



Effect of Spraying Micro-Nutrients and Amino Acids on The Fruiting of Saidy Date Palm

Radwan, E. M. A*¹.; El-Salhy, A. M²; and Amira I. A. Tawfik¹

¹Hort. Dept., Fac. Agric., New Valley Univ., El-Kharga, Egypt

²Pomology Dept., Fac. Agric., Assiut Univ., 71526 Assiut, Egypt

Abstract

The present study carried out during 2021 and 2022 seasons is to investigate the promotive effect of spraying Saidy date palm bunches with Micro-nutrients and Amino acids on yield and fruit physical and chemical characteristics. Bunches were sprayed with Micro-nutrients at 250,500 ppm or 1000 ppm and Amino acid at 5000-ppm. The Micro-nutrients and Amino acids were sprayed individually or in combination. Results indicated that all spray treatments significantly increased. The yield improved the physical and chemical characteristics of fruits compared with untreated bunches. Spraying bunches with Micro-nutrients at 500 or 1000 ppm alone or in combination with Amino acid at 5000 ppm was more effective in increasing the yield and improving physical and chemical fruits properties.

* Corresponding author
Radwan, E. M. A.



Received: 09/02/2024
Revised: 22/02/2024
Accepted: 17/03/2024
Published: 17/03/2024



©2024 by the authors. Licensee NVJAS, Egypt. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

Keywords: Date palm, Fruit yield, Fruit quality, Micro-nutrients, Amino acids

Introduction

Date palm (*Phoenix dactylifera L.*) one of the most important fruit crops grown in semiarid and arid- regions. In Egypt, many farmers rely on date palms cultivation and exportation of their fruit. According to **FAO (2010)**, Egypt is considered the leading country among the top ten date producers (1,130,000 tons). 'Saidy' is one of the most commercial and semi-dry cultivars in Egypt. Fruit trees are seriously impacted by climatic; the fruit trees are facing many challenges regarding their productivity due to changing climatic conditions (**Normand et al., 2013**). The yield and fruit quality are directly affected by climatic factors i.e. high temperature, increasing CO₂ levels low soil moisture and high evaporative. Therefore, under changing climate, the management of natural resources like nutrients and water is a possible solution (**Schaffer et al., 2009**). Moreover, major problems. Facing date growers as low annually average of yield and fruit quality. Minerals element especially micro-nutrients have an important role for increasing yield and fruit quality and It increase the tolerance of trees for many stresses, therefore determination the optimum levels for them is a necessity for date palm Orchards management. Foliar application of Micro-nutrients and Amino acids are the key to improve the productivity and fruits quality, as well as it has a beneficial role in reclamation of nutritional and physiological deficiency in fruit trees (**Rai, 2002; Lalithya et al., 2014 and Khan et al., 2020**).

Spraying micro-nutrients leads to improved yield and fruit quality as well as improved fruit retention (**Sarrwy et al., 2012; Omar et al., 2014 and Mostafa, 2015**). In this concern, boron is involved in many processes such as protein synthesis, transport of sugars and carbohydrate metabolism (**Hansch and Mendel, 2009**). It appears that the effect on date productivity and fruit quality is through some micro-elements such as boron, which plays an important role in achieving satisfactory fruit quality. It is involved in many physiological

processes such as sugar transport, carbohydrate metabolism and protein synthesis. (**Etman et al., 2007 and Khayyat et al., 2007**). Spraying of date palm inflorescences with calcium nitrate and/or boric acid had a significant impact on fruit set, yield, and fruit quality traits (**Harhash and Abdel Nasser 2010, Sarrwy et al., 2012, 2010; Omar et al., 2014; Mostafa, 2015; Merwad et al., 2019**)

Amino acids are among the most important antioxidants that play a clear role in solving the problem of poor yield by enhancing the nutritional status of growth, yield, and fruit quality in various fruit trees and have synergistic effects on growth and productivity of most fruit trees (**Khan et al., 2012; Merwad et al., 2015 and Khan et al., 2020**). Amino acids have a defensive role against fungal attack, cell aging and oxidative stress, in addition to promoting cell division and growth. Moreover, they improve flowering and fruit set, especially under stressful conditions (**Hayat and Ahmed, 2007; Al-Salhy et al., 2021**). The application of Amino acids for foliar use depends on the necessity of crops in general and at critical growth stages in particular and the demand for essential Amino acids is well known as an application to enhance productivity and fruit quality. Many studies have shown the proven role of Amino acids in increasing yield and improving fruit quality traits (**Rai, 2002; Khan et al., 2020; El-Salhy et al., 2021; Abdel-Ghany, 2021 and El-Kady et al., 2022**).

Many previous studies emphasized the benefits of Micro-nutrients and Amino acids in improving the fruiting of date palm trees (**Rai, 2002; Harhash and Abdel-Nasser, 2010; Sarrwy et al., 2012; Omar et al., 2014, Mostafa, 2015, Merwad et al., 2019, Khan et al., 2020; El-Salhy et al., 2021; Abdel-Ghany, 2021 and El-Kady et al., 2022**)

Therefore, the present study was planned to know the effect of foliar application of Fetrilon compi (NC) (Micro-nutrients) and amino acids on yield and fruit quality of Saidy date palm.

Materials and Methods

This study was conducted during the two successive seasons of 2021 and 2022 on 20-year-old Saidu palm trees. The chosen palm trees were planted in the Baris Oasis, New Valley Governorate, Egypt, on sandy loamy soil. The laboratory work was conducted in the Horticulture Department Faculty of Agriculture, New Valley University. Seven healthy palms nearly similar in growth vigor were selected. Regular agricultural practices were carried out as usual. The leaf/bunch ratio was adjusted at the end of the blooming season to meet its value of 8:1 leaving 8 bunches on each palm. Artificial pollination was uniformly performed in respect of source, date and method to avoid the effect of metaxenia. Spraying treatments were carried twice-immediately after fruit set and at the beginning of coloring as follows:

- 1- Control (spraying with water only)
- 2- Spraying the bunches with Nutrimix Complete (Micro-nutrients) at 250 ppm
- 3- Spraying the bunches with Nutrimix Complete at 500 ppm
- 4- Spraying the bunches with Nutrimix Complete at 1000 ppm.
- 5- Spraying the bunches with Amino acid at 5000 ppm.
- 6- Spraying the bunches with Nutrimix Complete at 250 ppm plus Amino acids at 5000 ppm

Fruit retention %

$$= \frac{\text{Total number of retained fruits strand}}{\text{Number of retained fruits / strand and flowers no. flower scars}} \times 100$$

The bunches were picked at the beginning of September when the fruits reach the Routab stage. The average crop weight/palm and bunch weight was recorded at kilograms.

Fruit physical characteristics:

Fruit was selected at random from each bunch to determine physical properties such as fruit weight (g), fruit dimensions (cm) (Length and diameter), and flesh %.

Fruit chemical characteristics:

Chemical properties i.e. total soluble solids content (T.S.S.) % was determined using hand refractometer, also percentage of

7- Spraying the bunches with Nutrimix Complete at 500 ppm plus Amino acids at 5000 ppm

8- Spraying the bunches with Nutrimix Complete at 1000 ppm plus Amino acids at 5000 ppm Triton B was added as a 0.05% wetting agent to each spray solution before use.

The chemical composition of the applied **Amino acid is: Super viga MaxR** (Commercial product produced by union for agricultural Development Co. (USD), Egypt,) containing 17.5% amino acid W / V

The design of the experiment is complete randomized block design that contain 8 treatments and 7 replications, the bunch/palm is considered as a replicate.

All spray treatments were thoroughly applied on bunches using a hand sprayer (2 liters capacity). The response of Saidu date palms to micro-nutrients or amino acid and their combinations were evaluated through the following determinations.

Yield components such as fruit retention, bunch weight.

The fruit retained percentages were calculated at time from five inner and outer strands per bunch. The percentages of fruit retention were calculated using the following equation:

total acidity as gm. citric acid/100gm fruit and total tannins. Reducing sugar %, non-reducing sugars % and total sugars % were determined according to **A.O.A.C. (1995)**.

Statistical analysis:

The obtained data during two studied seasons were subjected to analysis of variance according to **Snedecor and Cochran (1990)**. Means were differentiated using values of new LSD at 5% level.

Results

1- Yield components: Data in Table (1) showed that the effect of Micro-nutrients (NC) and Amino acids (Aa) on yield

components of Saidu date palm during 2021 and 2022 seasons. It is obvious from the data that results showed similar trend during the two studied seasons.

Results indicate that yield components i.e. fruit retention, bunch weight / kg significantly increased due to spraying Micro-nutrients (NC) by the different concentrations or amino acids (Aa) compared to (control). It could be noticed that all spraying treatments significantly increased fruit retention as compared with control. In this respect, the best treatment that gave the highest significant fruit retention was (70.37 & 70.36%) as an av. of the two studied seasons due to 1000 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₈ or 500 ppm Micro-nutrients (NC) plus Amino acid (Aa) 5000 ppm T₇ followed by 250 ppm (NC) plus 5000 ppm (Aa) T₆ as an av. of the two studied seasons. Control treatment gave the lowest significant fruit retention, where it was recorded (63.68%) as an av. of the two studied seasons. No significant differences were found due to spraying Micro-nutrients (NC) alone or Micro-nutrients (NC) plus Amino acids (Aa). Therefore, in general economic

view, it concluded that to spray Micro-nutrients (NC) alone or in combination with Amino acids (Aa) at lower concentrations.

Concerning the bunch weight, results in the same table reveal that, Micro-nutrients (NC) and Amino acid (Aa) singly or in combinations had a positive effect on bunch weight as compared with the control due to 1000 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₈ or 500 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₇ or 250 ppm (NC) plus 5000 ppm (Aa) T₆ gave the highest bunch weight (13.15, 13.04 and 12.65) followed by 500 ppm Micro-nutrients (NC) or 1000 ppm Micro-nutrients (12.29 & 12.34kg) as an av. of the two studied seasons. On the other hand, control treatment recorded the lowest bunch weight (10.62kg) as an av. of the two studied seasons. The recorded bunch weight was (10.62, 11.53, 12.29, 12.34, 11.93, 12.65, 13.04 & 13.15kg) as an av. of the two studied seasons due to T₁ to T₈, respectively. Then, the corresponding increment percentage of bunch weight due to treatments over control attained (8.57, 15.73, 16.20, 12.34, 19.21, 22.79 & 23.82%), respectively.

Table (1): Effect of spraying Micro-nutrients and Amino acid on yield component of Saidu date palm during 2021 and 2022 seasons.

Treatments		Fruit Retention %			bunch Weight (kg)		
		2021	2022	Mean	2021	2022	Mean
Control	T ₁	60.25c	67.10c	63.68D	9.88D	11.36D	10.62D
NC 250 ppm	T ₂	62.68B	69.65B	66.17C	10.72C	12.33C	11.53C
NC 500 ppm	T ₃	64.53AB	71.58AB	68.06B	11.43B	13.15B	12.29BC
NC 1000 ppm	T ₄	64.69AB	71.89AB	68.26B	11.48B	13.20B	12.34BC
Amino acids (Aa) 5000 ppm	T ₅	63.45B	70.52B	66.98BC	11.10BC	12.75BC	11.93C
NC 250+Aa 5000 ppm	T ₆	65.78AB	73.11A	69.45AB	11.76AB	13.53AB	12.65B
NC 500+Aa 5000 ppm	T ₇	66.83A	73.89A	70.36A	12.11A	13.96A	13.04AB
NC 1000+Aa5000 ppm	T ₈	66.79A	73.95A	70.37A	12.20A	14.10A	13.15A
New LSD 5%		2.36	2.49	1.78	0.46	0.61	0.41

2- Fruit quality

A- Fruit physical characteristics: Results in Tables (2 & 3) indicate that fruit weight, fruit dimensions and flesh percentage were significantly affected by different treatments during two studied seasons. In general, spraying 1000 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₈ or 500

ppm Micro-nutrients (NC) plus Amino acid (Aa) 5000 ppm T₇ followed by 250 ppm (NC) plus 5000 ppm (Aa) T₆ significantly increased the previously studied traits compared to control.

Moreover, 1000 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₈ was achieved higher fruit weight (10.84g)

and flesh % (87.48%) and fruit length (3.79 cm) and fruit diameter (2.18cm) as av. of the two studied seasons compared with the other treatments and control, while the control recorded the lowest value in this respect, fruit weight (9.47g), flesh % (84.99%) and fruit length (3.52cm) fruit diameter (2.05cm) as an av. of two studied seasons, respectively.

The recorded fruit weight was (9.47, 9.91, 10.33, 10.38, 10.17, 10.50, 10.80 & 10.84g) and flesh % was (84.99, 87.07, 87.17, 87.33, 87.08, 87.38, 87.42& 87.48%) and Moisture % was (15.20 , 15.85, 15.98, 16.43, 15.98, 16.31, 16.40& 16.41%) and fruit length was (3.52, 3.64, 3.68, 3.72, 3.72,3.76, 3.76& 3.79 cm) and fruit diameter

was (2.05, 2.12, 2.15, 2.16, 2.13,2.16, 2.18& 2.18 cm) as an av. of the two studied seasons due to T₁ to T₈, respectively.

Moreover, the increment percentage of fruit weight due spraying Micro-nutrients or Amino acids compared to control attained (10.46, 10.91, 10.96, 10.74, 11.09, 11.40& 11.45%), respectively.

These results showed that there were no significant differences due to increasing the concentration of Micro-elements or Amino acid solution. Therefore, from an economic point of view, it can be concluded that the best treatment is spraying with a concentration of 1000 ppm of Micro-elements (NC) in addition to 5000 ppm of the Amino acid (Aa) T₈.

Table (2): Effect of spraying Micro-nutrients and Amino acid on fruit weight, flesh% and Moisture % of Saidy dates during 2021 and 2022 seasons

Treatments	Fruit Wight(g)			Flesh%			Moisture%		
	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean
Control	9.31D	9.63D	9.47D	84.71B	85.26B	84.99B	15.08C	15.31C	15.20
NC 250 ppm	9.72C	10.10C	9.91C	86.83A	87.31A	87.07A	15.73B	15.97B	15.85
NC 500 ppm	10.13B	10.53BC	10.33BC	86.95A	87.38A	87.17A	15.85AB	16.10AB	15.98
NC 1000 ppm	10.18B	10.58B	10.38BC	87.11A	87.54A	87.33A	16.01B	16.85AB	16.43
Amino acids (Aa) 5000 ppm	9.98BC	10.35BE	10.17C	86.86A	87.30A	87.08A	15.85AB	16.10AB	15.98
NC 250+Aa 5000 ppm	10.29AB	10.71AB	10.50B	87.15A	87.60A	87.38A	16.18AB	16.43AB	16.31
NC 500+Aa 5000 ppm	10.60A	11.00AB	10.80A	87.25A	87.59A	87.42A	16.27A	16.52A	16.40
NC 1000+Aa5000 ppm	10.63A	11.05A	10.84A	87.28A	87.67A	87.48A	16.31A	16.52A	16.41
New LSD 5%	0.38	0.43	0.30	0.10	0.10	0.07	0.47	0.51	0.37

Table (3): Effect of spraying Micro-nutrients and Amino acid on fruit length and fruit diameter of Saidy dates during 2021 and 2022 seasons.

Treatments		Fruit length (cm)			Fruit diameter (cm)		
		2021	2022	Mean	2021	2022	Mean
Control	T ₁	3.47C	3.56C	3.52C	2.03C	2.07B	2.05C
NC 250 ppm	T ₂	3.59B	3.68B	3.64B	2.09B	2.14A	2.12B
NC 500 ppm	T ₃	3.63B	3.72B	3.68B	2.12AB	2.17A	2.15AB
NC 1000 ppm	T ₄	3.66AB	3.77AB	3.72AB	2.13AB	2.18A	2.16AB
Amino acids (Aa) 5000 ppm	T ₅	3.69AB	3.75AB	3.72AB	2.10B	2.15A	2.13B
NC 250+Aa 5000 ppm	T ₆	3.71AB	3.81AB	3.76A	2.13AB	2.18A	2.16AB
NC 500+Aa 5000 ppm	T ₇	3.70AB	3.82AB	3.76A	2.15AB	2.20A	2.18A
NC 1000+Aa5000 ppm	T ₈	3.74A	3.84A	3.79A	2.16A	2.20	2.18A
New LSD 5%		0.10	0.10	0.07	0.05	0.06	0.04

B- Fruit chemical characteristics: It is clear from the results in Tables (4, 5 & 6) that spraying Micro-nutrients and Amino acid, led to a significant improvement in fruit chemical properties, in terms of increasing T.S.S%, sugar contents and decreasing the acidity and tannins in relative to the control treatment. As for T.S.S %, and sugar contents, the results in Tables (4 & 5) reveal that using foliar application of 1000 ppm Micro-nutrients (NC) plus 5000-ppm Amino acid (Aa) T₈ followed by 500 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₇ in descending order gave better results (74.48& 74.39%) and (64.77&64.80%) as an av. of the two studied seasons for T.S.S and total sugars due to T₈ and T₇, respectively. On the other hand, control scored the lowest value in this respect (70.08& 60.38%), respectively.

The recorded T.S.S was (70.08, 71.89, 72.56, 73.42, 72.89, 73.95, 74.39& 74.48%) and total sugar was (60.38, 62.54, 63.10, 63.73, 63.37, 64.29, 64.77& 64.80%) as an av. of the two studied seasons due to T₁, T₂, T₃, T₄, T₅, T₆, T₇and T₈ respectively. Then, the corresponding increment percentage of total sugar attained (3.58, 4.50, 5.55, 4.85, 6.48, 7.27 & 7.32%) due to T₂ to T₈ compared to T₁, respectively.

The values of non-reducing sugars percentage were (5.00, 5.47, 5.68, 5.68, 5.61, 5.67, 5.48 and 5.45%) as an av. the respectively two studied seasons due to using T₁, T₂, T₃, T₄, T₅, T₆, T₇ and T₈, respectively.

Moreover, no significant differences were found due to spray 1000 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₈ followed by 500 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₇.

As for acidity % and tannins contents, all spray treatments of these studied characteristics decreased compared to the control, and the lower values in this respect was (0.182 & 0.433%) and (0.177 & 0.423%) as an av. of two studied seasons were obtained by 1000 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₈ followed by 500 ppm micro-nutrients (NC)

plus 5000 ppm Amino acid (Aa) T₇, respectively. Meanwhile, control treatment gave the highest value in this respect (0.210& 0.509 %) as an av. of two studied seasons.

Hence, the decrement percentage of tannin contents attained (0.509, 0.471, 0.465, 0.453, 0.467, 0.440, 0.433and 0.423 %) as an av. of the two studied seasons due to the use of T₂ to T₈ compared to T₁, respectively.

The corresponding B-Carotene was (0.681, 0.759, 0.715, 0.721, 0.712, 0.725, 0.730 and 0.723) as an av. the two studied seasons due to T₁, T₂, T₃, T₄, T₅, T₆, T₇ and T₈, respectively.

In general, the lowest percentage of fruit chemical properties except acidity and tannins contents were found in control. On the other hand, spraying 1000 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₈ followed by 500 ppm Micro-nutrients (NC) plus 5000 ppm Amino acid (Aa) T₇ recorded the highest value in this respect. No significant differences were found due to spraying Micro-nutrients alone or Micro-nutrients plus Amino acids in any concentration of spraying solution. Therefore, in general, the economic view concluded that spraying Micro-nutrients alone or in combination with Amino acids at lower concentrations to get a high yield with good date quality.

Discussion

In this research, Micro-nutrients and Amino acids were used to enhance the Productivity and fruit properties of Saidu date palm fruits. One of the most widely used bio stimulants in agriculture is amino acids (Rai, 2002).

Moreover, they are substances that increase the availability of nutrients, enhance quality traits and promote plant growth. Amino acids can function as signaling molecules in plant cells under stressed and non-stressed conditions and precursors for the production of secondary metabolites (Rai, 2002 and Khedr, 2018). In this regard, many studies have reported that Amino acids have a positive effect in improving fruit characteristics and productivity (El-Salhy *et*

al., 2017; Al-Najjar *et al.*, 2020 and El-Kady *et al.*, 2022).

The results obtained were confirmed with those obtained by (Omer *et al.*, 2014), who reported that the percentage of fruit retention and bunch weight, as well as the productivity of the Saidy date palm variety, were improved by using zinc and boron. In this regard, the tentative explanation is that zinc and boron increase the removal power due to their participation in several enzymatic reactions that regulate carbohydrate metabolism essential for growth, development and protein (Swietlik, 1999 and Sarrway *et al.*, 2012). The obtained results are almost the same as those obtained by (El-Sawy 2005, Khayyat *et al.* 2007, Harhash and Abdel-Nasser 2010, Soliman and Obeed 2011, Osman *et al.* 2011, Mahmoud 2012, Elkhyat and El-Noam 2013, Omar *et al.* 2014, Roshdy 2014 and Mostafa 2015). The quality of the fruits of the Saidy date palm variety was improved by using Amino acids, Zinc and Boron. Zinc and Boron play a major role in many processes, especially carbohydrate metabolism and the transfer of sugars and

proteins, which increases cell division and enlargement, leading to accelerated fruit ripening, as well as increasing the weight and dimensions of the fruit. In addition, the amounts of Amino acids and essential Micro-nutrients that promote cell division and enlargement lead to accelerated fruit ripening in addition to increasing the weight and size of the fruit. These results are consistent with those obtained by (Ashour *et al.* 2004, El-Sawy 2005, Khayyat *et al.* 2007, Harhas and Abdel-Nasser 2010, Sarrwy *et al.* 2012, Mahmoud 2012, Oraby 2013, Roshdy 2014, Omar *et al.* 2014 and Mostafa 2015).

Conclusion

From the current study, it can be concluded that fruit yield and fruit physical and chemical characteristics were improved significantly by bunches twice foliar application with 500 ppm Micro-nutrients alone or combination with 5000 ppm Amino acids. These treatments were the best and the most effective treatments in enhancing yield and improving fruit quality of Saidy date palms.

Table (4): Effect of Micro-nutrients and Amino acid spraying on TSS and total sugars of Saidy dates during 2021 and 2022 seasons

Treatments		TSS%			Total sugars%		
		2021	2022	Mean	2021	2022	Mean
Control	T ₁	69.45C	70.71C	70.08C	60.100C	60.75C	60.38C
NC 250 ppm	T ₂	71.19B	72.58B	71.89B	61.98B	63.09B	62.54B
NC 500 ppm	T ₃	71.85B	73.26B	72.56B	62.56AB	63.63AB	63.10B
NC 1000 ppm	T ₄	72.73AB	74.11AB	73.42AB	63.28AB	64.18AB	63.73AB
Amino acids (Aa) 5000 ppm	T ₅	72.19AB	73.59AB	72.89B	62.83AB	63.91AB	63.37BB
NC 250+Aa 5000 ppm	T ₆	73.26AB	74.64AB	73.95AB	63.74A	64.84A	64.29AB
NC 500+Aa 5000 ppm	T ₇	73.68A	75.10A	74.39A	64.30A	65.23A	64.77A
NC 1000+Aa5000 ppm	T ₈	73.75A	75.21A	74.48A	64.40A	65.20A	64.80A
New LSD 5%		1.64	1.81	1.25	1.56	1.64	1.18

Table (5): Effect of Micro-nutrients and Amino acid spraying on reducing and non-reducing sugars of Saidy dates during 2021 and 2022 seasons

Treatments		Reducing sugars%			Non-reducing sugars%		
		2021	2022	Mean	2021	2022	Mean
Control	T ₁	54.96C	55.79C	55.38D	5.04B	4.96C	5.00C
NC 250 ppm	T ₂	56.41B	57.43B	56.92C	5.57A	5.36B	5.47B
NC 500 ppm	T ₃	56.93B	57.91B	57.42C	5.63A	5.72A	5.68A
NC 1000 ppm	T ₄	57.56B	58.54B	58.05BC	5.72A	5.64AB	5.68A
Amino acids (Aa) 5000 ppm	T ₅	57.19B	58.33B	57.76B	5.64A	5.58AB	5.61AB
NC 250+Aa 5000 ppm	T ₆	58.10AB	59.15AB	58.63B	5.64A	5.69AB	5.67AB
NC 500+Aa 5000 ppm	T ₇	58.87A	59.80A	59.29A	5.52A	5.43B	5.48B
NC 1000+Aa5000 ppm	T ₈	58.18A	59.85A	59.33A	5.54A	5.35B	5.45B
New LSD 5%		1.43	1.51	1.08	0.21	0.28	0.19

Table (6): Effect of a Micro-nutrients and Amino acid spraying on acidity, tannins and B. carotene of Saidu dates during 2021 and 2022 seasons

Treatments	Acidity			Tannins			B. carotene mg /100g		
	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean
Control	0.211A	0.208A	0.210	0.513A	0.505A	0.509A	0.677B	0.685B	0.681C
NC 250 ppm	0.201B	0.197B	0.199	0.475B	0.467B	0.471B	0.705A	0.713A	0.709B
NC 500 ppm	0.198B	0.195B	0.197	0.468B	0.461BC	0.465B	0.710A	0.720A	0.715AB
NC 1000 ppm	0.193B	0.195B	0.194	0.457B	0.448BC	0.453BC	0.716A	0.725A	0.721AB
Amino acids (Aa) 5000 ppm	0.199B	0.186B	0.198	0.470B	0.463B	0.467B	0.708A	0.715A	0.712AB
NC 250+Aa 5000 ppm	0.187B	0.183B	0.185	0.443C	0.436C	0.440C	0.721A	0.728A	0.725AB
NC 500+Aa 5000 ppm	0.184B	0.180B	0.182	0.435C	0.430C	0.433C	0.725A	0.735A	0.730A
NC 1000+Aa5000 ppm	0.178B	0.176B	0.177	0.426C	0.419C	0.423C	0.725A	0.730A	0.723AB
New LSD 5%	0.008	0.009	0.006	0.022	0.026	0.018	0.025	0.023	0.18

References

- A.O.A.C. (1995)**. Official Methods of Analysis 14th ed. Benjamin Franklin station, Washington D.E.U.S.A., 490-510.
- Abdel-Ghany, A.M.M. (2021)**. Effect of foliar application with some amino acids, vitamins and algae extract on vegetative growth, yield and berry quality of some grape cultivars. Ph.D. Thesis, Department of Pomology Faculty of Agriculture Assiut Uni. Egypt.
- Al-Najjar, M.A.; W.F. Alpresem & M.A. Ibrahim (2020)**. Effect of amino acid proline treatment on anatomical characteristics of leaves and roots of date palm seedling (*Phoenix dactylifera* L.) development under saline stress conditions. *Plant Archives*, 20(1): 755-760.
- Ashour, N.E.; H.S.A. Hassan & E.A.M. Mostafa (2004)**. Yield and fruit quality of Zaghoul and Samany date palm (*Phoenix dactylifera* L.) as affected by pollination methods. *Annals Agric. Sci. Ain Sham Univ., Cairo*, 49(2): 631-642.
- Elkady, E. M., El-Mahdy, M. T., El-akkad, M. M., & Mostafa, R. A. (2022)** Effect of Spraying with Amino Acids, Yeast, and Some Plant Extracts on Fruiting of Sewi Date Palm. *Assiut Journal of Agricultural Sciences*, 53(4), 79-91.
- El-khyat, H.M. and El-Noam, S.M. (2013)**. The use of bio-fertilizer to enhance fruit quality and productivity of Zaghoul and Samani date palms. *Alex. J. Agric. Res.*, 58(2): 131-140.
- El-Salhy, A. F. M., Kamal, M., E. M. A. Radwan, R., & Haleem, A. (2021)**. Effect of some treatments on heat stress tolerance of Flame Seedless vineyards. *Assiut Journal of Agricultural Sciences*, 52(4), 85-97.
- El-Salhy, A. M., Abou-Zaid, E. A., Diab, Y. M. S., & Mohamed, H. A. (2017)**. Effect of antioxidants, growth regulators and yeast spraying on fruiting of Seewy date palms. *Assiut J. Agric. Sci*, 48(5), 178-186.
- El-Sawy, Y.A. (2005)**. Studies on the effect of some organic fertilizers, ammonium nitrate and the bio-fertilizer (*Algae extract*) on growth and productivity of Williams banana (*Musa Cavendishii* L.). *M.Sc. Thesis Fac. Of Agric. Minia Univ., Egypt*.
- Etman, A.A.; A.M. Attalla; A.M. El-Kobbia & S.M. El-Nawam (2007)**. Influence of flower boron spray and soil application with some micro-nutrients in calcareous soil on I- Vegetative growth and leaf mineral content of date palms cv. Zaghoul in Egypt. The 4th symposium on

date palm in Saudi Arabia, Date Palm. Research Center, King Faisal Univ., 72 p.

FAO. (2010). FAO production yearbook. Food and Agriculture Organization of the United Nations.

Hansch, R. & R.R. Mendel (2009). Physiologically mineral, micronutrients (Cu, Zn, Mn, Fe, Ni, Mo, B & Cl. *Curr Opin, Plant Biol.*, 12(3): 259-266.

Harhash, M. M., & Abdel-Nasser, G. (2010). Improving of fruit set, yield and fruit quality of " Khalas" tissue culture derived date palm through bunches spraying with potassium and/or boron *Australian Journal of Basic and Applied Sciences*, 4(9), 4164-4172.

Hayat, S., & Ahmed, A. (2007). *Salicylic acid. A plant hormone*, Springer Science & Business Media, pp.401,

Khan, A.S.; B. Ahmad; M.J. Jaskani; R. Ahmed & A.U. Malik (2012). Foliar application of mixture of amino acids and seaweed (*Ascophylum nodosum*) extract improve growth and physicochemical properties of grapes. *Int. J. Agric. Biol.*, 14(3): 383-388.

Khan, A.S.; Ibrahim, M.; Basra, S.M.A.; Ali, S.; Almas, M.H.; Azam, R.; Anwar, M., & Hasan, M.U. (2020). Post-bloom applied moringa leaf extract improves growth, productivity and quality of early season maturing grapes (*Vitis vinifera*). *Inter. J. Agric. & Biolo.*, 24: 1217-1225.

Khayyat, M.; E. Tafazoli; S. Eshaghi & S. Rajae (2007). Effect of nitrogen, boron, potassium and zinc sprays on yield and fruit quality of date palm. *American Eurasian J. Agric. & Environ. Sci.*, 2 (3): 289-296.

Khedr, E. (2018). Improving productivity, quality and antioxidant capacity of Le-Conte pear fruits using foliar tryptophan, arginine, and salicylic applications. *Egyptian Journal of Horticulture*, 45(1): 93-103.

Lalithya, K.A., H.P. Bhagya, & R. Choudhary (2014). Response of silicon and micro-nutrients on fruit character and nutrient content in leaf of sapota. *Biolife*, 2(2):593-598.

Mahmoud, Kh. M.H. (2012). Reducing inorganic N fertilizer in Balady mandarin orchard through application of extracts of yeast, seaweed and farmyard manure. M.Sc. Thesis, Fac. Agric. Minia Univ. Egypt.

Merwad M.A., E.A.M. Mostafa, N.E. Ashour & M.M.S. Saleh (2019). effect of boron, zinc and seaweed sprays on yield and fruit quality of Barhee date palms. *Plant Archives*, 19(2): 393-397

Merwad, M.A.; R.A. Eisa & E.A.M. Mostafa (2015). Effect of some growth regulators and antioxidants sprays on productivity and some fruit quality of Zaghoul date palm. *International Journal of Chem Tech Research*, 8 (4): 1430-1437.

Mostafa, R.A.A. (2015). Effects of zinc, boron and active dry yeast sprays on yield and fruit quality of Zaghoul date palm. *Arab Univ. J. Agric. Sci., Ain Shams Univ., Cairo*, 23(2): 467-473.

Normand, F.; P.E. Lauri & J.M. Legane (2013). Climate change and its probable impacts on mango production and cultivation. In Mango. Opportunities and Challenges in the 21st Century. International Mango Symposium 3-7 June, Punta Cana, Dominican Republic.

Omar, A.K.; Ahmed, M.A. & Al-Obeed, R.S. (2014). Improving fruit set, yield and fruit quality of date palm (*Phoenix dactylifera L.*) through bunch spray with boron and zinc. *J. Testing and Evaluation*, 43(4): 1-6.

Oraby, A.A.F. (2013). Partial replacement of inorganic nitrogen fertilizer by spraying some vitamins, yeast and seaweed extract in Ewase mango orchard under Upper Egypt conditions. M.Sc. Thesis Fac. of Agric. Minia Univ., Egypt.

Osman, S.O.A.; Moustafa, F.M.A.; Abdel-Galil, H.A. & Ahmed, A.Y.M. (2011). Effect of yeast and effective microorganisms (EM1) application on the yield and fruit characteristics of Bartamouda date palm under Aswan conditions. *Assiut J. Agric. Sci.*, 42 (special issue) 5th Conf. of Young Scientists, Fac. of Agric., Assuit Univ., 332-349.

- Rai, V.K. (2002).** Role of amino acids in plant responses to stress. *Biol. Plant*, 45: 471-478.
- Roshdy, Kh.A. (2014).** Effect of spraying silicon and seaweed extract on growth and fruiting of Grandnaine banana. *Egypt. J. Agric. Res.*, 92(3): 979-991.
- Sarrwy, S.M.A.; E.G. Gadalla & E.A. Mostafa (2012).** Effect of calcium nitrate and boric acid on fruit set and fruit quality of cv. amhat date palm," *World Agric. Sci.*, 8(5): 506–515.
- Schaffer, B.; L. Lu; P. Urban & A.W. Wiley (2009).** Ecophysiology. In P.E. Litz (ed), the Mango. Botany Production and Uses 2nd edition CAB, Wallingford 170-209.
- Snedecor, C.W. & W.G. Cochran (1990).** *Statistical methods 7th ed.* Iowa State Univ. Press. Ames Iowa. U.S.A. p.593.
- Soliman, S.S. & Al-Obeed, R.S. (2011).** Effect of boron and sugar spray on fruit retention and quality of date palm. *American-Eurasian J. Agric. & Environ. Sci.*, 10(3): 404-409.
- Swietlik, D. (1999).** Zinc nutrition in horticultural crops. *Horticultural Review*, 23: 109-180.

تأثير رش العناصر الصغرى والأحماض الأمينية على إثمار نخيل البلح الصعيدى

عصام محمد عبدالظاهر رضوان^{1*}، عبد الفتاح مصطفى الصالحي²، اميرة إبراهيم احمد توفيق¹

¹قسم البساتين – كلية الزراعة – جامعة الوادي الجديد
²قسم الفاكهة – كلية الزراعة – جامعة اسيوط

الملخص العربى

أجريت هذه الدراسة خلال موسمين متتاليين 2021 و 2022 علي نخيل البلح الصعيدى المنزرع بواحة الخارجة بمركز باريس محافظة الوادي الجديد – مصر، بهدف دراسة تأثير رش نوتريميكس كومبليت (المغذيات الدقيقة) والأحماض الأمينية علي إثمار نخيل البلح الصعيدى حيث تم الرش بتركيزات 250 و 500 و 1000 جزء في المليون من مركب نوتريميكس كومبليت (المغذيات الدقيقة) بالإضافة إلى 5000 جزء في المليون من الأحماض الأمينية. وقد أظهرت النتائج ما يلي:

سبب الرش بمركب نوتريميكس كومبليت (المغذيات الدقيقة) أو الأحماض الأمينية في حالة فردية أو معاً زيادة معنوية في نسبة الثمار الباقية ووزن السوباطة وبالتالي وزن المحصول / نخلة مقارنة بعدم الرش (معامله المقارنة). سبب الرش بتركيز 1000 جزء في المليون من مركب نوتريميكس كومبليت (المغذيات الدقيقة) بالإضافة إلى 5000 جزء في المليون من الأحماض الأمينية تليها 500 جزء في المليون من مركب نوتريميكس كومبليت (المغذيات الدقيقة) بالإضافة إلى 5000 جزء في المليون من الأحماض الأمينية. سواء في حالة فردية أو معاً زيادة معنوية في وزن وأبعاد الثمرة ونسبة اللحم. كذلك محتواها من المواد الصلبة الذائبة أو السكريات مع قلة الحموضة والتانينات مقارنة بعدم الرش.

لم تسجل فروق معنوية بين استخدام مركب نوتريميكس كومبليت (المغذيات الدقيقة) سواء فردية أو خليط مع الأحماض امينية ولذا من الناحية الاقتصادية يفضل استخدام التركيز الأقل 500 جزء في المليون من مركب نوتريميكس كومبليت (المغذيات الدقيقة) بالإضافة إلى 5000 جزء في المليون من الأحماض الأمينية من نتائج هذه الدراسة فإنه يوصي بأهمية رش سوباطات البلح الصعيدى بتركيز 500 جزء في المليون من مركب نوتريميكس كومبليت (المغذيات الدقيقة) بالإضافة إلى 5000 جزء في المليون من الأحماض الأمينية خلال فترة نمو الثمار وذلك لإنتاج محصول عال نو خصائص ثمرية جيدة.

الكلمات الدالة: نخيل البلح الصعيدى- المغذيات الدقيقة - الاحماض الامينية