Productive Performance of Sewy Date Palms In Relation to Spraying *Spirulina Platensis* Algae, Plant Compost Tea, Salicylic Acid and Tocopherol

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Abstract: This study was carried out during 2015 and 2016 seasons to investigate the effect of spraying *Spirulinaplatensis* algae at 1%, plant compost tea at 10 %, salicylic acid and Tocopherol (vitamin E) each at 100 ppm on growth, palm nutritional status, yield and fruit quality of Sewy date palms grown under sandy soil. The selected palms (30 palms) received three sprays of these materials at the first week of March and at two month intervals. Single and combined applications of *Spirulinaplatensis* algae at 1%, plant compost tea at 10% as well as salicylic acid and Tocopherol each at 100 ppm materially was accompanied with enhancing all growth criteria, leaf pigments and nutrients, initial fruit setting %, fruit retention %, yield / palm, bunch weight, fruit weight and dimensions, T.S.S., total and reducing sugars % relative to the check treatment. A great decline on the percentages of titratable acidity, total crude fibre and total soluble tannins was observed due to application of the present treatments. The best materials in this respect were arranged as follows in descending order, *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol. An outstanding promotion was observed on yield and fruit quality of Sewy date palms grown under sandy soil was observed due to spraying the palms three times (1st week of March, May and July) with a mixture of *Spirulinaplatensis* algae at 1 %, plant compost tea at 10 %, salicylic acid and Tocopherol each at 100 ppm.

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1. Introduction

Nowadays, many attempts are accomplished for finding out certain non-conventional methods for improving yield and fruit quality of palms without any inferior effects on environment. Recently, applications of naturals such as *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol was revealed for improving production instead of using chemicals.

Clean cultivation is suggested to be one possibility to restore the natural conditions and it has become in the last few decades a positive alternative to chemical fertilizers.

Organic farming agriculture is a unique production management system which promotes and enhances agro-eco system of health including bio diversity, biological cycles and soil biological activity. It has been systematically followed on a large scale in the developed countries including Egypt. The use of organic and biostimulants is associated to help low input sustainable agriculture (**Russo and Berlyn, 1990**).

Organic and biofertilization are responsible for enhancing soil fertility, organic matter, N fixation, water retention, availability of nutrients, secretion of B vitamins, natural hormones and antibiotics, tolerance to pathogeneses as well as reducing soil pH and salinity (**Marschener, 1995; Kannaiyan, 2002 and Formowitz *et al*., 2007**).

Spirulina is especially rich, relative to other sources, in the polyunsaturated fatty acid γ– liolenic acid), and in pigments such as phycocyanin, myxoxanthopthyl and zeaxanthin. The biochemical composition of *Spirulina* had showing high protein concentration, 60-70 % of its dry weight, whose nutritive value is related to the quality of amino acid. *Spirulina* contains essential amino acids, including leucine, isoleucsive and valine. It also contains a relative high concentrationof provitamin A, vitamin B_{12} and β–carotene. *Spirulina* has 4-7% lipids, essential fatty acids as linolenic acid, and polynsaturated fatty acids. Cyanonbacteria and algae posses a wide range colored compounds, including carotenoids, chlorophylls, and phycobiliproteins. C-phycocyanin is the principal phycobiliprotein. A selenium containing phycocyanin has been isolated from S. *platensis*. A *Spirulinaplatensis* contains about 13.5% carbohydrates, the sugar composition is mainly composed of glucose, along with rhamnose, mannose, xylose, galactose, and two unusual sugars: 2-O-methyl-1-rhamnose and 2-Omethyl-1- rhamnose. Nowadays, the antiviral activity of *Spirulina* has been attributed to three groups of substances: sulfated polysccharides, sulfoglycolipids, and a protein- bound pigment, theallophcocianin. *Spirulina* contains 2.2 % -

3.5% of RNA and 0.6 %-1% of DNA, which represents less than 5% of these acids, based on dry weight. (**Barron *et al.*, 2008**).

Nowadays, there is a widespread use of antioxidants especially vitamins and salicylic acid. They are very effective in protecting plant cells from senescence and disorders (**Robinson, 1973**) as well as enhancing cell division, biosynthesis of the natural hormones such as IAA, GA_3 and cytokinins, nutrient and water uptake, photosynthesis, building of plant pigments and most organic nutrients. The important roles of these antioxidants on the biosynthesis of alpha – ketoglutaric acid which is united with ammonia to form different amino acids and proteins are hot regulated (**Oretili, 1987; Samiullah *et al*., 1988 and Singh *et al*., 2001**).

Salicylic acid (SA) is one of the groups of common phenolic compounds that are produced naturally by plants and acts as endogenous plant growth regulator. It is consists of an oromatic ring bearing a OH group and it deduces as 2-hydroxyl benzoic acid. It is an important phytohormone materially regulated growth of plants under stress conditions, ion uptake and transmission, photosynthesis, stomatal closure, membrane permeability, storage life, defense responses under biotic and abiotic stress conditions due to its action as plant significancy molecule. It activates the expression of several defense-related genes and induces synthesis of some enzymes that participate in proline biosynthesis or causes accumulation of proline and glycine-betaine which play a role as defense compounds under stress conditions. It extends plant cells age due to its action on inhibiting ethylene biosthyesis (**Raskin, 1992; Carmeron, 2000; Hayat and Ahmad, 2007; Janda *et al*., 2007; Canakci and Manzuroglu, 2009; and Joseph *et al*., 2010**).

Recently, it was suggested that vitamins participate a vital role in plant growth and development indirectly by enhancing the endogenous levels of various growth factors such as cytokinins and gibberellins (**Robinson, 1973**). They are responsible for enhancing nutrient uptake, absorption of water, translocation of organic foods, cell division, building of natural hormones, photosynthesis, plant pigments and protein synthesis. Vitamins with their antioxidative properties play an important role in plant defense against oxidative stress induced by reactive oxygen speies (ROS). They are responsible in stimulating the formation of alpha ketoglutaric acid which in united with NH_3 to form amino acids and proteins (**Samiullah *et al*., 1988; Oretill, 1987 and Singh *et al*., 2001**).

Using different organic manures and biofertilizers for date palm cvs besides mineral N was accompanied with enhancing growth, palm nutritional status, yield and fruit quality (**Osman, 2003; Mansour *et al*., 2004; Gobara and Ahmed, 2004; Mohamed and Gobara, 2004; Mohamed and Ragab, 2004; El-Assar, 2005; Al- Wasfy and El-Khawaga, 2008; Morsi, 2009; Al-Kharusi-Latifa *et al*., 2009; Osman, 2009; Ibrahiem – Zenib, 2010; Saad *et al*., 2011; Saied, 2011; Ahmed-Samah, 2011; Refaai and Ahmed, 2013; Ahmed *et al*., 2014; Al-Wasfy and Abd- El-Rahman, 2014 and Abou-Baker, 2015**).

Using *Spirulinaplatensis*algae with organic manures in different fruit crops has measurable effect on growth, palm nutritional status, yield and fruit quality (**Aly-Samar, 2015 and Mohamed, 2017**).

Using vitamins (**Eshmawy, 2010; Sayed *et al*., 2011; Ahmed *et al.*, 2011; Osman-Samah, 2015 and Saied and Hussein, 2017**) and Salicylic acid (**Ragab, 2004; Ahmed, 2011; El- Khawaga, 2013; Abd El-Mageed, 2015; Ahmed *et al*., 2015; Omar, 2015 and El-Sayed- Eiman, 2017**) was followed by enhancing growth and fruiting palms.

The merit of this study was examining the beneficial effects of using *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol on fruiting of Sewy data palms grown in sandy soil under Souhag environmental conditions.

2. Materials and Methods

This study was conducted in El-Kauthar orchards Fac. of Agric. Souhag Univ. located at Souhag district Souhag governorate during two consecutive seasons of 2015 and 2016 in which 30 tissue cultured derived offshoots of Sewy date palms were selected for achieving this study. The palms were planted at 7 x 7 meters apart. The texture of soil is calcareous sandy soil.

This study was conducted to assess the different effects of using *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol on some vegetative growth characteristics, leaf chemical composition, yield, physical and chemical characters of Sewy date palm fruits. Nitrite content of the fruits in response to application of these materials was also investigated.

The selected palms were at the same age and uniform in vigour. These palms were 15 years old at the start of study, good physical conditions and free of insects, damages and diseases. The selected palms were irrigated through drip irrigation system. 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 by removing excess earliest, latest and small bunches. Pollination of the experimental palms was uniformly performed to avoid residues of metaxenia. 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 (**Omar, 2015**). To prevent contamination of pollens, every bunch was bagged after inserting the male strands by paper bags which were tied at the ends using a piece of cotton for aeration. The bags were shaken tightly to ensure pollen distribution and were removed after four weeks (**Dammas, 1998**). Before carrying out hand pollination, pollen grains viability was determined by using pollen stainability % (**Moreira and Gurgel, 1941 and Al- Tahir and Asif, 1983**) and percentage of pollen germination (**Furr and Enriquez, 1966**).

Soil is classified as sandy calcareous soil in texture with water table depth not less than two meters deep. The results of orchard soil analysis according to **Chapman and Pratt, (1968)** are given in Table (1).

Table (1): Analysis of the tested soil

Characters	Values
Particle size distribution	
Sand %	80.0
Silt %	9.1
Clay %	9.9
Texture grade	Sandy calcareous
pH (1: 2.5 extract)	8.00
E.C. (1:2.5 extract ((mmhos/1 cm/25^{o}C)	1.22
Organic matter %	0.55
$CaCO_3$ %	8.2
Macronutrients values	
Total N %	0.02
P (ppm, Olsen method)	1.6
K (ppm, ammonium acetate)	10.1
Mg (ppm)	1.22
S (ppm)	0.65
B (hot water extractable)	0.27
EDTA extractable micronutrients (ppm)	
Zn	0.98
Fe	1.01
Mn	1.15
Cu	0.32

Each selected palm received the common horticultural practices that are already applied in the orchard except those dealing with using *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol.

This experiment included the following ten treatments from single and accompanied applications of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol arranged as follows:

1- Control (sprayed with water palms).

2- Application of *Spirulinaplatensis* algae biofertilizer at 1 % (10 g / l water).

3- Application of plant compost tea at 10 %.

4- Application of salicylic acid at 100 ppm.

5- Application of Tocopherol (vitamin E) at 100 ppm.

6- Application of *Spirulinaplatensis* algae at 1 % plus plant compost tea at 10 % plussalicylic acid at 100 ppm.

7- Application of *Spirulinaplatensis* algae at 1 % plus salicylic acid at 100 ppmplus Tocopherol (vitamin E) at 100 ppm.

8- Application of *Spirulinaplatensis* algae plus Tocopherol at 100 ppmplus Tocopherol (vitamin E) at 100 ppm.

9- Application of *Spirulinaplatensis* algae at 1 % plus plant compost tea at 10 % plus plus Tocopherol at 100 ppm.

10- Application of *Spirulinaplatensis* algae at 1 % plus plant compost tea at 10 % plus salicylic acid plus Tocopherol each at 100 ppm.

Each treatment was replicated three times, one Sewy date palm per each. Plant compost tea was conducted at two months (Table 2). *S*alicylic acid was dissolved in 1 N Sodium hydroxide to adjust pH to 6 as well as the addition of ethyl alcohol before application to facilitate the solubility. Vitamin E (Tocopherol) was also added with ethyl alcohol.

All materials were sprayed three times started at the first week of March and the other two sprays were conducted at two months intervels (1st week of May and July).

Triton B as a wetting agent was added to all solutions of the four materials *(Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol) at 0.5 % and spraying was done till runoff (5L/palm).

Table (2): Analysis of the solid plant compost

Parameters	Values
Cubic meter weight (kg.)	600.00
Moisture %	29.0
Organic matter %	30.7
Organic carbon %	31.25
pH (1: 2.5 extract)	6
EC (ds/m) (1: 2.5 extract)	3.5
C/N ratio	18.82
Total N %	1.66
Total P %	0.52
Total K %	1.12
Total Ca %	1.25
Total Mg %	1.21
Total Fe (ppm)	320.0
Total Mn (ppm)	45.0
Total Zn (ppm)	34.0
Total Cu (ppm)	42.0

Tables (2 & 3) show the chemical composition of plant compost and *Spirulinaplatensis* algae respectively.

Table (3) Chemical analysis of *Spirulinaplatensis* (according to Barron *et al.*, 2008).

Parameters	Values
General composition (per 100 g)	
Moisture	3.5 g.
Protein	63.5 g.
Fat (Lipids)	9.5 g.
Fibre	3.00 g.
Ash	6.70 g.
N- free extract	15. g.
Pigments	
Phycocyanin	15.6 g.
Carotenoids	456.00 mg.
Chlorophyll- a	1.30 g.
Vitamins	
Provitamin A	213.00 mg.
Thiamin ($V.B_1$)	1.92 mg.
Riboflavin ($V. B_2$)	3.44 mg.
Vitamin B_6	0.49 mg.
Vitamin B_{12}	0.12 mg.
Vitamin E	10.40 mg.
Niacin	11.30 mg.
Folic acid	40 mg.
Panthothenic acid	0.94 mg.
Inositol	76.00 mg.
Minerals	
Phosphorus	916.00 mg.
Iron	53.60 mg.
Calcium	168 mg.
Potassium	1.83 g.
Sodium	1.09 g.
Magnesium	250 mg.

This experiment was arranged in a randomized complete block design (RCBD). Each treatment of the ten treatments was replicated three times, one palm per each replicate.

Generally, the following measurements were determined during the two investigated seasons.

1- Leaf morphology characteristics namely length, width (cm) and area (cm^2 or m^2) of pinnaeand leaf **Ahmed and Morsy (1999)**, number of pinnae / leave, number of spines / leaf as well as spine length (cm).

2-Leaf chemical components namely leaf pigments (chlorophyll a & b, total chlorophylls and total carotenoids as mg/ g. F.W.) (**Von- Wettstein, 1957 and Fadle and Seri – El-Deen, 1978**) as well as percentages of N, P, K and Mg on dry weight basis **(Peach and Tracey, 1968; Summer, 1985 and Wilde *et al.*, 1985**).

3- Percentages of initial fruit setting and fruit retention

Initial fruit setting % was measured by dividing number of initial setted fruits by number of total flowers per bunch in the three labelled bunches (1^{st} week of April) and multiplying the product by 100. Fruit retention % was calculated by dividing number of retained fruits per bunch in the three selected bunches (1^{st} week of September) by total number of flowers of bunch and multiplying the product by 100.

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

5- Quality parameters namely weight (g), diameter and height (cm) of fruit, percentages of pulp and seed weights, pulp / seed, T.S.S.%, total and reducing sugars% (**Lane and Eynone, 1965 and A.O.A.C, 2000**), titratable acidity (as g malic acid/ 100 g pulp) (**A.O.A.C., 2000**), total curdefibre % and total soluble tannins% (**Balbaa, 1981).**

Thereafter, the obtained data during the two seasons were collected, tabulated and subjected to the proper statistical analysis of variance method reported by **Mead *et al,* (1993)**. The differences between treatment means were differentiated using new L.S.D. at 5% parameter.

3. Results and Discussion

1. Vegetative growth aspects:

Data in Tables (4 & 5) clearly show that all growth characteristics (length and width and area of pinnae/leaf, number of spines/leaf and spine length) were significantly varied among the application of any one of the four biostimulants applied singly or in combinations over the control treatment. Using *Spirulinaplatensis* algae at 1 %, plant compost teaat 10 %, salicylic acid and Tocopherol each at 100 ppm, in descending order was very effective in stimulating the previously nine growth traits. Using the four materials (*Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol) together gave the maximum values. The untreated Sewy date palms gave the lowest values. These results were true during both seasons.

2. Leaf chemical components:

Data in Tables (6 & 7) clearly show that subjecting Sewy date palms three times with *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherolsingly or in combined application significantly was very effective in enhancing leaf pigments namely chlorophylls a, b, total chlorophylls, total carotenoids, N, P, K and Mg in the leaves relative to the control treatment. Significant differences on

these chemical constituents were observed among the ten treatments. The preferability of these materials on enhancing leaf pigments and nutrients could be arranged as follows in descending order *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol. Combined applications were significantly superior than single ones in enhancing these pigments and nutrients. The highest values were recorded on the palms that received *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol together. The control palms showed the lowest values. These results were true during both seasons.

3. **Percentages of initial fruit setting and fruit retention, yield/palm and bunch weight:**

It is worth to mention from the data in Table (8) that treating Sewy date palms three times with any one of the four materials (*Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol) significantly was accompanied with improving percentages of initial fruit setting and fruit retention, yield / palm and bunch weight over the control treatment. The promotion was significantly associated with spraying *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol, in descending order. Varying these materials had significant effect on these parameters. Combined application was significantly favourable than using each material alone in improving these parameters. The maximum initial fruit setting (71.7 & 70.4 %), fruit retention (56.9 & 56.9 %), yield per palm (112.0 & 116.0 kg) and bunch weight (11.2 & 11.6 kg) were recorded on the palms that received three sprays of a mixture containing *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol. The untreated palms produced yield reahed64 & 63 kg during 2015 and 2016 seasons, respectively. The percentage of increment on the yield due to application of the previous promised treatment over the check treatment reached 75 % and 84.1 % during both seasons, respectively. These results were true during both seasons.

4. **Some physical and chemical characteristics of the fruits:**

It is noticed from the data in Tables (9 & 10) that single and combined applications of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol was significantly very effective in improving quality of the fruits in terms of increasing weight, diameter and height of fruit, pulp weight %, pulp / seed, T.S.S.%, total and reducing sugars % and in decreasing seed weight %, titratable acidity%, total crude fibre % and total soluble tannins over the check treatment. Application of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol in descending order was significantly favourable in promoting both physical and chemical characteristics of the fruits. Combined applications of these materials were significantly preferable than using each material alone in improving fruit quality. The best results with regard to fruit quality were observed due to treating Sewy date palms with all materials together. Similar trend was noticed during both seasons.

Table (4): Effect of single and combined application of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol on some vegetative growth characteristics of Sewy date palms during 2015 and 2016 seasons

Treatments	Pinnae length (cm)		Pinnae width (cm)		Pinnae area (cm^2)		No. of Pinnae /leaf		Leaf area (m^2)	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	59.0	59.08	2.55	2.61	111.1	114.9	201.0	210.0	2.23	2.41
Spirulinaplatensis algae at 1.0 %	64.0	64.9	3.14	3.20	144.9	149.9	226.0	235.0	3.27	3.52
Plant compost tea at 10 %	62.3	63.1	3.00	3.07	135.5	140.0	220.0	228.0	2.98	3.19
Salicylic acid at 100 ppm	61.2	62.0	2.87	2.93	128.0	132.0	211.9	220.0	2.71	2.90
Tocopherol at 100 ppm	60.1	61.0	2.71	2.78	119.4	123.9	206.0	215.0	2.46	2.66
Spirulinaplatensis algae + Plant compost tea + Salicylic acid	69.0	69.9	3.91	3.98	191.0	196.7	257.0	266.0	4.91	5.23
Spirulinaplatensis algae + Salicylic acid + Tocopherol	66.7	88.0	3.50	3.57	166.0	172.9	237.0	246.0	3.95	4.25
Plant compost tea+ Salicylic acid + Tocopherol	65.6	66.4	3.36	3.43	155.3	161.9	332.0	241.0	3.60	3.90
Spirulinaplatensis algae + Plant compost tea +Tocopherol	68.1	69.0	3.71	3.78	179.6	185.0	248.0	258.0	4.45	4.77
Spirulinaplatensis algae + Plant compost tea + Salicylic acid + Tocopherol	71.3	72.1	4.05	4.11	203.8	208.8	266.0	280.0	5.42	5.85
New L.S.D. at 5%	**0.8**	**0.9**	**0.10**	**0.12**	**3.1**	**2.9**	**4.0**	**4.5**	**0.15**	**0.19**

Table (5): Effect of single and combined application of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol on some vegetative growth characteristics of Sewy date palms during 2015 and 2016 seasons

Treatments	Leaf length (cm)		Leaf width (m)		No. of spines / leaf		Spine length (cm)	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	4.41	4.50	14.11	14.20	18.0	17.0	13.11	13.00
Spirulinaplatensis algae at 1.0 %	5.80	4.89	15.20	15.29	29.0	30.0	13.58	13.41
Plant compost tea at 10 %	5.40	5.50	15.00	15.10	26.0	27.0	13.44	13.32
Salicylic acid at 100 ppm	5.06	5.16	14.70	14.80	24.0	24.0	13.32	13.21
Tocopherol at 100 ppm	4.72	4.82	14.48	14.59	21.0	20.0	13.21	13.10
Spirulinaplatensis algae + Plant compost tea + Salicylic acid	6.89	7.00	16.40	16.51	37.0	36.0	14.11	14.00
Spirulinaplatensis algae + Salicylic acid + Tocopherol	6.49	6.59	15.86	15.79	33.0	32.0	13.82	13.70
Plant compost tea+ Salicylic acid + Tocopherol	6.11	6.20	15.55	15.65	31.0	30.0	13.70	13.55
Spirulinaplatensis algae + Plant compost tea +Tocopherol	6.64	6.73	16.14	16.24	35.0	34.0	14.00	13.86
Spirulinaplatensis algae + Plant compost tea + Salicylic acid + Tocopherol	7.19	7.29	16.66	16.80	40.0	39.0	14.30	14.29
New L.S.D. at 5%	**0.29**	**0.28**	**0.20**	**0.19**	**2.0**	**2.0**	**0.09**	**0.08**

Table (6): Effect of single and combined application of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol on some leaf pigments of Sewy date palms during 2015 and 2016 seasons

Treatments	Chlorophyll a (mg/g F.W)		Chlorophyll b (mg/g F.W)		Total chlorophylls (mg/g F.W)		Total carotenoids (mg/g F.W)	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	4.1	4.4	1.4	1.2	5.5	5.6	1.5	1.3
Spirulinaplatensis algae at 1.0 %	6.6	7.0	2.6	2.7	9.2	9.4	4.0	4.0
Plant compost tea at 10 %	6.0	6.4	2.3	2.1	8.3	8.5	3.4	3.3
Salicylic acid at 100 ppm	5.2	5.6	2.0	1.8	7.2	7.4	2.8	2.8
Tocopherol at 100 ppm	4.5	4.9	1.7	1.5	6.2	6.4	2.1	2.00
Spirulinaplatensis algae + Plant compost tea + Salicylic acid	9.0	9.4	4.3	4.0	13.3	13.4	6.3	6.00
Spirulinaplatensis algae + Salicylic acid + Tocopherol	7.8	8.3	3.4	3.3	11.2	11.6	5.3	4.8
Plant compost tea+ Salicylic acid + Tocopherol	7.1	7.4	3.0	3.00	10.1	10.4	4.6	4.4
Spirulinaplatensis algae + Plant compost tea +Tocopherol	8.3	8.7	4.0	3.6	12.3	12.3	6.0	5.3
Spirulinaplatensis algae + Plant compost tea + Salicylic acid + Tocopherol	9.5	9.9	4.7	4.3	14.2	14.2	7.1	6.9
New L.S.D. at 5%	**0.3**	**0.3**	**0.2**	**0.2**	**0.5**	**0.5**	**0.6**	**0.6**

Table (7): Effect of single and combined application of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol on the percentages of N, P, K and Mg in the leaves of Sewy date palms during 2015 and 2016 seasons

Treatments	Leaf N %		Leaf P %		Leaf K %		Leaf Mg %	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	1.41	1.54	0.146	0.153	1.11	1.15	0.57	0.60
Spirulinaplatensis algae at 1.0 %	1.80	1.80	0.194	0.210	1.40	1.45	0.77	0.76
Plant compost tea at 10 %	1.69	1.72	0.182	0.188	1.31	1.36	0.71	0.71
Salicylic acid at 100 ppm	1.59	1.66	0.171	0.177	1.23	1.28	0.66	0.67
Tocopherol at 100 ppm	1.50	1.60	0.160	0.164	1.17	1.22	0.61	0.63
Spirulinaplatensis algae + Plant compost tea + Salicylic acid	2.13	2.06	0.255	0.270	1.81	1.87	0.96	0.94
Spirulinaplatensis algae + Salicylic acid + Tocopherol	1.97	1.92	0.225	0.240	1.59	1.66	0.88	0.84
Plant compost tea+ Salicylic acid + Tocopherol	1.90	1.86	0.211	0.225	1.50	1.55	0.82	0.79
Spirulinaplatensis algae + Plant compost tea +Tocopherol	2.06	2.00	0.241	0.255	1.69	1.74	0.92	0.82
Spirulinaplatensis algae + Plant compost tea + Salicylic acid + Tocopherol	2.22	2.12	0.270	0.281	1.93	1.99	1.04	0.99
New L.S.D. at 5%	**0.06**	**0.05**	**0.008**	**0.10**	**0.04**	**0.05**	**0.03**	**0.02**

Table (8): Effect of single and combined application of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol on the percentages of initial fruit setting and fruit retention, yield/palm and bunch weight of Sewy date palms during 2015 and 2016 seasons

Treatments	Initial fruit setting %		Fruit retention %		Yield / palm (kg.)		Bunch weight (g.)	
	2015	2016	2015	2016	2015	2016	2015	2016
Control	50.0	49.7	37.3	36.7	6.4	6.3	64.0	63.0
Spirulinaplatensis algae at 1.0 %	59.0	58.7	44.9	44.3	8.5	8.8	85.0	88.0
Plant compost tea at 10 %	56.9	56.6	43.0	32.3	8.0	8.4	80.0	84.0
Salicylic acid at 100 ppm	54.0	53.7	41.9	41.3	7.4	7.8	74.0	78.0
Tocopherol at 100 ppm	52.0	51.6	39.4	38.7	6.9	7.3	69.0	73.0
Spirulinaplatensis algae + Plant compost tea + Salicylic acid	69.0	68.7	53.6	53.0	10.6	10.9	106.0	109.0
Spirulinaplatensis algae + Salicylic acid + Tocopherol	64.0	63.7	48.9	48.3	9.5	9.8	95.0	98.0
Plant compost tea+ Salicylic acid + Tocopherol	61.0	60.58	47.0	46.5	9.0	9.3	90.0	93.0
Spirulinaplatensis algae + Plant compost tea +Tocopherol	66.3	65.9	51.1	50.5	10.0	10.3	100.0	103.0
Spirulinaplatensis algae + Plant compost tea + Salicylic acid + Tocopherol	71.7	70.4	56.9	56.9	11.2	11.6	112.0	116.0
New L.S.D. at 5%	**1.8**	**1.9**	**1.8**	**1.7**	**0.5**	**0.4**	**3.9**	**4.1**

Table (9): Effect of single and combined application of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol on some physical characteristics of the fruits of Sewy date palms during 2015 and 2016 seasons

Treatments	Fruit weight (g.)		Fruit diameter (cm)		Fruit height (g)		Pulp weight %		Seed weight %		Pulp / seed	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	9.69	9.72	2.47	2.48	3.51	3.52	81.1	80.0	18.9	20.0	4.29	4.00
Spirulinaplatensis algae at 1.0 %	10.50	10.53	2.91	2.90	3.85	3.86	88.0	88.0	12.0	12.0	7.33	7.33
Plant compost tea at 10 %	10.29	10.31	2.79	2.68	3.71	3.73	86.6	86.4	13.4	13.6	6.46	6.35
Salicylic acid at 100 ppm	10.11	10.14	2.62	2.60	3.63	3.65	85.0	84.9	15.0	51.1	5.67	5.62
Tocopherol at 100 ppm	9.90	9.94	2.55	2.60	3.56	6.56	82.2	82.1	17.8	17.9	4.62	4.59
Spirulinaplatensis algae + Plant compost tea + Salicylic acid	11.30	11.32	3.18	2.92	4.06	4.07	93.0	92.9	7.00	7.1	13.29	13.08
Spirulinaplatensis algae + Salicylic acid + Tocopherol	10.91	10.94	3.05	2.77	3.96	3.96	90.1	90.0	9.9	10.0	9.10	9.00
Plant compost tea+ Salicylic acid + Tocopherol	10.71	10.75	2.98	2.67	3.91	3.42	89.0	88.8	11.0	11.2	8.09	10.11
Spirulinaplatensis algae + Plant compost tea +Tocopherol	11.11	11.16	3.11	2.86	4.12	4.10	91.2	91.0	8.8	9.0	10.36	10.11
Spirulinaplatensis algae + Plant compost tea + Salicylic acid + Tocopherol	11.50	11.60	3.25	0.07	0.08	0.09	92.9	93.0	7.1	7.0	13.08	13.29
New L.S.D. at 5%	**0.16**	**0.15**	**0.06**	**0.05**	**0.04**	**0.04**	**1.0**	**1.1**	**2.1**	**1.9**	**0.31**	**0.29**

Table (10): Effect of single and combined application of *Spirulinaplatensis* algae, plant compost tea, salicylic acid and Tocopherol on some chemical characteristics of the fruits of Sewy date palms during 2015 and 2016 seasons

Treatments	T.S.S.%		Total sugars %		Reducing sugars %		Titratable acidity %		Total fibre crude %		Total soluble tannins %	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Control	70.1	69.3	63.0	62.9	58.8	59.0	0.300	0.305	1.27	1.24	1.09	1.11
Spirulinaplatensis algae at 1.0 %	72.7	72.0	15.6	15.4	61.8	62.0	0.211	0.219	0.94	0.91	0.88	0.90
Plant compost tea at 10 %	72.0	71.3	65.0	64.8	61.4	61.6	0.239	0.240	1.07	1.03	0.94	0.96
Salicylic acid at 100 ppm	71.2	70.6	64.2	64.0	59.9	60.1	0.259	0.261	1.16	1.12	1.00	1.03
Tocopherol at 100 ppm	70.6	69.9	63.6	63.4	59.3	59.5	0.281	0.281	1.22	1.18	1.04	1.07
Spirulinaplatensis algae + Plant compost tea + Salicylic acid	74.4	75.8	70.0	69.9	68.7	69.0	0.135	0.140	0.70	0.67	0.66	0.69
Spirulinaplatensis algae + Salicylic acid + Tocopherol	73.5	74.6	68.0	67.9	63.9	65.0	0.174	0.180	0.82	0.89	0.75	0.78
Plant compost tea+ Salicylic acid + Tocopherol	73.1	73.0	66.3	66.1	62.9	63.3	0.194	0.200	0.89	0.84	0.80	0.83
Spirulinaplatensis algae + Plant compost tea +Tocopherol	74.0	75.1	69.1	68.9	65.0	65.5	0.155	0.160	0.75	0.71	0.70	0.73
Spirulinaplatensis algae + Plant compost tea + Salicylic acid + Tocopherol	75.0	76.5	71.0	69.7	70.0	70.5	0.109	0.119	0.64	0.60	0.59	0.52
New L.S.D. at 5%	**0.4**	**0.5**	**0.4**	**0.4**	**0.3**	**0.3**	**0.019**	**0.015**	**0.03**	**0.04**	**0.03**	**0.03**

4. Discussion

Organic and biofertilization are responsible for enhancing soil fertility, organic matter, N fixation, water retention, availability of nutrients, secretion of B vitamins, natural hormones and antibiotics, tolerance to pathogeneses as well as reducing soil pH and salinity (**Marschener, 1995; Kannaiyan, 2002 and Formowitz *et al*., 2007**).

Using different organic manures and biofertilizers for date palm cvs besides mineral N was accompanied with enhancing growth, palm nutritional status, yield and fruit quality (**Osman, 2003; Mansour *et al*., 2004; Gobara and Ahmed, 2004; Mohamed and Gobara, 2004; Mohamed and Ragab, 2004; El-Assar, 2005; Al- Wasfy and El-Khawaga, 2008; Morsi, 2009; Al-Kharusi-Latifa *et al*., 2009; Osman, 2009; Ibrahiem – Zenib, 2010; Saad *et al*., 2011; Ahmed-Samah, 2011; Refaai and Ahmed, 2013; Ahmed *et al*., 2014; Al-Wasfy and Abd- El-Rahman, 2014 and Abou- Baker, 2015**).

The beneficial effects of the biofertilizers *Spirulinaplatensis* algae on growth and fruiting of Sewy date palms might be attributed to its higher contents from antibodies proteins, fats, leaf pigments namely phycocyanine, carotenoids and chlorophyll a, vitamins namely provitamin B_1, B_2, B_6, B_{12}, E, hitch, folic acid, pantheist acid, inositol and minerals namely P, Fe, Ca and K. These components in such biofertilizers surely reflected on enhancing cell division, palm nutrition status, yield and fruit quality (**Barron *et al*., 2008**).

Using *Spirulinaplatensis*algae with organic manures in different fruit crops has measurable effect on growth, palm nutrients status, yield and fruit quality (**Aly-Samar, 2015 and Mohamed, 2017**).

These results are in harmony with those obtained by **Aly-Samar, (2015) and Mohamed, (2017).**

Salicylic acid (SA) is one of the groups of common phenolic compounds that are produced naturally by plants and acts as endogenous plant growth regular. It is consists of an aerometric ring bearing a OH group and it decluces as 2-hydroxyl benzoic acid. It is an important phytohormone materially regulated growth of plants under stress conditions, ion uptake and transmission, photosynthesis, stomatal closure, membrane permeability, storage life, defense responses under biotic and abiotic stress conditions due to its action as plant significancy molecule. It activates the expression of several defense-related genes and induced synthesis of some enzymes that participate in praline biosynthesis or causes accumulation of praline and glycine-betaine which play a role as defense compounds under stress conditions. It extends plant cells age due to its action on inhibiting ethylene biosthynsis (**Raskin, 1992; Carmeron, 2000; Hayat and Ahmed, 2007; Janda *et al*., 2007; Canakci and Manzaroglu, 2009; and Joseph *et al*., 2010**).

Using vitamins (**Eshmawy, 2010; Sayed *et al*., 2011; Ahmed *et al.*, 2011; Osman-Samah, 2015 and Saied and Hussein, 2017**) and Salicylic acid (**Ragab, 2004; Ahmed, 2011; El- Khawaga, 2013; Abd El-Mageed, 2015; Ahmed *et al*., 2015; Omar, 2015 and El-Sayed- Elman, 2017**) were favourable for enhancing growth and frequencies of date palms cv.

Conclusion:

As outstanding promotion on yield and fruit quality of Sewy date palms grown under sandy soil was observed due to spraying the palms three times (1st week of March, May and July) with a mixture of *Spirulinaplatensis* algae at 1%, plant compost tea at 10 %, salicylic acid and Tocopherol each at 100 ppm.

References

1. Abd El-Mageed, M.M.H. (2015): Response of Sakkoti date palms to spraying salicylic acid under Aswan region conditions. M.Sc. Thesis Fac. of. Agric. Minia Univ. Egypt.
2. Abou-Baker, A.H.A. (2015): Effect of replacement of inorganic N fertilizer partially by using organic and biofertilization on productivity of Sakkoti palms. M.Sc. Thesis Fac. of. Agric. Minia Univ. Egypt.
3. Ahmed, E.F.S (2011): Response of Sakkoti date palms to foliar application of salicylic acid. Minia J. of Res. Dev. Vol. 21 (2): 305-316.
4. Ahmed, E.F.S.; Mohamed, H.H.S. and Gad Alla, E.G. (2011): Effect of some vitamins on fruiting of Zaghloul date palms. Minia J. of Agric. Res. & Develop. 31(3): 371-381.
5. Ahmed, F. F. and Morsy, M. H. (1999): A new method for measuring leaf area in different fruit species. Minia. J. of Agric.Rec. & Dev.19: 97 - 105.
6. Ahmed, F.F.; Ibrahim, I.M. and Abd El- Megeed, M.M.H. (2015): Response of Sakkoti date palms to spraying salicylic acid. World Rural Observations. 1(1): 119-125.
7. Ahmed, F.F.; Akl, A.M.M.A.; El- Mamlouk, E.A.H. and Mohamed, H.H.S. (2014): Effect of partial replacement of inorganic N fertilizer by using EM, compost tea and humic acid on fruiting of Sakkoti date palms. Stem Cell 5 (2): 40-51.
8. Ahmed- Samah, O. O. (2011): Effect of yeast and effective microorganisms (EM) application on yield and fruit characteristics of Bartamuda date palm under Aswan climatic conditions. M. Sc. Thesis, Fac. of Agric. Assiut Univ., Egypt.
9. Al- Kharusi- Latifa, M.; El- Mardi, M. O.; Ali, A.; Al- Said, F. A.; Abd El- Basit, K. M. and Al-Rawahy, S. (2009): Effect of mineral and organic fertilizers on the chemical characteristics and quality of date fruit. Inter. J. of Agric. & Biol., 11: 290-296.

10. Al-Tahir, O.A. and Asif, M.I. (1983): Study of variation and date pollen material. Proc. of the 1th Symp.On the Date Palm in Saudi Arabia, King Faissal Univ. pp. 62-66.
11. AWasfy, M.M.M. and Abd El-Rahman, M.M.A. (2014): Reducing inorganic N fertilizer partially in Hayany date palm orchards by using animal and chicken manures. World Rural Observations 5(5): 100-108.
12. Al- Wasfy, M.M. and El- Khawaga, A.S. (2008): Effect of organic fertilization on growth, yield and fruit quality of Zaghloul date palm grown in sandy Soil. Assiut J. of Agric. Sci. 39(1):121-133.
13. Aly-Samar, S.H. (2015): Influence of reducing mineral nitrogen fertilizer partially by using plant compost enriched with *spirulinaplatensis* algae fruiting of Flame seedless grapevines. M.Sc., Thesis. Fac. of Agric. Minia Univ.
14. Association of Official Agricultural Chemists (2000): Official Methods of Analysis 14th ed. (A.O.A.C.) Benjamin Franldin Station, Washington D.E.U.S.A., pp. 490-510.
15. Balbaa, S.I. (1981): Chemistry of drugs laboratory manual Cairo Univ. Chapter 6:127-132.
16. Barron, L.B.; Torres- Valencia, M.K., Chamorro-Cevallos, G. and Zooiga-Estrada, A. (2008): *Spirulina* as an Antiviral Agent, in M.E. Gershwin & Amha belay (ed.) *Spirulina* in human nutrition and health, CRC press, Taylor & Francis, pp. 227.
17. Cameron, R.K. (2000): Salicylic acid and its role in plant defense responses what do we really know?. Physiol. Mol. Plant. Patho. 56: 91-93.
18. Canakci, S. and Manzuroglu, O. (2009): Effect of salicylic acid on growth and chlorophyll destruction of some plant tissues. World Journal of Agric. Sci. 5(5): 577-581.
19. Chapman, H.D. and Pratt P.F. (1975): Methods of Analysis for Soil. Plant and Water.Univ. of California.Division of Agric., Sci. pp. 172-173.
20. Dammas, M. O. (1998): Fruit growth and receptivity of pistillate flowers pollination in two date palm cultivars (*Phoenix dactylifera* L.). M. Sc. Thesis, Fac. of Meteorology, Environment and Arid land Agri. King Abdel Aziz Univ., pp. 50 - 57.
21. El- Assar, A. M. (2005):Response of "Zaghloul" date yield and fruit characteristics to various organic and inorganic fertilization types as well as fruit thinning models in a richcarbonate soil. J. Agric. Sci. Mansoura Univ., 30 (5):2795-2814.
22. El- Khawaga, A.S. (2013): Effect of anti- salinity agents on growth and fruiting of different date palm cultivars. Asian Journal of Crop Science Vol. 5 Issue 1 p. 65-80.
23. El-Sayed-Eman, M.M.A. (2017): Effect of humic acid and salicylic acid on the growth, nutritional status and organic composition of apple plants in response to salinity stress. Ph.D. Thesis Fac. of Agric. Alexandria Univ. Egypt.
24. Eshmawy, E.M.S. (2010): Effect of some antioxidants and different pollination methods on fruiting of Sewy date palms M. Sc. Thesis Fac. of Agric. Minia Univ. Egypt.
25. Fadle, M.S. and Seri El- Deen, S.A. (1978): Effect of N Benzyl adenine on photosynthesis, pigments and total sugars on olive seedling grown under saline conditions, Res. Bull. No. 873, Fac. Agric., Ain Shams Univ.
26. Formowitz, B.; Elango, F.; Okamoto, S.; Willer, T. and Buerert, A. (2007): The role of effective microorganisms in thecompositing of banana *(Musa spp.)* residues. J. of Plant Nutrition and Soil Sci., 170: Issue 5 pp 649 – 656.
27. Furr, R. and Enriquez, V. M. (1966): Germination of date pollen in culture media. Rept Ann. Date cvs Inst. 45:24- 27.
28. Gobara, A.A. and Ahmed, F.F. (2004): Response of Zaghloul date palms to application of some biofertilizers. 2nd Inter. Conf. on Date palm Suez Canal Univ., El- Arish 6-8 Oct. 2004.
29. Hayat, and Ahmad, A. (2007): Salicylic acid, A plant hormone chapter 9. Date, J.F., Capelli, N and Dan-Breusegem, the interplay between salicylic acid and reactive oxygen species during cell death in plants. Springer p. 247-276.
30. Ibrahiem- Zenib, A. (2010): Fertilization of date palm Amhat cv. grown in new reclaimed land by organic and inorganic nitrogen sources. The Sixth Inter. Conf. of Sustain. Agric. and Develop. Fac. of Agric., Fayoum Univ. 27-29 Dec., 2010.
31. Janda, T.; Harvath, E.; Szalai, G. and Faldi, E. (2007): Role of salicylic acid in the induction of abiotic stress tolerance, Hayat S. and Ahmed, A. (eds.) salicylic acid a plant hormone chapter 5 pp. 91- 105.
32. Joseph, B.; Jini, D. and Sujatha, S. (2010): Insight into the role of exogenous salicylic acid on plants grown under salt environment. Asian J. Crop Sci, 2: 226-235.
33. Kannaiyan, S. (2002).Biotechnology of Biofertilizers. Alpha Sci. Inter. Ltd., P.O. Box 4067 Pangbourne R. 68 U.K., pp. 1-275.
34. Lane, J.H. and Eynon, L. (1965): Determination of reducing sugars by means of Fehling's solution with methylene blue as indicator A.O.AC. Washington D.C., U.S.A.
35. Mansour, A. E. M; Ahmed, F. F and Mohamed, A. Y. (2004): Effect of bio and organic source of N as a partial substitute for mineral fertilizers on fruiting of Sewy date palms. 2nd Inter. Conf. on Date Palm., Suez Canal Univ. El- Arish 6 – 8 Oct. 2004.
36. Marschner H. (1995): Mineral Nutrition of Higher Plants. Academic Press. (London).
37. Mead, R.; Currnow, R. N. and Harted, A. M. (1993): Methods in Agricultural and Experimental and Biology2nd Ed Hall, London pp. 10-44.
38. Mohamed, G. A and Gobara, A. A. (2004): Response of Sewy date palms grown under New

Valley conditions to organic, bio and mineral fertilization. Minia J. of Agric. Res. & Develop. (24): 3, pp. 397-414.
39. Mohamed, H.M.S. (2017): Effect of vine load and spraying citric acid on fruiting of Superior grapevines. M.Sc. Thesis Fac. of Agric. Minia Univ. Egypt.
40. Mohamed, M.A. and Ragab, A. M. (2004): Response of Sewy date palms to application of some organic fertilizers. 2nd Inter. Conf. on Date palm, Suez Canal Univ., El- Arish 68 Oct. 2004.
41. Moreira, S. and Gurgel, j. A. (1941): Pollen fertility and its correlation with number of seeds in species and forms of the genus citrus. Brogarntia, Saopaulo, 1: 669-711.
42. Morsi, M. E. (2009): Response of date palm Sewy cv. grown in new reclaimed land to organic and inorganic nitrogen sources Fayoum J. Agric. Res. & Dev. Vol. 33 No. (1):106-172.
43. Omar, M. G.G. (2015): Response of Saidy date palms growing under new Valley conditions to some organic, inorganic and biofertilization as well as some antioxidant treatments Ph. D. thesis, Fac. of Agric. Minia Univ. Egypt.
44. Peach, K and Tracey, I.M.V. (1968): Modern Methods of Plant Analysis, Vol. 11 p. 37-38.
45. Oretili, J.J. (1987): Exogenois application of vitamins as regulators for growth and development of plants. Pflanzenrahr Bpdenk, 150: 375-391.
46. Osman-Samah, O.A. (2015): Behavior of Sakkoti and Bartemoda date palms to foliar application of some vitamins. Ph.D. Thesis Fac. of Agric. Minia Univ. Egypt.
47. Osman, S. M. (2003): Effect of biofertilization on fruit physical and chemical properties of Zaghloul date palm. Annals Agric. Sci. Ain Shams Univ., Cairo, 48 (1): 297-305.
48. Osman, S. M. (2009): Response of Sakkoty date palm cultivar, propagated by tissue culture derived to different sources of fertilization. World J. of Agric. Sci. 5 (5): 631-638.
49. Ragab, M.A. (2004): Behavioral of Zaghloul date palm to foliar application of some antioxidants. Minia J. of Agric. Res. & Develop 24 (4): 501-520.
50. Raskin, I. (1992): Salicylic, a new plant hon. Physiology. 99: 799 - 803.
51. Refaai, M.M. and Ahmed, F.F. (2013): Using of compost enriched with some microorganism strains as a partial replacement of mineral N fertilizers in Ewaise mango orchards World Academy of Science, Engineering and Technology 1647-1666.
52. Robinson, F.A. (1973): Vitamins Phytochemistry. Vol. III: 195-198 Lawrence P. Miller (Ed.) Van Nostrand Rinhold Comp. New York.
53. Russo, A. and Berlyn, G.P. (1990): The use of organic biostimulants to help low input sustainable agriculture. J. Sus. Agric., 1(2):9-42.
54. Saad, Ri I.; Roshdy, Kh. A. and Abd El- Migeed-Nagwa, A. (2011): Response of Zaghloul date palms grown under new reclaimed lands to application of organic and biofertilizers. Alex. Exch. J. Vol. 31 No. 2 pp 121- 129.
55. Saied, H.H.M. (2011): Effect of inorganic, organic and biofertilization on growth, nutritional status, yield and fruit quality of Sakkoti date palms. M. Sc. Thesis Fac. of Agric. Minia Univ. Egypt.
56. Saied, H.H.M. and Hussein, M.A. (2017): Growth, flowering, yield and oil characteristics of Picual olives as affected by foliar application of vitamins and amino acids. New York. Sci. J. 10 (7): 79-85.
57. Sayed, E. F. A. (2002): The productive capacity of Sewy date palms grown under New Valley conditions in response to leaves/ bunch ratio. M. Sc. Thesis Fac. of Agric. Mnia Univ.
58. Sayed, F.F.A.; Saied, H.H.M. and Gad Alla, E.G. (2011): Effect of some vitamins on fruiting of Zaghloul date palms. Minia J. of Agric. Res. & Develop. 31(3): 371-381.
59. Samiulleh, S.A.; Ansori; M.M. and Afridi, R.K. (1988): B- vitamins in relation to crop productivity – Indian, Rev. Life Sci. 8: 51-74.
60. Singh, D.V.; Srivastava, G.C. and Abdin, M.S. (2001): Amelioration of negative effect of water stress in Gassiaangustifolia by benzyladenine and/ or ascorbic acid. Bidoyiaplantarum, 44 (1): 141-143.
61. Summer. M. E. (1985): Diagnosis and Recommendation. Integrated System (DRIS) as a guide to Orchard fertilization. Hort. Abst. 55 (8). 7502.
62. Von- Wettstein, D.Y. (1975): Chlorophyll lehale under submikroshopischeformiueshrel der plastidenceliprp. Trop. Res. Amer. Soc. Hort. Sci. 20pp. 427-433.
63. Wilde, S. A.; Corey, R. B.; Layer, J. G. and Voigt, G. K. (1985): Soils and Plant Analysis for Tree Culture. Mohan Primlani, Oxford & IBH Publishing Co., New Delhi, India, p 1- 142.

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