

Impact of Spraying Algae Extract, Boron and Silicon Nutrients on Growth and Fruiting of Sewy Date Palm Under New Reclaimed Soils

El-Mahdy, T.K.R.¹; M.A.F. Badran²; R.A. Ibrahim¹ and A.A. Ahmed²

¹Pomology Department, Fac. Agric., Assiut Univ.

²Central Lab of org. Agric ARC. Giza

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Abstract

This study was carried out during two consecutive seasons (2015 and 2016) on Sewy date palm cultivar grown in new reclaimed sandy soil at private orchard located at Al Assiuty valley, Assuit, Egypt. The effect of spraying algae extract, boron and silicon nutrients each alone or their combination on some vegetative growth characteristics, yield and some physical and chemical fruit traits were studied. The results showed that spraying algae extract, boron and silicon was very effective on enhancing vegetative growth characteristics, yield as well as some physical and chemical fruit properties. The promotion increased with increasing the concentration of algae extract and their combinations. In general, the best results of this study were recorded when using algae extract 0.3% + Boron 0.05% + Silicon 0.1% compared with the other investigated treatments.

Keywords : *algae extract, boron, silicon.*

Introduction

Date palm (*Phoenix dactylifera* L.) is one of the most important fruit species grown in Egypt. Date palm cultivars classified into three palm groups (soft, semi dry and dry) according to the available heat units and fruit moisture content. Dates have higher nutritional value, about three fourth of the dry matter in dates are sugars (sucrose, glucose and fructose) (Hussein, 1977). Low yield of Sewy date palms grown under sandy soil is considered a major problem that faces growers. Nowadays, many efforts have been established for finding out the best horticultural practices that are responsible for enhancing yield and fruit quality of Sewy date palm cv growing under Assiut region conditions. Using Algae extract, boron and silicon are considered the best treatment for solving the problem of poor fruit set and high fruit

drop percentage at different fruit growth stages especially in the new reclaimed lands. Algae extract have a positive effect on fruit setting, yield and fruit quality (Jaswant *et al.*, 1994 and Hegab *et al.*, 2005).

Algae extract as a new biofertilizer containing N, P, K, Ca, Mg, and S as well as Zn, Fe, Mn, Cu, Mo, and Co, some growth regulators, polyamines and vitamins applied to improve nutritional status, vegetative growth, yield and fruit quality in different orchards (Abd El-Migeed *et al.*, 2004; Abd El-Moniem- Eman & Abd-Allah, 2008 and Spinelli *et al.*, 2009).

Boron (B) is considered as an essential micro nutrient plays an important role on increasing pollen grains germination and pollen tube elongation, consequently, the fruit set % and yield. It is responsible for stimulating cell division, biosynthesis

and translocation of sugars, water and nutrients uptake, tolerance of fruit crops to different disorders, and the biosynthesis of IAA (Nijjar, 1985).

Although, silicon is the most abundant element both on the surface of the earth and in the soil, it has not yet been listed among the essential elements for higher plants. The beneficial effect of silicon on mitigating various biotic stresses and stimulating the antioxidant system in plants is known (Epstein and Bloom, 2003). Using silicon was very effective in enhancing growth and fruiting of different fruit crops (Gad El- Kareem, 2012 and Al- Wasfy, 2013).

The aim of this study was to investigate the effects of spraying Algae extract, boron and silicon either alone or their combinations on yield and fruit quality of Sewy date cultivar grown in new reclaimed sandy soil for enhancing yield and fruit quality.

Materials and Methods

The current study was imposed during the two successive seasons of 2015 and 2016 on Sewy date palm cultivar grown in new reclaimed sandy soil, at private orchard located at Al Assiuty valley, Assuit, Egypt. Analyses of tested soils according to Wild *et al.* (1985) are shown in Table (1).

Thirty three mature palms of Sewy date palms cultivar (15 years old) were randomly selected to study the effect of algae extract, boron and silicon on vegetative characteristics, yield as well as some physical and chemical fruit characteristics. The tested palms were nearly similar in vigor and subjected to the same horticulture managements and performed to maintain leaf/bunch ratio at 8:1 and 9 bunches were maintained. Pollination of the experimental palms was uniformly performed in respect of the same source, date and method to avoid residues of metaxinia.

Spraying Algae extract (Mechanical, physical and chemical analysis of Algae extract are shown in Table 2), Boric acid (17% B) and potassium silicate (25% Si + 10% K₂O) each alone or in combination between the three materials were done three times during each season at growth start (beginning of clusters appearing), Just after fruit setting and after 45 days later. Triton B as a wetting agent was used with all Solutions at 0.05 % and the spray was done till runoff (5 L/ palm). The Control received tap water mixed with Triton B at 0.5 %.

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

| Characters | Values | Characters | Values |
|--------------------|--------|---------------------|--------|
| Sand% | 73.92 | Organic matter% | 0.28 |
| Clay% | 8.08 | CaCO ₃ % | 32.23 |
| Silt% | 18 | Total N% | 0.011 |
| Soil Texture | Sandy | P (ppm) | 8.30 |
| pH | 8.35 | K (ppm) | 0.36 |
| E.C mmhos/ 20C/cm) | 0.31 | Mg (ppm) | 2.00 |

Table 2. Mechanical, physical and chemical analysis of Algae extract.

| Characters | Values | Characters | Values |
|-------------------|---------|------------------|--------|
| oligosaccharide | 3.0% | pepsin | 0.02% |
| algic acid | 5.0% | Potassium oxide | 12.0% |
| phytin | 0.003% | phosphorus oxide | 0.5% |
| menthol | 0.001% | N | 1.0% |
| cytokinine | 0.001% | Mn | 0.1% |
| indol acetic acid | 0.0002% | Fe | 0.2% |

The present work included eleven treatments as follow:-

1. Control(water spray) . (T₁)
2. Spraying algae extract at 0.1%. (T₂)
3. Spraying algae extract at 0.3%. (T₃)
4. Spraying boron at 0.05%%. (T₄)
5. Spraying silicon at 0.1%. (T₅)
6. Spraying algae extract at 0.1% +silicon at 0.1%. (T₆)
7. Spraying algae extract at 0.3% +silicon at 0.1%. (T₇)
8. Spraying algae extract at 0.1% +boron at 0.05%. (T₈)
9. Spraying algae extract at 0.3% +boron at 0.05%. (T₉)
10. Spraying algae extract at 0.1% +silicon at 0.1% + boron at 0.05%. (T₁₀)
11. Spraying algae extract at 0.3% +silicon at 0.1% + boron at 0.05%. (T₁₁)

Three date palms (3 replicates) were subjected to each treatment, 3 spathes of each replicate were chosen and subjected to determine the properties of fruits.

2- Experimental measurements:

2-1 Vegetative growth characteristics:

All growth characteristics were measured at the middle of Sept. for both seasons.

1- Leaf morphology:- Leaf length, number of spin, number of leaflets/leaf, average width of leaflet (cm) as well as length of leaflet on 8 leaflets/rachis for each leaf. Leaflet area (cm²) was calculated using Ahmed and Morsy (1999) equation: Leaflet area = (W × L) × 0.37 + 10.29, in which W and L are the maximum width and length of leaflet. Then leaf area (m²) of the leaf was calculated by multiplying the number of leaflet/ leaf by the leaf area of leaflet

3- Yield and quality parameters:

3-1 Initial fruit set and horticultural fruit set %:

The number of initial fruit set was counted by using 10 marked strands per spathe after thirty five days from pollination then the percentage of initial fruit set (I.F.S.) was calculated using the following equation

$$\text{Initial fruit set (\%)} = \frac{\text{Av. number of set fruit per strand}}{\text{Av. number of set fruit} + \text{Av. number of flower scars}} \times 100$$

As well as at harvest time the number of retained fruits on the same ten marked strands were counted then the fruit retention percentages (horticultural fruit set %) were determined using the following equation:

$$\text{Horticultural fruit set \%} = \frac{\text{Av. number of retained fruit}}{\text{Av. number of retained fruit} + \text{Av. number of flower scars}} \times 100$$

All bunches of the selected palms were harvested at first week of October, bunch weight was recorded

then yield per palm was calculated according to an equation of:

Yield/palm (kg) = number of bunches x average bunch weight

3-2 Fruit properties:

Samples of fifty ripe dates from the yield of each palm (replicate) were taken randomly and the following physical and chemical characteristics were measured:

- 1- Average of fruit, seed and flesh weights (g.)
- 2- Fruit volume (cm³) was determined using water displacement
- 3- Fruit length and diameter (cm) were measured by vernier caliper
- 4- Total soluble solids % (T.S.S %): was determined by hand refractometer.
- 5 -Sugar contents including reducing, non reducing and total sugars were determined according to Lane and Eynon described in A.O.A.C. (1995).
- 6- Total acidity was determined as malic acid per 100 g pulp according to A.O.A.C., (1995).

4-Statistical analysis:

The obtained data were tabulated and subjected to the proper statistical analysis of variance according to the complete randomized block design using L.S.D. test for recognizing the significance differences among

the various treatment means according to the method outlined by Mead *et al.* (1993).

Results and Discussion

A- Vegetative parameters:

Table (3, 4) showed the effect of algae extract, boron and silicon on Leaf length, leaflet length, leaflet width, Leaflet area, Leaf area, No. of Leaflets and No .of spine per leaf of Sewy date palm cultivar during the two experimental seasons of 2015 and 2016.

Data showed that, vegetative characteristics namely (Leaf length, leaflet length, leaflet width, Leaflet area, Leaf area, No. of Leaflets. No .of spine) are significantly increased by using algae extract , boron and silicon each alone or in combination between the three materials during the two experimental seasons, compared with control (water spray). The maximum values of such characters were obtained under T₁₁ (algae extract 0.3% + boron 0.05%+ silicon 0.1%) while the lowest values of such characters were obtained under the control during the two experimental seasons 2015 and 2016.

Likewise: In general, the leaf area increasing due to increase the number and area of leaflets.

Table 3. Effect of algae extract, boron and silicon nutrients on Leaf length, leaflet length, Leaflet width, Leaflet area of Sewy date palm during (2015 and 2016) seasons.

| Characters Treatments | Leaf length (m) | | Leaflet length (cm) | | Leaflet width (cm) | | Leaflet area (cm ²) | |
|-----------------------------------------------------|-----------------|-------------|---------------------|-------------|--------------------|-------------|---------------------------------|-------------|
| | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 |
| T ₁ control | 2.48 | 2.53 | 45.02 | 46.15 | 1.79 | 1.81 | 40.10 | 41.42 |
| T ₂ algae extract 0.1% | 2.53 | 2.68 | 46.13 | 46.36 | 1.81 | 1.82 | 41.29 | 41.62 |
| T ₃ algae extract 0.3% | 2.54 | 2.70 | 46.47 | 46.61 | 1.81 | 1.84 | 41.41 | 41.90 |
| T ₄ Boron 0.05% | 2.57 | 2.63 | 46.70 | 46.87 | 1.82 | 1.83 | 41.71 | 42.02 |
| T ₅ Silicon 0.1% | 2.69 | 2.79 | 46.33 | 46.89 | 1.83 | 1.83 | 41.59 | 42.15 |
| T ₆ algae extract 0.1% + Boron 0.05% | 2.84 | 2.87 | 53.99 | 54.62 | 2.12 | 2.12 | 52.64 | 53.20 |
| T ₇ algae extract 0.3% + Boron 0.05% | 2.92 | 2.98 | 57.01 | 57.48 | 2.23 | 2.23 | 57.39 | 57.71 |
| T ₈ algae extract 0.1% + Silicon 0.1% | 3.15 | 3.17 | 56.79 | 58.17 | 2.23 | 2.24 | 57.28 | 58.54 |
| T ₉ algae extract 0.3% + Silicon 0.1% | 3.38 | 3.38 | 58.52 | 59.18 | 2.25 | 2.26 | 59.08 | 58.77 |
| T ₁₀ algae extract 0.1% + Boron +Silicon | 3.52 | 3.59 | 59.25 | 60.21 | 2.28 | 2.29 | 60.29 | 61.31 |
| T ₁₁ algae extract 0.3% + Boron +Silicon | 3.60 | 3.63 | 60.00 | 60.93 | 2.35 | 2.36 | 62.60 | 63.57 |
| LSD at 5% | 0.09 | 0.13 | 1.74 | 1.83 | 0.02 | 0.04 | 1.38 | 1.59 |

Table 4. Effect of algae extract, boron and silicon on number of leaflet, leaf area and number of spine of Sewy date palm (2015 and 2016 seasons.).

| Characters Treatments | No. of Leaflets | | Leaf area (m ²) | | No. of Spine | |
|-----------------------------------------------------|-----------------|-------------|-----------------------------|-------------|--------------|-------------|
| | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 |
| T ₁ control | 186.00 | 187.67 | 0.74 | 0.77 | 18.00 | 18.00 |
| T ₂ algae extract 0.1% | 186.67 | 188.33 | 0.77 | 0.78 | 18.66 | 19.00 |
| T ₃ algae extract 0.3% | 187.33 | 189.67 | 0.77 | 0.79 | 18.66 | 18.00 |
| T ₄ Boron 0.05% | 187.33 | 190.33 | 0.78 | 0.79 | 18.66 | 20.00 |
| T ₅ Silicon 0.1% | 188.00 | 188.66 | 0.78 | 0.79 | 18.33 | 19.00 |
| T ₆ algae extract 0.1% + Boron 0.05% | 194.66 | 196.00 | 1.03 | 1.04 | 23.00 | 23.66 |
| T ₇ algae extract 0.3% + Boron 0.05% | 197.00 | 198.00 | 1.15 | 1.16 | 23.33 | 24.00 |
| T ₈ algae extract 0.1% + Silicon 0.1% | 201.66 | 202.33 | 1.15 | 1.17 | 24.66 | 25.33 |
| T ₉ algae extract 0.3% + Silicon 0.1% | 202.33 | 203.66 | 1.15 | 1.19 | 25.33 | 25.66 |
| T ₁₀ algae extract 0.1% + Boron +Silicon | 203.33 | 205.33 | 1.22 | 1.25 | 26.33 | 26.33 |
| T ₁₁ algae extract 0.3% + Boron +Silicon | 206.00 | 206.66 | 1.28 | 1.31 | 27.66 | 28.00 |
| LSD at 5% | 1.54 | 2.29 | 0.03 | 0.03 | 1.22 | 1.53 |

B- Yield components:

1. Initial and horticulture fruit set percentages, bunch weight and total yield (kg):

According to the data in Table (5), it's clear that all the investigated treatments increased initial fruit set, horticulture fruit set, bunch weight and consequently total yield compared with control which gave the lowest values. Application of (algae

extract at 0.3%+ boron at 0.05% +silicon at 0.1%) T₁₁ gave the highest values of initial and horticulture fruit set %, bunch weight and total yield (75.00 and 76.46), (53.60 and 54.), (12.53, 16.67 kg) and (112.80, 114.09 kg) during the two experimental seasons, respectively, in most cases the differences between T₁₁ and the other treatments were significant.

Table 5. Effect of algae extract, boron and silicon on Initial fruit set % horticulture fruit set %, bunch weight and total yield of Sewy date palm during 2015 and 2016 seasons.

| Character's Treatments | Initial fruit set % | | Hort. Fruit set% | | Bunch weight(kg) | | Total yield (kg) | |
|-----------------------------------------------------|---------------------|-------------|------------------|-------------|------------------|-------------|------------------|-------------|
| | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 |
| T ₁ control | 65.33 | 66.75 | 45.00 | 47.60 | 10.12 | 10.51 | 91.08 | 94.59 |
| T ₂ algae extract 0.1% | 67.50 | 69.39 | 46.88 | 47.61 | 10.65 | 10.87 | 95.85 | 97.83 |
| T ₃ algae extract 0.3% | 70.17 | 69.33 | 48.89 | 49.18 | 10.58 | 10.71 | 95.22 | 96.39 |
| T ₄ Boron 0.05% | 70.58 | 70.93 | 48.65 | 50.27 | 10.61 | 10.92 | 95.49 | 98.28 |
| T ₅ Silicon 0.1% | 69.00 | 69.75 | 49.25 | 49.70 | 10.92 | 11.22 | 98.28 | 100.98 |
| T ₆ algae extract 0.1% + Boron 0.05% | 70.33 | 71.46 | 49.41 | 49.95 | 11.50 | 11.75 | 103.5 | 105.75 |
| T ₇ algae extract 0.3% + Boron 0.05% | 71.66 | 73.17 | 51.10 | 51.86 | 11.61 | 11.89 | 104.49 | 107.01 |
| T ₈ algae extract 0.1% + Silicon 0.1% | 73.00 | 74.15 | 51.23 | 51.74 | 11.62 | 11.97 | 104.58 | 107.73 |
| T ₉ algae extract 0.3% + Silicon 0.1% | 72.00 | 73.22 | 51.25 | 51.80 | 11.73 | 11.94 | 105.57 | 107.46 |
| T ₁₀ algae extract 0.1% + Boron +Silicon | 74.00 | 75.45 | 52.58 | 53.23 | 11.95 | 12.18 | 107.55 | 109.62 |
| T ₁₁ algae extract 0.3% + Boron +Silicon | 75.00 | 76.46 | 53.60 | 54.51 | 12.53 | 12.67 | 112.77 | 114.03 |
| LSD at 5% | 3.25 | 3.57 | 3.35 | 3.69 | 0.36 | 0.37 | 3.53 | 3.37 |

Likewise, a positive relationship was found between bunch and total yield on hand and initial and horticultural fruit set on the other hand. So increasing initial and horticultural fruit set% resulted in increasing the bunch weight and total yield.

The previous promotive effect of seaweed extract on growth characteristics, 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).

The present promoting effect of boron could be explained on the light of its positive action on cell division, biosynthesis and movement of sugars, pollen germination, uptake of water

and nutrients and increasing the tolerance of plants to different disorders (Nijjar, 1985). The beneficial effects of silicon on enhancing the tolerance of plants to all stresses due to increasing antioxidant defense systems as well as their important role in the biosynthesis of organic foods (Epstein, 1999 and Epstein and Bloom, 2003).

These results are in harmony with those obtained by El-Sawy, (2005); Gamal, (2006); El-Sayed-Esraa, (2010); Abdelaal *et al.*, (2012); Mohamed and El-Sehrawy, (2013); Gamal, (2013) and Ahmed *et al.*, (2014) who found that treating Sakoti and Bartemuda with seaweed extract three or four times at 0.05, 0.1 and 0.2% was very effective in enhancing growth characters relatively to the check treatment. The promotion was associated with increasing concentrations and frequencies of seaweed extract.

The findings regarding the promoting effect of silicon on growth and fruiting of fruit crops are in harmony with those obtained by Gad El-Kareem (2012), Al-Wasfy (2013)

who studied the effect of spraying royal jelly at 0.025 to 0.1%, potassium silicate at 0.05 to 0.2 % and vitamins B (B1 at 250 ppm + B6 at 100 ppm and B12 at 250 ppm) either singly or in all possible combinations on growth of Sakkoti date palm fruits. Single and combined applications of royal jelly, silicon and vitamins B were very effective in enhancing growth.

2. Physical properties

The obtained data on Tables (6,7) showed that spraying the palms with algae extract, boron and silicon each alone or their combinations

caused an increase in fruit length, diameter, weight, size and flesh weight. In other words and in most cases using a combination of seaweed extract at 0.1 % with Silicon at 0.01 % and Boron at 0.05 % T₁₁ followed by T₁₀ (a combination of seaweed extract at 0.1 % with Silicon at 0.01 % and Boron at 0.05 % caused a significant promotion on fruit length, diameter, weight, size, and flesh weight over the check and the other investigated treatments. On the other hand seed weigh were insignificantly affected by various treatments during the two experimental seasons.

Table 6. Effect of algae extract, boron and silicon on fruit length, diameter, weight and size of Sewy date palm during 2015 and 2016 seasons.

| Characters Treatments | Fruit length (cm) | | Fruit diameter (cm) | | Fruit weight (g) | | Fruit size (cm ³) | |
|-----------------------------------------------------|-------------------|-------------|---------------------|-------------|------------------|-------------|-------------------------------|-------------|
| | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 |
| T ₁ control | 4.08 | 4.02 | 2.07 | 2.10 | 15.98 | 16.49 | 15.95 | 16.26 |
| T ₂ algae extract 0.1% | 4.09 | 4.10 | 2.08 | 2.12 | 16.11 | 16.68 | 16.29 | 16.50 |
| T ₃ algae extract 0.3% | 4.11 | 4.13 | 2.11 | 2.16 | 16.43 | 17.16 | 16.38 | 16.68 |
| T ₄ Boron 0.05% | 4.13 | 4.14 | 2.11 | 2.15 | 16.62 | 16.90 | 16.72 | 16.97 |
| T ₅ Silicon 0.1% | 4.13 | 4.20 | 2.13 | 2.14 | 16.72 | 17.80 | 16.88 | 16.99 |
| T ₆ algae extract 0.1% + Boron 0.05% | 4.17 | 4.20 | 2.15 | 2.16 | 16.90 | 17.25 | 16.98 | 17.20 |
| T ₇ algae extract 0.3% + Boron 0.05% | 4.20 | 4.22 | 2.18 | 2.19 | 16.92 | 17.24 | 17.00 | 17.39 |
| T ₈ algae extract 0.1% + Silicon 0.1% | 4.20 | 4.22 | 2.16 | 2.19 | 17.15 | 18.11 | 16.88 | 17.32 |
| T ₉ algae extract 0.3% + Silicon 0.1% | 4.21 | 4.23 | 2.19 | 2.22 | 17.66 | 18.17 | 17.31 | 17.80 |
| T ₁₀ algae extract 0.1% + Boron +Silicon | 4.25 | 4.27 | 2.20 | 2.23 | 18.09 | 18.29 | 18.16 | 18.58 |
| T ₁₁ algae extract 0.3% + Boron +Silicon | 4.27 | 4.31 | 2.21 | 2.24 | 18.51 | 18.36 | 18.41 | 18.80 |
| LSD at 5% | 0.09 | 0.09 | 0.03 | 0.02 | 0.29 | 1.02 | 0.45 | 0.42 |

Table 7. Effect of algae extract, boron and silicon on flesh and seed weights of Sewy date palm during 2015 and 2016 seasons.

| Characters Treatments | Flesh weight (g) | | Seed weight (g) | |
|-----------------------------------------------------|------------------|-------------|-----------------|------------|
| | 2015 | 2016 | 2015 | 2016 |
| T ₁ control | 14.11 | 14.98 | 1.83 | 1.51 |
| T ₂ algae extract 0.1% | 14.23 | 15.29 | 1.88 | 1.57 |
| T ₃ algae extract 0.3% | 14.66 | 15.23 | 1.77 | 1.86 |
| T ₄ Boron 0.05% | 14.78 | 15.24 | 1.84 | 1.99 |
| T ₅ Silicon 0.1% | 14.83 | 15.79 | 1.88 | 2.01 |
| T ₆ algae extract 0.1% + Boron 0.05% | 14.91 | 15.37 | 1.98 | 1.88 |
| T ₇ algae extract 0.3% + Boron 0.05% | 14.94 | 15.25 | 1.98 | 1.99 |
| T ₈ algae extract 0.1% + Silicon 0.1% | 15.19 | 16.19 | 1.96 | 1.92 |
| T ₉ algae extract 0.3% + Silicon 0.1% | 15.71 | 16.32 | 1.95 | 1.85 |
| T ₁₀ algae extract 0.1% + Boron +Silicon | 16.13 | 16.46 | 1.96 | 1.83 |
| T ₁₁ algae extract 0.3% + Boron +Silicon | 16.56 | 16.48 | 1.95 | 1.88 |
| LSD at 5% | 0.34 | 0.92 | N.S | N.S |

These results regarding the effect of algae extract, boron and silicon on fruit quality are in agreement with those of Abdelaal *et al.*, (2012); Ahmed *et al.*, (2013a and 2013b); Mohamed and El- Sehrawy, (2013); and Badran, *et al.*, (2015) found that Spraying “Zaghloul” and “Samany” date palm inflorescences grown in new reclaimed soil with potassium silicate (KSi 10 %) at 0.8% or K₂O 10%+ SiO₂ 25 % at 0.8% had a positive effect on fruit set, yield and fruit quality. Badran (2016). Who found that spraying Zaghloul date palm with seaweed extract at 2 or 4 % either alone or with silicon were very effective on improving yield and fruit quality (fruit weight, dimensions).

C. Chemical characteristics.

It is clear from the obtained data in Table (8) that spraying the palms with algae extract, boron and silicon each alone or in combination between the three materials significantly decreased the total acidity compared to the palms sprayed with water (control). According to the data of the TSS and sugar content (total, reducing sugar) results showed that using algae extract at 0.1 % and 0.3%, Boron at 0.05% and Silicon at 0.1%each

alone or in combination between the three materials increased the such values compared with control this increment was significant in most cases during the two seasons. Concerning the non reducing sugars it was found that using T₁₁ (algae extract at 0.3% + Boron at 0.05% +Silicon at 0.1%) gave the highest values and significantly increased it compared with the other investigation treatments during the second season while the differences between treatments during the first season were not significantly.

These results are in harmony with those obtained by El- Sayed- Esraa, (2010); Merwad (2011); Abdelaal *et al.*, (2012); Mahmoud, (2012); Mohamed and El- Sehrawy, (2013); Gamal, (2013) and Ahmed *et al.*, (2014). Who stated that Treating Zaghloul date palms with seaweed extract four times at 0.2 % gave the best results with regard to yield and fruit quality. Roshdy (2014) found that The best results with regard to yield as well as physical and chemical characteristics of the fruits of Grandnaine banana plants were obtained owing to using four a mixture containing Potassium silicate and Seaweed extract each at 0.05%.

Table 8. Effect of algae extract, boron and silicon on acidity, TSS, total sugars, reducing and Non red-sugars of Sewy date palm during 2015 and 2016 seasons.

| Characters Treatments | Acidity | | TSS | | Reducing sugar | | Non reducing sugar | | Total sugar | |
|-----------------------------------------------------|------------------------|-------------|-------------|-------------|----------------|-------------|--------------------|-------------|-------------|-------------|
| | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 | 2015 | 2016 |
| | T ₁ control | 0.23 | 0.23 | 49.09 | 48.44 | 23.25 | 23.45 | 21.10 | 19.40 | 44.36 |
| T ₂ algae extract 0.1% | 0.22 | 0.21 | 49.24 | 49.36 | 23.29 | 25.36 | 21.24 | 19.80 | 44.45 | 44.52 |
| T ₃ algae extract 0.3% | 0.22 | 0.20 | 49.69 | 49.33 | 23.60 | 24.88 | 21.13 | 19.89 | 44.73 | 44.77 |
| T ₄ Boron 0.05% | 0.21 | 0.21 | 49.78 | 50.38 | 23.76 | 25.75 | 21.63 | 19.37 | 45.39 | 45.12 |
| T ₅ Silicon 0.1% | 0.22 | 0.22 | 50.07 | 50.22 | 22.95 | 24.48 | 21.02 | 21.48 | 44.97 | 45.96 |
| T ₆ algae extract 0.1% + Boron 0.05% | 0.20 | 0.20 | 51.63 | 52.70 | 27.11 | 27.31 | 19.40 | 20.51 | 46.51 | 47.82 |
| T ₇ algae extract 0.3% + Boron 0.05% | 0.20 | 0.19 | 52.23 | 53.91 | 28.18 | 28.77 | 20.87 | 20.57 | 49.05 | 49.34 |
| T ₈ algae extract 0.1% + Silicon 0.1% | 0.21 | 0.20 | 51.52 | 52.84 | 28.42 | 29.30 | 19.73 | 19.72 | 48.33 | 49.02 |
| T ₉ algae extract 0.3% + Silicon 0.1% | 0.19 | 0.19 | 54.83 | 56.60 | 29.62 | 30.33 | 20.94 | 21.44 | 50.56 | 51.77 |
| T ₁₀ algae extract 0.1% + Boron +Silicon | 0.19 | 0.18 | 55.13 | 58.02 | 30.03 | 30.61 | 21.08 | 21.37 | 51.11 | 51.98 |
| T ₁₁ algae extract 0.3% + Boron +Silicon | 0.18 | 0.17 | 56.28 | 59.13 | 31.09 | 31.23 | 21.75 | 22.54 | 52.84 | 53.77 |
| LSD at 5% | 0.02 | 0.02 | 1.44 | 1.43 | 1.68 | 1.35 | N.S | 0.76 | 1.60 | 1.41 |

Conclusion

Spraying Sewy date palm with algae extract at 0.3%, boron 0.05% and silicon 0.1% three times during each season at growth start, Just after fruit setting and after 45 days later was very effective on increasing yield and improving fruit physical and chemical characteristics.

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تأثير الرش بمستخلص الطحالب وعناصر البورون والسيليكون على نمو وإثمار نخيل البلح السيوى تحت ظروف الاراضى حديثة الاستصلاح

طلعت كامل المهدي^١، محمد أحمد فؤاد بدران^٢، رشاد عبد الوهاب إبراهيم^١، أحمد عبد الحليم أحمد^٢

^١ قسم الفاكهة - كلية الزراعة - جامعة اسيوط

^٢ المعمل المركزي للزراعة العضوية - مركز البحوث الزراعية - الجيزة

الملخص:

أجريت هذه الدراسة خلال موسمي ٢٠١٥ و ٢٠١٦ على نخيل البلح السيوى المنزرع فى ارض رملية حديثة الاستصلاح بمزرعة خاصة فى الوادى الاسيوطى وذلك لدراسة تأثير الرش بمستخلص الطحالب والبورون والسيليكون على بعض صفات النمو الخضري والمحصول وكذلك بعض الصفات الطبيعية والكيميائية للثمار. وكانت التجربة تشمل عشرة معاملات بالاضافة الى الكنترول وكانت كالاتى

١- كونترول (رش بالماء فقط)

٢- رش مستخلص الطحالب عند تركيز ٠,١%

٣- رش مسخلص الطحالب عند تركيز ٠,٣%

٤- رش بورون عند تركيز ٠,٠٥%

٥- رش سيليكون عند تركيز ٠,١%

٦- رش مستخلص الطحالب عند تركيز ٠,١% + بورون عند تركيز ٠,٠٥%

٧- رش مسخلص الطحالب عند تركيز ٠,٣% + بورون عند تركيز ٠,٠٥%

٨- رش مسخلص الطحالب عند تركيز ٠,١% + سيليكون عند تركيز ٠,١%

٩- رش مسخلص الطحالب عند تركيز ٠,٣% + سيليكون عند تركيز ٠,١%

١٠- رش مسخلص الطحالب عند تركيز ٠,١% + بورون عند تركيز ٠,٠٥% +

سيليكون عند ٠,١%

١١- رش مسخلص الطحالب عند تركيز ٠,٣% + بورون عند تركيز ٠,٠٥% +

سيليكون عند ٠,١%

تم اجراء بعض القياسات الخضرية (طول الاوراق والوريقات وعرضها ومساحة سطح الورقة والوريقة وعدد الوريقات والاشواك). تم تقدير العقد المبدئى والنهائى للمحصول ووزن السوباطة والوزن الكلى للثمار وتم تقدير بعض الصفات الطبيعية مثل (وزن الثمرة ووزن اللحم ووزن البذرة وطول وقطر وحجم الثمرة) و بعض الصفات الكيميائية مثل (الحموضة والمواد الصلبة الكلية والسكريات الكلية والمختزلة والغير مختزلة)

وقد أوضحت النتائج ما يلى:

١- الصفات الخضرية

أوضحت النتائج ان الرش بمستخلص الطحالب منفردا بالاضافة الى عنصرى البورون والسيليكون كلا على حدا ادى الى زيادة واضحة فى معظم صفات النمو الخضرية مقارنة بالكنترول (الرش بالماء) وكانت الزيادة مرتبطة بزيادة تركيز مستخلص الطحالب والخليط مع البورون والسيليكون.

٢- العقد المبدئى والنهائى والمحصول

ادى الرش بمستخلص الطحالب بالاضافة مع البورون والسيليكون الى زيادة العقد المبدئى الذى بدوره انعكس على زيادة العقد النهائى والمحصول الكلى للثمار وكانت افضل القيم عند استخدام المعاملة الحادية عشر وهى (مستخلص الطحالب ٠,٣% + البورون ٠,٠٥% + السيليكون ٠,١%).

٣- الصفات الطبيعية

لوحظ من النتائج ان الرش بمستخلص الطحالب والبورون والسيليكون ادى الى زيادة معنوية فى معظم الصفات الطبيعية مثل طول وقطر وحجم ووزن الثمرة وايضا وزن اللحم والبذرة ولوحظ عدم وجود فروق معنوية فى وزن الثمرة ووزن اللحم خلال الموسم الثانى وكانت المعاملة (مستخلص الطحالب ٠,٣% + البورون ٠,٥% + السيليكون ٠,١%) هى افضل المعاملات قيمة مقارنة بباقي المعاملات.

٤- الصفات الكيميائية

ادى الرش بمستخلص الطحالب والبورون والسيليكون الى زيادة واضحة فى معظم الصفات الكيميائية وهى الحموضة والمواد الصلبة الكلية والسكريات وكانت هناك فروق معنوية فى معظم الاحوال وسجلت المعاملة (مستخلص الطحالب ٠,٣% + البورون ٠,٥% + السيليكون ٠,١%) اعلى القيم وكانت الكنترول (الرش بالماء) هى التى اعطت اقل القيم وكانت الزيادة مرتبطة بزيادة تركيز مستخلص الطحالب.

التوصية:

يمكن أن نوصى من خلال التجربة بأن استخدام الرش بمستخلص الطحالب عند تركيز ٠,٣% بالإضافة الى البورون ٠,٥% والسيليكون ٠,١% ثلاث رشات يؤدى إلى الحصول على أشجار نخيل سيوى ذات نمو خضرى قوى وثمار ذات جودة عالية ومحصول اقتصادى عالى.