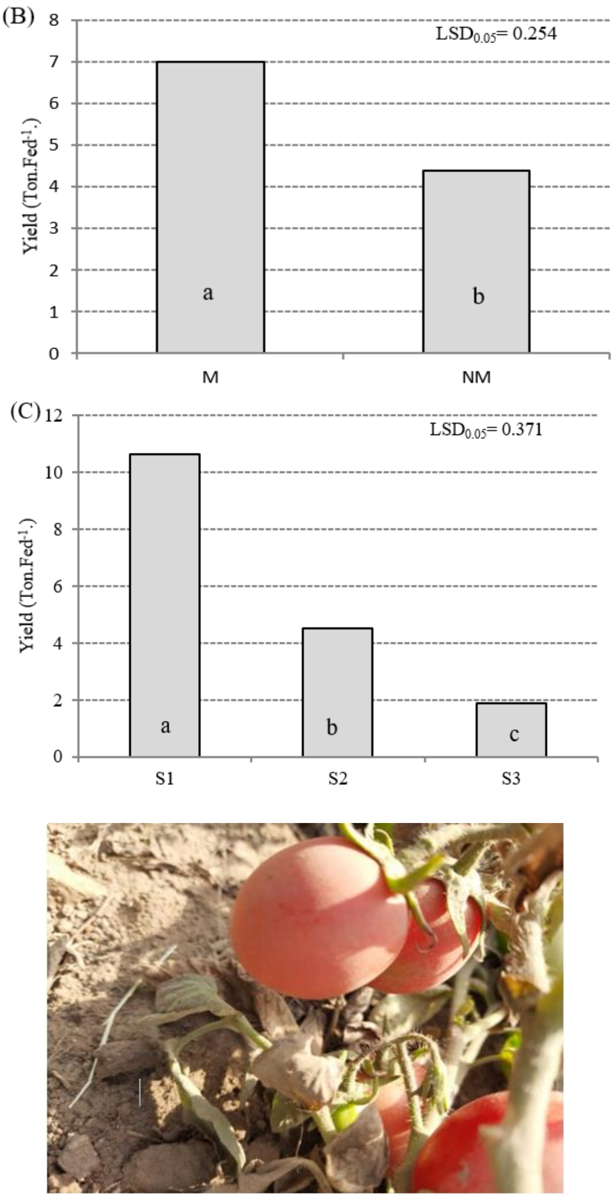


Fig. 4 The effect of Dripper treatment; Magnetic treatment; and saline water treatment, on tomato mean yield.

where lowercase letters above columns indicate significant differences at $p < 0.05$, LSD0.05 = least significant difference, Q1 = 4Lph, Q2 = 8Lph, M = Magnetic device, NM = without Magnetic device, S1=saline water with (2000 PPM), S2= saline water with (4000 PPM), S3= saline water with (6000 PPM).

Furthermore, data for Irrigation water use efficiency (IWUE) at fig (5) illustrate that there are a significant influence for magnetic water, saline water, and dripper discharge treatments on (IWUE).There are a positive effect for Magnetic water treatment compare with nonmagnetic treatment; where, IWUE was recorded (3.28 $Kg.m^{-3}$) under magnetic treatment (M) but with nonmagnetic treatment the value was (2.07 $Kg.m^{-3}$). In addition; by increasing water salinity from 2000 to 4000 to 6000 PPM the IWUE decreased significantly from (5.0 to 2.13 to 0.9 $Kg.m^{-3}$) respectively. Clearly, the IWUE decreased by irrigated with high saline water but using magnetic treatment with this water types help to get a positive impact in IWUE especially under experiment conditions. Similarly, (Grewal and Maheshwari, 2011), and (Surendran et al., 2016).

Further; there are a contrary relation between dripper discharge and IWEU; whereas, by increasing dripper discharge from (4Lph to 8Lph) the IWUE decreased significantly from (2.9 to 2.4 $Kg.m^{-3}$). The similar findings by (Reina-Sa´nchez et al., 2005).

Table (6) represented that there were not any significant influence on radius of fruit and total soluble solids (TSS %) specially with dripper discharge treatments. However, diameter of fruit affected significantly by saline water treatments whereas the highest value with S1 which recorded (3.9cm) but with S2 and S3 the diameter values of fruit decreased to (3.56 to 3.39 cm) respectively.

Kg.m^{-3}

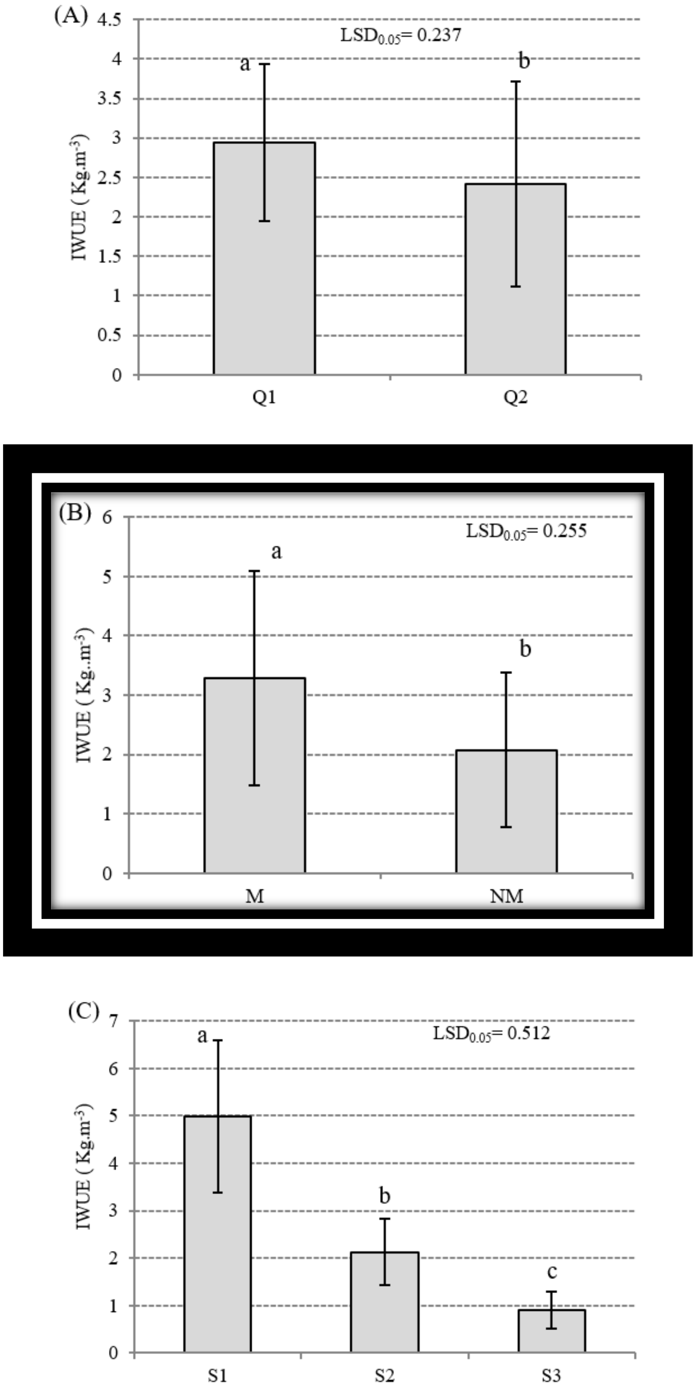


Fig. 5 The effect of Dripper treatment; Magnetic treatment; saline water treatment, on tomato mean IWUE.

where lowercase letters above columns indicate significant differences at $p < 0.05$, LSD0.05 = least significant difference, error bar = ±SD, Q1 = 4Lph, Q2 = 8Lph, M = Magnetic device , NM = without Magnetic device, S1=saline water with (2000 PPM), S2= saline water with (4000 PPM), S3= saline water with (6000 PPM).

Table 6. Influence of magnetic saline water treatments on some fruit parameters

ITEMS	Treatments						
	S1	S2	S3	Q1	Q2	M	NM
diameter of fruit(Cm)	$3.9^a \pm 0.229$	$3.56^b \pm 0.409$	$3.39^b \pm 0.345$	$3.6^a \pm 0.41$	$3.63^a \pm 0.37$	$3.68^a \pm 0.35$	$3.55^a \pm 0.42$
$LSD_{0.05}$		0.239		0.1558		0.1609	
Total soluble solids (TSS) (%)	$5.62^a \pm 0.67$	$5.55^a \pm 0.72$	$5.95^a \pm 0.68$	$5.75^a \pm 0.58$	$5.67^a \pm 0.814$	$5.89^a \pm 0.71$	$5.53^b \pm 0.66$
$LSD_{0.05}$		0.8279		0.442		0.1366	

$LSD_{0.05}$ = least significant difference, Values (mean ±SD) followed by the same lowercase superscript are not significantly different ($p < 0.05$), Q1 = 4Lph, Q2 = 8Lph, M = Magnetic device, NM = without Magnetic device, S1=saline water with (2000 PPM), S2= saline water with (4000 PPM), S3= saline water with (6000 PPM).

The same action acquired with magnetic water treatments where there was not any significantly impact on radius of fruit; thus, the values were (3.68 and 3.55cm) under M and NM respectively. Moreover, saline water or dripper discharge treatments did not effect on total soluble solids (TSS %) whereas the mean values were 5.62, 5.55 and 5.95 under S1, S2 and S3 saline treatments respectively. In addition, the highest value for TSS was 5.75 under Q1 discharge treatment comparing with Q2 which recorded 5.67.

On the other hand, the magnetic treatments have significant influence on TSS whereas the value of TSS obtained 5.89 with (M) treatment which is highest comparing with the value (5.53) under (NM) treatment.
Magnetic field treatment significantly increased marketable fruits yield, vitamin C, and TSS and fruit firmness as compared with the nonmagnetic field treatments. These results are in the same line with those obtained by (Selim et al., 2013), (Feizi et al., 2013), and (Efihimiadou et al., 2019)

STATISTICAL MODEL

Occasionally; a model is a schematic representation of the conception of a system or an act of mimicry or a set of equations, which represents the behaviour of a system (Murthy, 2003). Furthermore; Crop and plant growth model is a very effective tool for predicting possible impacts of different factors on crop growth and yield. Crop growth models are useful for solving various practical problems in agriculture. Thus; the regression models which utilization some parameters to determine Yield production for Tomato under Al-Qalyubia governorate and experimental conditions. Equation (7 & 8).

1. With (Magnetic device [M]):

$$\text{Yield}_{(M)} = 17.052 - (0.00281 * S) + (0.0106 * T) \qquad (7)$$

2. With (without Magnetic device [NM]):

$$\text{Yield}_{(NM)} = 7.79 - (0.00125 * S) + (0.0160 * T) \qquad (8)$$

Where:-
Yield = Yield (Ton.Fed^{-1}).
S = Saline water (ppm) [$2000 \leq S \leq 6000$].
T = Plant length (Cm).

CONCLUSION

Saline water has a negative effect on the growth parameters and yield production of tomato. Thus, irrigation with magnetic water overcome or alleviated the adverse effects of saline water on all the studied traits. Moreover, after application of magnetic technology on three saline water levels (2000 and 4000 and 6000PPM) under two dripper discharge (4 Lph and 8Lph) for cultivating tomato, data reflect enhancing significantly on yield and some growth parameters. For instance, the highest yield value corresponded with magnetic water treatment (M) by (7 Ton.Fed^{-1}) and the lowest value was (4.4 Ton.Fed^{-1}) with (NM) treatment. In addition, with saline water treatment data observed with highest yield value by (10.4 Ton.Fed^{-1}) under (2000PPM) but the low significant value was recorded with (6000PPM) by average (1.9 Ton.Fed^{-1}). On the other hand, yield obtained (6.2 Ton.Fed^{-1}) as an average with dripper discharge (4Lph); however, the lowest yield value recorded under (8Lph) by (5.1 Ton.Fed^{-1}). Further, Magnetic treatment had a significant influence on (PL) compare with (NM) non magnetic treatment where, (PL) value with (M) treatment obtained (111.27cm) but with (NM) treatment the value was (101.5cm). There are a positive effect for Magnetic water treatment compare with non magnetic treatment; where, the irrigation water use efficiency (IWUE) was recorded (3.28 Kg.m^{-3}) under magnetic treatment (M) but with non magnetic treatment the value was (2.07 Kg.m^{-3}).However, by increasing water salinity from 2000 to 4000 to 6000 PPM the IWUE decreased significantly from (5.0 to 2.13 to 0.9 Kg.m^{-3}) respectively. Cleary, Results reveal that the magnetically treated saline water has the potential to enhance yield and growth parameter under different saline water levels.

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