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EFFECT OF FERTILIZATION AND SPRAYING WITH SOME GROWTH REGULATORS ON GROWTH, FLOWERING, YIELD AND FRUIT CHEMICAL CONSTITUENTS OF TOMATO

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ABSTRACT

Two field experiments were undertaken at Fac. Agric. Moshtohor, Zagazig University in 1989 and 1990 summer seasons to study the effect of three NPK fertilizers level in combination with two growth regulators each at two concentrations, i.e., kinetin at 20 and 40 ppm and cycocel at 500 and 1000 ppm, in addition to the control treatment, on growth, flowering, yield and quality of tomato fruits cv. UC-97. Obtained results revealed that the combination between the third used level of fertilizers (200 kg N + 64 kg P_2O_5 + 72 kg K_2O/fad.) within kinetin foliar spray at 40 ppm after 4 and 8 weeks of tranplanting encouraged significantly plant growth expressed as plant height, number of leaves per plant, fresh and dry weight per plant, it also delayed flowering, increased number of flowering clusters per plant, increased fruit yield and its components expressed as average fruit weight, number of fruits per plant, fruit yield per plant and per faddan. Moreover, it improved fruit quality expressed as vitamin-C, titratable acidity, T.S.S. as well as reducing, non reducing and total sugars. However, the vitamin-C and T.S.S. values did not vary significantly.

INTRODUCTION

Tomato (Lycopersicon esculentum, Mill) occupied the first rank among the vegetable crops grown in Egypt. It is produced for both local consumption and export. Therefore, in order to achieve maximum output of tomato fruits per unit area with a good quality, one should reach to the proper level of NPK fertilization as well as the foliar spray with kinetin or cycocel on tomato plants, as a mean for increasing fruit yield and improving the quality.

The favourable effect of NPK application on the vegetative growth of tomato plants has been indicated by El-Beheidi et al., (1988); El-Sawy (1988) and Abdalla et al., (1990a). Regarding the use of the regulating substances, previous studies showed that kinetin and cycocel play an important role in controlling vegetative growth of treated plants. Among these investigations those reported by Sharma & Gupta (1972); Khalil (1987); Khalil (1990) working with kinetin and Zaki et al., (1976) and Khalil (1990), working with cycocel, on tomato plants.

Flowering time was significantly delayed by the use of the highest used level of N, P and K fertilizers but number of flowers was increased as reported by Adams (1978), on tomato, Farag (1984) on pepper and Abdalla et al., (1990b) on tomato. Flowering of tomato plants was also positiviely affected by the use of kinetin or cycocel (Wu et al., 1983; El-Mansi et al., 1988; Khalil, 1990, working with kinetin; Khalil, 1982; El-Mansi et al., 1988 working with CCC).

The promotive influence of NPK application on fruit yield per plant as well as per faddan and its components, i.e., average fruit weight and number of fruits per plant, has been pointed by Jaramillo et al., (1978); Abed & Eid (1987) and Abdalla et al., (1990b) on tomato. The promotive effect of the tested substances on fruit yield and its components was indicated by Sharma & Gupta (1972) and Khalil (1990) working with kinetin and by Zaki et al., (1976) and Khalil (1990) with CCC, on tomato plants.

As regard to the effect of N, P and K fertilizers on the chemical constituents of fruits, it was reported that vitamin C and total acidity were increased (Dimitrov & Rankov, 1979; Abed & Eid, 1987; Abdalla et al., 1990c on tomato). The fruit T.S.S., reducing, non reducing and total sugars content were also increased as a result of P and K fertilizers additions (Dimitrov & Rankov, 1979 and Abdalla et al., 1990c on tomato). Different used concentrations of the tested growth regulators of kinetin or cycocel have showed a favourable effect in producing fruits with higher vitamin C, total acidity, T.S.S. as well as reducing, non reducing and total sugars as reported by Zaki et al., (1976) and Khalil (1982), working with CCC and Khalil (1990) working with kinetin, all working on tomatoes.

MATERIALS AND METHODS

Two field experiments were carried out at the Experimental Farm of the Fac. of Agric., Moshtohor, Zagazig Univ., during 1989 and 1990 early summer seasons. The experimental soil is clay loam in texture with pH 7.5. It contains 0.091 available N%, 2.590 available P% and 0.50 meq/L potassium. Seeds of tomato (Lycopersicon esculentum, Mill) cv. UC-97-3 were broadcasted in the nursery on 25th of December 1988 and 1989 under low plastic tunnel. Transplanting took place on 18th and 21th of February 1989 and 1990 respectively. Transplants were planted at 25 cm apart on one side of ridges 100 cm wide and 3.50 m long. The experiment included 15 treatments resulted from combination of three different levels of Nitrogen, Phosphorus and Potassium fertilizers (100 kg N + 32 kg P_2O_5 + 24 kg K_2O/fad), (150 kg N + 48 P_2O_5 + 48 kg K_2O/fad) and (200 kg N + 64 kg P_2O_5 + 72 kg K_2O/fad) within 5 treatments of growth regulators (20 and 40 ppm of kinetin and 500 and 1000 ppm of cycocel) besides the control treatment which was distilled water.

Fertilizers were applied in the form of ammonium nitrate (33.5% N), calcium superphosphate (16.5% P_2O_5) and potassium sulphate (48% K_2O). Fertilizers were divided into three equal portions and then added at 3, 7 and 11 weeks after transplanting. Spraying of the growth regulators was done twice, one week after the first and second addition of fertilizers.

A split plot design with three replicates was adopted. The levels of NPK fertilization served as main plots while the growth regulators treatments served as sub-plots. The plot area was about 1/400 faddan. Other cultural practies were carried out as commonly followed in the district.

Experimental procedures:

Plant growth:

At full blooming stages, three plants were randomly taken from each experimental plot (about 85 days after transplanting) for measuring plant height, number of leaves per plant as well as fresh and dry weight per plant.

Flowering:

The period from sowing till the anthesis of the first flower on the first cluster was recorded as an expression for flowering time in days. Number of flowering clusters per plant at full blooming stage was counted and calculated as an average of number of clusters per plant.

Fruit yield and its components:

All harvested fruits from each experimental plot were used for determining average fruit weight (g) number of fruits per plant, fruit yield plant (g) and total yield (Ton) per faddan.

Fruit chemical constituents:

In representative samples (each of 20 fruits) of full mature fruits taken at the mid harvesting season from each experiemntal plot, the vitamin C content and total titratable acidity were determined as described in A.O.A.C. (1970). T.S.S.% in fruits was assayed using hand refractometer. Reducing, non reducing and total sugars were determiend colorimeterically by using the method described by Michel et al., (1956).

All collected data were subjected to the statistical analysis as mentioned by Snedecor and Cochran (1968).

RESULTS AND DISCUSSION

1- Plant vegetative growth:

Data illustrated in Table (1) show clearly the effect of NPK fertilization levels and the foliar spray with some growth substances on the vegetative growth of tomato plants expressed as plant height, number of leaves, fresh weight and dry weight per plant.

Concerning the effect of NPK fertilization levels, it is evident from such data that the third level of fertilizers (200 kg N + 64 kg P_2O_5 + 72 kg K_2O) enhanced plant growth significantly as compared with either low or medium levels at both successive seasons of this work. Such result may be explained on the basis that the soil of the Experimental Farm is not so rich in its content of N, P and K minerals (as reported in the materials and methods of this work), that high used level of fertilizers was effective. These results are in agreement with those reported by (El-Beheidi et al., 1988; El-Sawy, 1988 and Abdalla et al., 1990a) on tomato.

With regard to the effect of growth regulators foliar spray, it is evident from data in Table (1) that kinetin at 40 ppm proved to be effective in increasing significantly all vegetative growth parameters as compared with the other used concentrations of either kinetin or CCC. The physiological promotive effect of kinetin is due to its active role in many metabolic processes as it retardes chlorophyl

Table (1): Effect of fertilization and spraying with some growth regulators on the vegetative growth of tomato plants.

Fertilizers level (Kg/Fad.)*	Growth regulators	(ppm)	Season 1989 Plant height (cm)	No. of leaves/ plant	Fresh weight/ plant (g)	Dry weight/ plant (g)	Season 1990 Plant height (cm)	No. of leaves/ plant	Fresh weight/ plant (g)	Dry weight/ plant (g)
Level 1	Control	0	38.3	35.0	270.0	31.0	38.0	28.0	270.0	30.7
	Kinetin	20	54.3	50.0	455.3	57.3	36.3	58.0	450.0	59.7
	"	40	55.0	61.3	483.3	65.0	54.0	62.7	470.0	57.7
	CCC	500	49.0	47.3	376.3	45.7	48.0	42.3	370.0	45.0
	"	1000	42.3	33.3	351.3	44.3	42.0	33.3	340.0	41.0
Level 2	Control	0	47.3	46.7	329.0	41.7	48.0	46.0	320.0	36.3
	Kinetin	20	60.0	40.3	476.0	70.0	54.0	42.0	470.0	66.0
	"	40	63.3	68.3	662.3	104.0	59.3	68.7	650.3	97.0
	CCC	500	52.3	66.3	442.7	59.7	52.3	61.7	450.7	59.3
	"	1000	48.3	58.3	373.0	47.3	46.3	52.3	405.0	49.7
Level 3	Control	0	53.0	67.0	457.0	62.7	53.0	58.0	450.3	59.0
	Kinetin	20	66.0	58.0	478.3	72.7	57.0	66.3	480.3	65.0
	"	40	69.3	70.7	669.7	104.7	63.3	79.3	670.3	104.3
	CCC	500	55.0	55.7	489.3	72.3	55.3	66.3	475.7	62.0
	"	1000	49.3	62.0	435.3	58.7	48.3	54.0	420.7	52.7
L.S.D. at 0.05			1.7	3.2	9.2	5.5	11.9	12.3	9.6	3.1
Level 1		-	47.8	45.4	387.3	48.9	43.7	44.9	380.0	46.8
Level 2		-	54.3	56.0	457.0	64.5	52.0	54.1	459.2	61.7
Level 3		-	58.5	62.7	505.9	74.2	55.4	64.8	499.5	68.6
L.S.D. at 0.05			1.3	2.2	3.4	8.1	7.1	3.1	5.4	2.7
Control		0	46.2	49.6	352.0	45.1	46.3	44.0	346.8	42.0
Kinetin		20	60.1	49.4	469.9	66.7	49.1	55.4	466.8	63.6
		40	62.5	66.8	605.1	91.2	58.9	70.2	596.9	86.3
ccc		500	52.1	56.4	436.1	59.6	51.9	56.8	432.1	55.4
		1000	46.6	51.2	386.5	50.1	45.5	46.5	388.6	47.8
L.S.D. at 0.05			0.9	1.8	5.3	3.2	6.9	7.1	5.5	1.8

* Level (1): 100 Kg N + 32 Kg P_2O_5 + 24 Kg K_2O, Level (2): 150 Kg N + 48 Kg P_2O_5 + 48 Kg K_2O;
Level (3): 200 Kg N + 64 Kg P_2O_5 + 72 Kg K_2O.

degradation and encourages protein synthesis. The results obtained herein are going in agreement with those reported by Sharma & Gupta (1972); Khalil (1987) and Khalil (1990) working with kinetin. It is worthy to mention herein that CCC comes in the second rank in increasing the number of leaves especially at a concentration of 500 ppm. such promotive effect of the low concentration of CCC is in agreement with those reported by Zaki et al., (1976) and Khalil (1990), working on tomato.

With regard to the effect of interaction between NPK fertilization levels within growth regulators concentrations, it is evident from data in Table (1) that third used level of fertilizers (200 kg N + 64 kg P_2O_5 + 72 kg K_2O/fad.) combined with the growth regulating substance of kinetin at a concentration of 40 ppm proved to be the most effective treatment that promoted significantly all vegetative growth parameters.

2- Flowering:

Data in Table (2) show obviously that the third level of fertilizers led to delaying flowering time significantly as compared with the two other levels. However, the same level of fertilizers significantly increased the number of clusters per plant. The delaying effect of the used third level might be due to the increment in fresh and dry weight per plant. These results are going in agreement with those reported by Adams (1978), on tomato; Farag (1984), on pepper and Abdalla et al., (1990b) on tomato.

Concerning the effect of growth regulators on flowering, it is obvious from data shown in Table (2) that CCC at 1000 ppm led to enhancement of flowering time as compared with the other used concentrations of CCC or kinetin or the control treatments. These results are going in agreement with those obtained by (Khalil, 1982 and El-Mansi et al., 1988) working on tomato. Moreover, it is evident from the same data that spraying tomato plants with kinetin at 40 ppm gave the highest number of clusters per plant; such result is supported by the effective role of kinetin in flowering and sex expression as mentioned by (Krishnamoorthy, 1981). Obtained results dealing with the number of clusters are in accordance with those obtained by (Wu et al., 1983; El-Mansi et al., 1988 and Khalil, 1990) working with kinetin on tomato.

With respect to the effect of interaction between fertilization level and growth regualtors concentration, on the two factors of flowering, it is evident from data

Table (2): Effect of fertilization and spraying with some growth regulators on flowering of tomato plants.

Fertilizers level (Kg/Fad.)*	Growth regulators	(ppm)	Season (1989) Flowering time (days)	Season (1989) No. of clusters/ plant	Season (1990) Flowering time (days)	Season (1990) No. of clusters/ plant
Level 1	Control	0	95.00	15.00	94.67	13.67
	Kinetin	20	94.67	17.33	92.67	18.33
	"	40	94.33	24.33	94.00	25.67
	CCC	500	92.00	24.33	91.67	23.67
	"	1000	89.33	23.00	90.00	19.00
Level 2	Control	0	95.67	16.33	97.00	15.67
	Kinetin	20	94.67	22.33	94.00	22.00
	"	40	95.00	26.33	95.00	28.00
	CCC	500	93.33	24.33	93.00	25.00
	"	1000	91.67	23.33	91.00	20.67
Level 3	Control	0	99.67	18.33	99.67	16.67
	Kinetin	20	102.00	26.67	97.00	23.67
	"	40	105.00	36.33	105.00	38.00
	CCC	500	99.33	30.67	96.00	24.00
	"	1000	95.33	27.33	93.00	22.00
L.S.D. at 0.05			1.32	2.34	0.79	0.77
Level 1		-	93.07	20.80	92.60	20.07
Level 2		-	94.07	22.53	94.00	22.27
Level 3		-	100.27	27.87	98.13	24.87
L.S.D. at 0.05			1.68	1.08	0.41	0.69
Control		0	96.78	16.55	97.11	15.34
Kinetin		20	97.11	22.11	94.56	21.33
		40	98.11	28.99	98.00	30.56
CCC		500	94.88	26.44	93.56	24.22
		1000	92.11	24.55	91.33	20.56
L.S.D. at 0.05			0.76	1.35	0.46	0.45

* Level (1): 100 Kg N + 32 Kg P_2O_5 + 24 Kg K_2O,
Level (2): 150 Kg N + 48 Kg P_2O_5 + 48 Kg K_2O,
Level (3): 200 Kg N + 64 Kg P_2O_5 + 72 Kg K_2O.

in Table (2) that third used level of fertilizers (200 kg N + 64 kg P_2O_5 + 72 kg K_2O/fad.) combiend with kinetin at 40 ppm resulted in significant delaying in flowering as compared with control or other growth regulators concentrations. Moreover, the same treatment of interaction increased significantly the number of clusters per plant. This was true during both seasons of growth.

3- Fruit yield and its components:

Data presented in Table (3) show that fruit yield and its components were significantly increased with increasing the fertilization level. In this respect, the highest average fruit weight, number of fruits per plant, fruit yield per plant and per faddan were obtaiend when plants were fertilized with the highest used level of NPK fertilizers. These results may be attributed to the highest vegetative growth rate experssed mainly as fresh and dry weigth as well as number of flowering clusters per plant. Obtained results has been confirmed by Jaramillo et al., (1978); Abed & Eid (1987) and Abdalla et al., (1990) on tomato.

Regarding the effect of the foliar spray of either kinetin or cycocel on tomato plants, it is evident from such data in Table (3) that kintin foliar spray at 40 ppm promoted significantly all fruit yield parameters. In this respect, the CCC came in the second rank when sprayed at 500 ppm. The promotive effect of the tested substances on fruit yield and its components was also confirmed by Sharma & Gupta (1972) and Khalil (1990), working with kinetin and Zaki et al., (1976) and Khalil (1990) working with CCC on tomato plants.

With regard to the effect of interaction between fertilization level and growth regulator concentration on fruit yield and fruit yield parameters, it is evident from such data that the third used level of fertilizers (200 kg N + 64 kg P_2O_5 + 72 kg K_2O/fad.) combined with kinetin at 40 ppm resulted in significant increments in average fruit weight, number of fruits per plant, fruit yield per plant and per faddan. The only exception herein is the number of fruits per plant which did not show significantly during the first season of growth (1989).

4- Chemical constituents of fruits:

Data presented in Table (4) revealed that increasing the fertilizers level of NPK led to significant increment in fruit chemical constituents expressed as vitamin C, total titratable acidity, T.S.S.%, reducing, non reducing and total sugars. These results are true during both seasons

Table (3): Effect of fertilization and sp. ying with some growth regulators o. omato fruit yield and its components.

Fertilizers level (Kg/Fad.)*	Growth regulators (ppm)	Season 1989 Average fruit weight (g)	No. of fruit/ plant	Fruit yield/ plant (g)	Fruit yield/ faddan (Ton)	Season 1990 Average fruit weight (g)	No. of fruit/ plant	Fruit yield/ plant (g)	Fruit yield/ faddan (Ton)
Level 1	Control 0	58.00	11.67	676.67	11.33	61.00	12.67	773.33	13.00
	Kinetin 20	62.67	13.67	856.33	14.67	64.00	14.33	916.67	15.67
	" 40	63.67	16.33	1041.00	17.67	66.00	16.33	1077.33	18.00
	ccc 500	65.00	14.67	953.67	16.00	65.00	14.67	953.00	16.00
	" 1000	62.33	13.67	852.00	14.33	63.00	13.67	860.33	14.33
Level 2	Control 0	62.33	15.33	955.67	16.33	63.00	14.67	923.67	15.67
	Kinetin 20	66.00	17.00	1121.33	19.00	68.67	15.67	1076.00	18.33
	" 40	74.00	17.33	1283.00	21.67	76.00	18.00	1368.00	23.00
	ccc 500	71.00	16.00	1135.33	19.00	72.33	16.67	1205.67	20.33
	" 1000	70.33	15.33	1078.33	18.33	71.00	14.67	1041.33	17.67
Level 3	Control 0	66.00	16.00	1056.67	17.67	67.00	16.33	1093.67	18.67
	Kinetin 20	65.67	17.67	1159.67	19.33	70.00	18.33	1281.67	21.67
	" 40	78.00	18.67	1456.33	24.33	76.00	19.00	1444.00	24.33
	ccc 500	75.00	16.67	1251.00	21.00	75.00	16.67	1249.67	20.67
	" 1000	71.33	16.00	1141.00	19.33	73.67	16.33	1203.00	20.33
L.S.D. at 0.05		1.69	N.S.	113.38	1.93	3.17	0.83	51.36	3.57
Level 1	-	62.33	14.00	875.93	14.80	63.80	14.33	916.13	15.40
Level 2	-	68.73	16.20	1114.73	18.87	70.20	15.93	1122.93	19.00
Level 3	-	71.20	17.00	1212.93	20.33	72.33	17.33	1254.40	21.13
L.S.D. at 0.05		1.28	1.14	98.30	1.71	1.28	0.79	36.02	0.76
Control	0	62.11	14.33	896.34	15.11	63.67	14.56	930.22	15.78
Kinetin	20	64.78	16.11	1045.78	17.67	67.56	16.11	1091.45	18.56
	40	71.89	17.44	1260.11	21.22	72.67	17.78	1296.44	21.78
ccc	500	70.33	15.78	1113.33	18.67	70.78	16.00	1136.11	19.00
	1000	67.99	15.00	1023.78	17.33	69.22	14.89	1034.89	17.44
L.S.D. at 0.05		0.97	0.89	65.46	1.11	1.83	0.48	29.65	0.62

* Level (1): 100 Kg N + 32 Kg P_2O_5 + 24 Kg K_2O, Level (2): 150 Kg N + 48 Kg P_2O_5 + 48 Kg K_2O, Level (3): 200 Kg N + 64 Kg P_2O_5 + 72 Kg K_2O.

Table (4): Effect of fertilization and spra; ıg with some growth regulators on th :hemical constituents of tomato fruits.

Fertilizers levels (Kg/Fad.)*	Growth regulators (ppm)	Season 1989						Season 1990					
		Total acidity	Vit. C	T.S.S. %	Reducing sugars	Non reducing sugar	Total sugars	Total acidity	Vit. C	T.S.S. %	Reducing sugars	Non reducing sugar	Total sugars
		mg/100 cm³			G/100 g D.W.			mg/100 cm³			G/100 g D.W.		
Level 1	Control	0	537.0	36.3	5.0	4.2	1.1	5.3	542.0	38.0	5.3	4.0	1.0	5.0
	Kinetin	20	549.3	42.0	5.3	5.7	1.4	7.1	560.0	41.0	5.6	5.6	2.0	7.6
	"	40	569.0	44.0	5.7	5.8	1.5	7.3	580.0	43.3	5.6	6.0	2.0	8.0
	CCC	500	560.0	43.0	6.0	5.0	1.5	6.5	572.0	43.0	6.0	6.0	2.0	8.0
	"	1000	551.0	41.0	5.0	4.9	1.5	6.4	572.0	41.3	5.0	6.0	1.3	7.3
Level 2	Control	0	549.0	39.0	5.0	4.5	1.1	5.6	544.0	40.0	5.0	4.6	1.0	5.6
	Kinetin	20	560.0	43.0	5.0	5.6	1.4	7.0	567.0	42.0	5.0	6.0	2.0	8.0
	"	40	587.0	46.0	6.0	6.0	1.7	7.7	591.0	45.0	6.3	7.0	2.0	9.0
	CCC	500	580.0	43.0	5.6	5.9	1.7	7.6	576.0	43.3	5.0	6.0	2.0	8.0
	"	1000	575.0	43.0	5.3	5.8	1.2	7.0	575.0	42.0	5.0	6.0	2.0	8.0
Level 3	Control	0	554.0	43.0	5.0	5.4	1.7	7.1	548.0	41.3	5.0	5.0	2.0	7.0
	Kinetin	20	566.0	44.0	5.0	6.4	2.0	8.4	572.0	43.0	5.3	6.0	2.0	8.0
	"	40	620.0	47.0	6.7	6.9	2.0	8.9	599.0	46.6	6.3	8.0	2.0	10.0
	CCC	500	592.0	45.0	5.3	6.0	1.9	7.9	582.0	44.0	5.3	7.0	2.0	9.0
	"	1000	579.0	41.0	5.3	5.9	1.9	7.8	580.0	42.3	5.6	6.6	2.0	8.6
L.S.D. at 0.05			7.6	n.s.	n.s.	0.9	0.8	1.1	8.5	n.s.	n.s.	3.6	0.2	0.2
Level 1		-	553.3	41.3	5.0	5.1	1.4	6.5	565.2	41.3	5.5	5.5	1.6	7.1
Level 2		-	570.2	42.8	5.4	5.6	1.5	7.1	570.6	42.5	5.3	5.9	1.8	7.7
Level 3		-	582.2	44.0	5.5	6.1	1.9	7.8	576.2	43.5	5.5	6.5	2.0	8.5
L.S.D. at 0.05			4.9	1.2	0.5	0.7	0.5	0.4	3.4	1.0	0.2	0.3	0.1	0.1
Control		0	546.7	39.4	5.0	4.7	1.1	5.8	544.7	39.8	5.1	4.5	1.3	5.8
Kinetin		20	558.4	43.0	5.1	5.9	1.5	7.4	566.3	42.0	5.3	5.9	2.0	7.9
		40	592.0	45.7	6.1	6.2	1.8	8.0	590.0	44.9	6.1	7.0	2.0	9.0
ccc		500	577.3	43.7	5.7	5.6	1.7	7.3	576.7	43.4	5.4	6.3	2.0	8.3
		1000	568.3	41.7	5.2	5.5	1.7	7.2	575.7	41.9	5.2	6.2	1.8	8.0
L.S.D. at 0.05			4.4	2.0	0.5	0.5	0.5	0.6	6.2	0.8	0.7	0.7	0.1	0.1

* Level (1): 100 Kg N + 32 Kg P_2O_5 + 24 Kg K_2O, Level (2): 150 Kg N + 48 Kg P_2O_5 + 48 Kg K_2O
Level (3): 200 Kg N + 64 Kg P_2O_5 + 72 Kg K_2O.

of growth. These results are confirmed with those reported by (Dimitrov & Rankov, 1979; Abed & Eid, 1987 and Abdalla et al., 1990c) on tomato PK, NPK and PK additions respectively with respect to vitamin C and total titratable acidity and with (Dimitrov & Rankov, 1979; Abdalla et al., 1990c) on tomato PK additions as regared to T.S.S.%, reducing, non reducing and total sugars fruit content.

Regarding the effect of the tested growth regualtors on the fruit chemical constituents, it is obvious from such data presented in Table (4) that kinetin foliar spray at 40 ppm showed significant increments in all fruit chemical constituents, i.e., vitamin C, total titratable acidity, T.S.S.%, reducing, non reducing and total sugars. In this respect, the CCC came in the second rank at the concentration of 500 ppm. These results are confirmed by those reported by Zaki et al., (1976) and Khalil (1982), working with CCC and Khalil (1990), working with kinetin, all working on tomato.

Concerning the interactional effect between the fertilizers level and the tested growth regulators concentration, it is obvious from the same data that the third fertilizers level combined with kinetin spray at 40 ppm showed the highest fruit chemical constituents of total titratable acidity, reducing and total sugars. Similar trend could be detected regarding vitamin C and T.S.S.% but without singificant variations. These results are true during the two seasons of growth.

Generally, it could be concluded from the forementioned results that the stimulative effect of the fertilization level and the tested used growth substances, i.e., kinetin and cycocel was differed according to the chemical nature of the regulating substance and its concentration.

Consequently, the third used level of fertilizers, 40 ppm kinetin or 500 ppm cycocel were more achieved for promoting plant growth, increasing fruit yield and improving fruit quality.

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تأثير التسميد والرش ببعض منظمات النمو على النمو والازهار والمحتوى الكيماوى لثمار الطماطم

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أقيمت تجربتان حقليتان بمزرعة كلية الزراعة بمشتهر جامعة الزقازيق خلال الموسم الصيفى لعامى ١٩٨٩، ١٩٩٠ على الطماطم صنف يوسى ٩٧ - ٣ لدراسة تأثير تداخل فعل ثلاث مستويات من الأسمدة الأزوتية والفوسفاتية والبوتاسية مع خمسة معاملات لمنظمى للنمو وهما الكينتين عند ٤٠،٢٠ جزء فى المليون والسيكوسيل عند ١٠٠٠،٥٠٠ جزء فى المليون بالاضافة الى معاملة المقارنه على النمو الخضرى والازهار والمحصول ومكوناته وكذلك المحتوى الكيماوى لثمار الطماطم. وقد اتضح من النتائج المتحصل عليها ان استخدام المستوى الثالث من الأسمدة (٢٠٠ كجم ن + ٦٤ كجم فوأه + ٧٢ كجم بو٢ أ/فدان) مع الرش بالكينتين بتركيز ٤٠ جزء فى المليون وذلك بعد ٨،٤ أسابيع من الشتل شجع النمو الخضرى معبرا عنه بارتفاع النبات وعدد الأوراق والوزن الغض والجاف للنبات وأدى الى تأخير بداية الازهار وزيادة عدد العناقيد الزهرية للنبات كما أدى الى زيادة المحصول الثمرى ومكوناته معبرا بمتوسط وزن الثمرة وعدد ثمار النبات ومحصول النبات وكذلك محصول الفدان. كما تحسنت صفات الثمره من الناحية الكيماوية حيث زاد فيتامين س والحموضة الكلية والمواد الصلبة الذائبة وأيضا السكريات المختزلة والغير مختزلة والكلية ... الا أن الزيادة فى كل من فيتامين س والمواد الصلبة الذائبة لم تصل الى مستوى المعنوية.