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RESPONSE OF ALPHONSE MANGO TREES TO FOLIAR APPLICATION OF ALGAE EXTRACT

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ABSTRACT

During 2010 and 2011 seasons, mango cv. Alphonse trees received one spray of Algae extract at growth start, first bloom, just after fruit setting or at one month after fruit setting of those trees by concentration of 0.1, 0.05, 0.1, 0.2 or 0.4 %. Growth characters, percentages of N, P and K in the leaves, fruit retention %, yield as well as fruit characteristics in response to Algae extract treatments were investigated.

Results showed that advancing the date of spraying of Algae extract from fruit development to growth start stage and increasing the applied concentrations from 0.1 to 0.4 % caused a gradual promotion of growth traits, leaf content of N, P and K, fruit retention % and fruit weight. Chemical characteristics of the fruits tended to promote gradually with delaying date of spraying Algae extract as well as increasing concentrations from 0.1 to 0.4 %.

Treating Alphonse mango trees once at growth start with Algae extract at 0.2 % was beneficial in promoting yield quantitatively and qualitatively.

INTRODUCTION

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Any attempt made for improving yield quantitatively and qualitatively of the prime mango cv. Alphonse was appreciated. Amending mango trees with all essential organic and inorganic nutrients at balanced rate was accompanied with improving production (Hulme, 1971). Recently, Algae extract was detected as a natural source of organic and mineral nutrients, since it contains more than 70 nutrients and 21 amino acids, natural hormones and vitamins (Subba Rao, 1984). It was used for amending the trees with their requirements from all nutrients and using such compound at the optimum time and concentration which promote the productivity of the trees (Sanderson and Hameso, 1986; Cassan *et al.*, 1992; Verklij, 1992; Strick *et al.*, 1997; Adam, 1999; Fornes *et al.*, 2002; Norric *et al.*, 2002; Gobara, 2004; Fornes *et al.*, 2005; Hegab *et al.*, 2005; Chouliaras *et al.*, 2005; El- Sawy *et al.*, 2005; Gamal, 2006; Ebeid-Sanaa, 2007; Mouftah, 2007; Ahmed *et al.*, 2008; Hassan- Hoda, 2008; Chouliaras *et al.*, 2009; Khan *et al.*, 2009; Abd El- Motty El-ham *et al.*, 2010 and El- Sayed- Esraa, 2010).

MATERIALS AND METHODS

This study was carried out during 2010 and 2011 seasons on sixty seedling rootstock Alphonse mango trees having 14 years old. The trees are grown in a private mango orchard located at Kom Ombo district, Aswan Governorate. Sixty uniform vigour trees of Alphonse mango were planted at 2 x 2 meter apart. The texture of the tested soil was silty clay with a water table depth not less than two meters. The results of orchard soil analysis (according to Wilde *et al.*, 1980) are shown in Table (1)

Table 1: Soil analysis of the tested soil:

Particle size distribution	Values
Sand %	: 10.7
Silt %	: 58.0
Clay %	: 31.4
Texture	: Silty clay
pH(1:2.5 extract)	: 8.0
EC (1: 2.5 extract) mmhos/1cm/25°C	: 0.69
O.M. %	: 2.9
CaCO ₃ %	: 1.22
Total N %	: 0.11

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P (ppm, Olsen method)	:٥.٦
K (ppm/ ammonium acetate)	:٤١٠

The experiment included two factors, the first factor (A) comprised from five concentrations of Algae extract namely a_١) ٠.٠ %, a_٢) ٠.٠٥ %, a_٣) ٠.١ %, a_٤) ٠.٢ % and a_٥) ٠.٤ %. While the second factor (B) related to four dates of application of Alga extract spraying which applied at different growth stages of the trees; b_١) growth start, b_٢) first bloom, b_٣) just after fruit setting, and b_٤) at one month after setting. Therefore, the experiment evolved twenty treatments. Each treatment replicated three times, one tree per each. Triton B as a wetting agent was added to all Algae extract solutions till runoff (٢٥ L/ tree). Horticultural practices were carried out as usual. Complete randomized block design in split plot arrangement with three replicates was adopted. The five concentrations and the four dates of spraying Algae extract were occupied the main and subplots, respectively.

During both seasons (٢٠١٠ and ٢٠١١) the following parameters were carried out:

١. At the last week of May, the length of shoots in the spring growth cycle (cm.) was measured.
٢. Twenty leaves below panicles in the spring growth cycle/ tree (according to Summer, ١٩٨٥ and Bharagava and Chadha, ١٩٨٨) were taken (last week of May) for measuring the leaf area (cm^٢) (Ahmed and Morsy, ١٩٩٩).
٣. In the same previous leaves, percentages of N, P and K were determined according to Chapman and Pratt, (١٩٦٥) and Peach and Tracey, (١٩٦٨).
٤. Percentage of fruit retention.
٥. In the middle of June, yield expressed in weight (kg.) was recorded.
٦. Physical and chemical characteristics of the fruits represented in fruit weight (g.), total soluble solids %, total and reducing sugars, and total acidity % (as g citric acid/ ١٠٠ ml juice) were determined according to Ranganna, (١٩٧٨) and A.O.A.C., (١٩٩٥).

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All the obtained data were tabulated and statistically analyzed using new L.S.D. test at 0 % for made all comparisons among the studied treatments according to Steel *et al.*, (1997).

RESULTS AND DISCUSSION

1- Shoot length and leaf area in the spring growth cycle.

It is clear from the data of Table (2) that foliar application of Algae extract at 0.0 to 0.4 % significantly increased stimulating the shoot length and leaf area in spring growth cycle comparing with the control treatment. The promotion was associated with increasing concentrations of Algae extract. Increasing Algae extract concentrations from 0.2 to 0.4 % had no significant promotion on such two growth characters.

Table 2: Effect of different concentrations and dates of spraying Algae extract on the shoot length (cm.) and leaf area (cm²) of spring growth cycle of Alphonse mango trees during 2010 and 2011 seasons.

Algae extract concentrations (A)	Shoot length (cm.)									
	2010					2011				
	Dates of spraying Algae extract (B)									
	b ¹	b ²	b ³	b ⁴	Mean (A)	b ¹	b ²	b ³	b ⁴	Mean (A)
a ₁ 0.0 %	10.0 3	10.0 2	10.0 2	10.0 1	10.0 2	14.9 9	14.9 9	14.9 8	14.9 7	14.9 8
a ₂ 0.05 %	10.9 6	10.7 0	10.0 0	10.2 0	10.7 2	17.0 0	10.7 9	10.0 0	10.2 0	10.7 4
a ₃ 0.1 %	17.2 1	17.0 3	10.7 6	10.0 0	10.8 8	17.2 2	17.0 0	10.7 9	10.0 2	10.8 8
a ₄ 0.2 %	17.7 3	17.3 1	17.1 0	10.7 7	17.2 2	17.7 1	17.2 2	17.0 1	10.7 9	17.1 8
a ₅ 0.4 %	17.7 4	17.3 2	17.1 1	10.7 7	17.2 4	17.7 2	17.2 3	17.0 3	10.8 0	17.2 0
Mean (B)	17.1 3	10.8 9	10.7 0	10.4 6		17.1 2	10.8 0	10.7 6	10.4 7	
New L.S.D at 0 %	A		B		AB	A		B		AB
	0.19		0.18		0.40	0.20		0.19		0.43
Character	Leaf area (cm ²)									
a ₁ 0.0 %	07.2	07.2	07.1	07.0	07.1	07.7	07.0	07.0	07.4	07.0
a ₂ 0.05 %	71.9	70.7	09.0	08.2	70.1	72.4	71.2	70.0	08.9	70.7
a ₃ 0.1 %	73.0	71.9	71.0	09.7	71.4	74.1	72.9	71.0	70.3	72.7

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a ₁ 0.2 %	77.0	73.9	72.0	71.2	73.0	77.1	74.1	73.0	71.0	73.7
a ₂ 0.4 %	76.8	74.0	72.6	71.3	73.7	76.2	74.3	73.2	71.0	73.8
Mean (B)	73.1	71.0	70.0	69.0		73.3	72.0	71.0	69.9	
New L.S.D at 5 %	A	B	AB	A	B	AB				
	1.0	1.0	2.2	0.9	0.8	1.8				

b₁ = Growth start

b₂ = Just after fruit setting

b₃ = First bloom

b₄ = One month after fruit setting

Delaying dates of spraying Algae extract contributed in gradual reduction on such two growth characters. The maximum values were recorded on the trees that foliage spraying with Algae extract was applied at growth start. Treating the trees once with Algae extract at one month after fruit setting gave the lowest values.

One spray of Algae extract at 0.2 % at growth start of Alphonse mango trees gave the maximum values. These results were similar during both seasons.

The promoting effect of Algae extract on growth characters might be attributed to its positive role in supplying the trees with their requirements from all organic and mineral nutrients at balanced rate. The higher own content of Algae extract from natural hormones and antioxidants which encourages cell division could give another explanation (Subba- Rao, 1984).

These results are in agreement with those obtained by Chouliars *et al.*, (2000); El- Sawy *et al.*, (2000); Gamal (2006) and Ebeid-Sanaa (2007).

2- Percentages of N, P and K in the leaves:

Data in Tables (3 & 4) clearly showed that leaf content of N, P and K was significantly higher in the trees treated with Algae extract at 0.2 to 0.4 % rather than non- application (0.0 %). The gradual promotion of these nutrients was observed with increasing Algae extract concentrations from 0.0 to 0.4 %. No significant promotion was observed among the two higher concentrations namely 0.2 and 0.4 % on these nutrients. The maximum values were recorded on the trees that sprayed with Algae extract at 0.2 %.

With advancing dates of spraying Algae extract there was a gradual and significant promotion on these nutrients. Growth start

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spray of Algae extract gave the maximum values. Treating the trees once at one month after fruit setting of Algae extract gave the minimum values.

The maximum values were recorded when the trees received one spray of 0.2 % Algae extract at growth start. Similar results were recorded during both seasons (2010 and 2011).

Table 3: Effect of different concentrations and dates of spraying Algae extract on the percentages of N and P in the leaves of Alphonse mango trees during 2010 and 2011 seasons.

Algae extract concentrations (A)	Leaf N %											
	2010					2011						
	Dates of spraying Algae extract (B)											
	b ₁	b ₂	b ₃	b ₄	Mean (A)	b ₁	b ₂	b ₃	b ₄	Mean (A)		
a ₁ 0.0 %	1.72	1.72	1.72	1.71	1.72	1.70	1.70	1.70	1.74	1.70		
a ₂ 0.05 %	2.11	2.03	1.93	1.81	1.97	2.12	2.04	1.96	1.80	1.99		
a ₃ 0.1 %	2.20	2.10	2.00	1.90	2.10	2.21	2.12	2.00	1.96	2.09		
a ₄ 0.2 %	2.39	2.20	2.10	2.00	2.21	2.34	2.21	2.12	2.07	2.16		
a ₅ 0.4 %	2.40	2.20	2.16	2.07	2.22	2.30	2.21	2.12	2.07	2.19		
Mean (B)	2.17	2.08	2.00	1.92		2.10	2.07	2.00	1.94			
New L.S.D at 5 %	A		B		AB		A		B		AB	
	0.08		0.07		0.13		0.07		0.00		0.11	
Character	Leaf P %											
a ₁ 0.0 %	0.17	0.17	0.16	0.16	0.17	0.17	0.17	0.17	0.10	0.17		
a ₂ 0.05 %	0.30	0.26	0.23	0.20	0.20	0.30	0.27	0.24	0.20	0.20		
a ₃ 0.1 %	0.33	0.30	0.26	0.23	0.28	0.33	0.30	0.27	0.24	0.29		
a ₄ 0.2 %	0.38	0.33	0.30	0.26	0.32	0.39	0.33	0.30	0.27	0.32		
a ₅ 0.4 %	0.39	0.34	0.31	0.27	0.33	0.40	0.34	0.30	0.27	0.33		
Mean (B)	0.31	0.28	0.20	0.22		0.32	0.28	0.26	0.23			
New L.S.D at 5 %	A		B		AB		A		B		AB	
	0.03		0.02		0.04		0.03		0.02		0.04	

b₁ = Growth start

b₂ = Just after fruit setting

b₃ = First bloom

b₄ = One month after fruit setting

The higher own content of Algae extract of nutrients, amino acids and antioxidants may explain the present results (Adam, 1999).

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These results are in agreement with those obtained by Fornes *et al.*, (٢٠٠٥); Hegab *et al.*, (٢٠٠٥); Mouftah (٢٠٠٧); Khan *et al.*, (٢٠٠٩) and El- Sayed- Esraa (٢٠١٠).

٣- Percentage of fruit retention:

It is clear from the data in Table (٤) that spraying Algae extract at ٠.٠٥ to ٠.٤ % significantly improved the percentage of fruit retention comparing with non- application. The promotion was associated with increasing concentrations of Algae extract from ٠.٠ to ٠.٤ %. Negligible promotion was obtained with increasing concentrations from ٠.٢ to ٠.٤ %. Supplying the trees with Algae extract at ٠.٢ % from economical point of view gave the best results with regard to fruit retention.

Table ٤: Effect of different concentrations and dates of spraying Algae extract on the percentages of K in the leaves and fruit retention of Alphonse mango trees during ٢٠١٠ and ٢٠١١ seasons.

Algae extract concentrations (A)	Leaf K %									
	٢٠١٠					٢٠١١				
	Dates of spraying Algae extract (B)									
	b ^١	b ^٢	b ^٣	b ^٤	Mean (A)	b ^١	b ^٢	b ^٣	b ^٤	Mean (A)
a _١ ٠.٠ %	١.٢٥	١.٢٥	١.٢٥	١.٢٥	١.٢٥	١.٣٠	١.٣٠	١.٣٠	١.٢٩	١.٣٠
a _٢ ٠.٠٥ %	١.٥٠	١.٤٢	١.٣٧	١.٣١	١.٤٠	١.٥٣	١.٤٦	١.٤١	١.٣٦	١.٤٤
a _٣ ٠.١ %	١.٥٣	١.٤٨	١.٤٣	١.٣٨	١.٤٦	١.٦١	١.٥٥	١.٤٦	١.٤٢	١.٥١
a _٤ ٠.٢ %	١.٦٦	١.٥٦	١.٥٠	١.٤٤	١.٥٤	١.٧٢	١.٦٢	١.٥٦	١.٤٦	١.٥٩
a _٥ ٠.٤ %	١.٦٦	١.٥٧	١.٥١	١.٤٥	١.٥٥	١.٧٣	١.٦٣	١.٥٧	١.٤٧	١.٦٠
Mean (B)	١.٥٢	١.٤٦	١.٤١	١.٣٧		١.٥٨	١.٥١	١.٤٦	١.٤٠	
New L.S.D at ٥ %	A		B		AB	A		B		AB
	٠.٠٥		٠.٠٤		٠.٠٩	٠.٠٥		٠.٠٤		٠.٠٩
Character	Fruit retention %									
a _١ ٠.٠ %	٠.١٦	٠.١٦	٠.١٦	٠.١٦	٠.١٦	٠.١٨	٠.١٨	٠.١٨	٠.١٧	٠.١٨
a _٢ ٠.٠٥ %	٠.٤٧	٠.٤٠	٠.٣٣	٠.٢٧	٠.٣٧	٠.٤٩	٠.٤١	٠.٣٣	٠.٢٦	٠.٣٧
a _٣ ٠.١ %	٠.٥٣	٠.٤٧	٠.٤٠	٠.٣٣	٠.٤٣	٠.٥٧	٠.٥٠	٠.٤٢	٠.٣٤	٠.٤٦
a _٤ ٠.٢ %	٠.٦٦	٠.٥٣	٠.٤٧	٠.٤٠	٠.٥٢	٠.٧١	٠.٥٨	٠.٥٠	٠.٤٢	٠.٥٥
a _٥ ٠.٤ %	٠.٦٧	٠.٥٥	٠.٤٨	٠.٤١	٠.٥٣	٠.٧٢	٠.٦٠	٠.٥١	٠.٤٣	٠.٥٧
Mean (B)	٠.٥٠	٠.٤٢	٠.٣٧	٠.٣١		٠.٥٣	٠.٤٥	٠.٣٩	٠.٣٢	
	A		B		AB	A		B		AB

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New L.S.D at °	.٠٧	.٠٦	.١٣	.٠٧	.٠٥	.١١
%						

b₁ = Growth start

b_r = Just after fruit setting

b_v = First bloom

b_t = One month after fruit setting

Advancing dates of spraying Algae extract caused a significant and gradual promotion on fruit retention %. Spraying Algae extract once at growth start or at first blooming stage gave the best results. Worst results were obtained with spraying Algae extract once at one month after fruit setting.

One application of ٠.٢ % Algae extract at growth start gave the best results with regard to fruit retention. These results were similar during both seasons.

The beneficial effects of Algae extract on growth and nutritional status of the trees surely reflected on improving fruit retention.

These results are in conformity with those obtained by Ebeid-Sanaa (٢٠٠٧); Mouftah (٢٠٠٧) and El- Sayed- Esraa (٢٠١٠).

٤- Yield/ tree:

It is evident from the data in Table (٥) that treatment the trees once with Algae extract at ٠.٠٥ to ٠.٤ % always accompanied with improving the yield per tree comparing with the control treatment. There was a gradual promotion on the yield with increasing Algae extract concentrations from ٠.١ to ٠.٤ %. No significant increase on the yield was observed among the higher two concentrations of Algae extract (٠.٢ and ٠.٤ %). Therefore, the recommended concentrations from economical point of view was ٠.٢ % Algae extract.

There was a gradual promotion on the yield with advancing dates of spraying Algae extract. Treating the trees once with Algae extract at growth start gave the best results.

One spray at growth start with Algae extract at ٠.٢ % from economical point of view gave the best results with regard to yield of Alphonse mango trees. Yield per tree in such promised treatment during both seasons reached ٦٧ and ٦٩ kg, respectively, comparing

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with 40.4 and 50.6 kg produced by untreated trees in both seasons (2010 and 2011), respectively. These results were similar during both seasons.

Table 5: Effect of different concentrations and dates of spraying Algae extract on the yield/ tree (kg.) and average fruit weight (g.) of Alphonse mango trees during 2010 and 2011 seasons.

Algae extract concentrations (A)	Yield per tree (kg.)									
	2010					2011				
	Dates of spraying Algae extract (B)									
	b ₁	b ₂	b ₃	b ₄	Mean (A)	b ₁	b ₂	b ₃	b ₄	Mean (A)
a ₁ 0.0 %	40.6	40.0	40.0	40.0	40.4	01.0	01.0	01.0	01.0	01.0
a ₂ 0.05 %	04.0	02.0	00.0	47.0	00.9	00.9	03.7	01.7	49.0	02.7
a ₃ 0.1 %	09.0	07.0	04.0	01.0	00.4	70.0	08.0	00.0	02.0	07.4
a ₄ 0.2 %	77.0	73.0	09.0	07.0	71.3	79.0	73.9	09.0	07.0	72.0
a ₅ 0.4 %	78.0	73.7	09.7	07.0	71.9	79.3	74.0	09.7	07.0	72.4
Mean (B)	08.8	07.2	03.7	01.2		71.0	08.2	00.1	02.7	
New L.S.D at 5 %	A		B		AB	A		B		AB
	1.4		1.2		2.7	1.0		1.3		2.9
Character	Average fruit weight (g.)									
a ₁ 0.0 %	172. .	172. .	172. .	171. .	171. 8	172. .	172. .	172. .	171. 9	172. .
a ₂ 0.05 %	204. .	197. .	188. .	180. .	192. 3	200. 7	198. 0	189. 7	181. 7	193. 9
a ₃ 0.1 %	213. .	200. .	198. .	189. .	201. 3	210. .	207. .	199. .	190. .	202. 0
a ₄ 0.2 %	241. 9	210. .	207. .	199. 9	217. .	229. 9	217. .	207. .	200. .	213. 2
a ₅ 0.4 %	242. .	210. 0	207. 0	200. .	217. 3	230. .	217. 7	207. 0	201. .	213. 8
Mean (B)	214. 7	200. 9	194. 0	188. .		210. 0	201. 8	190. .	188. 9	
New L.S.D at 5 %	A		B		AB	A		B		AB
	7.0		0.0		12.3	0.0		0.0		11.2

b₁ = Growth start
 b₂ = Just after fruit setting
 b₃ = First bloom
 b₄ = One month after fruit setting

The previous beneficial effect of Algae extract on fruit retention positively reflected on improving the yield.

These results are in conformity with those obtained by Ebeid-Sanaa (2007); Mouftah (2007) and El- Sayed- Esraa (2010).

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•- Fruit characteristics:

Data in Tables (ϕ & ϑ & ϒ) obviously revealed that supplying mango trees cv. Alphonse with Algae extract at 0.10 to 0.25 % associated with improving quality of the fruits in terms of increasing fruit weight, T.S.S % as well as total and reducing sugars % and reducing total acidity % rather than non- application. The promotion on both physical and chemical characteristics of the fruits was associated with increasing Algae extract concentrations. Increasing Algae extract concentrations from 0.2 to 0.25 % failed to show measurable and significant promotion on the fruit quality. Therefore, the recommended concentration of Algae extract in this respect was 0.2 %.

Table ϑ: Effect of different concentrations and dates of spraying Algae extract on some chemical characteristics of the fruits of Alphonse mango trees during 2010 and 2011 seasons.

Algae extract concentrations (A)	Total soluble solids %									
	2010					2011				
	Dates of spraying Algae extract (B)									
	b ₁	b ₂	b ₃	b ₄	Mean (A)	b ₁	b ₂	b ₃	b ₄	Mean (A)
a ₁ 0.10 %	17.2	17.2	17.2	17.2	17.2	17.3	17.4	17.4	17.4	17.4
a ₂ 0.15 %	17.7	17.9	17.0	18.0	17.3	17.0	17.3	17.7	18.0	17.0
a ₃ 0.1 %	17.0	17.0	17.8	18.3	17.7	17.0	17.8	18.2	18.7	18.1
a ₄ 0.2 %	17.2	17.7	18.1	18.0	17.9	17.8	18.3	18.7	18.9	18.4
a ₅ 0.25 %	17.3	17.8	18.1	18.0	17.9	17.9	18.4	18.8	18.9	18.0
Mean (B)	17.9	17.2	17.0	17.9		17.3	17.7	17.9	18.2	
New L.S.D at 5 %	A		B		AB	A		B		AB
	0.3		0.2		0.4	0.3		0.2		0.4
Character	Total sugars %									
a ₁ 0.10 %	14.1	14.1	14.1	14.1	14.1	14.3	14.3	14.3	14.4	14.3
a ₂ 0.15 %	14.7	10.0	10.3	10.7	10.1	14.9	10.3	10.7	10.9	10.4
a ₃ 0.1 %	10.0	10.0	10.8	17.1	10.7	10.3	10.8	17.2	17.0	17.0
a ₄ 0.2 %	10.7	10.9	17.2	17.7	17.1	17.0	17.4	17.7	17.9	17.0
a ₅ 0.25 %	10.7	17.0	17.3	17.8	17.2	17.0	17.0	17.8	17.0	17.7
Mean (B)	10.0	10.3	10.0	10.9		10.3	10.7	10.9	17.1	
New L.S.D at 5 %	A		B		AB	A		B		AB
	0.2		0.2		0.4	0.2		0.2		0.4

b₁ = Growth start

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b_{γ} = Just after fruit setting

b_{γ} = First bloom

b_{ξ} = One month after fruit setting

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Table V: Effect of different concentrations and dates of spraying Algae extract on some chemical characteristics of the fruits of Alphonse mango trees during 2010 and 2011 seasons.

Algae extract concentrations (A)	Reducing sugars %									
	2010					2011				
	Dates of spraying Algae extract (B)									
	b ₁	b ₂	b ₃	b ₄	Mean (A)	b ₁	b ₂	b ₃	b ₄	Mean (A)
a ₁ 0.0 %	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1
a ₂ 0.05 %	3.4	3.7	4.0	4.2	3.8	3.0	3.8	4.2	4.4	4.0
a ₃ 0.1 %	3.9	4.2	4.0	4.7	4.3	4.0	4.2	4.6	4.8	4.4
a ₄ 0.2 %	4.2	4.0	4.7	4.9	4.6	4.3	4.6	4.8	4.9	4.7
a ₅ 0.4 %	4.2	4.0	4.7	0.0	4.6	4.3	4.6	4.9	0.0	4.7
Mean (B)	3.7	4.0	4.2	4.4		3.8	4.1	4.3	4.4	
New L.S.D at 0 %	A		B		AB	A		B		AB
	0.2		0.2		0.4	0.2		0.2		0.4
Character	Total acidity %									
a ₁ 0.0 %	0.39 1	0.38 9	0.38 8	0.33 8	0.38 9	0.39 0	0.39 0	0.38 8	0.38 8	0.38 9
a ₂ 0.05 %	0.37 1	0.30 1	0.33 1	0.32 0	0.34 3	0.36 7	0.34 8	0.32 8	0.31 7	0.34 0
a ₃ 0.1 %	0.30 1	0.33 1	0.32 0	0.30 8	0.32 8	0.34 8	0.32 8	0.31 7	0.30 8	0.32 0
a ₄ 0.2 %	0.33 1	0.32 0	0.30 8	0.27 7	0.30 9	0.32 8	0.31 7	0.30 7	0.27 1	0.30 7
a ₅ 0.4 %	0.33 0	0.31 8	0.30 7	0.27 0	0.30 8	0.32 7	0.31 7	0.30 7	0.27 0	0.30 0
Mean (B)	0.30 0	0.34 2	0.33 1	0.31 3		0.30 2	0.34 0	0.32 9	0.31 1	
New L.S.D at 0 %	A		B		AB	A		B		AB
	0.014		0.011		0.020	0.010		0.013		0.029

b₁ = Growth start

b₂ = Just after fruit setting

b₃ = First bloom

b₄ = One month after fruit setting

Delaying dates of spraying Algae extract from growth start till one month after fruit setting resulted in gradual promotion on chemical quality and a reduction on fruit weight. The best results with

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regard to fruit weight were obtained with using Algae extract at growth start. Spraying Algae extract at one month after fruit setting gave favourable effects on chemical characteristics of the fruits.

The largest fruits were recorded with using Algae extract once at growth start. The same trend was obtained in both seasons of the study.

The beneficial effect of Algae extract on enhancing cell division and the biosynthesis of sugars may help in advancing maturity stages (Adam, 1999).

These results are in conformity with those obtained by Ebeid-Sanaa (2007); Mouftah (2007) and El- Sayed- Esraa (2010).

As a conclusion, treatment of Alphonse mango trees once at growth start with 0.2 % Algae extract seem to be beneficial for promoting the productivity of the trees.

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The effect of application of algae extract on mango trees استجابة أشجار المانجو الفونس للرش الورقي لمستخلص الطحالب

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خلال موسمي ٢٠١٠، ٢٠١١ تم رش أشجار المانجو صنف العويس مرة واحدة في بداية النمو أو في بداية الإزهار أو بعد عقد الثمار مباشرة أو بعد عقد الثمار بشهر بمستخلص الطحالب بتركيز صفر، ٠.٠٥، ٠.١، ٠.٢، ٠.٤ % . تم دراسة درجة استجابة خصائص النمو والنسبة المئوية لعناصر النيتروجين والفسفور والبوتاسيوم في الأوراق، النسبة المئوية للثمار الباقية علي الشجرة، كمية محصول الشجرة وخصائص الجودة للثمار لمعاملات مستخلص الطحالب.

أشارت نتائج الدراسة أن التبريد في موعد رش مستخلص الطحالب من مرحلة نمو الثمار الي مرحلة بداية النمو الخضري مع زيادة التركيز المستخدم من المستخلص من صفر الي ٠.٤ % أدى الي تحسن تدريجي في صفات النمو الخضري ومحتوي الورقة من عناصر النيتروجين والفسفور والبوتاسيوم، النسبة المئوية للثمار الباقية علي الشجرة وكمية محصول الشجرة ووزن الثمرة. وكانت الخصائص الكيميائية للثمار تميل الي التحسن مع تأخير موعد رش مستخلص الطحالب وكذلك مع زيادة التركيز المستخدم من مستخلص الطحالب.

كان معاملة أشجار المانجو العويس مرة في بداية النمو الخضري بمستخلص الطحالب بتركيز ٠.٢ % مفيدا في تحسين المحصول كما ونوعا.