Effect of Some Foliar Spray Treatments on Growth and Yield of Tomatoes

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ABSTRACT

This study was conducted during the two consecutive summer seasons of 2020 and 2021 at the farm of the Faculty Agriculture, Al-Azhar University, Assiut, Egypt to study the effect of some treatments on Thuraya and Princes tomato hybrids. These treatments are garlic at rates 5,10 ml/L and licorice extracts at rates 5,10 ml/L , as well as the concentrations of boron at 2,4 ml/L and calcium 4,8 ml/L beside the control (non-coefficient). All applications were added four times starting after 45 days transplanting at 10 days intervals. Measurements of plant height, number of leaves, number of branches, total chlorophyll content, total soluble solid, average fruit weight per plant, total yield of crop expressed in tons\fed were recorded in this investigation. The data was statistically analysed, and the result shows that there was a significant differentiation in the characteristics between the hybrids, as well as a significant difference between treatments and interaction between them in both seasons. The best treatments used were garlic extract concentration 5 cm per litre, and the average increase in the total yield was estimated at 24.4% compared to control.

Keywords: Garlic extract, Boron, Chlorophyll, Tomato, Total yield.

INTRODUCTION

Tomato (Solanum lycopersicum) belongs to Solanaceae family dicotyledonous plant. It is a popular vegetable crop with a high commercial value and uses in a different of ways. It contains a higher quantity of total sugar (2.5-4.5%), starch (0.6-1.2%), and minerals like potassium, calcium, sodium, magnesium, phosphorus, boron, manganese, zinc, copper, iron, etc. It also contains organic acids including malic, citric, and acetic acid, which are recognized to be beneficial acids in fresh tomato fruit. (Vamadeva Angadi *et al.*, 2017). Every 100 grams of fruits contains 93.1g water, 0.7 g protein, 0.2 g fat, 3.1 g of carbohydrate, 17 mg of vitamin C, and many minerals, including iron, phosphorus, and magnesium, contain antioxidants, particularly lycopene, which protects body tissues against compounds that increase the risk of chronic and malignant diseases. (Gerster, 1997., Wongsa-Ngasir, 2004). Fao's statistics refer that the total planted area and production of this crop in the Arab Republic of Egypt were 166.206\ha with production 6,729,004 ton in 2017, 174,802\ha with production 6,777,754 ton in 2018, and were that area 173,276\ha with production 6,751,856 ton in 2019 (FAO STAT, 2020).

Licorice extract: This plants follow the legume family and contain many chemical compounds, the most important of which are gleserzine and acid as they have effects similar to the effectiveness of steroid hormones as they are structural hormones that lead to the increased composition of botnets as well as they increased the growth rate. (Al-Mohammadi and Ali fadam Abdullah, 2010). The roots of licorice contain compounds that have a similar effect to growth organizations and a wide range of minerals, amino acids, and vitamins as well as carbohydrates. Also, it contains mevalonic acid, which has a role in the bio-construction of fabric acid. (Al-Ajeeli, 2005).

Garlic plant has a high amount of sulfur-containing amino acids such as methionine, Cysteine, vitamins, hormones, and disinfectants concentrated such as allicin, which is a medicinal classification ingredient. Allicin is a component of garlic that is released when the enzyme Alliinase decomposes Alliin during garlic extraction. (Krest and Keusgen.1999) (Yousif *et al.*, 2020). Garlic extract contain a complex growth-promoting substances such as vitamins, saponins, carbohydrates, proteins, alkaloids and sugars as an example fructose. (Martins *et al.*,2016).

Boron (B) has physiological important roles in the strength of cell wall and as part of the cell membranes and also is a vital element in cell division and development as well as it participates in the synthesis of nucleic acid (RNA and DNA), amino acids, proteins, carbohydrates metabolism, starch and sugars transport, indole acetic acid (IAA) metabolism and hormonal regulation (Parr and Loughman, 1983). It works on nitrogen and phosphorus metabolism and pollen tube growth which plays an important role in flowering and fertilization thus boron supply is

necessary for improving fruits yield and quality of vegetable crops (Marschner, 1995., Uchida, 2000., Esringü *et al..*,2011).

Calcium is a macronutrient that all higher plants require. It's crucial for plant growth and fruit development, and it plays many structural roles in the cell wall and membranes. It's also involved in many biochemical and physiological processes in plants, all of which can assist boost yields (White, 2003)., (Marschner, 1995).

Therefore, this study aimed to investigate the response of some tomato hybrids to foliar spraying with some organic extracts, boron, calcium on vegetative growth parameters and yield of tomato hybrids.

MATERIALS AND METHODS

Experimental site:

This experiment was conducted at the research farm of the Faculty of Agriculture, Al-Azhar University, Assuit governorate, Egypt at latitude = 27° 12- 16.67 north and longitude = 31° 09 - 36.86 south for two consecutive summer seasons of 2020 and 2021, respectively, on two-hybrid tomatoes, the Prince's Hybrid F1 and the Thuraya Hybrid F1, to study the impact of some two plant extracts and two chemical elements on growth and productivity of the two hybrids in clay loam soil. Before planting, randomized samples of the experimental soil were taken at a depth of 0-30 cm to determine the physical and chemical characters using the standard method given by Jackson, (1976), and the findings are provided in Table (1).

Experimental Materials

Licorice extract: These are roots of the licorice plant brought from the local market dried, cleaned, milled and sifted into rough powder. 10 g of this powder was added to one liter of cold distilled water and left for 24 hours to ensure the melting of the powder in water and then nominated the extract with a cotton cloth to be ready for using in spraying processes with two rates 5 and 10 ml/L (Abd El-Azim *et al..,* 2017).

Garlic extract: The Balady garlic cloves were brought, cleaned, peeled, and added 100 g to 1-liter water and placed in an electric mixer to ensure mixing for 3 minutes and then filtered the extract with a cotton cloth to filter impurities and the final extract was kept in the refrigerator at 5 °C until it is used in the process of spraying with the subsequent concentrations of 5 and 10 ml/liter (ELDesouky et al.,1998).

Some chemical constituents of garlic cloves analyzed as shown in Table 2.

Boron: 15.4%B in a commercial name of Universal Power B, produced by Green Universe Agricultural Company– Madrid-Spain.

Calcium: a commercial name of Basfoliar Combi Stipp, calcium 22.5%, Boron 0.3%, N 12.5%, Mg 1.5%, Mn 0.6%, EDTA 3%. And produced by COMPO EXPERT Company - GmbH Germany- EUR efilling: Starchem Chemicals.

Experimental Treatments:

The experiments included two factors as follows:

Main factor, contained the two hybrids Princes and Thuraya.

Sub factor, contained nine foliar applications as follows:

T1\ Foliar application of Licorice extract at rate of 5 ml/L.

T2\ Foliar application of Licorice extract at rate of 10 ml/L.

T3\ Foliar application of Garlic extract at rate of 5 ml/L.

T4\ Foliar application of Garlic extract at rate of 10 ml/L.

T5\ Foliar application of Boron (Universal Power B,) at rate of 2 ml/L.

T6\ Foliar application of Boron (Universal Power B,) at rate of 4 ml/L.

T7\ Foliar application of Calcium `(Basfoliar Combi Stipp) at rate of 4 ml/L.

T8\ Foliar application of Calcium (Basfoliar Combi Stipp) at rate of 8 ml/L.

T9\ Control (foliar spray by distilled water).

Experimental Plant material:

The tomato seedlings were obtained as Princes and Thuraya Hybrids from a famous private nursery, and these Hybrids were produced by Named Harry Seeds and Kanza Group, respectively, and the seedlings were grown at the age of 40 days. Thuraya hybrid has growth limited and strong thermal node and good green growth, which provides good coverage of the fruits and the shape of the fruits circular, but Princes Hybrid is Limited in

vegetative growth and the shape of the fruits with a beard like the fruits of the pear.

Experimental Design:

The experiment included 18 experimental plots of two hybrids, with nine foliar treatments, with three replicates and the design of Randomized Complete Block Design that were used with split plots system, hybrids were considered the main plots and spraying with treatments are sup plots.

Agricultural practices were as follows:

The experimental soil classified as clay loam soil and the irrigation method was surface irrigation. At the time of preparing the land for agriculture, the land was cleaned from the grass of the previous crop and then plowed and sniffed. Then the land was plowed twice perpendicularly and softened well and then divided the into 54 experimental plots so that the area of one plot is 7 m^2. The length of the terrace is 3.5 m and the width of the terrace is 1 m by 2 terraces per experimental plot and then calcium super phosphate monolithic fertilizer at the rate of 90 k/fed was added during preparing of land. Before transplanting, Seedlings were treated with innate disinfectant and the land was irrigated. During transplanting, seedlings were grown in the irrigated land at a distance of 45 cm between plants on 9/3/ 2020, and 6\3\ 2021. All plants were poisoned by ammonia 120k/f after 21 days of transplanting and harvested after 85 days of transplanting.

Data recorded:

Vegetative growth:

The measurements of vegetative growth were made after three months of agriculture and the selection of five plants from the center of the experimental plot to recorded the following parameters:

Plant height (cm) from ground level to the highest point of the plant by meter bar.

Number of Brunches: It was calculating the number of main branches on the plant and then calculating the average readings.

Number of Leaves: It was calculated on the plant and then calculated the average readings per experimental plot.

Fruit characteristic:

Fruits weight\plot: The fruits were harvested after 85 days of manual cultivation and then the fruits of each experimental plot separately weighed using a digital scale and recording readings of each week harvested once by seven weeks and then calculated the total harvest times per trial plot.

Total yield\ fed: Average fruit weight per three replicates per treatment × 0.6 for fed.

Fruits weight\ plant: Average fruit weight per experimental plot divided on the number of plants in it which is 12.

Chemical analysis:

Total Chlorophyll:

The photosynthetic pigments were extracted from a fresh leaf sample in 5 ml of 95 % ethyl alcohol in a test tube at 60 ° C until colourless. The total volume was divided into 10 mL using 95% ethyl alcohol, and absorbance values were taken using a spectrophotometer (Unico UV 2100 spectrophotometer) The following formulae were used to calculate chlorophyll concentrations as mg/g FW at 663, 644 nm (Lichtenthaler,1987)

$$\text{Chl . a} = (13.36 \times A_{644}) - (5.19 \times A_{644})$$

$$\text{Chl. b} = (27.49 \times A_{644}) - (8.12 \times A_{663})$$

Total soluble solids (T.S.S):

It was estimated by hand refractometer and the reading was corrected by laboratory temperature at the measurement (Ibrahim, 2010).

Statistical analysis:

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split-plot design (Gomez and Gomez .,1984) using SPSS version 16.0 and Statistix9 computer software package. Least Significant Difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by (Snedecor.,1980).

RESULTS AND DISCUSSION

Plant height

It is evident from the data in Tables (3) that the average plant height was not significantly varied between the two hybrids in the first season but in the second season was varied significantly between the two hybrids. The average plant height was significantly varied among treatments and the interaction in both seasons. Data recorded that plant height values of Thuraya and Princes hybrids were (68.4 and 64.4cm) respectively in the first season. While in the second season, Thuraya hybrid gave the highest values (69.4 cm) and the Princes hybrid

recorded the shortest plants (65.6 cm). Treatments with (licorice, garlic extracts, boron, and calcium) significantly affected on Thuraya and Princes hybrids in both seasons. Garlic extract at (5 ml) gave the highest values (81.7 and 82.3cm). While control treatment gave the lowest values (52.5 and 52.9 cm) in both seasons, respectively. These results agree with those of Sikandar Hayat *et al.*, (2018.) who found that foliar spraying with garlic extract at a concentration of 100 mg/ml was the best treatments in the characteristic of plant height for tomatoes and gave the highest value. In addition to Tartoura,(2013) stated that the foliar spraying with garlic extract concentration of 2.5 cm/L gave the highest value in the length of the plant to the summer squash (*Cucurbita pepo L.*) plant. Theseresults may be due to Garlic extract has an effect similar to that of oaxins, which increases the effectiveness of the important cellulose enzyme in the lateral expansion, lengthening, and large size of cells as mentioned by Abou-Hussein *etal.,* (1975). Interaction between treatments and hybrids was that foliar spray with treatments was highly significant. Hybrid princes and treatment with garlic extract at 5 ml gave the highest value (88.8 and 88.6 cm) in both seasons, respectively, While control plant gave the lowest values with the Princes hybrid (49.8 and 51.4 cm) in both seasons, respectively.

Number of branches:

It is evident from the data in Table (4) that there are no differences in the number of branches per plant between hybrids in the both seasons. The results were recorded in Thuraya hybrid (7.4 and 7.5 branches / plant) while Princes hybrid showed (7.6 and 7.4 branches / plant) in both seasons, respectively. Nevertheless, there are significant differences among treatments and interaction in both seasons, respectively. The results were recorded as the number of branches due to treatments that foliar spray with garlic extract concentration 5 ml gave the highest values (11.8 and 10.2 branches / plant). While the lowest values (3.8 and 4.0 branches /plant) resulted by control treatment in both seasons, respectively. These results agreement with Massoud et al.,(2020) who found that foliar spraying of garlic extract with a concentration of 15% on the Chinese pepper(*Zanthoxylum beecheyanum K. Koch*) plant gave the highest value of number of branches per the plant. It may be due to containing enzymes, B vitamins, proteins, minerals, saponins, flavonoids, and maillard reaction products, which are non sulphur containing compounds. Furthermore, aphytoalexin (allixin) has been found Pandya et al., (2011). Also, Ali.et al.,(2015) found that the foliar spraying of boron at a concentration of 25 ppm (boric acid) gave significant increase in the characteristic of the number of branches compared to control and the result was that it is the second best treatments after the treatment (mixture between boron and zinc), it may be because Boron treatment could improve growth by increasing IAA content and IAA/ cytokinin ratio in plant by blocking IAA oxidase inhibitors by forming complexes with these inhibitors (Puzina, 2004).The interaction effect of between hybrids tomatoes and foliar spray with licorice, garlic extracts and Boron, Calcium it was limited. Where the Thuraya hybrid and treatment with garlic extract concentration 5 ml gave the highest values (12.0 and 10.3 brunch / plant) in both seasons, respectively. while control treatment gave the lowest value (3.4 and 4.1) with Princes hybrid.

Number of leaves:

It is evident from the data in Table (5) that the number of leaves was varied significantly among both of two hybrids and nine foliar applications and the interaction between them in both seasons. The results were recorded in Thuraya hybrid gave the highest value (33.6 and 32.7 leaves / plant) while Princes hybrid gave the lowest value (30.4 and 30.7 leaves / plant) in both seasons, respectively. Foliar spray by garlic extract with at 5 ml gave the highest value (48.0 and 44.5 leaves / plant). While the control gave the lowest value (16.8 and 16.7 leaves / plant) in both seasons, respectively. These results agree with Abdulrazzaq., (2017) who revealed that foliar spraying with garlic extract, at rate of 2 ml per liter, gave the highest values of *Gazania splendes L* in Leaves number. Garlic extract may be contains vitamins, seventeen amino acids, eight essential enzymes and more than 200 chemical compounds (Pons, 2003) and also agrees with those of Tantawy et al., (2017) who found that foliar spraying with boron concentration of 0.5 ml/ litre gave the highest value to the number of leaves compared to treatments in potato plant. It may be that Boron is involved in sugar transport, cell wall synthesis, lignification and IAA synthesis and phenol metabolism (Parr and Loughmann. 1983). The interaction effect between tomato hybrids and foliar pray with licorice, garlic extracts and Boron, Calcium where significantly affected on number of tomato leaves per plant, where that foliar spray by

garlic extract by 5 ml with Thuraya hybrid gave the highest values (52.0 and 48.0 leaves / plant) .while control gave the lowest value with Princes hybrid (16.1 and 16.7) in both seasons, respectively.

Fruits weight\plot:

It is evident from the data in Table (6) that the total of fruits weight (kg) per plot was varied significantly among two hybrids, treatments and the interaction between them in both seasons. Where the data for fruits weight\plot recorded the highest value in the hybrid (42.1 and 37.9 kg) in both seasons, respectively. While, Princes hybrid recorded is the lowest values (36.1 and 35.1 kg) in both seasons, respectively. For foliar treatments, the data recorded the highest value of garlic extract at 5 ml (72.1 and 67.4 kg).While the control treatment gave the lowest value (18.0 and 16.1 kg) in both seasons, respectively. These results agree with those of Bhyan et al., (2007) who found that foliar spraying of garlic extract on the okra plant gave the second highest value of treatments after karamja (*pongamia pennata*) extract. (Saadoon et al,2004) reported that garlic extract contained about 30% carbohydrate and rich with phosphors, potassium and magnesium elements with addition of vitamin B1, B2 and C and fly oils and which play an important role in flowering and fruit formation. The interaction effect of between tomato hybrids and foliar spray with licorice, garlic extracts, Boron and Calcium where that foliar spray by garlic extract concentrate 5 ml with Thuraya hybrid resulted the highest values (79.7 and 72.7 kg), while control gave the lowest value with Thuraya hybrid (17.2 and 15.2 kg) in both seasons, respectively.

Total chlorophyll

It is evident from the data in Table (7) that the average of total chlorophyll was varied significantly among of two hybrids and treatments and the interaction between them in both seasons. Total chlorophyll recorded the highest value with the hybrid Thuraya (2.68 and 3.09) While Princes hybrid recorded the lowest values (1.76 and 2.08) in both seasons, respectively. For foliar application, the highest value of chlorophyll content was obtained from garlic extract at 5 ml which gave (3.11 and 3.51) in both seasons, respectively. While the control gave the lowest values (1.09 and 1.49) in both seasons, respectively. These results are in agreement with those of Attia et al., (2020) who found that spraying with garlic extract at a concentration of 50% gave the highest value of all single treatments in total chlorophyll in leaves(*Hedychium coronrium*) plant. It could be because garlic extract effect on plant characters has been discussed (Sayeeda., 2005). The interaction effect between tomato hybrids and treatments where that foliar spray by garlic extract concentrate 5 ml with Thuraya hybrid gave the highest values (3.27 and 3.67). while control gave the lowest value with Princes hybrids (1.03 and 1.43) in both seasons, respectively.

Total soluble solids (T.S.S)

It is evident from the data in Table (8) that the TSS % was varied significantly among two hybrids and treatments and the interaction between them in both seasons. Where the data for Total soluble solids was recorded the highest value in the hybrid Thuraya and the data was (3.18 and 3.29). While princes hybrid recorded less valuable which is (2.77 and 3.06) in both seasons, respectively. Treatments, the data recorded the highest value of garlic extract at 5 ml where it gave (3.65 and 3.74). While the control gave the lowest values (2.19 and 2.40) in both seasons, respectively. These results are in agreement with El-Amary et al., (2018) who found that spraying with garlic extract concentration 5% gave the highest value in total soluble solids on grapes may be because of the presence of sulfuric substances with garlic as it increases the total soluble solids which they are similar to Abbas and Mohamed, (2015) and Also, Avato et al., (2000) and Jones et al., (2007), they said that garlic contains vital organ sulfur compounds such as allicin, DADS, DATS etc. The interaction effect of between hybrids tomatoes and foliar spray with licorice, garlic extracts ,Boron and Calcium where that foliar spray by garlic extract concentrate 5 ml with Thuraya hybrid is gave the highest value (3.83 and 4.54). while, control gave the lowest value with Thuraya hybrid (2.07 and 2.23) in both seasons, respectively.

Fruits weight \ Plant

It is evident from the data in Table (9) that the average of fruits weight \ plant was varied significantly among the two hybrids in the first season, but not significant of between two hybrids in the second season.where the data for fruits weight \ plant recorded the highest value in the hybrid Thuraya and the data was (3.51 and 3.16) in both seasons, respectively. While Princes hybrid recorded the lowest values (3.01 and 2.92) in both seasons, respectively. Treatment of, the data recorded the highest value of garlic extract at 5 ml

where it gave (6.01 and 5.62) in both seasons, respectively. Followed by Boron 2 ml that gave (5.14 and 4.68) in both seasons, respectively. While, the control gave the lowest value (1.50 and 1.35) in both seasons, respectively. These results are in agreement with Wanas.,(2007) who said that spraying with garlic extract with a concentration gave the highest values of all other treatments in the productive characteristic of acres of grain in the wheat plant and that may be due to many compounds and essential requirements at vegetative and reproductive growth in garlic and improve the growth, sex expression and fruit yield and quality. EL-Desouky etal., (1998) on squash plant, (Husain and EL-Rekaby.,2006) and Abbas etal.,(2007) on cucumber plant. The interaction effect between hybrids tomatoes and foliar spray with licorice, garlic extracts,Boron and Calcium where that foliar spray by garlic extract concentrate 5 ml with Thuraya hybrid is gave the highest value (6.64 and 6.06),while control gave the lowest value with Thuraya hybrids (1.44 and 1.27) in both seasons, respectively.

Total yield (ton \ fed)

It is evident from the data in table (10) that the average of Total yield (ten \ fed) was varied significantly among the two hybrids in the first season, but non significantly between two hybrids in the second season where the data for Total yield (ten \ fad) recorded the highest value in the hybrid Thuraya and the data was (25.28 and 22.72) in both seasons, respectively. While Princes hybrid recorded the lowest values (21.63 and 21.05) in both seasons, respectively. Treatments of the data recorded the highest value of garlic extract at 5 ml where it gave (43.25 and 40.45) in both seasons, respectively. Followed by Boron 2 ml where gave (37.00 and 33.70) in both seasons, respectively. While, the control given the lowest values (10.78 and 9.68) in both seasons, respectively. These results agreement with El-Saadony et al .,(2017) who found that garlic extract treatment concentration 5% gave the highest values after treatment salicylic acid in the fruit product in the plant of peas. It is because garlic has an important role in the activity of metabolic reactions (Shalaby and El-ramady, 2014) and therefore leads to an increase in chlorophyll as a result of the presence of amino acids in it and thus leads to an increase in the amount of production. The interaction effect between hybrids tomatoes and foliar spray with licorice, garlic extracts, Boron and Calcium where that foliar spray by garlic extract concentrate 5 ml with Thuraya hybrid is gave the highest value (47.80 and 43.60) .while control gave the lowest value with Thuraya hybrids (10.34 and 9.14) in both seasons, respectively.

CONCLUSION

The results showed that Thuraya hybrid of tomato was better than princes hybrid, and that foliar spraying with garlic extract concentration 5 ml was the best treatment, and that it is recommended to use it on the leaves because it increased production and quality while also being safe for humans and harmless, and that spraying boron at 2cm on the leaves gave a good crop and good hardness to the fruits.

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Table 1: The physical and chemical characteristics of the soil in the experiment site in the Research Farm of Al-Azhar University, Assiut City, during 2020 and 2021 seasons.

20220		2021	
Characteristic	Value	Characteristic	Value
O.M.%	% 0.8	O.M.%	0.75%
$CaCO_3$%	1.65	$CaCO_3$%	1.59
Sand%	25.5	Sand%	24.3
Silt %	39.8	Silt %	31.5
Clay%	34.7	Clay%	29.9
Texture class	Clay loam	Texture class	Clay loam
PH	7.9	PH	7.9
EC (dS/m)	1.2	EC (dS/m)	1.1
Ca^{+2} (meq/L)	3.4	Ca^{+2}(meq/L)	3.5
HCO_3^- (meq/L)	2.34	HCO_3^- (meq/L)	2.40
Cl^- (meq/L)	2.2	Cl^- (meq/L)	2.1
Mg^{+2} (meq/L)	1.9	Mg^{+2} (meq/L)	2.0
Na^+ (meq/L)	6.2	Na^+ (meq/L)	5.9
K + (meq/L)	0.21	K + (meq/L)	0.22
NH_4	49.0	NH_4	45.0
N (ppm)	62.4	N (ppm)	63.1
P (ppm)	9.2	P (ppm)	8.9
Zn (ppm)	2.3	Zn (ppm)	2.4
Fe (ppm)	9.5	Fe (ppm)	9.1
Mn (ppm)	4.1	Mn (ppm)	3.9
SO_4^{-2}(meq/L)	6.6	SO_4^{-2}(meq/L)	6.3

Table 2: Some chemical constituents of garlic cloves:

Components	Concentration
GA_3	1.63 mg.100 g^{-1} F.W.

IAA	Trace amount
ABA	Trace amount
Ca	1.36 %
Mg	1.23 %
SO_4	0.18 %
Zn	66.5 ppm
Mn	94.4 ppm

Table 3: Effect of foliar spray with organic extracts and some mineral elements on plant height of two tomato hybrids in 2020 and 2021 seasons.

Years	2020			2021		
adjectives	Plant height					
	Thuraya	princes	Mean (B)	Thuraya	princes	Mean (B)
T1	59.8	58.7	59.2D	60.4	60.0	60.2D
T2	61.6	54.5	58.0DE	62.8	58.3	60.6D
T3	74.7	88.8	81.7A	75.9	88.6	82.3A
T4	81.3	66.2	73.8BC	84.1	67.1	75.6B
T5	82.0	68.1	75.1B	83.9	69.2	76.6B
T6	69.7	72.1	70.9BC	70.8	73.5	72.2BC
T7	70.6	64.3	67.5C	71.8	64.2	68.0C
T8	60.7	57.2	58.9DE	60.5	57.8	59.1D
T9	55.1	49.8	52.5E	54.4	51.4	52.9E
Mean (A)	68.4A	64.4A		69.4A	65.6B	
LSD A		4.1576			2.9098	
LSD B		6.5128			5.1135	
LSD A*B		10.484			8.2312	

Table 4: Effect of foliar spray with organic extracts and some mineral elements on Number of branches of tomato hybrids in 2020 and 2021 seasons.

Years	2020			2021		
adjectives	Number of branches					
	Thuraya	Princes	Mean (B)	Thuraya	Princes	Mean (B)
T1	7.5	7.1	7.3C	7.4	6.8	7.1C
T2	6.1	6.3	6.2D	6.8	5.6	6.2CD
T3	12.0	11.7	11.8A	10.3	10.1	10.2A
T4	8.8	9.3	9.1B	8.9	9.3	9.1B
T5	9.7	9.7	9.7B	9.6	9.8	9.7AB
T6	7.1	8.8	8.0C	8.5	9.3	8.9B
T7	6.3	6.8	6.6D	6.9	6.2	6.5C
T8	4.8	4.9	4.9E	5.6	5.0	5.3D
T9	4.1	3.4	3.8F	4.0	4.1	4.0E
Mean (A)	7.4A	7.6A		7.5A	7.4A	
LSD A		0.2666			0.4009	
LSD B		0.6495			1.0269	
LSD A*B		1.0455			1.6530	

Table 5: Effect of foliar spray with organic extracts and some mineral elements on Leaves number of tomato hybrids in 2020 and 2021 seasons

Years	2020	2021

adjectives	Number of leaves/plant					
	Thuraya	Princes	Mean (B)	Thuraya	Princes	Mean (B)
T1	31.9	30.3	31.1C	29.0	27.4	28.2C
T2	26.8	23.0	24.9D	28.8	23.0	25.9CD
T3	52.0	44.0	48.0A	48.0	41.0	44.5A
T4	42.7	36.0	39.3B	40.7	39.7	40.2B
T5	42.0	41.0	41.5B	45.0	40.4	42.7AB
T6	40.8	35.9	38.3B	36.1	41.3	38.7B
T7	30.9	27.1	29.0CD	25.7	26.4	26.1CD
T8	20.4	20.1	20.3E	24.3	20.3	22.3D
T9	17.4	16.1	16.8E	16.7	16.7	16.7E
Mean (A)	33.9A	30.4B		32.7A	30.7B	
LSD A		0.9614			0.8934	
LSD B		4.4201			4.1502	
LSD A*B		7.1151			6.6805	

Table 6: Effect of foliar spray with organic extracts and some mineral elements on fruits weight\plot of tomato hybrids in 2020 and 2021 seasons.

Years	2020			2021		
adjectives	fruits weight\plot					
	Thuraya	Princes	Mean (B)	Thuraya	Princes	Mean (B)
T1	20.7	19.8	20.2GH	20.0	16.8	18.4EF
T2	20.3	22.1	21.2G	18.7	19.4	19.0EF
T3	79.7	64.5	72.1A	72.7	62.2	67.4A
T4	58.0	51.1	54.5C	52.5	49.7	51.1BC
T5	69.4	53.9	61.7B	61.7	50.6	56.2B
T6	52.0	47.0	49.5D	51.3	44.0	47.6C
T7	31.8	27.8	29.8E	30.5	26.8	28.6D
T8	30.2	19.6	24.9F	18.3	29.2	23.7DE
T9	17.2	18.7	18.0H	15.2	17.0	16.1F
Mean (A)	42.1A	36.1B		37.9A	35.1B	
LSD A		2.7379			3.2985	
LSD B		3.1818			6.2449	
LSD A*B		5.1217			10.052	

Table 7: Effect of foliar spray with organic extracts and some mineral elements on total chlorophyll content of tomato hybrids in 2020 and 2021 seasons.

Years	2020			2021		
adjectives	Total chlorophyll					
	Thuraya	Princes	Mean (B)	Thuraya	Princes	Mean (B)
T1	2.93	1.15	2.04F	3.33	1.55	2.44E
T2	2.95	1.30	2.13E	3.36	1.70	2.53D
T3	3.27	2.75	3.11A	3.67	3.15	3.51A
T4	3.06	1.66	2.25D	3.46	2.01	2.63D
T5	3.14	2.39	2.77B	3.55	2.52	3.04B
T6	3.15	2.12	2.64C	3.67	2.07	2.87C
T7	2.27	1.75	2.01F	2.67	2.14	2.41E
T8	2.18	1.70	1.94G	2.58	2.10	2.34F
T9	1.14	1.03	1.09H	1.54	1.43	1.49G
Mean (A)	2.68A	1.76B		3.09A	2.08B	
LSD A		0.0180			0.0162	
LSD B		0.0323			0.0341	
LSD A*B		0.0520			0.0549	

Table 8: Effect of foliar spray with organic extracts and some mineral elements on Total soluble solids (T.S.S) of tomato hybrids in 2020 and 2021 seasons.

Years	2020	2021

adjectives	T.S.S					
	Thuraya	Princes	Mean (B)	Thuraya	Princes	Mean (B)
T1	2.80	2.35	2.58F	3.02	2.45	2.73G
T2	2.64	2.10	2.37G	3.12	3.23	3.17E
T3	3.83	3.47	3.65A	4.54	2.93	3.74A
T4	3.79	2.72	3.25C	3.61	3.15	3.38C
T5	3.66	3.03	3.34B	3.53	3.73	3.63B
T6	3.44	3.04	3.24C	3.16	3.47	3.32D
T7	3.37	2.87	3.12D	2.95	3.63	3.29D
T8	3.02	3.03	3.03E	3.44	2.33	2.89F
T9	2.07	2.31	2.19H	2.23	2.57	2.40H
Mean (A)	3.18A	2.77B		3.29A	3.06B	
LSD A		0.0101			0.0209	
LSD B		0.0336			0.0335	
LSD A*B		0.0541			0.0539	

Table 9: Effect of foliar spray with organic extracts and some mineral elements on fruits weight \ Plant of tomato hybrids in 2020 and 2021 seasons.

years		2020			2021	
adjectives	fruits weight \ Plant					
	Thuraya	Princes	Mean (B)	Thuraya	Princes	Mean (B)
T1	1.72	1.65	1.69GH	1.67	1.40	1.54EF
T2	1.70	1.84	1.77G	1.56	1.62	1.59EF
T3	6.64	5.38	6.01A	6.06	5.18	5.62A
T4	4.83	4.26	4.55C	4.37	4.14	4.26BC
T5	5.79	4.49	5.14B	5.15	4.22	4.68B
T6	4.33	3.92	4.12D	4.27	3.67	3.97C
T7	2.65	2.32	2.48E	2.54	2.23	2.38D
T8	2.52	1.63	2.08F	1.52	2.43	1.98DE
T9	1.44	1.56	1.50H	1.27	1.42	1.35F
Mean (A)	3.51A	3.01B		3.16A	2.92A	
LSD A		0.2243			0.2768	
LSD B		0.2633			0.5216	
LSD A*B		0.4239			0.8397	

Table 10: Effect of foliar spray with organic extracts and some mineral elements on Total yield (ton \ fed) of tomato hybrids in 2020 and 2021 seasons.

Years		2020			2021	
adjectives	Total yield(ton \ fed)					
	Thuraya	Princes	Mean (B)	Thuraya	Princes	Mean (B)
T1	12.41	11.88	12.15GH	12.01	10.08	11.05EF
T2	12.20	13.25	12.73G	11.20	11.65	11.43EF
T3	47.80	38.71	43.25A	43.60	37.31	40.45A
T4	34.79	30.63	32.71C	31.48	29.83	30.66BC
T5	41.65	32.36	37.00B	37.05	30.36	33.70B
T6	31.17	28.18	29.68D	30.77	26.38	28.58C
T7	19.07	16.67	17.87E	18.27	16.07	17.17D
T8	18.11	11.76	14.94F	10.96	17.51	14.24DE
T9	10.34	11.22	10.78H	9.14	10.22	9.68F
Mean (A)	25.28A	21.63B		22.72A	21.05A	
LSD A		1.6433			1.9779	
LSD B		1.9098			3.7488	
LSD A*B		3.0742			6.0345	

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الملخص العربي

أجريت هذة الدراسة في مزرعة كلية الزراعة جامعة الأزهر فرع اسيوط واستخدم فيها هجينين من الطماطم هما ثريا F1 والبرنسيسة F1 وتمت الزراعة في الموسم الصيفي 2020 و 2021 وكان الهدف هو دراسة تأثير بعض المعاملات علي هذين الهجينين وهذة المعاملات هي: مستخلص الثوم ومستخلص العرقسوس بالتركيزات الآتية (10,5 مل) لكل لتر ماء لكل مستخلص منهم وكذلك دراسة تأثير كل من البورون والكالسيوم بالتركيزات الآتية(البورون :4,2 مل) (الكالسيوم :8,4مل) وذلك لكل لتر ماء بالاضافة الي الكنترول (الغير معامل) وتتم الاضافة اربعة مرات بعد 45 يوم من زراعة الشتلات بين الرشة والأخري 10 ايام . وتم أخذ قياسات ارتفاع النبات، عدد الأفرع،عدد الأوراق، المحتوي من الكلورفيل في الأوراق، وزن الثمار لكل نبات ولكل قطعة تجريبية والمحصول الكلي معبرا عنه بالطن للفدان، ونسبة المادة الصلبة الكلية وقد تم تحليل البيانات إحصائيا وأوضحت النتائج ان هناك تباين معنوي للصفات بين الهجن المستخدمة وكذلك كان هناك اختلاف معنوي بين المعاملات والتداخل بينهم في موسمي الزراعة وكانت أفضل المعاملات المستخدمة هو مستخلص الثوم تركيز 5 مل للتر والذي أظهر تأثيرا قويا في معظم الصفات ومنها محتوي الأوراق من الكلوروفيل ونسبة المادة الصلبة الكلية ووزن الثمار لكل قطعة تجريبية ولكل نبات وكذلك المحصول الكلي للفدان مقارنة بالكنترول(الغير معامل) وقدرت نسبة الزيادة في المحصول الكلي في المتوسط (24.4%) مقارنة بالكنترول.

الكلمات الاسترشادية: مستخلص الثوم, البورون, الكلوروفيل, الطماطم, المحصول الكلى.