

Response of Zaghloul Date Palms Grown Under Minia Region Conditions to Spraying Wheat Seed Sprout Extract and Nano- Boron

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Abstract: This study was conducted during 2013 and 2014 seasons to examine the impact of spraying wheat seed sprout extract at 0.5 to 2.0 % and / or nano- boron at 0.05 to 0.1 % four times on growth, palm nutritional status, yield as well as physical and chemical characteristics of the fruits. Single and combined application of wheat seed sprout at 0.5 to 2.0 % and nano- boron at 0.25 to 0.1% was considerably very effective in enhancing all growth characters, plant pigments, total carbohydrates, nutrients, bunch weight, yield as well as both physical and chemical characteristics of the fruits rather than the check treatment. Using wheat seed sprout extract was preferable than using nano – boron in this respect. Supplying the palms with both wheat seed sprout extract and nano – boron together was favourable than using each alone in this connection. Treating Zaghloul date palms four times with wheat seed sprout extract at 1.0 % besides nano- boron at 0.05% is suggested to be very beneficial in improving yield and fruit quality under Minia region conditions.

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1. Introduction

Poor of yield in Zaghloul date palms grown under Minia region conditions considered serious problem facing date palm growers. Recent studies clarified the beneficial effect of using extracts of crop seed sprouts for solving most drawbacks facing fruit crops. Sprouting of seeds may alter the content and composition of proteins, fats and amino acids and enhance the biosynthesis of essential amino acids, vitamins B& C and most macro and micronutrients and makes them very available to the plants (Camacho *et al.*, 1992; Patil *et al.*, 1997; Cairney 1999 and 2005).

Boron especially that manufactured via nano-technology system has many merits, the first is the quick and easily uptake by plants. Such form has lower tendency to leach via soil and appear its impact for shorter times. As a general, boron is responsible for enhancing cell division, pollination and fertilization of flowers, pollen germination, uptake of water and various nutrients, the resistance of plants to various disorders as well as the biosynthesis and translocation of sugars (Gauch and Dugger, 1953 and Nijjar, 1985).

Previous studies showed that using extracts of crop seed sprouts had beneficial effects on promoting growth, tree nutritional status and fruiting in different fruit crops (Abdallah *et al.*, 2000; Crews and Peoples, 2004; Cazuola *et al.*, 2004; Biommeron, 2007; Abdallah, 2008b, Darwish, 2009; Anwar *et al.*, 2009; Anderson and

Cedergreen, 2012, Al- Shereif *et al.*, 2013 and El-Sayed- Faten, 2014).

The results of Mahfouz (2007); Ebeid-Sanaa (2007), Etman *et al.* (2007); Khayyat *et al.* (2007); Abdallah (2008a); Harhash and Abdel-Nasser (2010); El- Sayed – Esraa (2010); Ahmed *et al.* (2013); Gamal (2013) and Al- Wasfy (2013) emphasized the beneficial effects of using boron on growth, nutritional status, yield and fruit quality of fruit corps.

The target of this study was examining the effect of spraying wheat seed sprout extracts and/or nano boron on fruiting of Zaghloul date palms.

2. Material and Methods

This study was initiated during 2013 and 2014 seasons in a private orchard situated at Matay district, Minia governorate on thirty uniform in vigour 20-years old Zaghloul date palms. They are planted at 9x9 meters apart.

Irrigation was carried out by surface method. The texture of the soil is clay loam. Physical and chemical analysis of the tested soil (according to Carter, 1993) are shown in table (1).

All the selected palms received the same horticultural practices that already applied in the orchard especially carrying out hand pollination (five strands / female spathe) at two days after spathe cracking (El-Kosary, 2003). Number of bunches / palm was adjusted to then bunches. Another horticultural practices such as pruning, irrigation,

hoeing fertilization with N, P, K and micronutrient (except B) and pest management were carried out as usual.

Table (1): Analysis of the tested soil

Characters	Values
Sand %	33.0
Silt %	6.0
Clay %	61.00
Texture	Clay loam
pH (1: 2.5 extract)	7.77
EC (1: 2.5 extract) (ppm)	590
O.M.%	2.51
Total CaCO ₃ %	2.11
Total N %	0.09
Available K (ppm)	410
Available P (ppm)	4.2

This experiment included the following ten treatments:

- 1- Control.
- 2- Spraying extract of wheat seed sprout at 0.5 %.
- 3- Spraying extract of wheat seed sprout at 1 %.
- 4- Spraying extract wheat seed sprout at 2 %.
- 5- Spraying nano- boron at 0.025 %.
- 6- Spraying nano- boron at 0.05 %.
- 7- Spraying nano- boron at 0.1 %.
- 8- Spraying both at the low concentration.
- 9- Spraying both at the medium concentration.
- 10- Spraying both at the higher concentration.

Table (2): Chemical analysis of wheat seed extract

Constituent	Values (mg/ 100 g F.W.)
Asparatic acid	3.3
Arginine	4.0
Alanine	3.1
Isoleucine	4.1
Glutamic acid	5.2
Thiamine	3.1
Riboflavine	3.0
Pyridoxine	2.5
Vitamin E	0.59
K	644
P	600
Mg	319
Ca	292
Fe	511
Zn	218

Each treatment was replicated three times, one palm per each. The source of boron was Nano

technology product namely Boron -10. It contains 10% boron. Extract of wheat seed sprouts was prepared by cleaning the seeds for removing all impurities and then subjected to sprout production. Wheat seeds were sown in open trays and left under shade conditions till ten days then the sprouts were picked and homogenized with distilled water using an electric blender for five minutes, then filtered and kept under 4°C in the refrigerator till use. Extracts of wheat seed sprouts (Table2) and nano- boron were sprayed four times at growth start (1st week of Mar.), just after fruit setting (last week of Apr.) and at three week intervals. Triton B as a wetting agent was applied as 1.0 ml / L water and spraying was performed till runoff. Untreated palms received water containing Triton B.

The present experiment was arranged in randomized complete block design (RCBD) During both seasons, the following parameters were measured:

- 1- Vegetative growth characters namely number of pinnae/ leaf, length, width and area of pinna and leaf (**Ahmed and Morsy, 1999**) and number of new leaves. Palm, number of spines/ leaf and pine length.
- 2- Plant pigments namely chlorophylls a & b, total chlorophylls and total carotenoids (mg/ 100 g F.W.) (**Von- Wettstein, 1957**).
- 3- Total carbohydrates % in the leaf (**A.O.A.C., 2000**).
- 4- Percentages of N, P, K, Mg, Ca and S in the leaves (**Chapman and Pratt, 1975** and **Summer, 1985**).
- 5- Yield/ palm (kg.) and bunch weight (kg.)
- 6- Some physical and chemical characteristics of the fruits namely fruit weight (g.) and dimensions (width & length in cm), percentages of pulp and seed, pulp / seed, T.S.S. %, total and reducing sugars %, total and reducing sugars %, total acidity % (as malic acid), total soluble tannins % and total fibre %.

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

3. Results

a) Results

1- Effect of spraying wheat seed sprout extract and/ or nono- boron on some vegetative growth characters.

It is clear from the obtained data in Tables (3 &4) that single and combined applications of wheat seed sprout extract at 0.5 to 2.0 % and nano- boron at 0.025 to 0.1% significantly stimulated the ten vegetative growth characters namely number of pinnae/ leaf, length & width and area of pinnae and leaf, number of new leaves / palm, number of spines/

leaf and spine length relative to the control treatment. Spraying wheat seed sprout extract at all concentrations was significantly preferable than using nano- boron in this respect. Combined application of wheat seed sprout extract plus nano- boron was significantly superior than using each alone in this connection. The promotion on all growth aspects was significantly associated with increasing concentrations of wheat seed sprout extract from 0.5 to 2.0 % and nano- boron from 0.05 to 0.1%. No significant stimulation on these growth characters was observed among the higher two concentrations of wheat seed sprout (1.0 & 2.0%) and nano- boron (0.05 & 0.1%). Using wheat seed sprout extract at 2.0 % plus nano- boron at 0.1% gave the maximum values. Untreated palms produced the minimum values. These results were true during both seasons.

2-Effect of spraying wheat seed sprout extract and/ or nano- boron on the leaf chemical compositions.

Data in Tables (4 &5) clearly show that spraying wheat seed sprout extract and/ or nano – boron significantly was accompanied with enhancing plant pigments namely chlorophylls a & b, total chlorophylls and total carotenoids as well as percentages of N, P, K, Mg, S and Ca and total carbohydrates in the leaves comparing with the control treatment. Using extracts of wheat seeds sprout at 0.5 to 2.0 % significantly surpassed the application of nano- boron at 0.025 to 0.1% in enhancing these organic and mineral nutrients. Using wheat seed sprout extracts and nano- boron together was significantly preferable than using each alone in this respect. There was a gradual stimulation on these chemical constituents with increasing concentrations of each material. Negligible stimulation was observed on these chemical characters when the concentration of each compound was increased from medium concentration to high one. Using both at the highest concentration gave the maximum values. The minimum values were recorded on the untreated palms. Similar results were announced during both seasons.

3- Effect of spraying wheat seed sprout extract and/ or nano- boron on bunch weight and yield per palm:

Data in Table (6) clearly show that bunch weight and yield per palm of Zaghoul date palms were significantly improved in response to single and combined applications of wheat seed sprout extracts and nano- boron. Using wheat seed sprout extract was

significantly superior than using nano- boron on improving the yield and bunch weight. Combined applications was significantly superior than using each alone in this respect. There was a gradual promotion on the yield and bunch weight with increasing concentrations of each material. A slight and insignificant stimulation was observed among the higher two concentrations of each material. From economical point of view, it is suggested to use a mixture of wheat seed sprout extract at 1.0 % plus nano – boron at 0.05% for maximizing yield and bunch weight of Zaghoul date palms. Under such promised treatment, yield per palm reached 172 & 173 kg during both seasons, respectively. The yield of untreated palms reached 110 & 108 kg during both seasons, respectively. The percentage of increase on the yield due to using the recommended treatment over the check treatment reached 56.4 & 60.2 % during both seasons, respectively. These results were true during both seasons.

4- Effect of spraying wheat seed sprout extract and/ or nano- boron on both physical and chemical characteristics of the fruits

It is clear from the data in Tables (6 & 7) that single and combined applications of wheat seed sprout extract at 0.5 to 2.0% and nano – boron at 0.025 to 0.1% significantly improved fruit quality in terms of increasing fruit weight and dimensions (length & width), pulp%, pulp / seed, T.S.S. % and total and reducing sugars and decreasing seed %, total acidity %, total fibre % and total soluble tannins % relative to the check treatment. Combined applications of wheat seed sprout extract and nano- boron significantly was favourable than using each alone in promoting fruit quality. Using wheat seed sprout extract significantly was preferable than using nano- boron in enhancing fruit quality. Fruit quality was gradually improved with increasing concentrations of wheat seed sprout extract and nano – boron. Increasing concentrations of wheat seed sprout extract from 1.0 to 2.0 % as well as nano- boron with 0.05 to 0.1% had no significant promotion on fruit quality, therefore the recommended concentration for wheat seed sprout extract and nano- boron were 1.0 and 0.05%, respectively. From economical point of view, spraying both wheat seed sprout extract at 1.0 % and nano- boron at 0.05% resulted in the best results with regard to fruit quality. Unfavourable effects on fruit quality were observed on untreated palms. These results were true during both seasons.

Table (3): Effect of some wheat seed sprout and nano- boron treatments on some vegetative growth characters of Zaghloul date palms during 2013 & 2014 seasons.

Wheat seed sprout and nano – boron treatments	No. of pinnae /leaf		Pinna length (cm.)		Pinna width (cm.)		Pinna area (cm ²)		Leaf length (m.)		Leaf width (cm.)		Leaf area (m ²)	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	185.0	186.1	46.2	47.2	1.82	1.90	41.4	43.7	2.50	2.55	1.20	1.19	0.77	0.81
Wheat seed sprout at 0.5%	197.0	198.1	54.0	55.3	2.11	2.19	52.4	55.1	2.81	2.86	1.36	1.38	1.03	1.09
Wheat seed sprout at 1.0 %	200.0	201.1	57.0	58.3	2.22	2.31	57.1	66.1	2.88	2.92	1.42	1.44	1.14	1.21
Wheat seed sprout at 2.0 %	201.0	202.1	57.6	59.0	2.23	2.32	57.8	60.9	2.89	2.93	1.43	1.45	1.16	1.23
Nano- boron at 0.025%	191.9	193.0	78.9	50.2	1.92	2.00	45.0	74.4	2.59	2.64	1.24	1.25	0.87	0.91
Nano- boron at 0.05%	193.7	195.0	51.9	53.3	2.00	2.10	48.7	51.7	2.69	2.73	1.29	1.30	0.94	1.01
Nano- boron at 0.1%	194.0	195.3	52.0	53.3	2.01	2.11	49.0	51.9	2.70	2.74	1.30	1.32	0.95	1.01
Both at the low conc.	203.6	205.0	60.0	61.4	2.36	2.46	62.7	66.2	2.97	3.01	1.28	1.30	1.28	1.36
Both at the mid. conc.	207.0	208.3	62.9	64.2	2.41	2.51	66.4	69.9	3.11	3.15	1.32	1.34	1.37	1.46
Both at the high conc.	207.6	209.0	63.0	64.3	2.42	2.52	66.7	70.2	3.12	3.16	1.33	1.35	1.38	1.47
New L.S.D. at 5%	1.9	1.7	1.8	1.9	0.06	0.07	1.4	1.3	0.06	0.07	0.03	0.04	0.06	0.07

Table (4): Effect of some wheat seed sprout and nano- boron treatments on some growth characters and plant pigments of Zaghloul date palms during 2013 & 2014 seasons.

Wheat seed sprout and nano – boron treatments	No. of new leaves /palm		No. of spines /leaf		Mean spine length (cm.)		Chlorophyll a (mg/ 100 g. F.W.)		Chlorophyll b (mg/ 100 g. F.W.)		Total chlorophylls (mg/ 100 g. F.W.)		Total carotenoids (mg/ 100 g. F.W.)	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	20.0	20.0	18.0	19.0	10.0	9.9	8.4	8.6	2.5	2.3	10.9	10.9	2.1	2.0
Wheat seed sprout at 0.5%	22.0	22.0	22.9	24.0	12.3	12.2	9.4	9.6	3.4	3.2	12.8	12.8	3.4	3.3
Wheat seed sprout at 1.0 %	23.0	23.0	24.1	25.1	13.0	12.9	10.0	10.2	3.8	3.6	13.8	13.8	3.8	3.7
Wheat seed sprout at 2.0 %	23.0	23.0	24.3	25.3	13.1	13.0	10.2	10.5	3.9	3.7	14.1	14.2	3.9	3.8
Nano- boron at 0.025%	21.0	21.0	19.5	20.7	10.7	10.5	8.7	9.0	2.8	2.6	11.5	11.6	2.6	2.5
Nano- boron at 0.05%	21.0	21.0	20.7	22.0	11.4	11.3	9.0	9.3	3.0	2.8	12.0	12.1	3.0	2.9
Nano- boron at 0.1%	21.0	21.0	21.0	22.0	11.5	11.4	9.1	9.4	3.1	2.9	12.2	12.3	3.1	3.0
Both at the low conc.	23.0	24.0	26.0	27.0	14.3	14.2	11.9	12.0	4.3	4.1	16.2	16.1	4.4	4.3
Both at the mid. conc.	23.0	24.0	27.0	28.0	15.5	15.4	12.9	13.0	4.5	4.4	17.4	17.5	4.8	4.7
Both at the high conc.	23.0	24.0	27.6	29.0	15.5	15.5	13.0	13.1	4.6	4.5	17.6	17.7	4.9	4.8
New L.S.D. at 5%	1.0	1.0	1.1	1.2	0.5	0.5	0.3	0.3	0.2	0.2	0.4	0.4	0.4	0.3

Table (5): Effect of some wheat seed sprout and nano- boron treatments on the leaf chemical composition of Zaghloul date palms during 2013 & 2014 seasons.

Wheat seed sprout and nano – boron treatments	Leaf N %		Leaf P %		Leaf K %		Leaf Mg %		Leaf Ca %		Leaf S %		Leaf total carbohydrates %	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	1.55	1.49	0.14	0.12	1.15	1.14	0.60	0.58	2.97	2.81	0.61	0.59	14.1	13.9
Wheat seed sprout at 0.5%	1.81	1.80	0.25	0.26	1.39	1.40	0.77	0.75	3.35	3.19	0.80	0.82	17.1	16.9
Wheat seed sprout at 1.0 %	1.90	1.89	0.28	0.29	1.45	1.46	0.82	0.80	3.50	3.34	0.85	0.87	18.1	17.9
Wheat seed sprout at 2.0 %	1.91	1.90	0.29	0.30	1.46	1.47	0.83	0.81	3.51	3.35	0.86	0.88	18.2	18.0
Nano- boron at 0.025%	1.64	1.63	0.17	0.19	1.23	1.23	0.65	0.63	3.11	3.95	0.66	0.67	15.1	14.8
Nano- boron at 0.05%	1.71	1.69	0.20	0.22	1.30	1.30	0.70	0.69	3.24	3.08	0.72	0.73	16.0	15.8
Nano- boron at 0.1%	1.72	1.71	0.21	0.23	1.32	1.31	0.71	0.70	3.25	3.09	0.73	0.74	16.1	15.9
Both at the low conc.	2.05	2.04	0.34	0.36	1.53	1.55	0.87	0.86	3.62	3.50	0.93	0.91	19.9	19.7
Both at the mid. conc.	2.15	2.13	0.38	0.40	1.60	1.69	0.91	0.90	3.72	3.61	1.00	0.98	20.8	20.6
Both at the high conc.	2.16	2.14	0.39	0.41	1.61	1.70	0.92	0.91	3.73	3.62	1.01	0.99	20.9	20.7
New L.S.D. at 5%	0.06	0.02	0.02	0.03	0.05	0.04	0.04	0.03	0.10	0.09	0.03	0.04	0.9	1.0

Table (6): Effect of some wheat seed sprout and nano- boron treatments on the bunch weight, yield per palm and some physical characteristics of the fruits of Zaghloul date palms during 2013 & 2014 seasons.

Wheat seed sprout and nano – boron treatments	Av. Bunch weight (kg.)		Yield palm/(kg.)		Fruit weight (g.)		Fruit length (cm.)		Fruit width (cm.)		Pulp %		Seed %	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	11.0	10.8	110.0	108.0	26.1	27.0	5.61	5.63	2.20	2.23	79.1	80.0	20.9	20.0
Wheat seed sprout at 0.5%	14.2	14.2	142.2	142.0	28.1	29.0	5.89	5.91	2.41	2.44	84.6	86.0	15.4	14.0
Wheat seed sprout at 1.0 %	15.2	15.3	152.0	153.0	28.7	29.6	6.00	6.02	2.46	2.50	86.0	87.2	14.0	12.8
Wheat seed sprout at 2.0 %	15.3	15.4	153.0	154.0	29.0	30.0	6.01	6.03	2.74	2.51	86.3	87.5	13.7	12.5
Nano- boron at 0.025%	12.1	12.2	121.0	122.0	26.7	27.6	5.71	5.75	2.25	2.30	80.5	82.0	19.5	18.0
Nano- boron at 0.05%	13.1	13.2	131.0	132.0	27.4	28.5	5.81	5.85	2.30	2.35	82.0	83.9	18.0	16.1
Nano- boron at 0.1%	13.2	13.3	132.0	133.0	27.5	28.5	5.82	5.86	2.31	2.36	82.3	87.0	17.7	16.0
Both at the low conc.	16.3	16.3	163.0	163.0	30.0	31.0	6.41	6.44	2.59	2.64	88.0	89.0	12.0	11.0
Both at the mid. conc.	17.2	17.3	172.0	173.0	32.3	33.3	6.60	6.66	2.69	2.74	89.2	90.2	10.8	9.8
Both at the high conc.	17.3	17.4	173.0	179.0	32.5	33.5	6.61	6.67	2.71	2.75	89.3	90.3	10.7	9.7
New L.S.D. at 5%	0.9	1.0	6.1	6.4	0.5	0.4	0.06	0.06	0.04	0.04	1.1	1.1	0.9	0.9

Table (7): Effect of some wheat seed sprout and nano- boron treatments on pulp/ seed and some chemical characteristics of the fruits of Zaghloul date palms during 2013 & 2014 seasons.

Wheat seed sprout and nano – boron treatments	Pulp/ seed		T.S.S. %		Total sugars %		Reducing sugars %		Total acidity %		Total fibre %		Total soluble tannins %	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	3.78	4.00	27.0	26.5	19.0	18.8	13.5	13.4	0.361	0.368	0.82	0.80	0.72	0.70
Wheat seed sprout at 0.5%	5.49	6.14	29.1	29.6	21.0	20.8	15.5	15.8	0.294	0.301	0.66	0.65	0.56	0.55
Wheat seed sprout at 1.0 %	6.14	6.81	30.1	30.2	21.6	21.4	16.0	16.3	0.270	0.277	0.60	0.59	0.50	0.49
Wheat seed sprout at 2.0 %	6.30	7.00	30.2	30.3	21.7	21.5	16.1	16.4	0.269	0.276	0.59	0.58	0.48	0.48
Nano- boron at 0.025%	4.13	4.56	27.6	28.1	19.5	19.3	14.1	14.4	0.340	0.347	0.77	0.76	0.67	0.66
Nano- boron at 0.05%	4.56	5.21	28.2	29.0	20.0	19.8	14.7	15.0	0.319	0.326	0.74	0.73	0.63	0.62
Nano- boron at 0.1%	4.65	5.25	28.3	29.1	20.2	20.0	14.8	15.1	0.318	0.325	0.73	0.72	0.62	0.61
Both at the low conc.	7.33	8.09	31.7	31.9	22.7	22.5	16.7	17.0	0.245	0.252	0.50	0.49	0.41	0.59
Both at the mid. conc.	8.26	9.20	32.0	33.0	23.1	22.9	17.4	17.8	0.220	0.226	0.41	0.40	0.30	0.40
Both at the high conc.	8.35	9.31	32.1	33.1	23.2	23.0	17.5	17.9	0.218	0.225	0.40	0.39	0.29	0.33
New L.S.D. at 5%	0.19	0.20	0.5	0.5	0.4	0.4	0.3	0.3	0.019	0.018	0.03	0.03	0.04	0.04

4. Discussion

The higher own content of wheat seed sprout from essential amino acids, vitamins, antioxidants and essential nutrients (Caireny 1999 and 2005 and Abdallah, 2008b) could explain the present results.

Previous studies showed that using extracts of crop seed sprouts had beneficial effects on promoting growth, tree nutritional status and fruiting in different fruit crops (Abdallah *et al.*, 2000; Crews and Peoples, 2004; Cazuola *et al.*, 2004; Biommeron, 2007; Abdallah, 2008b, Darwish, 2009; Anwar *et al.*, 2009; Anderson and Cedergreen, 2012, Al- Shereif *et al.*, 2013 and El- Sayed- Faten, 2014).

The beneficial effects of boron on the tolerance of trees to different disorders, pollen germination pollination fertilization of flowers as well as uptake and absorption of water and nutrients (Nijjar, 1985), could result in promoting fruiting of Zaghloul date palms.

These results concerning the promoting effect of boron on growth and fruiting of Zaghloul date palms are in harmony with those obtained by El- Sayed- Esraa (2010); Ahmed *et al.* (2013), Gamal (2013) and Al- Wasfy (2013) on different fruit corps.

5. Conclusion:

The best results with regard to yield and fruit quality of Zaghoul date palms grown under Minia region were obtained due to using a mixture containing wheat seed sprout extract at 1.0% plus nano- boron at 0.05% four times.

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