RESULTS AND DISCUSSION

IV. RESULTS AND DISCUSSION

IV.1- Washington navel orange.

IV.1.1- Vegetative growth measurements:

IV.1.1.1- Shoot length (cm.).

It is clear from **Table (4)** that, in both seasons, the highest length of shoot was obtained from 300 ml/l "yeast extract" (14.05 and 14.30) followed by 75 ppm "GA_3" (13.52 and 13.98) and 150 ml/l "yeast extract" (13.27 and 13.42). On the other hand, the lowest length of shoot was obtained from "control" (10.28 and 10.64) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" 0.5 g/l "best flower" + 0.5 ml/l "amino power" (10.60 and 11.43), 0.5 g/l "best flowers" (11.85 and 11.80) and 0.5 ml/l "amino power" (12.10 and 12.40) during the first and second season, respectively.

This results is in agreement with that reported by **Vu and Yelenosky (1988)** on rough lemon and **Fawzi and Eman (2004)** on Flame seedless grapevines.

IV.1.1.2- Leaf area (cm.).

It is obvious from **Table (4)** that, in both seasons, the largest leaf area was obtained from 300 ml/l "yeast extract" (35.70 and 33.14) followed by 75 ppm "GA_3" (32.98 and 32.50) and 150 ml/l "yeast extract" (32.80 and 32.44). On the contrary, the lowest leaf area was obtained from "control" (30.67 and 28.55) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (31.35 and 28.83), 0.5 g/l "best flowers" (31.19 and 29.11) and 0.5 ml/l "amino power" (31.83 and 29.49) during the first and second season, respectively.

Table (4): Some vegetative growth measurements (shoot length, leaf area and leaf dry weight) of Washington Navel orange Cv., in response to some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	Shoot length (cm.)		Leaf area (cm^2)		Dry weight of leaf (mg.)	
	2008	2009	2008	2009	2008	2009
Spray tap water (control)	10.28e	10.64d	30.67c	28.55b	230.7e	242.7d
Spray GA_3 at 50 ppm	12.90a-c	13.97a	32.27bc	31.69a	261.7b	275.7b
Spray GA_3 at 75 ppm	13.52ab	13.98a	32.98b	32.50a	269.7a	279.3b
Spray yeast extract at 150 ml/l	13.27a-c	13.42ab	32.80b	32.44a	261.7b	274.0b
Spray yeast extract at 300 ml/l	14.05a	14.30a	35.70a	33.14a	272.7a	287.0a
Spray best flowers at 0.5 g/l	11.85cd	11.80c	31.19bc	29.11b	241.7d	246.7d
Spray best flowers at 1.0 g/l	12.45bc	12.57bc	31.83bc	29.77b	251.0c	263.3c
Spray amino power at 0.5 ml/l	12.10bc	12.40bc	31.83bc	29.49b	242.3d	264.3c
Spray amino power at 1.0 ml/l	12.21bc	13.15ab	32.07bc	29.78b	246.3cd	262.7c
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	10.60de	11.43cd	31.35bc	28.83b	232.0e	243.7d

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

These results are in harmony with those obtained by **Hegab *et al.*, (1997)** on Valencia orange trees and **Fawzi and Eman (2004)** on Flame seedless grapevines.

IV.1.1.3- Leaf dry weight (mg.).

It is clear from **Table (4)** that, in both seasons, the highest dry weight of leaf was obtained from 300 ml/l "yeast extract" (272.7 and 287.0) followed by 75 ppm "GA_3" (269.7 and 279.3), 50 ppm "GA_3" (261.7 and 275.7) and 150. ml/l "yeast extract" (261.7 and 274.0). On the other hand, the lowest dry weight of leaf was obtained from "control" (230.7 and 242.7) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" 0.5 ml/l "amino power" (232.0 and 243.7), 0.5 g/l "best flowers" (241.7 and 246.7) and 0.5 ml/l "amino power" (242.3 and 264.3) during the first and second season, respectively.

These results confirmed that reported by **Singh *et al.*, (2000)** on Volkamarian rootstock as well as **Omran and Abd El-Latif (2003)** on Red Roomy grapevines. They reported that spraying with GA_3 or active dry yeast significantly increased dry weight of different plant organs.

IV.1.2- Leaf mineral composition:

IV.1.2.1- Nitrogen (%).

It is obvious from **Table (5)** that in both seasons, the highest value of leaf nitrogen content was obtained from 75 ppm "GA_3" (2.91 and 2.53) followed by 300 ml/l "yeast extract" (2.90 and 2.36) and 50 ppm "GA_3" (2.31 an 2.35). On the contrary, the lowest value of leaf nitrogen content was obtained from "control" (2.15 and 2.11) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (2.19 and 2.13), 0.5 g/l "best flowers" (2.21 and 2.13)

and 0.5 ml/l "amino power" (2.22 and 2.23) during the first and second season, respectively.

IV.1.2.2- Phosphorus (%).

It is clear from **Table (5)** that in both seasons, the highest value of leaf phosphorus content was obtained from 300 ml/l "yeast extract" (0.313 and 0.277) followed by 1.0 ml/l "amino power" (0.223 and 0.330) and 0.50 g/l "best flowers" (0.207 and 0.320). On the contrary, the lowest value of leaf phosphorus content was obtained from "control" (0.137 and 0.130) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (0.160 and 0.137) and 50 ppm "GA_3" (0.190 and 0.180) during the first and second season, respectively.

IV.1.2.3- Potassium (%).

It is obvious from **Table (5)** that in both seasons, the highest value of leaf potassium content was obtained from 75 ppm "GA_3" (1.46 and 1.41) followed by 300 ml/l "yeast extract" (1.47 and 1.39), 50 ppm "GA_3" (1.45 and 1.38) and 150 ml/l "yeast extract" (1.43 and 1.34). On the other hand, the lowest value of leaf potassium content was obtained from "control" (1.24 and 1.20) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower + 0.5 ml/l "amino power" (1.28 and 1.23), 0.5 g/l "best flowers" (1.32 and 1.26) and 0.5 ml/l "amino power" (1.34 and 1.25 during the first and second season, respectively.

IV.1.2.4- Calcium (%).

It is clear from **Table (5)** that in the first season, the highest value of leaf calcium content was obtained from 0.5 ml/l "amino power" followed by 50 ppm "GA_3" + 150 ml/l "yeast

Table (5): Some macro-nutrients contents (N, P, K, Ca and Mg) in leaves of Washington Navel orange Cv., as influenced by some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	N (%)		P (%)		K (%)		Ca (%)		Mg (%)	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Spray tap water (control)	2.15c	2.11c	0.137g	0.130c	1.24d	1.20f	4.21c	4.42a	0.323d	0.243e
Spray GA_3 at 50 ppm	2.31b	2.35b	0.190e	0.180bc	1.45a	1.38ab	3.98de	3.62ef	0.403ab	0.427ab
Spray GA_3 at 75 ppm	2.91a	2.53a	0.203de	0.320a	1.46a	1.41a	3.94e	3.48g	0.417a	0.460a
Spray yeast extract at 150 ml/l	2.30bc	2.32b	0.277b	0.150c	1.43ab	1.34bc	4.12c-e	3.59f	0.387a-c	0.383bc
Spray yeast extract at 300 ml/l	2.90a	2.36b	0.313a	0.277a	1.47a	1.39ab	3.99de	3.71de	0.440a	0.440ab
Spray best flowers at 0.5 g/l	2.21bc	2.13c	0.207c-e	0.320a	1.32c	1.26de	4.40b	3.92b	0.330cd	0.283de
Spray best flowers at 1.0 g/l	2.27bc	2.32b	0.217cd	0.163bc	1.33c	1.28c-e	4.11c-e	3.90bc	0.343cd	0.330cd
Spray amino power at 0.5 ml/l	2.22bc	2.23bc	0.203de	0.220b	1.34c	1.25ef	5.11a	3.80cd	0.350b-d	0.260e
Spray amino power at 1.0 ml/l	2.25bc	2.32b	0.223c	0.330a	1.36bc	1.31cd	4.16cd	3.88bc	0.330cd	0.300de
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	2.19bc	2.13c	0.160f	0.137c	1.28cd	1.23ef	4.49b	4.45a	0.327cd	0.277de

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" and 0.5 g/l "best flowers". Meanwhile, the lowest value of leaf calcium content in the first season was obtained from 75 ppm "GA_3" followed by 50 ppm "GA_3" and 300 ml/l "yeast extract". On the contrary, the highest value of leaf calcium content in the second season was obtained from 50 ppm "GA_3" + 150 ml/l "yeast extract" 0.5 g/l "best flower" + 0.5 ml/l "amino power" and "control". Meanwhile, the lowest value of leaf calcium content in the second season was obtained from 75 ppm "GA_3" and 150 ml/l "yeast extract.

IV.1.2.5- Magnesium (%).

It is obvious from **Table (5)** that in both seasons, the highest value of leaf magnesium content was obtained from 75 ppm "GA_3" (0.417 and 0.460) followed by 300 ml/l "yeast extract" (0.440 and 0.440) and 50 ppm "GA_3" (0.403 and 0.427).On the other hand, the lowest value of leaf magnesium content was obtained from "control" (0.323 and 0.243) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (0.327 and 0.277), 0.5 g/l "best flowers" (0.330 and 0.283) and 1.0 ml/l "amino power" (0.330 and 0.300) during the first and second season, respectively.

IV.1.2.6- Iron (ppm).

It is clear from **Table (6)** that in both seasons, the highest value of leaf iron content was obtained from 75 ppm "GA_3" (51.67 and 61.67) followed by 300 ml/l "yeast extract" (50.33 and 60.67) and 50 ppm "GA_3" (50.00 and 59.33). On the contrary, the lowest value of leaf iron content was obtained from "control" (42.67 and 39.33) followed by 0.5 ml/l "amino power"

(44.00 and 39.33), 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flowers" (45.00 and 41.33) during the first and second season, respectively.

IV.1.2.7- Zinc (ppm).

It is clear from **Table (6)** that in both seasons, the highest value of leaf zinc content was obtained from 75 ppm "GA_3" (47.00 and 30.67) followed by 50 ppm "GA_3" (44.67 and 29.67), 150 ml/l "yeast extract" (35.67 and 28.67) and 300 ml/l "yeast extract" (34.67 and 29.33). On the contrary, the lowest value of leaf zinc content was obtained from "control" (25.33 and 19.67) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (27.00 and 21.67), 0.5 g/l "best flowers" (29.67 and 22.33) and 0.5 ml/l "amino power" (34.33 and 24.33) during the first and second season, respectively.

IV.1.2.8- Manganese (ppm).

It is obvious from **Table (6)** that in both seasons, the highest value of leaf manganese content was obtained from 75 ppm "GA_3" (31.33 and 29.67) followed by 50 ppm "GA_3" (30.67 and 27.67) and 300 ml/l "yeast extract" (29.00 and 25.33). On the other hand, the lowest value of leaf manganese content was obtained from "control" (20.33 and 18.33) followed by 0.5 ml/l "amino power" (23.33 and 21.33), 0.5 g/l "best flowers" (24.33 and 19.33) and 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" during the first and second season, respectively.

In this respect the present result is in agreement with that reported by **Abd El-Rahman (2003)** who mentioned that leaf N, Ca, Fe, Mn and Zn content of Washington navel orange trees

Table (6): Some micro-nutrients contents (Fe, Zn and Mn) in leaves of Washington Navel orange Cv., as influenced by some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	Fe (ppm)		Zn (ppm)		Mn (ppm)	
	2008	**2009**	**2008**	**2009**	**2008**	**2009**
Spray tap water (control)	42.67e	39.33e	25.33d	19.67e	20.33e	18.33e
Spray GA_3 at 50 ppm	50.00ab	59.33a	44.67a	29.67a	30.67a	27.67ab
Spray GA_3 at 75 ppm	51.67a	61.67a	47.00a	30.67a	31.33a	29.67a
Spray yeast extract at 150 ml/l	49.00a-c	54.33b	35.67b	28.67ab	28.67a-c	23.67c-e
Spray yeast extract at 300 ml/l	50.33ab	60.67a	34.67bc	29.33ab	29.00ab	25.33bc
Spray best flowers at 0.5 g/l	45.00c-e	41.33de	29.67cd	22.33de	24.33d	19.33e
Spray best flowers at 1.0 g/l	46.00b-e	45.67cd	33.33bc	26.67a-c	27.00b-d	21.67c-e
Spray amino power at 0.5 ml/l	44.00de	39.33e	34.33bc	24.33cd	23.33de	21.33de
Spray amino power at 1.0 ml/l	47.33a-d	47.33c	34.67bc	25.33b-d	24.33d	22.00c-e
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	44.33de	40.00e	27.00d	21.67de	25.00cd	19.67e

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

were significantly maximized when the trees were sprayed with GA_3. on the other hand, **El-Saida (2007)** reported that spraying navel orange trees with active dry yeast led to elevate N, P, Ca, Mg, Fe, Zn and Mn concentrations in the leaves. The same result was obtained by **Bakry (2007)** on Java orange trees.

IV.1.3- Fruiting parameters:

IV.1.3.1- Fruit set (%).

Table (7) shows that, the highest fruit set percentage of the first and second seasons was obtained from spraying trees with GA_3 (at 50 ppm) + yeast (at 150 ml/l) + Best flower (at 0.5 g/l) + Amino power (at 0.5 ml/l) and yeast extract 300 ml/l. on the other hand, the lowest fruits set percentages were obtained when the trees were sprayed with best flower at 0.5 g/l and GA_3 at 50 ppm treatments compared with the control. Meanwhile, the differences between all used treatments were significant as each treatment compared with the control.

These results are in agreement with the findings of **Atawia and El-Desouky (1997).**

IV.1.3.2- Remaining fruits after June drop.

Regarding the data obtained during the both seasons as shown in **Table (7)** pointed out that remaining fruits after June drop and yield the percentages of mature fruits followed the same trend and significantly compared with the control.

The obtained result is in general agreement with the findings of **Atawia (1984) and Atawia and El-Desouky (1997).**

Table (7): Effect of foliar sprays by some stimulative compounds on fruit set, remaining fruits after June drop and yield of Washington Navel orange Cv., trees during 2008 and 2009 seasons.

Treatments	Fruit set %		Remain fruits after June drop %		Mature fruits (%)		Yield (kg/tree)		Yield increment (%) over the control	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Spray tap water (control)	3.75f	3.64e	2.59e	2.26d	3.45d	2.46a	42.90d	48.00e	0.00h	0.00i
Spray GA_3 at 50 ppm	5.63e	4.93d	3.92d	3.13c	5.63c	4.90d	50.30c	52.00d	17.25f	8.33h
Spray GA_3 at 75 ppm	6.32cd	6.10c	4.43cd	3.90bc	6.78c	5.88cd	52.60bc	53.00cd	22.61d	10.42g
Spray yeast extract at 150 ml/l	6.73bc	6.96b	5.39ab	4.25ab	8.92ab	5.92cd	53.00bc	53.00cd	23.54c	10.45g
Spray yeast extract at 300 ml/l	7.42a	8.02a	5.54a	4.89a	9.85a	9.64a	65.00a	70.67a	51.52b	47.23b
Spray best flowers at 0.5 g/l	6.57cd	5.94c	4.83bc	3.42c	7.75bc	4.92d	50.00c	54.00cd	16.55g	12.50f
Spray best flowers at 1.0 g/l	7.29ab	7.36ab	5.51ab	4.23ab	8.90ab	6.98a	53.00bc	55.00cd	23.54c	14.58e
Spray amino power at 0.5 ml/l	6.06de	7.00b	4.30cd	3.27c	6.85c	6.26cd	51.33c	56.00c	19.65e	16.67d
Spray amino power at 1.0 ml/l	7.16ab	7.68a	5.25ab	3.89bc	8.79ab	7.89b	53.00bc	62.00b	23.54c	29.17c
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	7.32a	7.94a	5.52a	4.81a	10.71a	9.86a	66.67a	72.00a	55.41a	50.00a

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

IV.1.3.3- Yield (kg/tree) and yield increment % in relation to the control.

Data tabulated in Table (7) displayed clearly that, both yield as (kg/tree) and yield increment percentage in relation to the control were responded significantly to all used treatments as compared to the control during the two seasons of study. Furthermore, the greatest statistically values of both yield parameters were resulted from Washington Navel orange trees being sprayed with GA3 (50 ppm) + yeast extract (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 g/l) followed by yeast extract at 300 ml/l treatments as compared with either the control or other investigated treatments. On the other hand, the opposite trend was detected with water sprayed trees (control) which reflected significantly the lowest value of tree yield (as kg). also, the response of the yield increment percentage in relation to the control was typically followed the same trend previously detected with the abovementioned parameter (yield as kg/tree). In addition to that, other treatments gave intermediate values in both 2008 and 2009 seasons for both yield parameters.

IV.1.4.1- Fruit quality (properties):

IV.1.4.1.a- Average fruit weight (g.).

It is obvious from **Table (8)** that in both seasons, the highest average weight of fruit was obtained from 75 ppm "GA_3" (252.0 and 255.3) followed by 300 "yeast extract" (221.0 and 232.5) and 50 ppm "GA_3" (218.0 and 229.1). On the other hand, the lowest average weight of fruit was obtained from "control" (168.5 and 169.5) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (180.5 and 199.2), 0.5 g/l "best flowers" (190.1 and 132.8) and 0.5 ml/l "amino power" (200.0 and 200.0) during the first and second season, respectively.

IV.1.4.1.b- Average fruit volume (ml).

It is clear from **Table (8)** that in both seasons, the highest average volume of fruit was obtained from 75 ppm "GA_3" (0.167 and 0.167) followed by 300 ml/l "yeast extract" (0.157 and 0.167) and 50 ppm "GA_3" (0.152 and 0.155). On the contrary, the lowest average volume of fruit was obtained from "control" (0.061 and 0.048) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (0.118 and 0.134), 0.5 ml/l "amino bower" (0.121 and 0.137) and 0.5 g/l "best flowers" (0.141 and 0.137) during the first and second season, respectively.

IV.1.4.1.c- Average fruit length (cm).

It is obvious from **Table (8)** that in both seasons, the highest average length of fruit was obtained from 75 ppm "GA_3" (7.34 and 7.13) followed by 50 ppm "GA_3" (6.60 ad 6.98) and 300 ml/l "yeast extract" (6.58 and 6.82). On the other hand, the lowest average length of fruit was obtained from "control" (5.94 and 6.12) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (6.11 and 6.14), 0.5 g/l "best flowers" (6.36 and 6.30) and 0.5 ml/l amino power" (6.43 and 6.45) during the first and second season, respectively.

IV.1.4.1.d- Average fruit diameter (cm).

It is clear from **Table (8)** that in both seasons, the highest average diameter of fruit was obtained from 75 ppm "GA_3" (7.25 and 7.38) followed by 50 ppm "GA_3" (6.94 and 6.62), 300 ml/l "yeast extract" (6.58 and 6.45) and 150 ml/ yeast extract (6.53 and 6.44). On the contrary, the lowest average diameter of fruit was obtained from "control" (6.02 and 5.80) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5

Table (8): Some fruit physical properties (average fruit weight, volume, length and diameter) of Washington Navel orange Cv., in response to some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	Average fruit weight (g.)		Average fruit volume (ml^3)		Average fruit length (cm.)		Average fruit diameter (cm.)	
	2008	2009	2008	2009	2008	2009	2008	2009
Spray tap water (control)	168.5e	169.5f	0.061d	0.048	5.94d	6.12f	6.02d	5.80f
Spray GA_3 at 50 ppm	218.0bc	229.1bc	0.152ab	0.155ab	6.60b	6.98ab	6.94ab	6.62b
Spray GA_3 at 75 ppm	252.0a	255.3a	0.167a	0.167a	7.34a	7.13a	7.25a	7.38a
Spray yeast extract at 150 ml/l	214.1bc	218.0cd	0.152ab	0.147bc	6.51b	6.69b-d	6.53bc	6.44bc
Spray yeast extract at 300 ml/l	221.0b	232.5b	0.157ab	0.167a	6.58b	6.82a-c	6.58bc	6.45bc
Spray best flowers at 0.5 g/l	190.1c-e	132.8e	0.141b	0.137bc	6.36bc	6.30ef	6.40cd	6.01d-f
Spray best flowers at 1.0 g/l	204.0b-d	140.7de	0.142b	0.137bc	6.48b	6.45d-f	6.47b-d	6.23c-e
Spray amino power at 0.5 ml/l	200.0b-d	200.0e	0.121c	0.137bc	6.43b	6.45d-f	6.41cd	6.21c-e
Spray amino power at 1.0 ml/l	211.1bc	212.0de	0.142b	0.143bc	6.49b	6.63c-e	6.49b-d	6.32b-d
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	180.5de	199.2e	0.118c	0.134c	6.11cd	6.14f	6.25cd	5.99ef

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

ml/l "amino power" (6.25 and 5.99), 0.5 g/l "best flowers" (6.40 and 6.01) and 0.5 ml/l "amino power" (6.41 and 6.21) during the first and second season, respectively.

IV.1.4.1.e- Average peel thickness.

It is obvious from **Table (9)** that in both seasons, the highest average thickness of peel was obtained from 75 ppm "GA_3" (3.93 and 4.47) followed by 300 ml/l "yeast extract" (4.13 and 4.77) and 50 ppm "GA_3" (3.90 and 4.30). On the other hand, the lowest average thickness of peel was obtained from "control" (3.50 and 3.63) followed by 0.5 g/l "best flowers" (3.70 and 4.10), 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (3.63 and 4.03) and 1.0 ml/l "amino power" (3.83 and 4.27) during the first and second season, respectively.

IV.1.4.1.f- Average juice weight (g.).

It is obvious from **Table (9)** that in both seasons, the highest average weight of juice was obtained from 75 ppm "GA_3" (80.00 and 78.33) followed by 300 "yeast extract" (68.17 and 70.17) and 50 ppm "GA_3" (64.00 and 65.33). On the other hand, the lowest average weight of juice was obtained from "control" (46.50 and 48.83) followed by 0.5 g/l "best flowers" (57.50 and 52.00), 0.5 ml/l "amino power" (56.83 and 56.67) and 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (56.83 and 59.67) during the first and second season, respectively.

IV.1.4.1.g- Average juice volume (ml).

It is clear from **Table (9)** that in both seasons, the highest average volume of juice was obtained from 75 ppm "GA_3" (89.60 and 91.20) followed by 300 ml/l "yeast extract" (80.40 and 82.20) and 50 ppm "GA_3" (78.00 and 75.60).

Table (9): Some fruit physical properties (average peel thickness, juice weight and volume) of Washington Navel orange Cv., in response to some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	Average peel thickness (mm)		Average juice weight (gm/fruit)		Average juice volume (ml^3/fruit)	
	2008	2009	2008	2009	2008	2009
Spray tap water (control)	3.50g	3.63c	46.50f	48.83e	56.00f	57.60f
Spray GA_3 at 50 ppm	3.90b	4.30ab	64.00c	65.33bc	78.00bc	75.60bc
Spray GA_3 at 75 ppm	3.93b	4.47ab	80.00a	78.33a	89.60a	91.20a
Spray yeast extract at 150 ml/l	3.93b	4.37ab	63.00cd	63.17b-d	63.00c	72.20b-d
Spray yeast extract at 300 ml/l	4.13a	4.77a	68.17b	70.17ab	80.40b	82.20ab
Spray best flowers at 0.5 g/l	3.70ef	4.10bc	57.50e	52.00de	64.00e	63.00d-f
Spray best flowers at 1.0 g/l	3.80cd	4.17bc	58.67e	59.67b-e	69.60d	70.40c-e
Spray amino power at 0.5 ml/l	3.7.3de	4.20a-c	56.83e	56.67c-e	69.00d	68.20c-f
Spray amino power at 1.0 ml/l	3.83bc	4.27ab	59.67de	59.33b-e	71.20d	68.80c-f
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	3.63f	4.03bc	56.83e	59.67b-e	65.20e	60.40ef

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

On the contrary, the lowest average volume of juice was obtained from "control" (56.00 and 57.60) followed by 0.5 g/l "best flowers" (64.00 and 63.00), 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (65.20 and 60.40), 0.5 ml/l "amino bower" (69.00 and 68.20) during the first and second season, respectively.

These results are in agreement with the findings of **Mansour (1998)** on Anna apple and **Tawfik (2001)** on Balady mandarin trees.

IV.1.4.2- Fruit chemical properties:

IV.1.4.2.a- Total soluble solids (%) (T.S.S).

It is clear from **Table (10)** that the highest values of T.S.S. in the first season were obtained from 0.5 ml/l "amino power" followed by 300 ml/l "yeast extract", 1.0 ml/l "amino power" and 50 ppm "GA_3". Meanwhile, the lowest values of T.S.S. in the first season were obtained from 75 ppm "GA_3" followed by 150 ml/l "yeast extract", 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" and "control". On the contrary, the highest values of T.S.S. in the second season were obtained from 1.0 ml/l "amino power" followed by 300 ml/l "yeast extract", 50 ppm "GA_3", "control" and 50 ppm "GA_3" + 150 ml/l "yeast extract" +0.5 g/l "best flower" + 0.5 ml "amino power". Meanwhile, the lowest values of T.S.S. in the second season were obtained from 75 ppm "GA_3" followed by 150 ml/l "yeast extract" and 0.5 ml/l "amino power".

IV.1.4.2.b- Total acidity (%).

It is clear from **Table (10)** that in both seasons, the highest values of acidity were obtained from 1.0 ml/l "amino

power" (1.363 and 0.620) followed by 1.0 g/l "best flower" (1.273 and 0.593) and 0.5 ml/l "amino power" (1.267 and 0.573). On the other hand, the lowest values of acidity were obtained from 150 ml/l "yeast extract" (0.540 and 0.513) and 0.5 g/l "best flowers" (0.593 and 0.583) during the first and second season, respectively.

IV.1.4.2.c- TSS/acidity ratio.

It is clear from **Table (10)** that in both seasons, the highest values of TSS/acidity were obtained from 150 ml/l "yeast extract" (2.25 and 2.37) followed by 300 ml/l "yeast extract" (2.16 and 2.21) and 0.5 g./l "best flowers" (2.15 and 2.18). On the other hand, the lowest values of TSS/ acidity were obtained from 1.0 ml/l "amino power" (0.967 and 2.21) followed by 1.0 g/l "best flowers" (0.992 and 2.14) and 0.5 ml/l "amino power" (1.08 and 2.16) during the first and second season, respectively.

IV.1.4.2.d- L ascorbic acid.

It is obvious from **Table (10)** that in both seasons, the highest values of L ascorbic acid were obtained from 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml "amino power" (4.97 and 4.93) followed by 1.0 g/l "best flowers" (4.43 and 4.40), 50 ppm "GA_3" (4.50 and 4.27) and 300 ml/l "yeast extract" (4.47 and 4.27). On the contrary, the lowest values of L ascorbic acid were obtained from "75" ppm "GA_3" (3.90 and 3.73) followed by "control" (3.93 and 4.13), 0.5 g./l "best flowers" (4.10 and 3.93) during the first and second season, respectively.

Table (10): Some fruit chemical properties (T.S.S, acidity, TSS/acid ratio and vitamin C) of Washington Navel orange Cv., in response to some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	T.S.S %		Acidity %		TSS/acidity ratio		L. ascorbic acid (mg/100 ml juice)	
	2008	2009	2008	2009	2008	2009	2008	2009
Spray tap water (control)	12.60c-e	12.73c	0.620cd	0.627a	2.03ab	2.03b	3.93c	4.13bc
Spray GA_3 at 50 ppm	13.03bc	12.73c	0.617cd	0.600a	2.14ab	2.15ab	4.50b	4.27bc
Spray GA_3 at 75 ppm	12.07f	12.00d	0.593cd	0.600a	2.04ab	2.00b	3.90c	3.73d
Spray yeast extract at 150 ml/l	12.17ef	12.13d	0.540d	0.513b	2.25a	2.37a	4.37b	4.23bc
Spray yeast extract at 300 ml/l	13.23ab	13.20b	0.620cd	0.613a	2.16ab	2.21ab	4.47b	4.27bc
Spray best flowers at 0.5 g/l	12.70cd	12.70c	0.593cd	0.583ab	2.15ab	2.18ab	4.10bc	3.93cd
Spray best flowers at 1.0 g/l	12.63cd	12.67c	1.273b	0.593a	0.992c	2.14ab	4.43b	4.40b
Spray amino power at 0.5 ml/l	13.60a	12.33cd	1.257b	0.573ab	1.08c	2.16ab	4.13bc	4.07bc
Spray amino power at 1.0 ml/l	13.17ab	13.67a	1.363a	0.620a	0.967c	2.21ab	4.23bc	4.20bc
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	12.53de	12.73c	0.653c	0.620a	1.92b	2.06b	4.97a	4.93a

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

Data of the present study, concerning the effect of GA_3 and yeast extract sprays on fruit chemical properties of Valencia orange agree with those obtained by **Mansour (1998)** on Anna apple and **Badawy-Sabah (2005)** on Balady mandarin trees.

IV.2- Valencia orange.

IV.2.1- Vegetative growth measurements:

IV.2.1.1- Shoot length (cm.).

It is obvious from **Table (11)** that in both seasons, the highest shoot length was obtained from 75 ppm "GA_3" (14.33 and 13.33) followed by 50 ppm "GA_3" (14.00 and 12.67) and 300 ml/l "yeast extract" (11.33 and 12.67). On the contrary, the lowest length of shoot was obtained from "control" (9.33 and 10.00) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" 0.5 g/l "best flower" + 0.5 ml/l "amino power" (9.33 and 10.00), 0.5 g/l "best flowers" (10.00 and 10.67) and 0.5 ml/l "amino power" (10.33 and 11.33) during the first and second season, respectively.

This result is in agreement with that reported by **Vu and Yelenosky (1988)** on rough lemon and **Fawzi and Eman (2004)** on Flame seedless grapevines.

IV.2.1.2- Leaf area (cm.).

It is clear from **Table (11)** that in both seasons, the largest leaf area was obtained from 75 ppm "GA_3" (37.67 and 38.33) followed by 300 ml/l "yeast extract" (33.00 and 37.67) and 150 ml/l "yeast extract" (30.33 and 34.00). On the other hand, the lowest leaf area was obtained from "control" (24.67 and 28.33) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (24.67 and 28.33), 0.5 g/l "best flowers" (26.67 and 29.67) and 0.5 ml/l "amino power"

Table (11): Some vegetative growth measurements (shoot length, leaf area and leaf dry weight of leaf) Valenica orange Cv., in response to some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	Shoot length (cm.)		Leaf area (cm^2)		Dry weight of leaf (mg.)	
	2008	2009	2008	2009	2008	2009
Spray tap water (control)	9.33c	10.00c	24.67d	28.33d	333.7d	233.0e
Spray GA_3 at 50 ppm	14.00a	12.67ab	29.00b-d	35.33ab	349.0ab	253.7bc
Spray GA_3 at 75 ppm	14.33a	13.33a	37.67a	38.33a	355.3a	264.7a
Spray yeast extract at 150 ml/l	11.00bc	11.33bc	30.33bc	34.00b	347.7ab	253.3bc
Spray yeast extract at 300 ml/l	11.33b	12.67ab	33.00b	37.67a	355.7a	260.3ab
Spray best flowers at 0.5 g/l	10.00bc	10.67c	26.67cd	29.67d	339.7b-d	242.7d
Spray best flowers at 1.0 g/l	10.67bc	11.33bc	27.67cd	33.00bc	335.0cd	244.0d
Spray amino power at 0.5 ml/l	10.33bc	11.33bc	25.33d	30.00cd	335.3cd	243.7d
Spray amino power at 1.0 ml/l	11.00bc	11.33bc	28.00cd	33.67b	347.7ab	251.3c
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	9.33c	10.00c	24.67d	28.33d	345.0bc	233.3e

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

(25.33 and 30.00) during the first and second season, respectively.

These results are in harmony with those obtained by **Hegab *et al.*, (1997)** on Valencia orange trees and **Fawzi and Eman (2004)** on Flame seedless grapevines.

IV.2.1.3- Leaf dry weight (mg.).

It is obvious from **Table (11)** that in both seasons, the highest dry weight of leaf was obtained from 75 ppm "GA_3" (355.3 and 264.3) followed by 300 ml/l "yeast extract" (355.7 and 260.3) and 50 ppm "GA_3" (249.0 and 253.7). On the contrary, the lowest dry weight of leaf was obtained from "control" (333.7 and 233.0) followed by 1.0 g./l "best flowers" (335.0 and 244.0) and 0.5 ml/l "amino power" (335.3 and 243.7) during the first and second season, respectively.

These results confirmed that reported by **Singh *et* al., (2000)** on Volkamarian rootstock as well as **Omran and Abd El-Latif (2003)** on Red Roomy grapevines. They reported that spraying with GA_3 or active dry yeast significantly increased dry weight of different plant organs.

IV.2.2- Leaf mineral composition

IV.2.2.1- Nitrogen (%).

It is obvious from **Table (12)** that, in both seasons, the highest value of leaf nitrogen content was obtained from 75 ppm "GA_3" (2.91 and 2.43) followed by 300 ml/l "yeast extract" (2.87 and 2.43) and 50 ppm "GA_3" (2.77 an 2.38). On the other hand, the lowest value of leaf nitrogen content was obtained from "control" (2.12 and 2.22) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (2.12 and 2.31), 0.5 ml/l "amino power" (2.17 and 2.30)

and 0.5 g/l "best flowers" (2.20 and 2.31) during the first and second season, respectively.

IV.2.2.2- Phosphorus (%).

It is clear from **Table (12)** that, in both seasons, the highest value of leaf phosphorus content was obtained from 75 ppm "GA_3" (0.210 and 0.310) followed by 50 ppm "GA_3" (0.190 and 0.270) and 300 ml/l "yeast extract" (0.153 and 0.213). On the contrary, the lowest value of leaf phosphorus content was obtained from "control" (0.110 and 0.130) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (0.113 and 0.133), 0.5 ml/l "amino power" (0.117 and 0.147) and 0.5 g/l "best flowers" (0.127 and 0.157) during the first and second season, respectively.

IV.2.2.3- Potassium (%).

It is obvious from **Table (12)** that, in both seasons, the highest value of leaf potassium content was obtained from 75 ppm "GA_3" (1.42 and 1.40) followed by 50 ppm "GA_3" (1.37 and 1.39), 300 ml/l "yeast extract" (1.34 and 1.34). On the other hand, the lowest value of leaf potassium content was obtained from "control" (1.13 and 1.19) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower + 0.5 ml/l "amino power" (1.15 and 1.20), 0.5 ml/l "amino power" (1.18 and 1.20) and 0.5 g/l "best flowers" (1.20 and 1.21) during the first and second season, respectively.

IV.2.2.4- Calcium (%).

It is clear from **Table (12)** that, in the first season, the highest value of leaf calcium content was obtained from 0.5 g/l "best flower" (4.28 and 4.40) and 0.5 ml/l "amino power" (4.16 and 4.29). On the contrary, the lowest value of leaf calcium

Table (12): Some macro-nutrients contents (N, P, K, Ca and Mg) in leaves of Valencia orange Cv., as influenced by some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	N (%)		P (%)		K (%)		Ca (%)		Mg (%)	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Spray tap water (control)	2.12f	2.22c	0.110f	0.130f	1.13e	1.19f	3.19g	3.33f	0.297d	0.233g
Spray GA_3 at 50 ppm	2.77b	2.38a	0.190b	0.270b	1.37ab	1.39a	3.33de	3.36d-f	0.370ab	0.330c
Spray GA_3 at 75 ppm	2.91a	2.43a	0.210a	0.310a	1.42a	1.40a	3.39d	3.43c-e	0.380a	0.410a
Spray yeast extract at 150 ml/l	2.73b	2.32b	0.150cd	0.207c	1.31c	1.32c	3.28ef	3.42c-e	0.373ab	0.333c
Spray yeast extract at 300 ml/l	2.87a	2.43a	0.153c	0.213c	1.34bc	1.34b	3.40d	3.44c	0.380a	0.367b
Spray best flowers at 0.5 g/l	2.20e	2.31b	0.127ef	0.157de	1.20d	1.21f	4.28a	4.40a	0.317b-d	0.280de
Spray best flowers at 1.0 g/l	2.27d	2.31b	0.133de	0.163de	1.20d	1.27e	3.86c	3.44cd	0.370ab	0.297d
Spray amino power at 0.5 ml/l	2.17ef	2.30b	0.117ef	0.147ef	1.18de	1.20f	4.16b	4.29b	0.287d	0.263ef
Spray amino power at 1.0 ml/l	2.32c	2.32b	0.150cd	0.170d	1.29c	1.30d	3.79c	3.44cd	0.357a-c	0.337c
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	2.12f	2.31b	0.113f	0.133f	1.15de	1.20f	3.21fg	3.35ef	0.300cd	0.260f

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

content was obtained from "control" (3.19 and 3.33 and 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (3.21 and 3.35) during the first and second season, respectively.

IV.2.2.5- Magnesium (%).

It is obvious from **Table (12)** that in both seasons, the highest value of leaf magnesium content was obtained from 75 ppm "GA_3" (0.380 and 0.410) followed by 300 ml/l "yeast extract" (0.380 and 0.367) and 150 ml/l "yeast extract" (0.373 and 0.333). On the other hand, the lowest value of leaf magnesium content was obtained from "control" (0.297 and 0.233) followed by 0.5 ml/l "amino power" (0.287 and 0.263), 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (0.300 and 0.260), 0.5 g/l "best flowers" (0.317 and 0.280) during the first and second season, respectively.

IV.2.2.6- Iron (ppm).

It is clear from **Table (13)** that in both seasons, the highest value of leaf iron content was obtained from 75 ppm "GA_3" (53.33 and 56.33) followed by 150 ml/l "yeast extract" (51.33 and 42.67) and 300 ml/l "yeast extract" (48.33 and 51.33). On the contrary, the lowest value of leaf iron content was obtained from "control" (39.33 and 38.67) followed by 0.5 ml/l "amino power" (39.67 and 39.00), 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flowers" (41.67 and 40.00) during the first and second season, respectively.

IV.2.2.7- Zinc (ppm).

It is clear from **Table (13)** that in both seasons, the highest value of leaf zinc content was obtained from 75 ppm

"GA_3" (35.33 and 35.67) followed by 50 ppm "GA_3" (33.33 and 34.33) and 300 ml/l "yeast extract" (32.67 and 30.67). On the contrary, the lowest value of leaf zinc content was obtained from "control" (18.67.33 and 19.00) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (20.33 and 19.33), 0.5 g/l "best flowers" (21.33 and 19.67) and 0.5 ml/l "amino power" (25.33 and 20.33) during the first and second season, respectively.

IV.2.2.8- Manganese (ppm).

It is obvious from **Table (13)** that in both seasons, the highest value of leaf manganese content was obtained from 75 ppm "GA_3" (31.33 and 29.67) followed by 75 ppm "GA_3" (34.00 and 26.67) followed by 50 ppm "GA_3" (33.33 and 22.33) and 300 ml/l "yeast extract" (31.33 and 26.00). On the other hand, the lowest value of leaf manganese content was obtained from "control" (19.33 and 22.33) followed by 0.5 g/l "best flowers" (20.00 and 22.67), 0.5 ml/l "amino power" (20.67 and 22.67) and 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (26.33 and 22.67) during the first and second season, respectively.

In this respect the present result is in agreement with that reported by **Abd El-Rahman (2003)** who mentioned that leaf N, Ca, Fe, Mn and Zn content of Washington navel orange trees were significantly maximized when the trees were sprayed with GA_3. on the other hand, **El-Saida (2007)** reported that spraying navel orange trees with active dry yeast led to elevate N, P, Ca, Mg, Fe, Zn and Mn concentrations in the leaves. The same result was obtained by **Bakry (2007)** on Java orange trees.

Table (13): Some micro-nutrients contents (Fe, Zn and Mn) in leaves of Valencia orange Cv., as influenced by some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	Fe (ppm)		Zn (ppm)		Mn (ppm)	
	2008	2009	2008	2009	2008	2009
Spray tap water (control)	39.33f	38.67e	18.67e	19.00e	19.33c	22.33b
Spray GA_3 at 50 ppm	48.67c	46.33c	33.33ab	34.33a	33.33a	26.33a
Spray GA_3 at 75 ppm	53.33a	56.33a	35.33a	35.67a	34.00a	26.67a
Spray yeast extract at 150 ml/l	51.33b	42.67c-e	29.67bc	28.00c	27.67b	26.00a
Spray yeast extract at 300 ml/l	48.33c	51.33b	32.67ab	30.67b	31.33a	26.00a
Spray best flowers at 0.5 g/l	41.67de	40.00de	21.33e	19.67e	20.00c	22.67b
Spray best flowers at 1.0 g/l	42.00de	40.00de	25.67cd	20.67de	27.67b	24.67ab
Spray amino power at 0.5 ml/l	39.67f	39.00e	25.33d	20.33de	20.67c	22.67b
Spray amino power at 1.0 ml/l	42.67d	43.33cd	29.67bc	23.00d	31.33a	25.33a
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	40.33ef	41.33de	20.33e	19.33e	26.33b	22.67b

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

IV.2.3- Fruiting parameters:

IV.2.3.1- Fruit set (%):

It is obvious from **Table (14)** from sprayed trees with yeast extract 300 ml/l (17.00 & 21.64) followed by spraying trees with GA_3 (at 50 ppm) + yeast (at 150 ml/l) + Best flower (at 0.5 g/l) + Amino power (at 0.5 ml/l) (17.33 & 21.67), respectively. On the other hand, the remaining treatments were intermediate between the two mentioned treatment and the control.

IV.2.3.2- Remaining fruits after June drop:

It is clear from **Table (14)** that, in both seasons the highest values of remaining fruits after June drop were obtained when Valencia orange trees were sprayed with yeast extract with 300 ml/l (22.67 & 26.67) followed by spraying trees with GA_3 (at 50 ppm) + yeast (at 150 ml/l) + Best flower (at 0.5 g/l) + Amino power (at 0.5 ml/l) (22.50 &26.00) for both seasons, respectively.

IV.2.3.3- Yield (kg/tree) and yield increment % in relation to the control.

Referring of spraying Valencia orange trees with different stimulative compounds on the mature fruits and the yield as kg/tree were obtained in **Table (14)** it is quite obvious that, generally the superiority treatment of both season was obtained when the trees sprayed with spraying trees with GA_3 (at 50 ppm) + yeast (at 150 ml/l) + Best flower (at 0.5 g/l) + Amino power (at 0.5 ml/l) (13.67 & 17.00) and (84.67 & 82.33), respectively.

On the other hand, GA_3 at 50 ppm treatments gave the lowest values of mature fruit percentage and the yield as kg/tree (6.67 & 10.00) (62.33 & 60.67), respectively.

Table (14): Effect of foliar sprays by some stimulative compounds on fruit set, remaining fruits after June drop and yield of Valencia orange trees during 2008 and 2009 seasons.

Treatments	Fruit set %		Remain fruits after June drop %		Mature fruits (%)		Yield (kg/tree)		Yield increment (%) over the control	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Spray tap water (control)	8.33g	11.67f	13.33f	16.33f	5.00f	8.00g	60.00g	53.67f	0.00i	0.00h
Spray GA_3 at 50 ppm	10.33ef	14.67e	17.00d	20.00e	6.67e	10.00f	62.33fg	60.67e	3.88h	13.04g
Spray GA_3 at 75 ppm	12.67cd	18.00cd	19.67c	23.33cd	9.67d	12.33e	65.67e	64.33d	9.45f	19.86f
Spray yeast extract at 150 ml/l	14.67cd	19.33bc	20.67bc	25.33ab	12.33ab	14.67b-d	81.00b	75.67b	35.00c	40.99c
Spray yeast extract at 300 ml/l	17.00a	21.67a	22.67a	26.67a	13.88a	16.85a	83.67a	81.33a	39.45b	51.54b
Spray best flowers at 0.5 g/l	9.33fg	17.00d	17.00d	21.00e	7.33e	12.33e	63.00f	65.00d	5.00g	21.11e
Spray best flowers at 1.0 g/l	14.00bc	18.67b-d	19.33c	23.37b-d	10.33cd	13.33de	71.67c	70.00c	19.45d	30.43d
Spray amino power at 0.5 ml/l	11.33de	17.67cd	19.00c	23.00d	10.00d	14.33cd	67.33d	70.33c	12.22e	31.04d
Spray amino power at 1.0 ml/l	13.33bc	20.00ab	20.00c	25.00a-c	10.67b-d	15.33bc	71.67c	75.67b	19.45d	40.99c
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	17.33a	21.67a	22.50a	26.00a	13.67a	17.00a	84.67a	82.33a	41.12a	53.40a

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

Considering the tree yield (kg) of Valencia orange in response to the investigated treatments, data represented in Table (14) disclosed clearly that, all treatments were used in this study gave a significant increase in yield per three in both 2008 and 2009 seasons as compared to watered trees (control). The highest yield in this respect resulted from trees sprayed with (GA_3 at 50 ppm + yeast extract at 150 ml/l + best flower at 0.5 g/l + amino power at 0.5 ml/l) followed by yeast extract at 300 ml/l treatments, respectively during both seasons of study.

With regard to the yield increment percentage as compared with yield of control trees, it is obvious from data in the same Table that, nearly a similar trend to that found with tree yield was detected during both 2008 and 2009 seasons.

Data of the present study, concerning of the effect of GA_3 and yeast extract sprays on fruit set, remaining fruit June drop and yield of Valencia orange trees agree with **Smith (1992), El-Desouky (1997) and Bakry (2007).**

IV.2.4- Fruit physical properties:

IV.2.4.1- Average fruit weight (g.).

It is obvious from **Table (15)** that in both seasons, the highest average weight of fruit was obtained from 75 ppm "GA_3" (316.6 and 322.0) followed by 300 "yeast extract" (302.5 and 321.5) and 50 ppm "GA_3" (294.7 and 312.0). On the other hand, the lowest average weight of fruit was obtained from "control" (189.4 and 208.0) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (195.3 and 222.7), 0.5 g/l "best flowers" (212.9 and 250.9) and 0.5 ml/l "amino power" (262.6 and 236.2) during the first and second season, respectively.

IV.2.4.2- Average fruit volume (ml).

It is clear from **Table (15)** that in both seasons, the highest average volume of fruit was obtained from 75 ppm "GA_3" followed by 300 ml/l "yeast extract" and 150 ml/l "yeast extract". Meanwhile, the lowest average volume of fruit in the first season was obtained from "control" followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" and 0.5 ml/l "amino bower". On the contrary, the highest average volume of fruit in the second season was obtained from 300 ml/l "yeast extract" followed by 75 ppm "GA_3", 150 ml/l yeast extract" and 50 ppm "GA_3". Meanwhile, the lowest average volume of fruit in the second season was obtained from "control" and 50 ppm "GA_3" + 150 ml/l yeast extract + 0.5 g./l "best flower" + 0.5 ml/l "amino power".

IV.2.4.3- Average fruit length (cm).

It is obvious from **Table (15)** that in both seasons, the highest average length of fruit was obtained from 75 ppm "GA_3" (7.63 and 8.37) followed by 300 ml/l "yeast extract" (7.54 and 7.91) and 50 ppm "GA_3" (7.64 ad 7.78). On the other hand, the lowest average length of fruit was obtained from "control" (6.51 and 6.65) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (6.59 and 6.82), 0.5 ml/l amino power" (7.01 and 7.00) and 0.5 g/l "best flowers" (7.39 and 7.48) during the first and second season, respectively.

IV.2.4.4- Average fruit diameter (cm).

It is clear from **Table (15)** that in both seasons, the highest average diameter of fruit was obtained from 75 ppm "GA_3" (7.61 and 7.54) followed by 50 ppm "GA_3" (7.61 and 7.41) and 300 ml/l "yeast extract" (7.60 and 7.37). On the

Table (15): Some fruit characteristics (average fruit weight, volume, length and diameter) of Valenica orange Cv., in response to some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	Average fruit weight (g.)		Average fruit volume (ml^3)		Average fruit length (cm.)		Average fruit diameter (cm.)	
	2008	2009	2008	2009	2008	2009	2008	2009
Spray tap water (control)	189.4f	208.0e	0.161e	0.159d	6.51c	6.65c	6.23d	6.22f
Spray GA_3 at 50 ppm	294.7bc	312.0ab	0.227ab	0.230b	7.64a	7.78b	7.61a	7.41b
Spray GA_3 at 75 ppm	316.6a	322.0a	0.243a	0.243ab	7.63a	8.37a	7.61a	7.54a
Spray yeast extract at 150 ml/l	287.6bc	306.8ab	0.234ab	0.231b	7.54a	7.75b	7.47a	7.37b
Spray yeast extract at 300 ml/l	302.5ab	321.5a	0.239ab	0.255a	7.54a	7.91b	7.60a	7.37b
Spray best flowers at 0.5 g/l	212.9e	250.9c	0.205c	0.197c	7.39a	7.48b	7.34a	7.03d
Spray best flowers at 1.0 g/l	276.9cd	292.1b	0.226ab	0.227b	7.53a	7.59a	7.53a	7.17c
Spray amino power at 0.5 ml/l	262.6d	236.2cd	0.180d	0.204c	7.01b	7.00c	6.92b	6.60e
Spray amino power at 1.0 ml/l	282.5b-d	303.3ab	0.221bc	0.224b	7.59a	7.64b	7.40a	7.10cd
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	195.3ef	222.7de	0.165de	0.170d	6.59c	6.82c	6.64c	6.51e

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

contrary, the lowest average diameter of fruit was obtained from "control" (6.23 and 6.22) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (6.64 and 6.51), 0.5 ml/l "amino power" (6.92 and 6.60) and 0.5 g/l "best flowers" (7.34 and 7.03) during the first and second season, respectively.

IV.2.4.5- Average peel thickness.

It is obvious from **Table (16)** that in both seasons, the highest average thickness of peel was obtained from 300 ml/l "yeast extract" (4.27 and 4.67) followed by 75 ppm "GA_3" (4.40 and 5.37) and 150 ml/l "yeast extract" (3.97 and 4.40). On the other hand, the lowest average thickness of peel was obtained from "control" (3.43 and 3.87) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (3.63 and 3.97), 0.5 g/l "best flowers" (3.57 and 3.63) and 0.5 ml/l "amino power" (3.93 and 4.03) during the first and second season, respectively.

IV.2.4.6- Average juice weight (g.).

It is obvious from **Table (16)** that in both seasons, the highest average weight of juice was obtained from 75 ppm "GA_3" (97.00 and 96.67) followed by 50 ppm "GA_3" (93.33 and 89.67) and 300 "yeast extract" (77.00 and 80.33). On the other hand, the lowest average weight of juice was obtained from "control" (55.00 and 53.83) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (60.00 and 61.33), 0.5 g/l "best flowers" (66.00 and 65.83) and 0.5 ml/l "amino power" (64.00 and 71.33) and during the first and second season, respectively.

Table (16): Some fruit characteristics (average peel thickness, juice weight and volume) of Valenica orange Cv., in response to some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	Average peel thickness (mm)		Average juice weight (gm/fruit)		Average juice volume (ml^3/fruit)	
	2008	2009	2008	2009	2008	2009
Spray tap water (control)	3.43f	3.87de	55.00g	53.83g	68.75e	67.29e
Spray GA_3 at 50 ppm	4.07bc	4.13cd	93.33b	89.67b	116.66a	112.09a
Spray GA_3 at 75 ppm	4.40a	5.37a	97.00a	96.67a	121.25a	120.84a
Spray yeast extract at 150 ml/l	3.97b-d	4.40bc	71.00d	73.73d	88.75c	92.16bc
Spray yeast extract at 300 ml/l	4.27ab	4.67b	77.00c	80.33c	96.25b	100.41b
Spray best flowers at 0.5 g/l	3.57ef	3.63cd	66.00e	65.83e	82.50c	82.29cd
Spray best flowers at 1.0 g/l	3.90c-e	4.13cd	67.00e	73.17d	83.75c	91.46bc
Spray amino power at 0.5 ml/l	3.93b-d	4.03cd	64.00e	71.33d	80.00cd	89.16cd
Spray amino power at 1.0 ml/l	3.83c-e	3.90de	71.00d	72.67d	88.75c	90.84bc
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	3.63d-f	3.97de	60.00f	61.33f	75.00de	76.66de

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.

IV.2.4.7- Average juice volume (ml).

It is clear from **Table (16)** that in both seasons, the highest average volume of juice was obtained from 75 ppm "GA_3" (121.25 and 120.84) followed by 50 ppm "GA_3" (116.66 and 112.09) and 300 ml/l "yeast extract" (96.25 and 100.41). On the contrary, the lowest average volume of juice was obtained from "control" (68.75 and 67.29) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" (75.00 and 76.66), 0.5 ml/l "amino bower" (80.00 and 89.16) and 0.5 g/l "best flowers" (82.50 and 82.29) during the first and second season, respectively.

These results are in agreement with the findings of **Mansour (1998)** on Anna apple and **Tawfik (2001)** on Balady mandarin trees.

IV.2.5- Fruit chemical properties:

IV.2.5.1- Total soluble solids (%) (TSS).

It is obvious from **Table (17)** that the highest values of T.S.S. in the first season were obtained from 150 ml/l "yeast extract followed by 1.0 g/l "best flowers" and "control". Meanwhile, the lowest values of T.S.S. in the first season were obtained from 0.5 g/l "best flowers" followed by 50 ppm "GA_3" + 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml/l "amino power" and 0.5 ml/l "amino power". On the other hand, the highest values of T.S.S. in the second season were obtained from 0.5 g/l "best flowers" followed by 150 ml/ "yeast extract" and "control". Meanwhile, the lowest values of T.S.S. in the second season were obtained from 50 ppm "GA_3" + 150 ml/l "yeast extract + 0.5 g/l "best flower" + 0.5 ml/l "amino power"

followed by 300 ml/l "yeast extract" and 0.5 ml/l "amino power".

IV.2.5.2- Total acidity (%).

It is clear from **Table (17)** that in both seasons, the highest values of acidity were obtained from 150 ml/l "yeast extract" (1.71 and 1.69) followed by 1.0 g/l "best flowers" (1.69 and 1.71) and 0.5 g./l "best flowers" (1.66 and 1.66). On the contrary, the lowest values of acidity were obtained from 300 ml/l "yeast extract" (1.37 and 1.40) followed by 50 ppm "GA_3" + 150 ml/l "yeast extract + 0.50 g./l "best flower" + 0.5 ml/l "amino power" (1.43 and 1.44 and 75 ppm "GA_3" (1.42 and 1.51) during the first and second season, respectively.

IV.2.5.3- TSS/acidity.

It is obvious from **Table (17)** that in both seasons, the highest values of TSS/acidity were obtained from 300 ml/l "yeast extract" (1.312 and 1.391) followed by 75 ppm "GA_3" (1.508 and 1.425) and 50 ppm "GA_3"+ 150 ml/l "yeast extract" + 0.5 g/l "best flower" + 0.5 ml "amino power" (1.422 and 1.459). On the other hand, the lowest values of TSS/ acidity were obtained from 1.0 g/l "best flowers" (1.296 and 1.294) followed by 0.5 ml/l "amino power" (1.318 and 2.265) and 150 ml/l "yeast extract" (1.312 and 1.391) during the first and second season, respectively.

IV.2.5.4- L. ascorbic acid.

It is clear from **Table (17)** that in both seasons, the highest values of L. ascorbic acid were obtained from 75 ppm "GA_3" (16.07 and 16.03) followed by 50 ppm "GA_3" (14.97 and 15.33) and 150 ml/l "yeast extract" (13.47 and 14.40). On the

contrary, the lowest values of L. ascorbic acid were obtained from 1.0 ml/1 "amino power" (11.00 and 11.17) followed by 0.5 ml/l "amino power" (11.37 and 11.47), 1.0 g./l "best flowers" (11.37 and 11.60) and 50 ppm "GA_3" + 150 ml/l "yeast extract + 0.5 g/l "best flowers" + 0.5 ml/l "amino power" (11.40 and 11.83) during the first and second season, respectively.

Data of the present study, concerning the effect of GA_3 and yeast extract sprays on fruit chemical properties of Valencia orange agree with those obtained by **Mansour (1998)** on Anna apple and **Badawy-Sabah (2005)** on Balady mandarin trees.

Table (17): Some fruit chemical properties (T.S.S, acidity, TSS/acid ratio and vitamin C) of Valencia orange Cv., in response to some stimulative compounds sprays and their combinations during both 2008 and 2009 seasons.

Treatments	T.S.S %		Acidity %		TSS/acidity ratio		L. ascorbic acid (mg/100 ml juice)	
	2008	2009	2008	2009	2008	2009	2008	2009
Spray tap water (control)	21.83b	22.20b	1.65ab	1.64ab	1.325c	1.354b-d	13.23c	13.54b-d
Spray GA_3 at 50 ppm	21.63bc	21.40c	1.50b-d	1.55a-d	1.447a-c	1.383a-d	14.42a-c	13.81a-d
Spray GA_3 at 75 ppm	21.37cd	21.47c	1.42cd	1.51b-d	1.508a-b	1.425a-c	15.05a-b	14.22a-c
Spray yeast extract at 150 ml/l	22.43a	23.47a	1.71a	1.69a	1.312c	1.391a-c	13.12c	13.89a-c
Spray yeast extract at 300 ml/l	21.17d	21.13cd	1.37d	1.40d	1.545a	1.513a	15.45a	15.09a
Spray best flowers at 0.5 g/l	17.07f	23.20a	1.66ab	1.66ab	1.030d	1.400a-d	10.28d	13.98a-d
Spray best flowers at 1.0 g/l	21.90b	22.13b	1.69a	1.71a	1.296c	1.294cd	12.96c	12.94cd
Spray amino power at 0.5 ml/l	20.47e	21.13cd	1.55a-c	1.67ab	1.318c	1.265d	13.21c	12.65d
Spray amino power at 1.0 ml/l	21.37cd	22.13b	1.55a-c	1.58a-c	1.376bc	1.403a-d	13.79bc	14.01a-d
Spray GA_3 (50 ppm) + yeast (150 ml/l) + best flower (0.5 g/l) + amino power (0.5 ml/l)	20.33e	20.97d	1.43cd	1.44cd	1.422a-c	1.459ab	14.22a-c	14.56ab

Mean followed by the same letter's within each column are not significantly different from each other at 0.5 level.