

Response Of Sakkoti And Bartemuda Date Palms To Spraying Seaweed Extract

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Abstract: During 2012 & 2013 seasons both date palm cvs Sakkoti and Bartemuda were subjected to spraying with seaweed extract three or four times at 0.05, 0.1 and 0.2% . Growth, palm nutritional status and productivity in such two date palm cvs in response to seaweed extract treatments were investigated. Carrying out three or four sprays of seaweed extract at 0.05 to 0.2 % was very effective in enhancing growth characters, total chlorophylls, different nutrients, yield and fruit quality relatively to the check treatment. The promotion was associated with increasing concentrations and frequencies of seaweed extract. The best results with regard to yield and fruit quality of Sakkoti and Bartemuda date palms were obtained with using seaweed extract three times at 0.1%.

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1. Introduction

Recently, many attempts were carried out for using seaweed extract to promote the yield and fruit quality of Sakkoti and Bartemuda date palms. Seaweed extract contains great amounts of nutrients, amino acids, antioxidants, vitamins natural hormones and plant pigments. It is also beneficial for increasing the tolerant of plants to all stresses (James, 1994).

Previous studies showed that using seaweed extract at various concentrations and frequencies had an announced promotion on growth and fruiting of all evergreen fruit crops (El- Sawy, 2005; Gamal, 2006; Mouftah, 2007; El- Sayed- Esraa, 2010; Merwad *et al.*, 2011; Abdelaal *et al.*, 2012; Mahmoud, 2012; Ahmed *et al.*, 2013a and 2013b; Mohamed and El-Sehrawy, 2013; Gamal, 2013 and Ahmed *et al.*, 2014).

The target of this study was elucidating the effect of different concentrations and frequencies of seaweed extract on fruiting of Sakkoti and Bartemuda date palms.

2. Material and Methods

This study was carried out during 2012 and 2013 seasons on twenty- one tissue culture derived Sakkoti and Bartemuda date palms grown in a private orchard located at Abo El- Riesh village, Aswan district, Aswan Governorate. All the palms of each cv were at the same age and uniform in vigour. The palms of both cvs were 10- years old at the start of this study, good physical conditions, free of insects, damage and diseases. The selected palms were planted at 8x8 meters apart. The selected palms were irrigated through surface irrigation system using Nile water. Soil is

classified as silty clay in texture with a water table depth not less than two meters deep.

Pruning was performed to maintain leaf bunch ratio at 8: 1 (according to Sayed, 2002). The number of female spathes per palm was adjusted to 10 spathes. Pollination was achieved by inserting five male strands into the female bunch using known high activity pollen source throughout 2-3 days after female spathe cracking.

Each selected palm /received the common horticultural practices that are already applied in the orchard except those dealing with inorganic, organic and biofertilization of N.

This study consisted from seven treatments from different concentrations and frequencies of seaweed extract for the two dry date palm cvs Sakkoti and Bartemuda. They can be arranged as follows:

- 1- Control palms (sprayed with water only).
- 2- Spraying seaweed extract at 0.05% three times before blooming , just after fruit setting and at one month later.
- 3- Spraying seaweed extract at 0.05% four times before blooming , just after fruit setting and at one month intervals.
- 4- Spraying seaweed extract at 0.1% three times as previously mentioned.
- 5- Spraying seaweed extract at 0.1% four times as previously mentioned.
- 6- Spraying seaweed extract at 0.2% three times as previously mentioned.
- 7- Spraying seaweed extract at 0.2% four times as previously mentioned.

Each treatment for both dry date palm cvs was replicated three times, one palm per each. Spraying was done till runoff using Triton B as a wetting agent.

During both seasons the following measurements were recorded:

1- Some vegetative growth characters namely number of pinnae / leaf, length & width and area of pinnae and leaf (**Ahmed and Morsy, 1999**) as well as spine length and number of spines / leaf 2) total chlorophylls (**Hiscox and Isralstam, 1979**) and N, P, K and Mg on the leaves (**Wilde et al., 1985**).

3- Flowering and fruit setting characters namely number of strands, bunch number of flowers and fruits / strand, initial fruits setting % and fruit retention%

4- Yield/ palm and bunch weight (kg.).

5- Physical and chemical characteristics of the fruits namely fruit weight and dimension (length & width in m) pulp %, T.S.S., total and reducing sugars (**A.O.A.C. 2000**), total acidity % (as gallic / 100 g pulp) and total soluble tannins (**A.O.A.C., 2000**).

Statistical analysis was done using new L.S.D. test at 5% (**Mead et al., 1993**)

3. Results and Discussion

a) Results

1- Effect of different concentrations and frequencies of seaweed extract on some growth characters.

It is clear from the obtained data in Tables (1 to 4) that using seaweed extract three or four times at 0.05 to 0.2% significantly was accompanied with stimulating the nine growth characters namely number of pinnae per leaf, length, width and area of pinnae and leaf, number of spines/ leaf and spine length relatively to the control treatment. The stimulation was associated with increasing concentrations from 0.05 to 0.2% and frequencies from three to four times. Increasing concentrations from 0.1 to 0.2% as well as frequencies from three to four times of seaweed extract failed significantly to show any stimulation on these growth characters. The maximum leaf area (2.38 & 2.48 m²) were recorded on the palms of Sakkoti that treated four times with seaweed at 0.2%. In date palm cv. Bartemuda, the same treatment gave 2.46 & 2.53 m² leaf area during both seasons respectively. The untreated palm cvs of both date palms recorded the minimum values. These results were true during both seasons.

2- Effect of different concentrations and frequencies of seaweed extract on the leaf chemical composition

It is clear from the data in Tables (3 to 6) that foliar application of seaweed extract three or four times at 0.05 to 0.2% had significant promotion on total chlorophylls as well as percentages of N, P, K and Mg in the leaves rather than non- application. There was a gradual promotion on these traits with increasing concentrations and frequencies of seaweed extract. Increasing concentrations from 0.1 to 0.2% as well as frequencies from three to four times had no significant stimulation on total chlorophylls and all

nutrients in the leaves. The maximum total chlorophylls in the leaves of Sakkoti date palms (13.0 & 13.5 mg / 100 g F.W) and Bartemuda date palms (15.1 & 14.6 mg/ 100 g F.W.) were recorded on the palms that received four sprays of seaweed extract at 0.2%. The minimum values of total chlorophylls in the leaves of Sakkoti date palms (11.0 & 11.0 mg/ 100 g F.W.) and Bartemuda date palms (11.9 & 12.1 mg/ 100 g F.W.) were recorded on the untreated palms. These results were true during both seasons.

3- Effect of different concentrations and frequencies of seaweed extract on spathe morphology.

It is evident from the obtained data in Tables (5 to 8) that supplying Sakkoti and Bartemuda date palms three or four times with seaweed extract at 0.05 to 0.2% significantly improved number of strands / spathe as well as number of flowers and fruits per strand over the check treatment. The promotion was clearly related to the increase in both concentrations and frequencies of seaweed extract. Meaningless promotion was recorded when concentrations of seaweed extract were increased from 0.1 to 0.2% and frequencies from three to four times. The maximum values were recorded on date palm cvs treated four times with seaweed extract at 0.2%. The lowest values of number of strands/ spathe in date palm cv. Sakkoti (71.0 & 72.0) and Bartemuda (74.1 & 75.0) were noticed in untreated palms during 2012 and 2013 seasons, respectively. These results were true during both seasons.

4-Effect of different concentrations and frequencies of seaweed extract on fruit setting

It can be stated from the obtained data in Tables (7 to 10) that treating the palms three or four times with seaweed extract at 0.05 to 0.2% significantly was responsible for promoting both initial fruit setting and fruit retention over the check treatment. The promotion was in proportional to the increase in both concentration and frequencies of seaweed extract. A slight and insignificant promotion was observed with increasing concentrations from 0.1 to 0.2% and frequencies from three to four times. The maximum values were recorded on the palms that received four sprays of seaweed extract at 0.2%. The lowest values were recorded on untreated palms. Fruit retention reached the maximum values in date palm cv. Sakkoti (41.7 & 42.3%) and Bartemuda (43.0 & 43.5%) treated four times with seaweed extract at 0.2% during both seasons, respectively. The lowest values were recorded on untreated palms of both cvs. These results were true during both seasons.

5- Effect of different concentrations and frequencies of seaweed extract on the yield and bunch weight

It is clear from the obtained data in Tables (9 to 12) that treating palms three or four times with seaweed extract at 0.05 to 0.2% significantly was

followed by promoting yield of palm and bunch weight over the check treatment. There was a progressive promotion on both yield and bunch weight with increasing concentrations from 0.05 to 0.02% and frequencies from three to four times of seaweed extract. Accordingly, the recommended concentration and frequencies were 0.1% and three times, respectively. From economical point of view spraying the palms three times with seaweed extract at 0.1% gave the best results with regard to yield. Under such promised treatment, yield of Sakkoti date palms reached 127.0 and 130.0 kg and yield of Bartemuda date palms reached 127.0 and 130.0 kg during both seasons, respectively. The minimum yield of Sakkoti date palms (110.0 and 111.0 kg) and Bartemuda date palms (110.0 and 111.0 kg) were recorded on untreated palms during both seasons, respectively. The percentage of increase on the yield due to using the promised treatment over the check treatment reached 15.5 and 17.1 % during both seasons, respectively. These results were true during both seasons.

6- Effect of different concentrations and frequencies of seaweed extract on fruit quality

The obtained data clearly show in Tables (9 to 12) that using seaweed extract three or four times at 0.05 to 0.2 % caused a significant promotion on fruit quality in terms of increasing fruit weight and dimensions (length & width), pulp %, T.S.S.% as well as total and reducing sugars and decreasing total acidity % and total soluble tannins % over the check treatment. The promotion on fruit quality was associated with increasing concentrations and frequencies of seaweed extract. Increasing concentration of seaweed extract from 0.1 to 0.2% and frequencies from three to four times failed significantly to promote fruit quality. From economical point of view treating these palms three times with seaweed extract at 0.1% gave the best results with regard to fruit quality. Unfavourable effects on fruit quality were observed on untreated palms. These results were true during both seasons.

Table (1): Effect of different concentrations and frequencies of seaweed extract on some vegetative growth characters of Sakkoti date palms during 2012 and 2013 seasons.

Seaweed extract treatments	No. of pinnae / leaf		Pinnae length (cm)		Pinnae width (cm)		Pinnae area (cm ²)		Leaf length (cm)	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	160.7	161.0	46.0	46.3	3.0	3.1	102.8	106.5	333.0	331.0
Seaweed extract at 0.05 % three times	163.0	164.0	47.5	48.0	3.3	3.5	115.3	122.9	337.3	339.0
Seaweed extract at 0.05 % four times	164.0	164.8	48.0	48.3	3.4	3.6	119.6	126.8	337.6	339.3
Seaweed extract at 0.1 % three times	167.8	169.0	49.9	50.0	3.7	3.9	134.0	140.9	341.9	344.7
Seaweed extract at 0.1 % four times	168.0	169.3	50.0	50.3	3.8	4.0	137.6	145.1	342.0	345.0
Seaweed extract at 0.2 % three times	168.3	169.3	50.0	50.6	3.8	4.0	137.6	145.9	342.0	345.0
Seaweed extract at 0.2 % four times	168.7	169.7	50.0	50.6	3.9	4.0	140.9	145.9	343.0	346.0
New L.S.D. at 5%	2.0	2.4	0.7	0.8	0.2	0.3	5.1	4.9	2.1	2.2

Table (2): Effect of different concentrations and frequencies of seaweed extract on some vegetative growth characters of Bartemuda date palms during 2012 and 2013 seasons.

Seaweed extract treatments	No. of pinnae / leaf		Pinnae length (cm)		Pinnae width (cm)		Pinnae area (cm ²)		Leaf length (cm)	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	121.0	123.0	49.0	50.0	4.0	4.0	141.6	144.3	295.0	293.3
Seaweed extract at 0.05 % three times	123.3	125.9	51.5	51.5	4.3	4.3	158.7	158.7	299.0	298.3
Seaweed extract at 0.05 % four times	124.0	126.0	51.9	51.7	4.4	4.4	163.3	162.7	300.0	301.0
Seaweed extract at 0.1 % three times	127.0	128.0	53.3	54.0	4.7	4.8	178.1	184.0	304.0	305.0
Seaweed extract at 0.1 % four times	127.7	128.3	53.5	54.6	4.8	4.9	182.3	189.5	305.0	306.0
Seaweed extract at 0.2 % three times	131.0	129.0	53.5	54.7	4.8	4.9	182.3	189.9	305.5	307.0
Seaweed extract at 0.2 % four times	131.9	130.0	53.6	55.0	4.9	5.0	186.3	194.5	305.5	307.0
New L.S.D. at 5%	2.1	2.2	0.8	0.8	0.3	0.3	5.1	5.5	2.2	2.3

Table (3): Effect of different concentrations and frequencies of seaweed extract on some vegetative growth characters and total chlorophylls in the leaves of Sakkoti date palms during 2012 and 2013 seasons.

Seaweed extract treatments	Leaf width(cm)		Leaf area (m ²)		Number of spines/leaf		Spine length (cm)		Total chlorophylls (mg/100g.F.W)	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	23.3	24.0	1.65	1.71	32.0	31.0	11.0	10.8	11.0	11.0
Seaweed extract at 0.05 % three times	24.7	25.5	1.88	2.02	35.0	36.7	11.5	11.6	11.7	11.9
Seaweed extract at 0.05 % four times	25.0	25.8	1.96	2.09	36.0	37.6	11.6	11.7	11.8	12.0
Seaweed extract at 0.1 % three times	26.3	27.1	2.25	2.38	39.0	42.0	12.0	12.1	12.7	13.3
Seaweed extract at 0.1 % four times	26.7	27.5	2.31	2.46	39.9	42.6	12.1	12.2	12.8	13.3
Seaweed extract at 0.2 % three times	26.5	27.3	2.31	2.47	39.3	42.3	12.1	12.2	12.9	13.5
Seaweed extract at 0.2 % four times	27.0	27.9	2.38	2.48	40.0	43.0	12.2	12.3	13.0	13.6
New L.S.D. at 5%	1.0	0.9	0.11	0.12	2.0	2.1	0.3	0.2	0.4	0.5

Table (4): Effect of different concentrations and frequencies of seaweed extract on some vegetative growth characters and total chlorophylls in the leaves of Bartemuda date palms during 2012 and 2013 seasons.

Seaweed extract treatments	Leaf width(cm)		Leaf area (m ²)		Number of spines/leaf		Spine length (cm)		Total chlorophylls (mg/100g.F.W)	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	25.0	25.3	1.71	1.77	33.0	33.7	11.5	11.5	11.9	12.1
Seaweed extract at 0.05 % three times	26.2	26.5	1.96	2.00	35.3	36.3	12.2	12.1	13.0	13.1
Seaweed extract at 0.05 % four times	26.3	27.0	2.02	2.05	36.0	37.0	12.3	12.2	13.3	13.4
Seaweed extract at 0.1 % three times	28.0	28.1	2.26	2.36	38.0	38.9	13.0	13.1	14.7	14.3
Seaweed extract at 0.1 % four times	28.4	28.2	2.33	2.43	38.7	39.0	13.3	13.3	15.0	14.5
Seaweed extract at 0.2 % three times	28.5	28.3	2.39	2.45	39.0	39.0	13.3	13.3	14.8	14.5
Seaweed extract at 0.2 % four times	28.7	28.5	2.46	2.53	39.3	39.3	13.4	13.5	15.1	14.6
New L.S.D. at 5%	1.0	1.1	0.09	0.10	2.0	2.0	0.3	0.3	0.5	0.5

Table (5): Effect of different concentrations and frequencies of seaweed extract on the percentages of N, P, K and Mg in the leaves and number of strands /bunch of Sakkoti date palms during 2012 and 2013 seasons.

Seaweed extract treatments	Leaf N %		Leaf P %		Leaf K %		Leaf Mg %		No. of strands / bunch	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	1.49	1.55	0.14	0.16	1.31	1.43	0.41	0.44	71.0	72.0
Seaweed extract at 0.05 % three times	1.57	1.63	0.18	0.20	1.38	1.41	0.46	0.50	74.0	75.0
Seaweed extract at 0.05 % four times	1.59	1.64	0.19	0.21	1.39	1.42	0.47	0.52	74.7	76.0
Seaweed extract at 0.1 % three times	1.66	1.74	0.23	0.25	1.47	1.49	0.53	0.57	77.3	79.0
Seaweed extract at 0.1 % four times	1.68	1.75	0.24	0.25	1.49	1.50	0.54	0.58	78.0	80.0
Seaweed extract at 0.2 % three times	1.69	1.82	0.24	0.26	1.48	1.51	0.54	0.58	78.0	79.6
Seaweed extract at 0.2 % four times	1.71	1.83	0.25	0.27	1.50	1.52	0.55	0.59	78.3	80.6
New L.S.D. at 5%	0.05	0.06	0.03	0.03	0.04	0.05	0.03	0.04	1.9	2.0

Table (6): Effect of different concentrations and frequencies of seaweed extract on the percentages of N, P, K and Mg in the leaves and number of strands /bunch of Bartemuda date palms during 2012 and 2013 seasons.

Seaweed extract treatments	Leaf N %		Leaf P %		Leaf K %		Leaf Mg %		No. of strands / bunch	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	1.55	1.59	0.14	0.15	1.34	1.36	0.45	0.44	74.1	75.0
Seaweed extract at 0.05 % three times	1.64	1.66	0.17	0.19	1.44	1.46	0.50	0.50	76.0	77.3
Seaweed extract at 0.05 % four times	1.65	1.67	0.18	0.20	1.46	1.47	0.51	0.51	76.3	78.0
Seaweed extract at 0.1 % three times	1.74	1.76	0.21	0.23	1.56	1.58	0.57	0.59	78.7	81.0
Seaweed extract at 0.1 % four times	1.75	1.77	0.22	0.24	1.57	1.60	0.58	0.60	79.0	81.3
Seaweed extract at 0.2 % three times	1.75	1.77	0.22	0.24	1.58	1.60	0.58	0.60	79.0	81.3
Seaweed extract at 0.2 % four times	1.76	1.78	0.23	0.25	1.59	1.61	0.59	0.61	79.3	81.7
New L.S.D. at 5%	0.06	0.06	0.03	0.03	0.05	0.05	0.04	0.04	1.7	1.6

Table (7): Effect of different concentrations and frequencies of seaweed extract on number of flowers and fruits per strand, percentages of initial fruit setting and fruit retention and yield per palm (kg.) of Sakkoti date palms during 2012 and 2013 seasons.

Seaweed extract treatments	No. of flowers / strand		No. of fruits / strand		Percentage of initial fruit setting		Percentage of fruit retention		Yield / palm (kg.)	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	38.0	37.0	28.0	29.0	67.0	66.3	36.5	37.0	110.0	111.0
Seaweed extract at 0.05 % three times	41.0	40.0	30.3	31.3	69.6	69.9	38.9	39.4	116.0	120.0
Seaweed extract at 0.05 % four times	41.2	40.2	30.6	31.6	70.0	70.0	39.0	39.5	117.0	121.0
Seaweed extract at 0.1 % three times	43.3	43.0	33.0	34.0	72.3	72.6	41.0	41.6	127.0	130.0
Seaweed extract at 0.1 % four times	43.6	43.1	33.1	34.1	72.5	72.8	41.2	41.7	128.0	131.0
Seaweed extract at 0.2 % three times	44.0	43.7	33.6	34.3	72.6	73.0	41.3	42.0	130.0	132.0
Seaweed extract at 0.2 % four times	44.3	44.0	33.9	34.5	73.0	73.7	41.7	42.3	131.0	133.0
New L.S.D. at 5%	2.0	2.0	1.6	1.7	1.8	1.9	1.6	1.7	2.0	2.1

Table (8): Effect of different concentrations and frequencies of seaweed extract on number of flowers and fruits per strand, percentages of initial fruit setting and fruit retention and yield, palm (kg.) of Bartemuda date palms during 2012 and 2013 seasons.

Seaweed extract treatments	No. of flowers / strand		No. of fruits / strand		Percentage of initial fruit setting		Percentage of fruit retention		Yield / palm (kg.)	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	40.0	41.0	21.0	22.0	70.0	69.3	37.3	38.0	110.0	111.0
Seaweed extract at 0.05 % three times	42.2	43.0	23.0	24.0	72.0	71.9	39.6	40.0	116.0	120.0
Seaweed extract at 0.05 % four times	43.0	43.3	23.6	24.3	72.3	72.0	40.0	40.6	117.0	121.0
Seaweed extract at 0.1 % three times	46.0	47.1	26.0	27.3	75.0	74.3	42.3	43.0	127.0	130.0
Seaweed extract at 0.1 % four times	46.7	47.3	26.6	28.0	75.4	74.5	42.5	43.3	128.0	131.0
Seaweed extract at 0.2 % three times	47.0	47.5	27.0	28.0	75.6	74.7	42.5	43.4	130.0	132.0
Seaweed extract at 0.2 % four times	47.3	47.6	27.3	28.3	75.7	74.8	43.0	43.5	131.0	133.0
New L.S.D. at 5%	1.4	1.9	1.7	1.7	1.9	1.9	1.5	1.5	1.8	1.8

Table (9): Effect of different concentrations and frequencies of seaweed extract on bunch weight , fruit weight & dimensions and percentage of pulp in the fruits of Sakkoti date palms during 2012 and 2013 seasons.

Seaweed extract treatments	Average bunch weight (kg.)		Av. fruit weight (g.)		Av. fruit length (cm.)		Av. fruit width (cm.)		Pulp %	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	11.0	11.1	10.7	10.9	5.0	5.0	2.2	2.2	64.9	65.0
Seaweed extract at 0.05 % three times	11.6	12.0	11.0	11.4	5.3	5.3	2.4	2.4	67.0	67.1
Seaweed extract at 0.05 % four times	11.7	12.1	11.1	11.5	5.4	5.5	2.5	2.5	67.3	67.4
Seaweed extract at 0.1 % three times	12.7	13.0	11.5	11.8	5.8	5.8	2.6	2.7	69.0	69.1
Seaweed extract at 0.1 % four times	12.8	13.1	11.6	11.6	5.9	5.8	2.6	2.7	69.3	69.5
Seaweed extract at 0.2 % three times	13.0	13.2	11.7	12.0	5.9	5.9	2.7	2.8	69.7	69.8
Seaweed extract at 0.2 % four times	13.1	13.3	11.9	12.1	6.0	5.9	2.8	2.9	70.0	70.2
New L.S.D. at 5%	0.5	0.6	0.3	0.3	0.2	0.2	0.2	0.2	1.8	1.7

Table (10): Effect of different concentrations and frequencies of seaweed extract on bunch weight , fruit weight & dimensions and percentage of pulp in the fruits of Bartemuda date palms during 2012 and 2013 seasons.

Seaweed extract treatments	Average bunch weight (kg.)		Av. fruit weight (g.)		Av. fruit length (cm.)		Av. fruit width (cm.)		Pulp %	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	12.1	12.0	12.0	12.1	6.0	6.0	2.5	2.6	67.0	68.0
Seaweed extract at 0.05 % three times	12.7	12.9	12.4	12.5	6.3	6.3	2.7	2.9	69.3	71.0
Seaweed extract at 0.05 % four times	12.8	13.0	12.5	12.6	6.4	6.4	2.7	3.0	70.0	71.5
Seaweed extract at 0.1 % three times	13.4	14.1	13.0	13.3	6.6	6.7	2.9	3.3	72.5	74.0
Seaweed extract at 0.1 % four times	13.5	14.8	13.1	13.4	6.7	6.7	3.0	3.3	73.0	74.3
Seaweed extract at 0.2 % three times	13.5	14.8	13.1	13.5	6.7	6.7	3.0	3.3	73.3	74.5
Seaweed extract at 0.2 % four times	13.6	14.9	13.2	13.6	6.8	6.8	3.0	3.3	73.5	74.6
New L.S.D. at 5%	0.5	0.5	0.3	0.3	0.2	0.2	0.2	0.2	1.9	2.0

Table (11): Effect of different concentrations and frequencies of seaweed extract on some chemical characters of the fruits of Sakkoti date palms during 2012 and 2013 seasons.

Seaweed extract treatments	T.S.S. %		Total sugars %		Reducing sugars %		Total acidity %		Total soluble tannins %	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	68.3	68.9	61.1	60.7	12.9	13.1	0.366	0.351	0.41	0.42
Seaweed extract at 0.05 % three times	70.9	71.5	62.1	63.0	13.4	13.7	0.331	0.301	0.36	0.37
Seaweed extract at 0.05 % four times	71.0	71.6	62.3	63.3	13.5	13.8	0.329	0.308	0.35	0.36
Seaweed extract at 0.1 % three times	73.0	73.7	63.9	64.9	13.9	14.3	0.297	0.271	0.32	0.31
Seaweed extract at 0.1 % four times	73.6	74.2	64.0	65.0	14.0	14.4	0.295	0.269	0.31	0.28
Seaweed extract at 0.2 % three times	73.6	74.2	64.0	65.0	14.0	14.4	0.291	0.269	0.30	0.28
Seaweed extract at 0.2 % four times	74.0	74.5	64.3	65.4	14.1	14.5	0.288	0.267	0.29	0.26
New L.S.D. at 5%	1.0	0.9	0.8	0.9	0.4	0.4	0.022	0.025	0.04	0.04

Table (12): Effect of different concentrations and frequencies of seaweed extract on some chemical characteristics of the fruits of Bartemuda date palms during 2012 and 2013 seasons.

Seaweed extract treatments	T.S.S.%		Total sugars%		Reducing sugars%		Total acidity %		Total soluble tannins%	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Control (spraying water)	71.1	71.6	65.0	66.0	14.0	14.3	0.311	0.321	0.31	0.31
Seaweed extract at 0.05 % three times	73.0	73.3	66.5	67.9	14.6	14.7	0.281	0.291	0.25	0.26
Seaweed extract at 0.05 % four times	73.3	74.0	67.0	68.0	14.7	14.8	0.280	0.288	0.23	0.25
Seaweed extract at 0.1 % three times	75.0	75.3	69.0	69.9	15.3	15.6	0.250	0.241	0.18	0.20
Seaweed extract at 0.1 % four times	75.4	75.5	69.5	70.0	15.4	15.7	0.248	0.238	0.17	0.19
Seaweed extract at 0.2 % three times	75.5	75.7	69.5	70.0	15.5	15.8	0.248	0.236	0.17	0.17
Seaweed extract at 0.2 % four times	75.6	75.8	69.7	70.3	15.6	15.9	0.246	0.233	0.16	0.16
New L.S.D. at 5%	0.9	0.9	0.7	0.8	0.4	0.4	0.022	0.020	0.04	0.04

4. Discussion

The previous promotive effect of seaweed extract on growth characters, palm nutritional status, yield and fruit quality might be attributed to its higher own content from natural plant hormones namely IAA; GA₃ and cytokinins that are responsible for enhancing cell division, glutathione, lecithin, vitamins, 60 nutrients and 21 amino acids. Also, seaweed extract plays an important role in enhancing the biosynthesis of all organic foods, plant pigments and antioxidants. Seaweed extract is also responsible for enhancing the resistance of palms to all stresses (James, 1994; and Spinelli *et al.*, 2009).

These results are in harmony with those obtained by El- Sawy, (2005); Gamal, (2006); Mouftah, (2007); El- Sayed- Esraa, (2010); Merwad *et al.*, (2011); Abdelaal *et al.*, (2012); Mahmoud, (2012); Ahmed *et al.*, (2013a and 2013b) ; Mohamed and El- Sehrawy, (2013); Gamal, (2013) and Ahmed *et al.*, (2014).

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