

Relation of Fruiting In Ewaise Mango Trees to Foliar Application of Royal Jelly, Magnesium and Boron

Farouk, H. Abdelaziz; Moawad A. Mohamed and Salah E.A. Mahmoud

Hort. Dept. Fac. of Agric. Minia Univ. Egypt
Email: faissalfadel@yahoo.com

Abstract: Growth, tree nutritional status, yield and fruit quality of Ewaise mango trees in response to spraying Royal jelly at 0.05%, magnesium sulphate at 0.5% and boric acid at 0.025% three times were investigated during 2013 and 2014 seasons. Single and combined applications of Royal jelly at 0.05%, magnesium sulphate at 0.5% and boric acid at 0.025% was very effective in improving the leaf area, chlorophylls a, b, total chlorophylls, total carotenoids, N, P, K, Mg, Zn, Fe and Mn, percentages of initial fruit setting, fruit retention, yield and fruit quality rather than non- application. Using Royal jelly, magnesium sulphate and boric acid in descending order was favourable in enhancing yield and fruit quality. Combined applications of these materials were superior than using each material alone in this connection. Three sprays of a mixture of Royal jelly at 0.05%, magnesium sulphate at 0.5% and boric acid at 0.025 % was responsible for improving yield and fruit quality of Ewaise mango trees.

[Farouk, H. Abdelaziz; Moawad A. Mohamed and Salah E.A. Mahmoud. **Relation of Fruiting In Ewaise Mango Trees to Foliar Application of Royal Jelly, Magnesium and Boron.** *World Rural Observ* 2015;7(2):85-92]. ISSN: 1944-6543 (Print); ISSN: 1944-6551 (Online). <http://www.sciencepub.net/rural>. 13

Keywords: Ewaise mango trees, Royal jelly, magnesium sulphate, boric acid, yield and fruit quality.

1. Introduction

Nowadays, many efforts had been established for findings out the best non- traditional horticultural practices that are responsible for enhancing yield and fruit quality of the prime mango cv. Ewaise.

Royal jelly is considered an essential bionutrient containing higher amounts of proteins, amino acids, lipids, fructose, glucose, sucrose, nutrients namely K, Mg, Ca, Fe, P, S, Mn, vitamins B₅ & B₆ & B₉, B₁₂, A.C.D.K and E and 6 hormones (Heyl, 1951; Townsend and Lucas, 1966 and Nation and Robinson, 1971).

Magnesium is essential for building chlorophylls, sugars, DNA, RNA, proteins, fats and amino acids. It is also responsible for enhancing P uptake and sugars translocation (Nijjar, 1985).

Boron plays an important role in enhancing cell division and cell wall development and the biosynthesis of nucleic acids, proteins, natural hormones, carbohydrates, photosynthesis, water uptake and pollen germination. It is responsible for stimulating nutrient uptake and sugars translocation and the tolerance of the trees to disorders (Belvius and Lukaszewski, 1998 and Perica *et al.*, 2001).

A remarkable promotion on growth, yield and fruit quality was observed owing to using Royal jelly (Al- Wasfy, 2013; Gad El- Kareem and Abada, 2014 and Abada and Ahmed- Basma, 2015), magnesium (El- Sayed- Esraa Hassan- Huda, 2014 and Ahmed *et al.*, 2014) and boron (Gamal 2013; Ahmed *et al.*, 2013; Ibrahiem and Al- Wasfy, 2014 and Refaai, 2014).

The objective of this study was examining the effect of single and combined application of Royal

jelly, magnesium and boron on growth, yield and fruit quality of Ewaise mango trees.

2. Material and Methods

This investigation was conducted during the two consecutive seasons of 2013 and 2014 on twenty four 15-years old Ewaise. mango trees onto seedling mango rootstock. The trees are grown in a private mango orchard located at Mankabad district, Assiut Governorate. The uniform in vigour trees of Ewaise mango (24 trees) were planted at 7 x 7 metre apart. The soil texture of the tested orchard is silty clay with a water table depth not less than two meters. Surface irrigation system was followed.

The results of orchard soil analysis (according to Wilde *et al.*, 1985) are shown in Table (1)

The selected trees received a basal recommended fertilizer including the application of 20 m³ farmyard manure (0.35 %N. 0.45 % P₂O₅, and 1.2 % K₂O) added in early December, 200 kg/ fed/ mono calcium superphosphate (15.5 % P₂O₅) added in mid January, 450 kg/ fed ammonium sulphate (20.6% N) added in three equal dressings in February, April and July and 200 kg/ fed potassium sulphate (48 % K₂O) added in two equal dressings applied in mid February and April, in addition to the regular agricultural and horticultural practices which were already followed in the orchard including pruning, hoeing, irrigation with Nile water as well as pathogens, pests and weed control.

Table (1): Mechanical, physical and chemical analysis of the tested orchard soil.

Particle size distribution:	
Sand %	:11.1
Silt %	:52.7
Clay	:36.2
Texture	:Silty clay
pH(1:2.5 extract)	:7.44
EC (1: 2.5 extract) (mmhos/lcm/25°C)	:0.66
O.M. %	:2.22
CaCO ₃ %	:1.69
Total N %	:0.14
Available P (ppm, Olsen)	:26
Available K (ppm/ ammonium acetate)	:4.95
Available Mg (ppm)	:146.00
Available S (ppm)	:6.96
B (ppm) (hot water extractable)	:0.27
Available EDTA extractable micronutrients (ppm)	
Zn	:1.31
Fe	:11.21
Mn	:10.25
Cu	:1.88

This experiment included the following eight treatments from spraying Royal jelly, magnesium and boron.

- 1) Control treatment.
- 2) Spraying boric acid at 0.025%
- 3) Spraying magnesium sulphate at 0.5%.
- 4) Spraying Royal jelly at 0.05%
- 5) Spraying boric acid at 0.025% + magnesium sulphate at 0.5%.
- 6) Spraying boric acid at 0.025% + Royal jelly at 0.05%.
- 7) Spraying magnesium sulphate at 0.5% + Royal jelly at 0.05%.

Spraying all materials together at the same previous concentrations.

Therefore, the experiment evolved eight treatments. Each treatment was replicated three times, one tree per each. Royal jelly (Table 2) was stored at 0.0°C till application. It was solubilized in cold water before use. Magnesium was applied in the source of magnesium sulphate (9.6% Mg) and boron was applied in the source of boric acid(17 % B). The three biostimulants namely Royal jelly, magnesium and boron were applied three times at growth started (1st week of March), just after fruit setting (last week of April) and at one month later (last week of May). Triton B as a wetting agent a 0.05% was added to all spraying solutions (each tree needs about 50 L solution). Spraying was done till runoff. The untreated trees sprayed with water containing triton B.

During both seasons, the following measurements were recorded:

- 1- Leaf area (Morsy and Ahmed, 1999) in cm².
- 2- Leaf pigments namely chlorophylls a & b, total chlorophylls and total carotenoids (mg/ 1.0 g F.W.) (Von – Wettstein, 1957 and Hiscox and Isralstam, 1979).
- 3- Leaf content of N, P, K and Mg (as %) and Zn, Fe and Mn (as ppm) (Piper, 1950; Peach and Tracey, 1968; Evenhuis and Deward, 1980; Cottenie *et al.*, 1982 and Summer, 1985).
- 4- Percentages of initial fruit setting and fruit retention, yield/ tree and number of fruits/ tree.
- 5- Physical and chemical characteristics of the fruits namely firmness (lb / inch²), weight (g.) length, width and thickness (cm²) of fruit, percentages of pulp, peel and seeds, edible to non- edible portions, T.S.S.%, total, reducing and non-reducing sugars, total acidity % (as g citric acid/ 100 g pulp) and (vitamin C (mg / 100 g pulp) (A.O.A.C., 2000).

Table (2): Chemical Analysis of royal jelly (Townsend and Lucas, 1966).

Constituents	Values mg/ 100 g F.W.
Water	65.3
Dry matter	34.7
Portents	48.2
Carbohydrate	37.8
Lipids	10.4
Ash	2.0
Sugar	23.0
Glucose	4.0
Fructose	4.0
Sucrose	5.0
K	220
Mg	105
Ca	112
Fe	50
P	118
S	44
Mn	32
Si	5
Vitamins B ₁	0.4
Vitamins B ₂	0.3
Vitamins B ₅	0.4
Vitamins B ₆	0.3
Vitamins B ₈	0.3
Vitamins B ₉	0.4
Vitamins B ₁₂	0.3
A	0.4
C	0.9
D	0.5
K	0.4
E	0.3
Essential amino acids	1100

Statistical analysis was done and treatment means were compared using New L.S.D. at 5% (Mead *et al.*, 1993).

3. Results

1-Effect of single and combined applications of boric acid, magnesium sulphate and Royal jelly on the leaf area.

It is clear from the obtained data in Table (3) that varying boric acid, magnesium sulphate and Royal jelly treatments had significant effect on the leaf area. Single and combined applications of boric acid at 0.025%, magnesium sulphate at 0.5% and Royal jelly, at 0.05% significantly stimulated the leaf area comparing with the control treatment. The stimulation on the leaf area was significantly depended on using boric acid, magnesium sulphate and Royal jelly in ascending order. Application of Royal jelly occupied the first position in this respect. Combined applications were significantly superior than using each material alone in stimulating the leaf area. The maximum leaf area (94.3 and 95.2 cm²) during both seasons, respectively were recorded on the trees that received three sprays of a mixture of boric acid at 0.025%, magnesium sulphate at 0.5% and Royal jelly at 0.05%. The untreated trees produced the minimum values (79.1 and 80.0 cm²) during both seasons, respectively. The percentage of increase on the leaf area due to using all materials together over the control treatment reached 19.2 and 19.0% during 2013 and 2014 seasons, respectively. These results were true during both seasons.

2- Effect of single and combined applications of boric acid, magnesium sulphate and Royal jelly on chlorophylls a & b, total chlorophylls and total carotenoids in the leaves.

Varying boric acid, magnesium sulphate and Royal jelly had significant effect on the chlorophylls a & b, total chlorophylls and total carotenoids in the leaves (Table 3, 4). Foliar application of boric acid at 0.025%, magnesium sulphate at 0.5% and Royal jelly at 0.05% either applied alone or in various combinations significantly was accompanied with enhancing all pigments in the leaves rather than non-application. The promotion was significantly related to using boric acid, magnesium sulphate and Royal jelly in ascending order. Using Royal jelly was significantly superior than using the other two materials namely magnesium sulphate and boric acid. Double and triple applications were significantly favourable than using each alone in this respect. The maximum values of chlorophylls a (3.1 & 2.9 mg/ 100 g F.W.), chlorophyll b (2.0 & 1.9 mg/ 1.0 g F.W.) and total carotenoids (2.2 & 2.3 mg/ 1.0 g F.W.) were observed on the trees that received all materials together. The minimum values of chlorophyll a (1.0 &

0.9 mg/ 1.0 g F.W.), chlorophyll b (0.3 & 0.3 mg/ 100 g F.W.), total chlorophylls (1.3 & 1.2 mg/ 1.0 g F.W.) and total carotenoids (0.5 & 0.3 mg/ 1.0 g F.W.) were presented on the trees that did not subject to any material. Similar results were obtained during both seasons.

3-Effect of single and combined applications of boric acid, magnesium sulphate and Royal jelly on the leaf content of N, P, K and Mg (as %) and Zn, Fe and Mn (as ppm) in the leaves

It is evident from the obtained data (Tables 4, 5) that single and combined applications of boric acid at 0.025%, magnesium sulphate at 0.5% and Royal jelly at 0.05% significantly was responsible for enhancing the seven nutrients in the leaves namely N, P, K, Mg, Zn, Fe and Mn comparing with the check treatment. Spraying Royal jelly, magnesium sulphate and boric acid, in descending order was significantly followed by enhancing these plant nutrients. Combined applications of these materials were significantly superior than using each material alone in enhancing these nutrients. The highest values of N (1.96, 1.88 %), P (0.30, 0.29 %), K (1.19, 1.22 %), Mg (0.90 & 0.91 %), Zn (65 & 69 ppm), Fe (112, 112.9 ppm) Mn (65, 69 ppm) during both seasons respectively were recorded on the trees that supplied with all material together at the second concentrations. The untreated trees produced the minimum values of N (1.53 & 1.48 %), P (0.13 & 0.12 %), K (0.79 & 0.72%), Mg (0.50 & 0.47 %), Zn (79.1 & 77.3 ppm), Fe (96 & 95 ppm) and Mn (55 & 57.5 ppm) during 2013, 2014 seasons, respectively. These results were true during both seasons.

4- Effect of single and combined applications of boric acid, magnesium sulphate and Royal jelly on the percentages of initial fruit setting and fruit retention

It is noticed from the obtained data (Table 6) that both percentages of initial fruit setting and fruit retentions were significantly varied among the eight boron, magnesium and Royal jelly treatments. Percentages of initial fruit setting and fruit retention were significantly improved due to using boric acid at 0.025%, magnesium sulphate at 0.5% and Royal jelly at 0.05% either singly or in all combinations rather than non application. Application of Royal jelly significantly surpassed the application of magnesium sulphate and boric acid in improving the two fruit setting characters. Using magnesium sulphate occupied the second position. The last position was presented by using boric acid. Combined applications were significantly very favourable than using each material alone in enhancing the percentages of initial fruit setting and fruit retention. The best results were obtained on the trees that treated with the three materials together. Under such promised treatment,

percentages of initial fruit setting and fruit retention reached 2.19 and 2.22 % as well as 1.30 and 1.36 during both seasons, respectively. The lowest values of initial fruit setting (1.091 % 1.82 %) and fruit

retention (0.90 & 0.88%) were observed on untreated trees during both seasons, respectively. These results were true during both seasons.

Table (3): Effect of single and combined application of boric acid, magnesium sulphate and Royal jelly on the leaf area, chlorophyll a & b and total chlorophylls in the leaves of Ewaise mango trees during 2013 and 2014 seasons.

Treatments	Leaf area (cm) ²		Chlorophyll a (mg/ 1.0 g F.W.)		Chlorophyll b (mg/ 1.0 g F.W.)		Total chlorophylls (mg/ 1.0 g F.W.)	
	2013	2014	2013	2014	2013	2014	2013	2014
Control (untreated tree)	79.1	80.0	1.0	0.9	0.3	0.3	1.3	1.2
Spraying boric acid at 0.025%	80.3	81.0	1.3	1.2	0.5	0.5	1.8	1.7
Spraying magnesium sulphate at 0.5%	81.7	82.7	1.6	1.5	0.5	0.8	2.4	2.3
Spraying Royal jelly at 0.05%	83.3	84.0	1.8	1.7	1.0	1.0	2.8	2.7
Spraying boric acid + Mg sulphate	85.0	85.7	2.1	2.0	1.2	1.3	3.3	3.3
Spraying boric acid + Royal jelly	88.0	88.6	2.3	2.3	1.5	1.5	3.5	3.8
Spraying Mg sulphate + Royal jelly	91.2	92.1	2.6	2.6	1.8	1.7	4.4	4.3
Spraying all together at the same conc.	94.3	95.2	3.1	2.9	2.0	1.9	5.1	4.8
New L.S.D. at 5%	1.1	1.0	0.2	0.2	0.2	0.2	0.2	0.3

Table (4): Effect of single and combined application of boric acid, magnesium sulphate and Royal jelly on total carotenoids and percentages of N, P and K in the leaves of Ewaise mango trees during 2013 and 2014 seasons.

Treatments	Total carotenoids (mg/ 1.0 g F.W.)		Leaf N %		Leaf P %		Leaf K %	
	2013	2014	2013	2014	2013	2014	2013	2014
Control (untreated tree)	0.5	0.3	1.53	1.48	0.13	0.12	0.79	0.72
Spraying boric acid at 0.025%	0.7	0.7	1.60	1.61	0.16	0.14	0.84	0.80
Spraying magnesium sulphate at 0.5%	1.0	1.1	1.66	1.66	0.18	0.17	0.90	0.87
Spraying Royal jelly at 0.05%	1.2	1.4	1.72	1.70	0.20	0.20	0.94	0.94
Spraying boric acid + Mg sulphate	1.5	1.6	1.80	1.74	0.22	0.23	0.99	1.01
Spraying boric acid + Royal jelly	1.8	1.8	1.85	1.79	0.25	0.25	1.06	1.06
Spraying Mg sulphate + Royal jelly	2.0	2.0	1.90	1.84	0.28	0.27	1.11	1.11
Spraying all together at the same conc.	2.2	2.3	1.96	1.88	0.30	0.29	1.19	1.22
New L.S.D. at 5%	0.2	0.2	0.05	0.04	0.02	0.02	0.04	0.04

Table (5): Effect of single and combined application of boric acid, magnesium sulphate and Royal jelly on the percentage of Mg and leaf content of Zn, Fe and Mn (as ppm) in the leaves of Ewaise mango trees during 2013 and 2014 seasons.

Treatments	Leaf Mg %		Leaf Zn (ppm)		Leaf Fe (ppm)		Leaf Mn (ppm)	
	2013	2014	2013	2014	2013	2014	2013	2014
Control (untreated tree)	0.50	0.47	79.1	77.3	96.0	95.0	55.0	57.5
Spraying boric acid at 0.025%	0.56	0.57	80.3	81.0	98.0	96.7	56.0	59.0
Spraying magnesium sulphate at 0.5%	0.63	0.64	81.5	82.2	99.7	100.0	57.9	60.5
Spraying Royal jelly at 0.05%	0.70	0.71	82.6	83.3	101.0	102.0	60.0	61.9
Spraying boric acid + Mg sulphate	0.76	0.77	83.8	84.5	104.4	104.5	61.3	63.3
Spraying boric acid + Royal jelly	0.81	0.82	85.0	85.8	107.0	108.7	62.5	65.0
Spraying Mg sulphate + Royal jelly	0.85	0.87	87.0	88.0	110.0	111.3	63.6	66.9
Spraying all together at the same conc.	0.90	0.91	88.5	89.3	112.0	112.9	65.0	69.0
New L.S.D. at 5%	0.04	0.04	1.1	1.2	1.3	1.4	0.9	1.0

5-Effect of single and combined applications of boric acid, magnesium sulphate and Royal jelly on the yield.

One can stated (Table 6) that single and combined applications of boric acid at 0.025%, magnesium sulphate at 0.5% and Royal jelly at 0.05% was significantly very effective in improving the yield

and number of fruits/ tree relative to the check treatment. Significant differences on the yield and number of fruits / tree were observed among all treatments. Using boric acid, magnesium sulphate and Royal jelly, in ascending order was significantly preferable in improving yield and number of fruits/ tree. Using Royal jelly ranked the first position

followed by magnesium sulphate in this connection. Combined applications were significantly superior than using each material alone in this respect. The best results were obtained due to treating the trees three times with a mixture of boric acid, magnesium sulphate and Royal jelly at the named concentration. Under such promised treatment yield per tree reached 55.9 and 58.3 kg, while number of fruits / tree was 237.0 and 245.0 fruits during both seasons, respectively. The lowest yield (38.2 and 37.5 kg) and number of fruits / tree (200 and 196 fruits) during both seasons, respectively were recorded on the untreated trees. The percentage of increase on the yield expressed in weight due to application of the superior treatment over the check treatment reached 46.3 and 55.5% during both seasons, respectively. These results were true during both seasons.

6-Effect of single and combined applications of boric acid, magnesium sulphate and Royal jelly on both physical and chemical characteristics of the fruits

It is obvious from the obtained data (Tables 7 to 9) that both physical and chemical characteristics of the fruits were significantly varied among the eight

boron, magnesium and Royal jelly treatments. A significant promotion on fruit quality was observed owing to using boric acid, magnesium sulphate and Royal jelly either applied alone or when used in combinations comparing with non- application. A significant promotion on fruit quality was observed due to using Royal jelly, magnesium sulphate and boric acid, in descending order. The promotion on fruit quality was appeared in terms of increasing weight length, width and thickness of fruit, edible to non-dibble portions, pulp %, T.S.S., total and reducing sugars and vitamin C content and decreasing percentages of peels and seeds and total acidity %. The present treatments had no significant effect on the fruit firmness and non – reducing sugars %. Combined applications (double or triple applications) were significantly superior than using each material alone in this respect. The best results were obtained due to using all materials together. Under such promised treatment fruit weight reaches 236 g and 238 g while T.S.S. % was 19.4 and 20.0% during both seasons, respectively. The untreated trees produced undesirable fruits. These results were true during both seasons.

Table (6): Effect of single and combined application of boric acid, magnesium sulphate and Royal jelly on the percentages of initial fruit setting and fruit retention, number of fruit/ tree and yield / tree of Ewaise mango trees during 2013 and 2014 seasons.

Treatments	Percentage of initial fruit setting		Percentage of fruit retention		No. of fruits / tree		Yield/ tree (kg.)	
	2013	2014	2013	2014	2013	2014	2013	2014
Control (untreated tree)	1.91	1.82	0.90	0.88	200.0	196.0	38.2	37.5
Spraying boric acid at 0.025%	1.99	2.00	0.97	0.95	204.0	204.0	40.2	40.4
Spraying magnesium sulphate at 0.5%	1.10	1.11	1.04	1.00	210.0	211.0	43.1	43.5
Spraying Royal jelly at 0.05%	1.25	1.6	1.10	1.06	215.0	216.0	45.2	45.6
Spraying boric acid + Mg sulphate	1.75	1.76	1.15	1.12	220.0	222.0	47.7	48.4
Spraying boric acid + Royal jelly	2.00	2.01	1.20	1.20	225.0	230.0	50.4	51.8
Spraying Mg sulphate + Royal jelly	2.07	2.08	1.25	1.28	230.0	237.0	52.9	54.7
Spraying all together at the same conc.	2.19	2.22	1.30	1.36	237.0	245.0	55.9	58.3
New L.S.D. at 5%	0.06	0.07	0.05	0.05	4.0	4.1	1.7	1.8

Table (7): Effect of single and combined application of boric acid, magnesium sulphate and Royal jelly on some physical characters of the fruits of Ewaise mango trees during 2013 and 2014 seasons.

Treatments	Fruit firmness (lb/ inch ²)		Fruit weight (g.)		Fruit length (cm.)		Fruit width (cm.)	
	2013	2014	2013	2014	2013	2014	2013	2014
Control (untreated tree)	18.0	18.1	190.9	191.2	9.40	9.37	6.10	6.00
Spraying boric acid at 0.025%	18.1	18.1	197.0	197.8	9.55	9.61	6.25	6.35
Spraying magnesium sulphate at 0.5%	18.1	18.2	205.0	206.0	9.75	9.81	6.40	6.51
Spraying Royal jelly at 0.05%	18.1	18.2	210.0	211.0	9.99	10.05	6.55	6.66
Spraying boric acid + Mg sulphate	18.2	18.3	217.0	218.0	10.15	10.21	6.71	6.82
Spraying boric acid + Royal jelly	18.2	18.4	224.0	225.0	10.35	10.41	6.90	7.00
Spraying Mg sulphate + Royal jelly	18.2	18.4	230.0	231.0	11.00	11.11	7.11	7.22
Spraying all together at the same conc.	18.2	18.4	236.0	238.0	11.19	11.30	7.32	7.45
New L.S.D. at 5%	NS	Ns	4.1	4.2	0.10	0.11	0.09	0.10

Table (8): Effect of single and combined application of boric acid, magnesium sulphate and Royal jelly on some physical characters of the fruits of Ewaise mango trees during 2013 and 2014 seasons.

Treatments	Fruit thickness (cm.)		Pulp %		Fruit peel weight %		Seed weight %		Edible / non – edible portions	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control (untreated tree)	5.00	5.10	72.1	73.0	13.1	13.3	14.8	13.7	2.58	2.70
Spraying boric acid at 0.025%	5.11	5.30	74.9	74.8	12.8	12.7	12.3	12.5	2.98	2.97
Spraying magnesium sulphate at 0.5%	5.31	5.50	77.0	76.7	12.5	12.4	10.5	10.9	3.35	3.29
Spraying Royal jelly at 0.05%	5.49	5.71	78.8	78.3	12.2	12.1	9.00	9.6	3.72	3.61
Spraying boric acid + Mg sulphate	5.71	5.82	80.0	80.0	11.9	11.8	8.1	8.2	4.00	4.00
Spraying boric acid + Royal jelly	5.94	5.92	81.7	81.7	11.5	11.4	6.8	6.9	4.46	4.46
Spraying Mg sulphate + Royal jelly	6.19	6.18	83.5	83.0	11.0	10.9	5.5	6.1	5.06	4.88
Spraying all together at the same conc.	6.29	6.29	85.0	84.6	10.7	10.6	4.3	4.8	5.67	5.49
New L.S.D. at 5%	0.09	0.09	1.7	1.6	0.2	0.3	0.9	0.9	0.26	0.28

Table (9): Effect of single and combined application of boric acid, magnesium sulphate and Royal jelly on some chemical characteristics of the fruits of Ewaise mango trees during 2013 and 2014 seasons.

Treatments	T.S.S. %		Total sugars %		Reducing sugars %		Non- reducing sugars %		Total acidity %		Vitamin C content (mg/ 100 g pulp)	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control (untreated tree)	17.1	16.9	15.0	15.5	7.0	7.2	8.0	8.3	0.371	0.361	35.1	36.0
Spraying boric acid at 0.025%	17.5	17.6	15.5	16.0	7.3	7.5	8.2	8.5	0.341	0.330	37.2	38.1
Spraying magnesium sulphate at 0.5%	17.8	18.0	15.8	16.4	7.6	7.8	8.2	8.6	0.325	0.314	39.3	40.1
Spraying Royal jelly at 0.05%	18.1	18.4	16.1	16.8	8.0	8.1	8.1	8.7	0.300	0.291	41.0	41.4
Spraying boric acid + Mg sulphate	18.5	19.0	16.5	17.1	8.3	8.5	8.2	8.6	0.275	0.265	42.1	42.6
Spraying boric acid + Royal jelly	18.8	19.3	17.0	17.5	8.6	8.8	8.4	8.7	0.250	0.241	43.9	43.9
Spraying Mg sulphate + Royal jelly	19.1	19.6	17.4	18.0	9.0	9.1	8.4	8.9	0.220	0.210	46.3	46.0
Spraying all together at the same conc.	19.4	20.0	17.8	18.4	9.3	9.4	8.5	9.0	0.199	0.197	48.5	47.3
New L.S.D. at 5%	0.3	0.3	17.8	0.3	0.2	0.2	NS	NS	0.021	0.22	1.1	1.2

4. Discussion:

The promoting effect of Royal jelly on growth, trees nutritional status, yield and fruit quality of Ewaise mango trees might be attributed to the higher own content of Royal jelly (Table 3) from various organic and mineral nutrients namely proteins, lipids, glucose, fructose, sucrose, K, S, P, Mg, Ca, Fe, Mn, Si vitamins B₁, B₂, B₅, B₆, B₉, B₁₂, A.C.D.K. and E as well as sixteen amino acids and hormones (Heyl, 1951, Townsend, and Lucas, 1966 and Nation and Robinson, 1991).

These results are in harmony with those obtained by Al- Wasfy (2013); Gad El- Kareem and Abada

(2014); Ahmed and Habasy- Randa (2014) and Abada and Ahmed - Basma (2015).

The beneficial effects of magnesium on fruiting of Ewaise mango trees might be attributed to its essential roles on enhancing activity of different enzymes, the biosynthesis and translocation of carbohydrates fats, proteins and natural hormones, cell division, cell enlargement uptake of water and nutrients, building of chlorophylls and amino acids and seed formation (Devlin and Withdam, 1983; Nijjar, 1985 and Mengel and Kirkby, 1987).

These results are in agreement with those obtained by El- Sayed- Esraa (2010); Mohamed and

Mohamed (2013); Hassan- Huda (2014) and Ahmed *et al.*, (2014).

The beneficial effects of boron on enhancing cell division, root development, proteins and natural hormones biosynthesis, building and movement of carbohydrates, photosynthesis, uptake of water and nutrients and pollen, germination (**Sister *et al.*, 1965; Pilbeam and Kirky, 1983; Blevius and Lukaszewski, 1998 and Ahmed *et al.*, (2009)** could explain the present results.

These results are in agreement with those obtained by **Gamal (2013); Ahmed *et al.*, (2013); Ibrahim and Al- Wasfy (2014) and Refaai (2014).**

Conclusion

Treating Ewaise mango trees three times at growth start, just after fruit setting and at one month later with a mixture of Royal jelly at 0.05%, magnesium sulphate at 0.5% and boric acid at 0.025% was essential for promoting yield and fruit quality.

References

1. Abada, M.A.M. and Ahmed- Basma, R. (2015): The beneficial effects of using Royal jelly, arginine and tryptophan on fruiting of Superior grapevines. 2nd Inter. Conf. on Hort. Crops. 15-18 March, 2015 (ICHC, 2015).
2. Ahmed, F.F. and Habasy- Randa E.Y. (2014): Productive performance of Washington Navel orange trees in relation to foliar application of Balady seed sprout and Royal jelly World Rural Observations 6(4): 109-114.
3. Ahmed, F. F. and Morsy, M. H. (1999): A new method for measuring leaf area in different fruit species. Minia J. of Agric. Res. & Develop., Vol. (19) pp 97—105.
4. Ahmed, F.F. Ali, A.H.S.; Sayed, E.S. and sayed-Ola, M.O. (2014): Using some amino acids enriched with certain nutrients for improving productivity of El- Sady date palms. World Rural Observations. Vol. 6(2)20-27.
5. Ahmed, F.F.; Gad El- Kareem, M. R. and Oraby-Mona, M.M. (2013a): Response of Zaghloul date palms to spraying boron, silicon and glutathione. Stem Cell 4(2): 29-34.
6. Ahmad, W.; Niaz, A.; Kanwal, S. and Rahinatullah, A. (2009): Role of Boron in Plant Growth: A review J. Agric Res.. 47(3): 329-338. ISSN.- 0368-1157.
7. Al- Wasfy, M.M. (2013): Response of Sakkoti date palms to foliar application of royal jelly, silicon and vitamins B. J. of Amer. Sci. 9 (5): 315-321.
8. Association of Official Agricultural Chemists (2000): Official Methods of Analysis A. O. A. C. 17th Ed Published by A. O. A. C. Washington, D. C. (U.S.A.). pp. 490-510.
9. Blevius, D.G. and Lukaszewski, K.M. (1998): Boron in plant structure and function. Annu. Plant Physio. Plant Mol. Bio. 49-481.
10. Cottenie A.; Verloo, M.; Kiekens, L.; Velgle, G. and Amerlynck, R. (1982): Chemical Analysis of Plant and Soil. 34 - 51. Laboratory of Analytical and Agroch. State Univ. Belgium, Gent.
11. Devlin. R.M. and Withdam, F.H. (1983): Plant Physiology. Renolds Book Corporation, New York (Chapter V).
12. El- Sayed – Esraa, M.H. (2010): Behaviour Ewaise mango trees to foliar application of some nutrients and seaweed extract. Ph. P. thesis Fac. of Agric. Minia Univ. Egypt.
13. Evenhuis, B. and Dewaad, P.W. (1980): Principles and practices in palm analysis F.A.O. Soil and Bull 38: 172-163.
14. Gad El- Kareem, M.R. and Abada, M.A.M. (2014): Trials for promoting productivity of Flame seedless grapevines. J. Biol. Chem. Environ. Sci. 9 (1): 35-46.
15. Gamal, A.F.O. (2013): Fruiting of Washington Navel orange trees in relation to application of Seaweed extract, boron and citric acid. Ph. Thesis Fac. of Agric. Minia Univ. Egypt.
16. Hassan-Huda, M.I. (2014): Impact of effective microorganisms and amino acids enriched with some nutrients on growth and fruiting of Valencia orange trees. Ph. D. Thesis Fac. of Agric. Minia Univ. Egypt.
17. Hyel, H.L. (1951): An observation suggesting the presence of gonadotrophic hormone in Royal Jelly. Science, 89: 590-591.
18. Hiscox, A. and Israelstam, B. (1979): A method for the extraction of chlorophyll from leaf tissue without maceration. Can. J. Bot.57: 1332-1334.
19. Ibrahim, H.I.M. and Al- Wasfy, M.M. (2014): The promotive impact of using silicon and selenium with potassium and boron on fruiting of Valencia orange trees grown under Minia region conditions. World Rural Observations 5(1): 1-14.
20. Mead, R.; Curnow, R.N. and Harted, A.M. (1993): Statistical Methods in Agricultural and Experimental Biology. Second Ed. Chapman: Hall. London, pp. 10- 20.
21. Mengel, K.E. and Kirkby, E. A. (1987): Principles of Plant Nutrition. Worblaufen-Bern Switzerland, International Potash Institute.pp. 70-85.
22. Mohamed, A. Y. and Mohamed, H. H. (2013): The synergistic effects of using turmeric with various nutrients on fruiting of Sewy date palms.

- Hort. Sci. J. of Suez Canal Univ. Vol. (1): 287-291.
23. Nation, J.L. and Robinson, E.A.S. (1991): Concentration of some major and trace elements in honey bee, Royal jelly and pollen. *J. Apic. Res.* 10(1): 35-43.
 24. Nijjar, G.S. (1985): Nutrition of fruit trees. Published by Kaylyani Publishers, New Delhi, India: 179 – 272.
 25. Peach, K. and Tracey, I.M.V. (1968): Modern Methods of plant Analysis, Vol. 11 p. 3 6-38
 26. Perica, S.; Bellaloui, N.; Gerve, C.; Hu, H. and Broan, P. H. (2001): Boron transport and soluble carbohydrate concentrations in olive. *Amer. Soc. Hort. Sci.* 126: 291 - 296.
 27. Pilbeam, D.J. and Kirkby, E.A. (1983): The physiological role of boron in plants. *J. Plant Nutrition* 6: 563-582.
 28. Piper, C.S. (1950): Soil and Plant Analysis, Inter Science New York pp. 48-110.
 29. Refaai, M.M. (2014): Response of Zaghoul date palms grown under Minia region conditions to spraying wheat seed sprout extract and non-boron Stem Cell 5 (4): 22-28.
 30. Sister, E.C.; Dugger, W.M. and Gaush, H.O. (1965): The role of boron in the translocation of organic compounds in Plants. *Plant Physiol.*, 31: 11-13.
 31. Summer, M.E. (1985): Diagnosis and recommendation Integrated system (DRIS) as a guide to orchard fertilization. *Hort. Abst.* 55 (8); 7502.
 32. Townsend, G. and Lucas, C. (1966): The chemical nature of Royal jelly. *Biochemical. J.* 34:1115-1162.
 33. Wilde S. A.; Corey, R. B.; Lyer, I. G. and Voigt, G. K. (1985): Soil and Plant Analysis/for Tree Culture. 3rd Oxford & 113H publishing Co., New Delhi, pp. 1 - 218.

5/12/2015