

Effect of Spraying Wheat Seed Sprout and Some Nutrients on Fruiting of Wonderful Pomegranate Trees

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Abstract: Wonderful pomegranate trees received four sprays of a mixture containing wheat seed sprout at 0.5 to 2%, NPKMg at 0.5% and Zn Fe Mn at 0.05% either alone or in all possible combinations. The study focused on the effect of these treatments on growth, tree nutritional status, yield and fruit quality of such pomegranate cv. Single and combined applications of wheat seed sprout at 0.5 to 2% as well as macro and micronutrients had an announced promotion on growth aspects nutritional status of the trees, yield and fruit quality relative to the check treatment. The promotion on these parameters were considerably associated with increasing wheat seed sprout concentrations. Negligible promotion on these parameters was detected with increasing concentrations from 1.0 to 2%. Using wheat seed sprout at all concentrations was materially superior than using macro and /or micronutrients in this connection. Combined applications were favourable than using each material alone in this respect. Four sprays of a mixture of wheat seed sprout at 1% plus NPKMg at 0.5 % and Zn Fe Mn at 0.05 % was responsible for maximizing yield and improving fruit quality of Wonderful pomegranate trees grown under Minia region conditions.

[Faissal F. Ahmed and Mahmoud R. Gad El- Kareem. **Effect of Spraying Wheat Seed Sprout and Some Nutrients on Fruiting of Wonderful Pomegranate Trees.** *World Rural Observ* 2014;6(4):115-120]. ISSN: 1944-6543 (Print); ISSN: 1944-6551 (Online). <http://www.sciencepub.net/rural>. 18

Keywords: Wheat seed sprout, macro and micronutrient, growth, yield, Wonderful pomegranate trees.

1. Introduction

Poor fruit setting and unirrregular coulouration of fruits in pomegranate cv. Wonderful grown under Middle Egypt region conditions are considered serious problems facing such pomegranate cv. Deficiency of macro and micro nutrients, vitamins, amino acids, plant growth regulators are the plant organs in the main causes of such two drawbacks. Such reduction in mineral and plant organic constituents surely reflected in disturbing plant metabolism and biosynthesis of all organic foods and reducing of all nutrients required for growth and development of plant organs namely flowers and fruits and greatly producing irregular and unfavourable fruits (Nijjar, 1985).

Sprouting is active and complex metabolic process that may alter the content and composition of proteins and essential amino acids and improve the nutritional value of sprouts. In wheat seed sprout, protein diegstibility increased by 15% and the biological activity of all vitamins was greatly enhanced. Sprouting is followed by enhancing the breakdown of proteins into various essential amino acids (Cairney, 2005; Biommerson, 2007 and Anwar *et al.*, 2009).

Previous studies showed that using fruit seed sprout extracts via leaves were beneficial in improving growth, yield and fruit quality in different horticultural crops (Abdallah *et al.*, 2000; Cazuola *et al.*, 2004; Abdallah, 2008; Mohamed, 2008; Darwish, 2009; Al- Shereif *et al.*, 2013; El- Sayed- Faten, 2014, and El- Khawaga and Mansour, 2014).

Using all micro and macro nutrients at balanced rate had an announced promotion on growth, yield and fruit quality of different fruit crops (Ahmed and Morsy, 2001; Ahmed- Omaima, 2001; Gowda, 2007; Hassan *et al.*, 2010; Stino *et al.*, 2010; AbdEl-Rahman –Ola, 2011 and Ali, 2013).

The main target of this study was elucidating the beneficial effects of using wheat seed sprout besides some micro and macro nutrients on fruiting of Wonderful pomegranate trees.

2. Material and Methods

Table (1) Analysis of the tested soil

Constituents	Values
Sand %	6.1
Silt%	13.9
Clay %	80.0
Texture	Clay
O.M. %	2.79
pH(1: 2.5 extract)	7.49
EC(1: 2.5 extract) mmhos/ cm 25°C)	0.91
CaCO ₃ %	1.09
Total N %	0.11
Available P (ppm)	4.2
Available K (ppm)	447

This study was carried out during 2013 and 2014 seasons on thirty uniform in vigour 6- years old

Wonderful pomegranate trees grown in a private orchard situated at El-Hawarta village, Minia district, Minia Governorate. The trees are planted in heavy clay soil (Table1) at 4x4 meters apart. Surface irrigation system using Nile water was followed. Regular horticultural practices were adopted to all the selected trees. Soil analysis was done using the procedures that outlined by **Wilde *et al.*, (1985)**.

This study included the following ten treatments

- 1- Control (untreated trees)
- 2- Spraying wheat sprout at 0.5%
- 3- Spraying wheat sprout at 0.5%
- 4- Spraying wheat seed sprout at 2%.
- 5- Spraying NPKMg at 1%.
- 6- Spraying Zn Fe Mn at 0.05%.
- 7- Spraying all nutrients (NPKMgZnFeMn) at the previous concentrations.
- 8- Spraying wheat seed sprout at 0.5 % + all nutrients.
- 9- Spraying wheat seed sprout a 1% + all nutrients.
- 10- Spraying wheat seed sprout at 2% + all nutrients.

Each treatment was replicated three times, one tree per each. Wheat seed sprout was prepared by sowing the seeds in open trays and left under shade conditions till ten days, then the sprouts were picked, homogenized with distilled water in an electric blender for five minutes, then filtrated and kept under 4°C in the refrigerator till use (Table 2). Nitrogen, phosphorus, potassium and magnesium were applied in the form of Urea, (46.s %N), orthophosphoric (85 % P₂O₅), potassium sulphate (48 % K₂O) and magnesium sulphate (9.6 % Mg), respectively. The three micronutrients namely Zn, Fe and Mn were applied in the chelated form at 0.05%. Wheat seeds sprout at all concentrations and all nutrients were applied four times at growth start (last week of March) and at one month intervals (last week of April, May and June). Triton B as a wetting agent was added to all solutions at 0.05%. Each tree received the investigated solutions till run off. Randomized complete block design (RCBD) was followed.

During both seasons, the following measurements were recorded:

- 1- Main short length (cm.) and leaf area (cm²) (**Ahmed and Morsy, 1999**).
- 2- Plant pigments namely chlorophylls a & b and total chlorophylls (mg / 100 g F.W.) (**Von- Wettstein, 1957**).
- 3- Percentages of N, P, K and Mn in the leaves (**Wilde *et al.*, 1985**).
- 4- Yield / tree(kg.).

5- Fruit characteristics namely fruit weight (g.), percentages of fruit peel, grain and juice, T.S.S. %, juice pH, total and reducing sugars, anthocyanins in the peel and juice (mg/ g F.W.) (**A.O.A.C., 2000**) and total soluble tannins (**Balbaa 1981**).

Statistical analysis was done using new L.S.D. at 5% for comparing between all treatment means (**Snedecor and Cochran, 1990**).

Table (2): Chemical analysis of wheat seed sprout

Constituents	Values (mg/ 100 g F.W.)
Asparatic acid	3.0
Alginine	3.8
Atanine	3.0
Glutamic acid	5.0
Thiamine (B1)	3.
Riboflavine (B2)	2.9
Pyrodoxine (N6)	2.0
Vitamin E	0.52
K	639
P	579
Mg	315
Ca	290
Fe	210
Zn	216

3. Results and Discussion

1- Main shoot length and leaf area:

It is clear from the obtained data in Table (3) that single and combined applications of macro (NPKMg) at 0.5% and micronutrients (ZnFeMn) at 0.05% as well as wheat seed sprout at 0.5 to 2% significantly stimulated the main shoot length and leaf area comparing to the check treatment. The promotion on such two growth characters was significantly associated with using micronutrients, macronutrients, all nutrients and wheat seed sprout, in ascending order. Generally, combined applications of these materials was significantly preferable than using each alone in this respect. Significant differences were observed on such two growth characters among the ten investigated treatments. Spraying extracts of wheat seed sprout at 0.5 to 2.0% besides all nutrients was significantly preferable than using each alone in enhancing such two growth characters. Using wheat seed sprout at 0.5 to 2.0% was significantly favourable than using micro and/ or macronutrients in this connection and the promotion was significantly related to the increase in wheat seed sprout concentrations from 0.5 to 2.0%. Increasing concentrations of wheat seed sprout form 1 to 2 % either when applied alone or when mixed with the investigated nutrients had no significant effect on such two growth traits. Treating Wonderful pomegranate

trees four times with a mixture of wheat seed sprout at 2% plus NPKMgZn Fe and Mn gave the maximum values. The minimum values were recorded on untreated trees. These results were true during both seasons.

2- Plant pigments and percentages of N, P, K and Mg in the leaves

Data presented in Tables (3 & 4) clearly show that treating the trees with wheat seed sprout at 0.5 to 2.0%, NPKMg at 0.5 % and ZnFeMn at 0.05% either applied alone or in all possible combinations significantly was accompanied with stimulating chlorophylls a & b, total chlorophylls, N %, P%, K %, and Mg in the leaves % relative to the check treatment. The promotion was significantly in proportional to the increase in wheat seed sprout concentrations from 0.5 to 2.0% with or without the application of the investigated nutrients. Spraying wheat seed sprout at different concentrations was significantly superior than using micro and/ or macronutrients in this respect.

A slight and insignificant promotion on these plant pigments and minerals was observed with increasing concentrations of wheat seed sprout from 1 to 2%. Four sprays of mixture containing wheat seed sprout at 2% besides all macro and micronutrients was responsible for maximizing these plant pigments and nutrients. Untreated trees produced the lowest values. These results were true during both seasons.

3- Yield / tree:

It is evident from the data in Table (4) that supplying the trees with single or combined applications of wheat seed sprout at 0.5 to 2%, macro and micronutrients had significant promotion on the yield / tree comparing with the check treatment. There was a gradual promotion on the yield with increasing concentrations of wheat seed sprout from 0.5 to 2%. Increasing concentrations from 1 to 2% failed to show significant increase on the yield. Using micronutrients at 0.05%, macronutrients at 0.5% and wheat seed sprout at 0.5 to 2%, in ascending order was significantly very effective in improving the yield. Combined applications of wheat sprout besides macro and micronutrients were superior than using each alone in this respect. The best results with regard to the yield were obtained due to treating the trees via leaves with wheat seed sprout at 1% (since no significant difference was observed among 1 and 2%) plus all nutrients. Using this promised treatment produced yield / tree reached 30.3 and 31.5 kg during both seasons, respectively. The yield / tree of the untreated trees reached 17.2 & 18.0 kg during 2013 & 2014 seasons, respectively. The percentage of increase on the yield due to using the previous recommended

treatment over the check treatment reached 76.2 and 75.0 during both seasons, respectively. These results were true during both seasons.

4- Physical and chemical characteristics of the fruits:

The data in tables (4 & 5) obviously reveal that spraying Wonderful pomegranate trees four times with wheat seed sprout at 0.5 to 2% either alone or in combinations with macro and /or micro nutrients was significantly very effective in improving fruit quality in terms of increasing fruit weight as well as percentages of grain and juice, T.S.S., total and reducing sugars and anthocyanins in both juice and peel and decreasing fruit peel weight, juice pH and total soluble tannins relative to the control treatment. Quality of the fruits was gradually improved with increasing concentrations of wheat seed sprout from 0.5 to 2%. Combined applications of these materials were significantly favourable than using each material alone in improving fruit quality. The best material in this respect was wheat seed sprout at all concentrations used followed by using all nutrients. No significant stimulation on fruit quality was detected among the higher two concentrations of wheat seed sprout namely 1.0 and 2.0 %. Therefore, the recommended concentration was 1%. Treating the trees four times with wheat seed sprout at 2% plus all macro and micronutrients gave the best results with regard to fruit quality. Unfavourable effects on fruit quality were revealed on untreated trees. These results were true during both seasons.

4. Discussion

The positive action of wheat seed sprout on fruiting of Wonderful pomegranate trees might be attributed to its higher own content from essential amino acids such as aspartic acid, arginine, alanine and glutamic acid, vitamins such as thiamin, riboflavin, pyridoxine and vitamin E and mineral i.e. K, P, Mg, Ca, Fe and Zn (Abdallah *et al.*, 2000; Cazuola *et al.*, 2004; Abdallah, 2008; Mohamed, 2008 and Darwish, 2009). The effect of sprouting in activating complex metabolic process that may alter the content and composition of proteins and essential amino acids and improve the nutritional value of sprouts gave another explanation for the present findings. (Anwar *et al.*, 2009).

These results were emphasized on various horticultural crops by Al-Shereif *et al.*, (2013); El-Sayed – Faten (2014) and El-Khawaga and Mansour (2014).

The beneficial effects of NPKMgZn Fe and Mn on the fruiting of Wonderful pomegranate trees mainly attributed to their important roles in enhancing cell division, and formation of plant pigments as well

as biosynthesis of carbohydrates and most organic foods (Nijjar, 1985). These results are in harmony with those obtained by Ahmed and Morsy (2001);

Ahmed – Omaima (2001); Gowda (2007); Hassan *et al.*, (2010). Stino *et al.*, (2010) and Ali (2013).

Table (3): Effect of spraying wheat seed sprout and some nutrients on main shoot length, leaf area, plant pigments and percentages of N and P in the leaves of Wonderful pomegranate trees during 2013 and 2014 seasons.

Treatment	Main shoot length (cm.)		Leaf area (cm ²)		Chlorophyll a (mg / 100 g F.W.)		Chlorophyll b (mg / 100 g F.W.)		Total chlorophylls (mg / 100 g F.W.)		Leaf N %		Leaf P %	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	66.0	66.6	7.0	6.7	6.0	5.9	2.0	1.8	8.0	7.9	1.61	1.60	0.16	0.14
Wheat seed sprout at 0.5 %	78.0	79.0	79.0	70.3	7.1	7.0	3.0	2.9	10.1	9.9	1.93	1.95	0.28	0.27
Wheat seed sprout at 1 %	80.0	81.0	81.0	11.0	7.3	7.2	3.3	3.2	10.6	10.5	2.01	2.03	0.30	0.29
Wheat seed sprout at 2 %	80.3	81.3	81.3	11.1	7.4	7.3	3.4	3.3	10.8	10.6	2.02	2.04	0.31	0.30
NPKMg at 0.5%	71.9	73.0	73.0	8.5	6.6	6.5	2.4	2.3	9.0	8.5	1.80	1.81	0.23	0.22
Zn Fe Mn at 0.5 %	96.9	71.0	71.0	7.4	6.3	6.2	2.2	2.1	8.5	8.3	1.71	1.72	0.19	0.18
All nutrients at the previous conc.	74.8	75.9	75.9	9.6	6.8	6.7	2.7	2.6	9.5	9.3	1.86	1.87	0.25	0.24
Wheat seed sprout at 0.5 % + all nutrients	83.9	85.0	85.0	11.7	7.7	7.6	3.6	3.5	11.3	11.1	2.11	2.11	0.34	0.33
Wheat seed sprout at 1% + all nutrients	86.7	87.8	87.8	12.3	8.0	7.9	3.8	3.7	11.8	11.6	2.20	2.21	0.36	0.35
Wheat seed sprout at 2 % + all nutrients	87.0	88.0	88.0	12.4	8.1	8.0	3.9	3.8	12.0	11.8	2.21	2.22	0.37	0.36
New L.S.D. at 5%	1.3	1.2	1.2	0.7	0.2	0.3	0.2	0.2	0.3	0.3	0.05	0.06	0.02	0.02

Table (4): Effect of spraying wheat seed sprout and some nutrients on the percentages of K and Mg, yield and some physical characters of the fruits of Wonderful pomegranate trees during 2013 and 2014 seasons.

Treatment	Leaf K %		Leaf Mg %		Yield/ tree (kg.)		Fruit weight (g.)		Fruit peel %		Grain %		Juice %	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	1.23	1.17	0.55	0.52	17.2	18.0	327.3	330.0	46.6	45.0	53.4	55.0	33.3	34.0
Wheat seed sprout at 0.5 %	1.57	1.51	0.72	0.69	26.0	26.9	388.8	401.0	41.5	40.0	58.5	60.0	37.3	38.0
Wheat seed sprout at 1 %	1.64	1.57	0.76	0.72	27.9	28.9	401.3	413.0	40.0	38.5	60.0	61.5	39.0	39.7
Wheat seed sprout at 2 %	1.65	1.59	0.77	0.73	28.0	29.0	403.6	414.0	39.4	38.0	60.6	62.0	39.3	40.0
NPKMg at 0.5%	1.39	1.38	0.64	0.61	20.3	21.0	361.6	374.0	43.5	42.0	56.5	58.0	35.0	35.7
Zn Fe Mn at 0.5 %	1.30	1.33	0.60	0.57	18.9	19.3	341.0	355.0	45.5	44.0	54.5	56.0	34.0	34.8
All nutrients at the previous conc.	1.50	1.43	0.68	0.65	24.0	25.0	375.3	389.9	42.5	41.0	57.5	59.0	35.9	36.5
Wheat seed sprout at 0.5 % + all nutrients	1.75	1.65	0.87	0.85	29.0	30.3	315.3	430.0	36.5	35.0	63.5	65.0	41.0	41.7
Wheat seed sprout at 1% + all nutrients	1.81	1.73	0.93	0.90	30.3	31.5	432.0	446.0	34.0	32.5	66.0	67.5	42.1	42.8
Wheat seed sprout at 2 % + all nutrients	1.82	1.74	0.94	0.91	30.4	31.6	434.0	447.3	33.7	32.3	66.3	67.7	42.3	43.0
New L.S.D. at 5%	0.05	0.04	0.03	0.03	0.4	0.4	11.5	12.0	1.0	0.9	0.9	0.9	0.6	0.6

Table (5): Effect of spraying wheat seed sprout and some nutrients on some chemical characteristics of the fruits of Wonderful pomegranate trees during 2013 and 2014 seasons.

Treatment	T.S.S. %		Juice pH		Total sugars %		Reducing sugars %		Total soluble tannins %		Anthocyanine in the fruit peel (mg/ 1.0 g F.W.)		Anthocyanin in the juice (mg / 1.0 g F.W.)	
	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
Control	15.2	14.8	3.11	3.22	11.1	10.7	9.9	9.3	0.71	0.75	81.3	82.0	36.5	36.0
Wheat seed sprout at 0.5 %	16.7	16.3	2.72	2.92	12.3	12.0	11.1	11.0	0.49	0.55	91.0	91.8	44.1	43.6
Wheat seed sprout at 1 %	16.9	16.5	2.64	2.86	12.6	12.3	11.4	11.3	0.45	0.50	93.2	94.0	46.3	45.8
Wheat seed sprout at 2 %	16.9	16.6	2.63	2.85	12.7	12.4	11.5	11.4	0.44	0.49	93.5	94.3	46.7	46.2
NPKMg at 0.5%	16.0	15.6	2.95	3.06	11.7	11.4	10.5	10.5	0.59	0.66	85.6	85.0	40.0	39.5
Zn Fe Mn at 0.5 %	15.6	15.2	3.04	3.15	11.4	11.1	11.2	10.2	0.64	0.70	83.0	83.5	38.0	37.5
All nutrients at the previous conc.	16.5	16.1	2.81	3.00	12.0	11.7	11.8	10.8	0.54	0.60	88.3	86.0	41.9	41.4
Wheat seed sprout at 0.5 % + all nutrients	17.0	16.8	2.53	2.74	13.0	12.8	11.8	11.6	0.39	0.45	97.0	97.0	51.0	50.5
Wheat seed sprout at 1% + all nutrients	17.2	16.8	2.47	2.68	13.3	13.1	12.1	11.9	0.35	0.40	98.5	99.5	54.0	53.4
Wheat seed sprout at 2 % + all nutrients	17.3	16.9	2.46	2.67	13.4	13.2	12.1	12.0	0.34	0.39	99.0	99.7	54.3	53.5
New L.S.D. at 5%	0.2	0.2	0.06	0.06	0.3	0.3	0.3	0.3	0.04	0.04	1.0	1.0	0.7	0.70

Conclusion:

Treating Wonderful pomegranate trees grown under Minia region conditions four times with a mixture containing wheat seed sprout at 1% besides NPKMg, at 0.5 % and Zn, Fe and Mn at 0.05% was responsible for improving yield and fruit quality

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12/20/2014