

EFFECT OF HUMIC ACID, NUMBER OF CLUSTERS AND CULTIVARS ON GROWTH, FLOWERING AND YIELD OF TOMATO PLANT (*Lycopersicon esculantum L.*) UNDER PLASTIC HOUSE CONDITIONS

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ABSTRACT

The study was to investigate the effects of two tomato cultivars, *Campeon F1* and *Calispo F1*, two levels of flower clusters (6,9) clusters.plant⁻¹ and foliar spray of Humic acid at concentrations (0, 15, 30 and 45 ml.L⁻¹) on vegetative growth, flowers, yield and yield characteristics of tomato plant grown in plastic house at Duhok governorate, batufa location, guvek village.

Results revealed that humic acid at concentration of 30 ml.L⁻¹ significantly increased stem diameter, number of flowers/plant 16.535 mm, 90.42 flowers.plant⁻¹ respectively, and 11.19 flowers/clusters at concentration 45 ml.L⁻¹.

So humic acid at concentration of 30ml.L⁻¹ significantly affected the number of fruits.Plant⁻¹, yield per unit area, 82.39 fruits, 23.74 kg/m².

Regarding the effect of level 9 clusters, were obtained the highest value in yield kg.m⁻², yield kg/plant, No. of flower/ plant) while at level 6 cluster in (no. of flower/ cluster).

In terms of cultivars, *Campeon* was overcome by *calispo* cultivar in fruit fresh weight 75.85, compared with *Calispo* cultivar 73.30gm.

KEY WORD: Humic acid, No of cluster, Cultivars, Tomato plants

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INTRODUCTION

Tomato (*Lycopersicon esculentum L.*) belongs to the Solanaceae family and is one of the most popular and widely full-grown vegetables, ranking second in position to potato in several countries. It's used in numerous forms both fresh and processed, plays a main role in its wide extent adoption.

The tomato is a first crop grown-up in the word as a processing (Chapagoin and wiesman 2004).

The select of an acceptable-yielding, tomato cultivar with favorite fruit qualities and longer sill life is a vital grower decision. Disappointment to select unsuitable cultivar may lead to inferior yield or less market acceptability (Hochmuth, 1991; Maynard and Olson, 2002; Papadopoulos, 1991; Snyder, 2001).

The select of diversities and fruit size must be according to consumers desire and proposes (paste, ketchup, juice) and others.

Plant growth substances are essential for growth and development of tomato plants. It

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plays a significant role in flowering, fruit setting, ripening and physiochemical changes over storage of tomato (Shareef j. H.M. 2004)

Unsuitable pruning may result weak stems with heavy and lots of unequal sized and shaped fruits. Fruit maturity also becomes unsatisfactory under this situation, thus making the harvesting difficult (Anonymous, 1998).

Humic acid can directly have helpful effects on plant growth and raising the growth of shoots and roots, absorption of nutrition element by plant. Humic acid is consistent with natural environment and not dangerous for the plant (Haghighi *et al.*, 2011). Abdel-Mawgoud *et al.*, (2007). The humic acid increases plant growth through absorption of different nutrients to overcome the lack of nutrients.

Phelps (2000) and Nardi *et al.* (2002) have reported that the humic acid increases vegetative growth by providing the acidic medium, which helps to bind to the positive ions and thereby inhibits its deposition. This is consistent with what Maggion *et al.* (1987) And Linderman (1989).

Effect of chemical manures from the soil and have a main effect on plant growth, as shown by many scientists (Ghabbour and Davies, 2001)

The Humic acid has different significant effects for transportation and availability of microelements in the plants (David *et al.*, 1994).

Cultivar selection is one of the crucial decisions that the commercial grower must make each season.

Variety selection is a vigorous process. Some varieties may retain favor for many years while others might be supplanted by newer cultivars after a few seasons (McAvoy and Ozores-Hampton, 2010). With good variety records, growers can identify which varieties will perform best in which fields, which season (early-mid-late) and other production conditions (e.g., climate, disease and insect pressure).

Presently large numbers of imported tomato varieties including cultivar are offered in the market, and seeds of these varieties are sold at excessive prices.

Shareef (2004) compared three cultivars of Tomato (Sun, Karina and King rock) he found that the King rock cultivar overcome others in the yield of plant and total yield which came to were 1.89 kg and 54.12 t.ha⁻¹ individually

Balemi (2008) detailed in Tomato plant that cultivar Melkashola produced higher mean percentage marketable fruit yield than Margelobe and had a more prominent number of fruits per bunch.

Abdul-Rahman (2011) found in Tomato plant that the Jinan hybrid overcame Hosin half and half in the yield per plant, weight of fruit.

MATERIAL AND METHOD

The experiment was conducted in a plastic house (500 m²) equipped with electric heating in the cold winter months, and was irrigated by drip irrigation system. The plastic house located at Zakho /Batufa in the Govek farming field, Kurdistan region /Iraq, during the growing season of 2015-2016.

The experiment comprised the effect of two hybrid cultivars (campeon F1 and calispo F1) of tomato, two levels of clusters number (6 and 9 clusters /plant) and four concentration of Humic

acid (0 mL/L- 15 ml/L- 30 ml/L and 45 ml/ L) Humic acid was sprayed on the vegetative growth ,three times the first and was sprayed after three weeks from transplanting and it was repeated every two weeks . At 25th February, 10thmarch and 25th march respectively. The surfactant agent Tween-80 was added to the solutions 2 drops per liter.

The treatment were arranged in split –split-plot design, the cultivars in main plot ,number of cluster levels sub plot and Humic acid four levels as sub-subplot, randomly in factorial experiment in a randomized complete blocks design (RCBD),2*2*4 =16 factorial treatments , every unit will be two lines with 9 plants/line (18 plants / unit area) with three replication and each unit area will be (4,80 m²).The number of plant in quartet meter was (3.75 plant).

The distance between plants was 30 cm and distance between line in the unit area (60 cm) and between block is (100 cm)

SAS, 2007programe was used for data analysis, means values were compared to by using Duncan multiple range test at 0.05 level

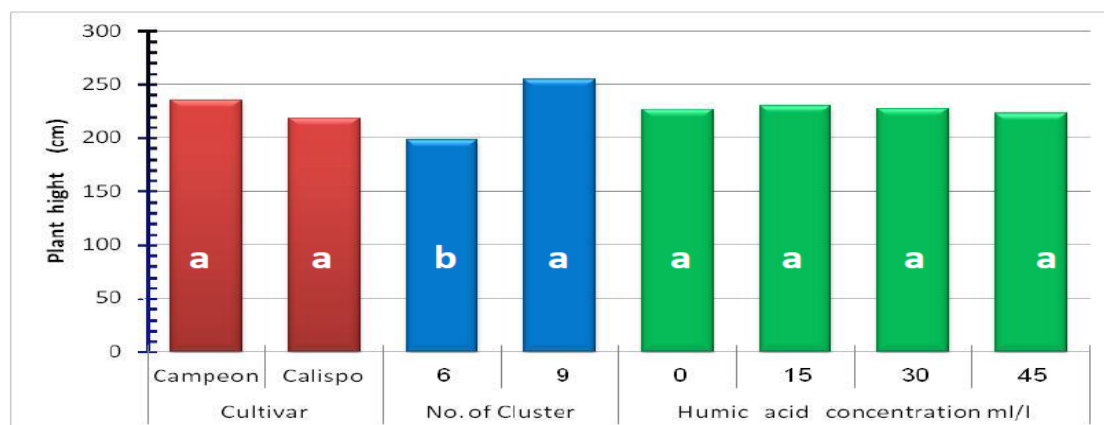
RESULTS AND DISCUSSION

1- Plant High (cm):

Data regarding the plant high illustrated in figure (1) shows that the plants high has no significant effect between two cultivars but the Campeon was higher than Calispo 234.92 cm respective 218.21 cm increasing by 7.65%. Referring to the number of cluster it's clear that plant with 9 cluster has a significant difference, the highest value obtained by 9 cluster 255.14cm compared with 6 cluster 197.99cm with higher of 28.86%.

Also the effect of Humic Acid application indicated that no significant effect on plant high, the highest rate was at 15ml/L 229.63cm compared to control 226.25cm.

The interaction between cultivars and level of Humic Acid, data in table (1) shows that the Campeon provided a highest length at 239.46cm in concentration of (15 ml/L) there was no significant effect on plant height, while Calispo was the same, but there was no significant differences between both cultivars



Different letters represent significant differences according to Duncan's multiple range tests at level 0.05.
Fig. (1): Effect of cultivars, cluster number and humic acid on plant height (cm) of tomato plants grown under plastic house conditions.

Regarding the interaction between cultivars and number of cluster observed significant effect on plant high. In Campeon was 261.46cm at level of 9 cluster compared by 6 cluster 208.38cm, in Calispo cultivar 248.81cm compared by 6 cluster 187.60cm. Rises with 25.47% respective 32.62%.

Table (1): Effect of the interaction between cultivars, cluster number and Humic acid on the plant high (cm) on tomato plants in plastic house.

Cultivar	NO.CLU	H1 0 ml/L	H2 15ml/L	H3 30 ml/L	H4 45ml/L	CULT°C
Campeon (A)	C6	205.75 cd	210.58 c	207.92 cd	209.25 cd	208.38 b
	C9	260.83 ab	268.33 a	263.25 ab	253.ab	261.46 a
Calispo (B)	C6	184.50 e	193.17 c-e	190.58 de	182.17 e	187.60 c
	C9	253.92 ab	246.42 b	247.33 b	247.58 b	248.81 A
CULTIVAR*H	A	233.29 a	239.46 ab	235.58 a	231.33 a	
	B	219.21 b	219.79 b	218.96 b	214.88 b	
C*H	C6	195.13 b	201.88 b	199.25 b	195.71 b	
	C9	257.38 a	257.38 a	255.29 a	250.50 a	

Different letters represent significant differences according to Duncan's multiple range tests at 5% levels.

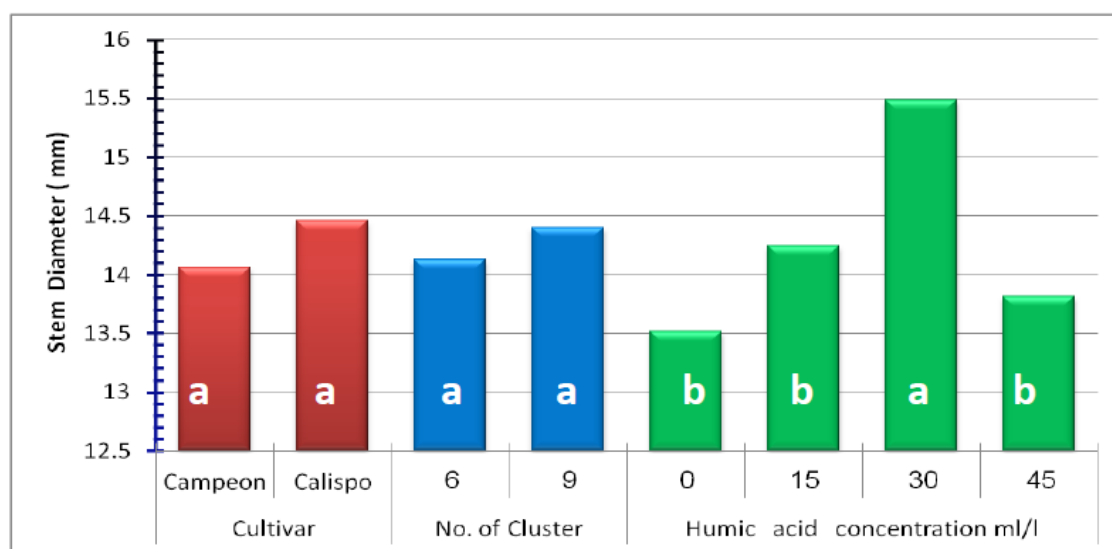
Also the effect of interaction between concentration of Humic Acid and number of cluster on plant, resulted no significant difference between application of Humic Acid level for both cultivars but it was significant between number of cluster by highest length on level 15ml/L 257.38 cm.

Regarding the effect of triple interaction among cultivars, number of cluster and concentration of spraying by Humic Acid shows that cultivar Campeon in rate 15ml/L at 9 clusters provided highest length 268.33cm compared with control 184.50cm caused an increase of 45%.

2- Plant stem diameter (mm):

Data illustrated in figure (2) shows that there are no significant differences between both cultivars regarding the stem diameter with a little difference 14.46mm in Calispo respective 14.06mm in Campeon cultivar increasing by 2.99%.

The same result regarding the effect of number of cluster, no significant effect between both cultivars in plant stem diameter. Regarding the effect of Humic Acid indicates that the diameter was thicker in level 30 ml/L (15.48mm) is significant compared with control 13.51mm.



Different letters represent significant differences according to Duncan's multiple range tests at level 0.05.

Fig.(2): Effect of cultivar, clusters number and humic acid on stem diameter (mm) of tomato plants grown under plastic house conditions.

Data presented in table(2) illustrates the interaction between cultivar and Humic acid which caused a significant increase in stem diameter at level 30ml/L of 15.784mm compared with control 13.214mm rises by 18.69%.

Concerning the interaction between number of cluster and level of Humic Acid on stem diameter, the result showed that the application of Humic Acid with 30ml/L provided thicker

diameter 15.684mm significantly with the control 13.214mm at 6 number of cluster increases by 18.81%.

The triple interaction among cultivars, number of cluster and Humic Acid table (2) shows that the level (30ml/L) gave a significant effect by providing a thicker effect in stem diameter 16.536mm compared with control 12.266 .mm increasing by 25.82%.

Table (2): Effect of the interaction between cultivars, cluster number and Humic acid on the stem diameter (mm) on tomatoes plant in plastic house.

Cultivar	NO.CLU	H1 0 ml/L	H2 15ml/L	H3 30 ml/L	H4 45ml/L	CULT*C
Campeon (A)	C6	14.199 b-e	14.952 a-d	16.335 a	14.927 a-d	15.10 a
	C9	12.266 e	13.086 de	14.033 c-e	12.710 e	13.02 b
Calispo (B)	C6	12.229 e	12.790 e	15.033 a-c	12.543 e	13.15 b
	C9	15.353 a-c	16.133 a-b	16.535 a	15.052 a-c	15.77 a
CULTIVAR*H	A	13.233 c	14.019 bc	15.184 ab	13.818 bc	
	B	13.791 bc	14.462 bc	15.784 a	13.797 bc	
C*H	C6	13.214 c	13.871 bc	15.684 a	13.735 bc	
	C9	13.809 bc	14.610 ab	15.284 a	13.881 bc	

Different letters represent significant differences according to Duncan's multiple range tests at 5% levels.

3 - Number of flowers/plant:

Figure (3) reveals that the number of flowers/plant are not significant between both cultivars, only little increasing in the number of flowers in Calispo cultivar 72.81 compared with Campeon 70.09 flowers which rises by 3.80%. In a same figure the effect of clusters number caused significant increasing in number of flowers/ plant at 9 clusters 81.61 flowers compared to 6 clusters, 61.29 flowers increases by 33.15%.

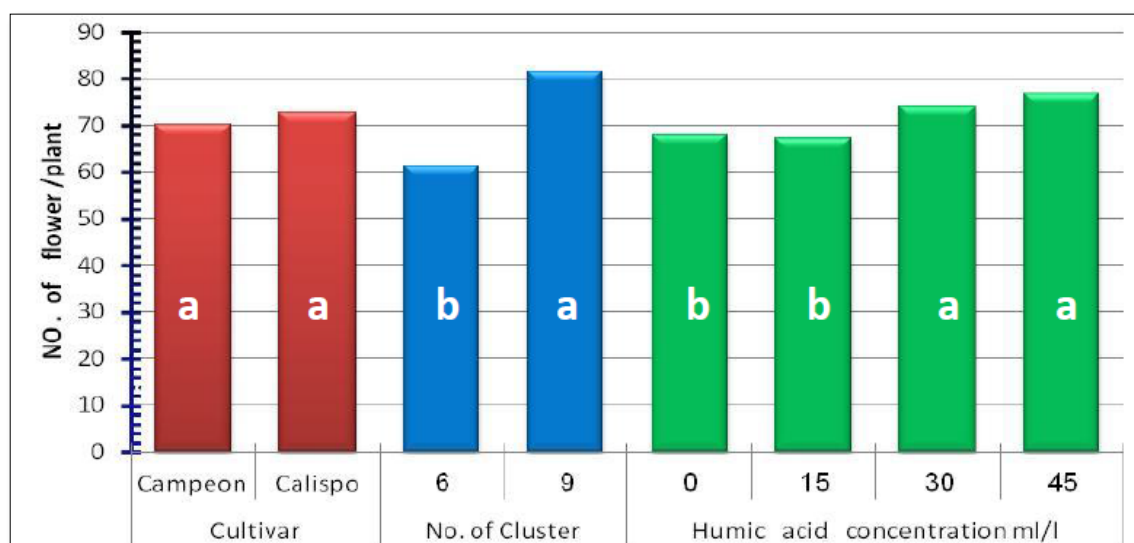
Also Humic acid significantly affected number of flowers/plant in level 45ml/L 76.63 flowers compared with control 67.90 flowers rises by 12.85%.

Data presented in Table (3) shows the effect of interaction between cultivars and number of clusters on number of flowers/plant, which is increasing significantly at 9 clusters 82.21 respective 81.02 flowers compared to 6 clusters for both cultivars

Concerning the interaction between cultivars and Humic acid, remarked the significant

increase in the number of flowers in application of Humic acid at level 45ml/L 77.63 flowering in Calisp cultivar comparison with lowest value 65.46 in campeon at 15ml/L humic acid.

Regarding the interaction between number of clusters and Humic acid, the significant affect in number of flowers at 9 clusters (88.79) flowers compared with 6 clusters 0 ml/L of humic acid were recorded lowest value 59.42 flowers.



Different letters represent significant differences according to Duncan's multiple range tests at level 0.05.

Fig.(3): Effect of cultivar, clusters number and Humic acid on number of flower/plant of tomato plant grown under plastic house condition

Table (3): Effect of cultivar, clusters number and Humic acid on number of flower/plant of tomato plant grown under plastic house conditions

Cultivar	NO.CLU	H1 0 ml/L	H2 15ml/L	H3 30 ml/L	H4 45ml/L	CULT*C
Campeon (A)	C6	57.58 ef	58.92 ef	56.42 f	63.75 de	59.17 b
	C9	74.17 b	72.00 bc	90.42 a	87.50 a	81.02 a
Calispo (B)	C6	63.42 d-f	60.64 d-f	62.42 d-f	67.17 cd	63.41 b
	C9	76.42 b	77.17 b	87.17 a	88.08 a	82.21 a
CULTIVAR*H	A	65.88 cd	65.46 d	73.42 ab	75.63 a	
	B	69.92 bc	68.90 cd	74.79 a	77.63 a	
C*H	C6	60.50 d	59.78 d	59.42 d	65.46 c	
	C9	75.29 b	74.58 b	88.79 a	87.79 a	

Different letters represent significant differences according to Duncan's multiple range tests at 0.05 levels.

In the same table the triple interaction among cultivars, number of clusters and Humic acid caused significant effect in number of flowers, the best result obtained in application 45ml/L in Calispo cultivar at 9 clusters 88.08 flowers compared with all other treatments.

4- Number of flowers/cluster:

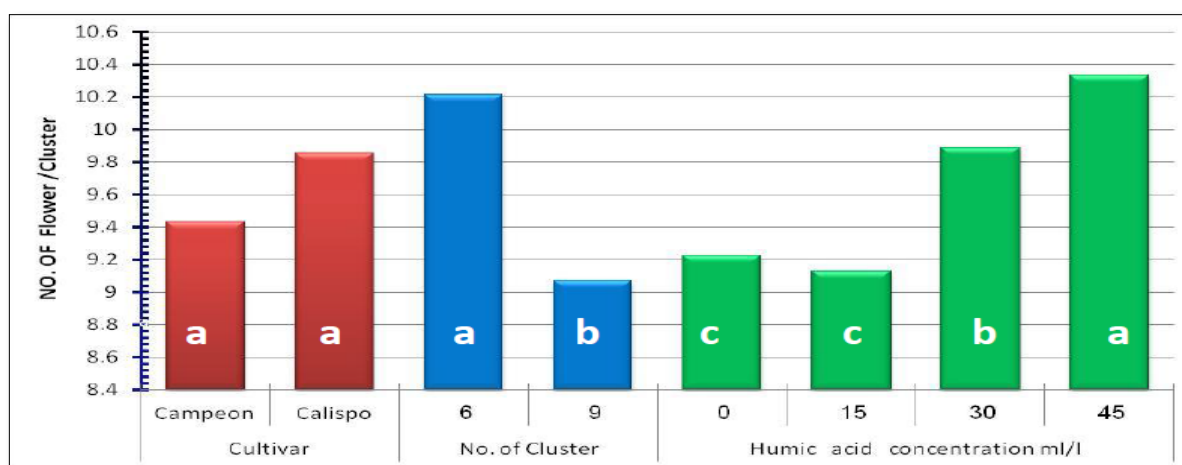
Figure (4) shows no significant change between cultivars on number of flowers/cluster.

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The Calispo cultivar provided more flowers/cluster compared than Campeon 9.85 and 9.43 flowers/cluster respectively rises by 4.45% .

Regarding the effect of clusters number, remarked a significant a difference between the treatments on the number of flowers/cluster, at 6 clusters/ plant gave more compared to 9

clusters/plant 10.21 flowers respective 9.07 flowers increasing by 12.56%.



Different letters represent significant differences according to Duncan's multiple range tests at level 0.05.

Fig. (4): Effect of cultivar, clusters number and Humic acid on number of flower/cluster of tomato plants grown under plastic house conditions.

Table (4): Effect of cultivars, clusters number and Humic acid on the number of flower/cluster on number of cluster/plant on tomato plants in plastic house conditions.

Cultivar	NO.CLU	H1 0 ml/L	H2 15ml/L	H3 30 ml/L	H4 45ml/L	CULT*C
Campeon (A)	C6	9.60 bc	9.82 bc	9.40 cd	10.63 ab	9.86 b
	C9	8.24 e	8.00 e	10.05 bc	9.72 bc	9.00 c
Calispo (B)	C6	10.57 ab	10.11 bc	10.40 a-c	11.19 a	10.57 a
	C9	8.49 de	8.57 de	9.69 bc	9.79 bc	9.13 c
CULTIVAR*H	A	8.92 e	8.94 e	9.72 b-d	10.17 ab	
	B	9.53 c-e	9.34 de	10.04 a-c	10.49 a	
C*H	C6	10.08 b	9.96 b	9.90 b	10.91 a	
	C9	8.37 c	8.29 c	9.87 b	9.75 b	

Different letters represent significant differences according to Duncan's multiple range tests at 0.05 levels

Concerning the effect of Humic acid, there is a significant increase in number of flowers/cluster at level 45ml.L 10.33 flower compared with control 9.22 flower rises by 12.03%.

The effect of interaction between cultivars and number of clusters on number of flowers/cluste,

Also the effect of interaction between cultivars and Humic acid remarked significant increasing the number of flower/cluster 10.49 at level of

Table (4) shows a significant increase in number of flower/cluster 10.49 at level of 45ml/L Humic acid at 6 cluster/plant compared with out spraying flowers/cluster at 6 clusters in cultivar Calispo 10.57 flowers/cluster.

45ml/L Humic acid at 6 clusters/plant compared with campeon without spraying by Humic 8.92 flowers.

The interaction between the number of clusters and level of Humic acid on flowers number/cluster significantly affected the number of flowers/cluster 10.91 at level of 45ml/L at 6 clusters/plant compared to 6 clusters and 15ml/L humic acid that recording smallest value 8.29 flowers rises by 31.6%.

The effect of triple interaction among cultivars, number of clusters and Humic acid on number of flower /cluster, displays that significant increasing was observed in calispo cultivar 6 clusters at level 45ml/L that obtained 11.19 flowers compared to lowest mean 8 flowers were obtained from treatment of campeon 9 clusters 15ml/L humic acid which rises by 39.87% .

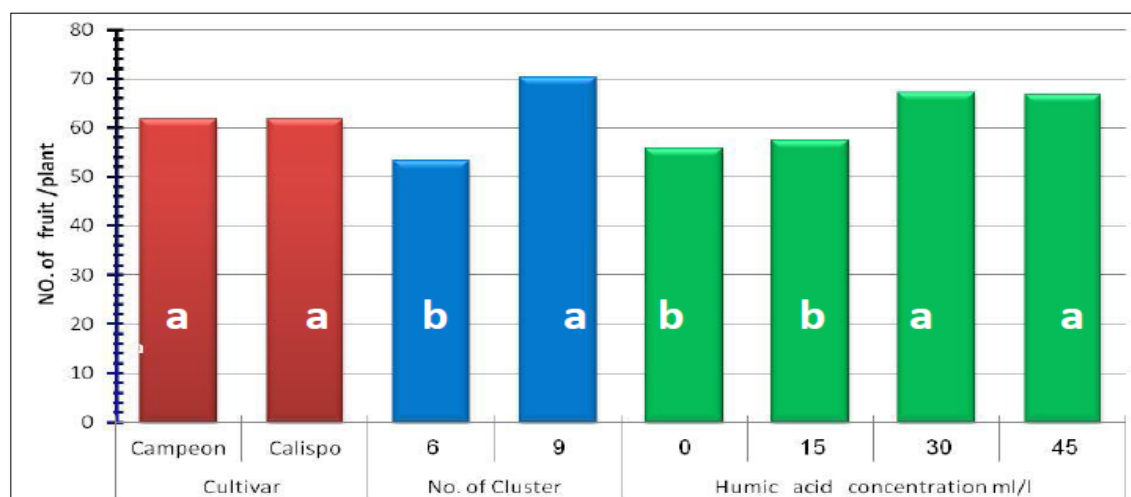
Yield character:

5- Number of fruit /plant:

Figure (5) shows the effect of cultivars on number of fruit/plant, observed no significant difference between cultivars only a little increasing in number of fruit in cultivar Campeon compared with Calispo cultivar.

Regarding the effect of clusters number on number of fruit/plant, observed the plant with 9 clusters had significant effect on number of fruit /plant 70.33 compared with 6 clusters/ plant 53.14 with increasing of 32.48%.

In a same figure effect of Humic acid on number of fruit/plant remarked significant difference among rate of Humic acid 30ml/L 67.20 fruit/plant compared with control 55.67 with increasing of 20.71%



Different letters represent significant differences according to Duncan’s multiple range tests at level 0.05.

Fig.(5): Effect of cultivar,clusters number and Humic acid on number of fruit /plant of tomato plant grown under plastic house conditions.

Table (5) show the interaction between cultivar and number of clusters on number of fruit/plant had a significant difference in a same cultivar regarding the number of clusters The plant with 9 clusters provided more number of fruit compared with 6 clusters in both cultivar, in Campeon cultivar at 9 clusters 71.04 compared with 6 clusters 52.56 fruit/plant it was increasing by 35.15%, also at Calispo cultivar with 9 clusters was increasing by 29.37% more than 6 clusters 53.73 fruit/plant

Regarding the interaction between cultivars and Humic acid on number of fruit/plant

remarked significant effect at rate of Humic acid in level of 45ml/L 67.83 fruit compared with control 54.90 fruit increasing by 23.55% at Campeon cultivar. It is the same for Calispo cultivar with increasing 16.32% compared with control.

Concerning the effect of interaction between number of clusters and humic acid on number of fruit/plant is significantly increased number of fruit at level 9 clusters in rate 30ml/L 80.10 compared with smallest number 50.19 fruit /plant at 6 clusters without spraying humic acid increasing by 59.59%.

Also the triple interaction among cultivars, number of clusters and Humic acid remarked significant in level of 9 clusters at rate of 30 ml/L in Campeon cultivar 82.39 fruit/plant

compared with lowest mean 48.47 fruit/plant obtained from campeon *6clusters *0ml/L (control), increasing by 69.98%.

Table (5): Effect of the interaction between cultivars, clusters number and Humic acid on the fruit number/plant on the tomato plants in plastic house conditions.

Cultivar	NO.CLU	H1 0 ml/L	H2 15ml/L	H3 30 ml/L	H4 45ml/L	CULT*C
Campeon (A)	C6	48.47 h	51.79 gh	52.44 fg	57.54 de	52.56 b
	C9	61.33 c	62.32 c	82.39 a	78.12 b	71.04 a
Calispo (B)	C6	51.90 gh	50.98 gh	56.16 e	55.87 ef	53.73 b
	C9	60.97 cd	64.29 c	77.80 b	75.41 b	69.62 a
CULTIVAR*H	A	54.90 c	57.06 bc	67.42 a	67.83 a	
	B	56.43 bc	57.64 b	66.98 a	65.64 a	
C*H	C6	50.19 e	51.39 e	54.30 d	56.71 d	
	C9	61.15 c	63.31 c	80.10 a	76.76 b	

Different letters represent significant differences according to Duncan's multiple range tests at 0.05 levels.

6 - Average fruit Weight(gm):

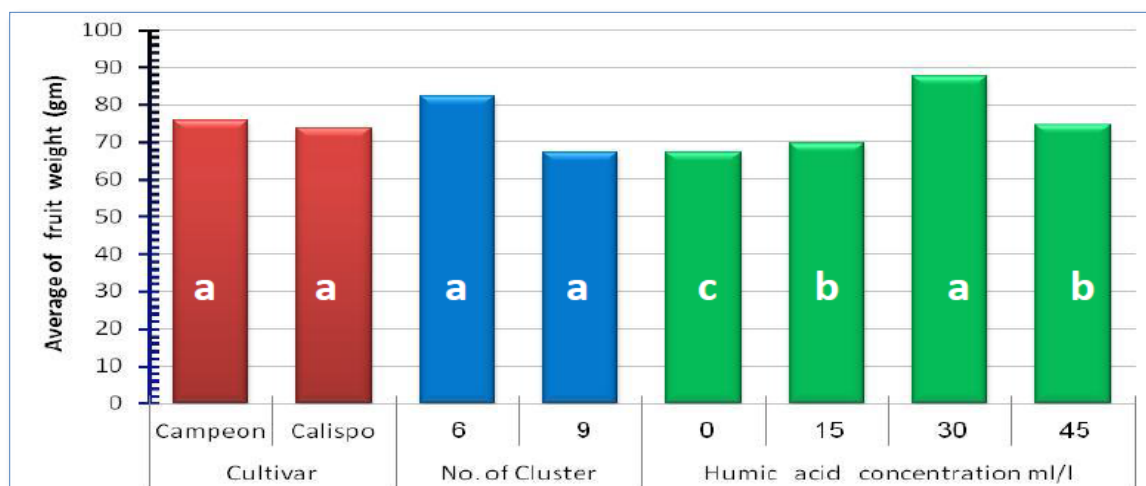
The figure (6)shows that there were no significant difference between cultivar in fruit fresh weight, the Campeon cultivar with 75.85gm compared to Calispo cultivar 73.70gm .

Regarding the effect of clusters number in fruit weight, there is significant difference between level of clusters 9 and 6 .The fruit fresh weight is 82.30gm at level 6clusters compared with 67.25 gm at level of 9clusters increasing by 22.38%.

The weight of fruit increased at level of 6 clusters because of better nutrition Concerning

the effect of Humic acid, remarked significant difference. the highest value was obtained in rate of 30ml/L 87.70gm compared with control 67.28gm. Increasing by 30.35%.

Data presented in table (6) displays the effect of interaction between cultivars and clusters number on fruit weight is significantly different. at level of 6 clusters in both cultivars campeon and calispo overcome to 9 clusters which 84.05 gm and 80.54 gm compared to 67.64gm and 66.86 at level of 9clusters in both cultivar, increasing by 24.26% respective 20.47% respectively.



Different letters represent significant differences according to Duncan's multiple range tests at level 0.05.
Figure (6): Effect of cultivars, clusters number and Humic acid on fruit fresh weight (gm) of tomato plant grown under plastic house conditions.

Data presented in the same table shows that the interaction between cultivars and Humic acid on fruit weight is significant. In Campeon cultivar 88.42gm at level 30ml/L was overcome compared to calispo with 0ml/L humic acid 65.94gm with an increasing of 34.09%.

Regarding the effect of interaction between clusters number and Humic acid on fruit weight were significantly affected, in rate 30ml/L at level of 6 clusters 99.58gm compared with lowest mean 60.31 gm recorded in treatment of 9

clusters with 0ml/L humic acid an increasing of 65.11%.

The same table indicate significant difference between the treatments of interaction among cultivars, number of clusters and Humic acid. at rate of 30ml/L at level of 6 clusters in both cultivars 100.10gm in Campeon and 99.06gm in Calispo cultivar overcome to all other treatments ,however the lowest value 59.75 gm were shown in calispo with 9 clusters and without spraying by humic acid.



Picture (1) cultivar A Campeon F1

Picture (2) cultivar B Calispo F1

Table (6): Effect of the interaction between cultivars, clusters number and Humic acid on the fruit fresh weight (gm) on the tomato plants in plastic house

Cultivar	NO.CLU	H1 0 ml/L	H2 15ml/L	H3 30 ml/L	H4 45ml/L	CULT*C
Campeon (A)	C6	76.36 b-d	81.12 b	100.10 a	78.63 bc	84.05 a
	C9	60.87 e	61.71 e	76.74 b-d	71.26 d	67.64 b
Calispo (B)	C6	72.13 d	74.53 d	99.06 a	76.45 b-d	80.54 a
	C9	59.75 e	60.58 e	74.91 cd	72.22 d	66.86 b
CULTIVAR*H	A	68.61 cd	71.41 bc	88.42 a	74.94 b	
	B	65.94 d	67.55 cd	86.99 a	74.33 b	
C*H	C6	74.25 bc	77.82 b	99.58 a	77.54 b	
	C9	60.31 D	61.14 d	75.83 b	71.74 c	

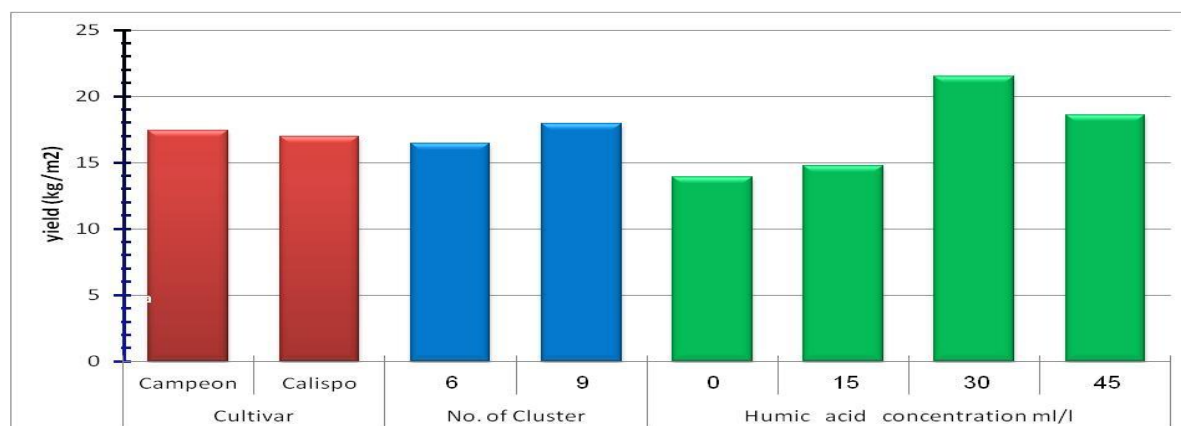
Different letters represent significant differences according to Duncan's multiple range tests at 0.05 levels.
7 - Yield (Kg.m⁻²):

Figure (7) shows the effect of cultivar on yield production kg/m², remarked no significant effect on both cultivars on yield kg/m², only little increasing in Campeon cultivar overcome on Calispo by 2.59%.

About the effect of clusters number there is a significant effect on yield kg/m², in level of

9 clusters 17.95 kg/m² compared with 6 clusters 16.43 kg/m² rising by 9.25%.

Regarding the effect of Humic acid application on yield kg/m², were caused significant effect at level of 30ml/L 21.53 kg/m² compared with control 13.89 kg/m² rising by 55%.



Different letters represent significant differences according to Duncan's multiple range tests at level 0.05.

Fig. (7): Effect of cultivar ,clusters number and Humic acid on yield kg.m⁻² of tomato plants grown under plastic house conditions

Data presented in Table (7) show the interaction between cultivars and clusters number observe significant effect on yield kg/m², the highest mean was in Campeon at level of 9 clusters 18,26 kg/m². however the

lowest mean was In Calispo cultivar at level of 6 clusters 16.30 kg/m², which differ by 12.02% as comparison.

In a same table show interaction between cultivars and Humic acid application cased

significant effect on yield kg/m² in both cultivars at level of 30ml/L overcome to all other treatments , highest yield obtained from Campeon 21.69 kg/m² compared with lowest yield 13.85 kg/m² obtained from calispo with 0ml/L humic acid rising by 56.60% .////////The interaction between number of clusters and

Humic acid, remarked a significant difference between them on yield kg/m², highest yield 22.80 kg/m² at level of 9 clusters spraying with 30ml/L compared with lowest yield 13.83 kg/plant in treatment of 9 clusters with control of humic acid that increased by 64.86%.

(7): Effect of the interaction between cultivars,clusters number and Humic acid on the yield (kg/m2) of tomato plants grown under plastic house conditions.

Cultivar	NO.CLU	H1 0 ml/L	H2 15ml/L	H3 30 ml/L	H4 45ml/L	CULT* ^c
Campeon (A)	C6	13.88	15.75	19.64	16.97	16.56
		g	d-f	c	d	ab
	C9	14.00	14.41	23.74	20.88	18.26
		f	e-g	a	bc	a
Calispo (B)	C6	14.04	14.27	20.87	16.02	16.30
		fg	e-g	bc	de	c
	C9	13.66	14.61	21.86	20.42	17.64
		g	e-g	b	bc	ab
CULTIVAR*H	A	13.94	15.08	21.69	18.92	
		d	c	a	b	
	B	13.85	14.44	21.37	18.22	
		d	cd	a	b	
C*H	C6	13.96	15.01	20.25	16.49	
		d	d	b	c	
	C9	13.83	14.51	22.80	20.65	
		d	d	a	b	

Different letters represent significant differences according to Duncan's multiple range tests at level 0.05.

The triple interaction among cultivars, clusters number and Humic acid application on yield kg/m², Campeon cultivar caused significant effect at level of 9 clusters and 30ml/L humic acid, which recorded 23.74kg/m² compared by calispo at level of 9 clusters and 0 ml/L humic acid 13.66kg/m² as a lowest value among all treatments, which rises by 57.54%.

DISCUSSION

Regarding the vegetative growth (plant higher, stem diameter) cultivar campion overcome calispo, in a same term number of flower/cluster due to the difference in genotypes. **1-**Regarding to several report, Humic acid significantly increasing the plant height of tomato (Kazemi 2013, 2014). Also, several studies have shown that HA has the ability to

decrease the harmful effect of stressors on plants (Ozkutlu et al. 2006); Abdul Mawgoud A. *et al.* **2-**Higher fruit yield components in the campion cultivar than Calispo can be explained by the fact Humic acid level provides better genotype.

3-Concerning the number of cluster, the plants with 9 cluster have more yield than 6 cluster in both cultivars.

4- With regard to fruit weight, the plants with 6 cluster in both cultivars has bigger size and heavier weight because of better nutrition at 6 cluster as compared to 9 cluster.

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پوخته

ئامانچ ژفئى فهكولينئى ئهوه بو ديار كرنا كارتيكرنا دوو توخميت باجان سوركا (كامپيون ئيف 1 وكا ليسپو ئيف 1) و دوو ئاستيت ئبشيبئ گوليلكا 6-9 ئيشى بو هر رووهكه كئى و رهشاندا زبلئى ئورگانيك

(ترشئ هيوميك) بخهستيا (0,15,30,45) مل/ليتر ل سهر شينبون ,ژمارا كوليلكا ,بهرهه م و چهنداتيا بهرهه مئ باجان سوركا د بن كاودانيت خانيبئ نا يلونى ل پاريزگه ها دهوك, دهقهرا باتيفئ گوندئ گوفكئ.

د ئهجامادا دهركهت ترشئ هيوميك بخهستيا 30 مل/ليتر بو ئهگه رئ زئده كرنا ستيراتيا قه دئى روه كى ,ژمارا گولا /رووهك (16.535مليمه ترئو 90.42 گول/رووهك) لديق ئيك ههروه سا خهستيا 45 مل/ليتر ژمارا گولا بو ههر ئيشيبه كئى زئده كر(11.19) گول بو ههر ئيشيبه كئى. ههروه سا ترشئ هيوميك بخهستيا 30 مل/ليتر بو ئهگه رئ زئده كرنا ژمارا باجانكا/رووهكئوبو كو (82.39 با جان) بهرهه م دهست كه فت دروبه ريت چانديدا و (23.74 كگرام/ميتردوجا).

ههروه سا ئاستئ 9 ئيشيا بو ئهگه رئ زئده بونا بهرهه مئ (كگم/ميتردوجا) ئو بهرهه م (كگم) دروبه ريت چانديدا, ژمارا گولا بو ههر رووهك, به لئ 6 ئيشيا بو ئهگه رئ زئده كرنا گولا بو ههر ئيشيبه كئى. پاشئ توخمئ كامپيون سهركه فت لسهر توخمئ كا ليسپو ي دگرانيا باجانكئ دا(75.85 گم) ب بهراوردكرن دگه ل كاليسپو كو (73.70 گم) بدهست كه قتبوو .

الخلاصه

الهدف من هذه الدراسة لبيان تأثير عدد العناقيد الزهرية (6,9) عنقود لكل نبات والرش بحامض الهيوميك بتركيز (0,15,30,45) مل لكل لتر على الصفات الخضرية والثمارية لصنفين من الطماطة (كمبيون, كاليسبو) في البيوت البلاستيكية الواقعة في قرية كوفك تابع ل ناحية باطوفة في محافظة دهوك.

تبين من النتائج أن تركيز حامض الهيوميك 30 مل لكل لتر أدت الى زياده معنويه في قطر الساق و عدد الأزهار في النبات الواحد (16.353) مليمتر و (90.42) زهره لكل نبات و(11.19) زهره لكل عنقود زهري عند تركيز (45 مل لكل لتر) و كانت لتركيز (30 مل لكل لتر) تأثيرمعنوي على عدد الثمار في النبات وكمية الإنتاج في وحدة المساحة (39 . 82) ثمرة ه و(74 . 23) كغم في المتر المربع و فيما يتعلق بعدد العناقيد على مستوى 9 عنقود أدت الى زيادة الإنتاج في المتر المربع و حاصل النبات الواحد وعدد الأزهار في النبات الواحد مقارنة مع 6 عناقيد زهريه و التي ادت الى زيادة معنوية في عدد الأزهار في العنقود الواحد ما يتعتق بوزن الثمره تبين ان صنف كامبيون تفوق على صنف كاليسبو (85 75 غم و 73 70 غم) على التوالي .