Effect of Spraying Moringa Oil and Methylene Urea on Fruiting of Valencia Orange Trees

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Abstract: During 2016/ 2017 & 2017/ 2018 seasons, Valencia orange trees received three sprayes at growth start, just after fruit setting and two months later with Moringa oil and methylene urea each at 0.05 % to 0.2 %. The merit was examining the effect of these treatments on fruiting of the trees. Treating the trees with Moringa oil and/or methylene urea each at 0.05 % to 0.2 % gave an obvious promotion on growth, nutritional status of the trees, yield and fruit quality relative to the control. Using methylene urea was superior in improving all the investigated parameters than using Moringa oil. Combined applications were favorable than using each material alone in this connection. Carrying out three sprays of a mixture of Moringa oil and methylene urea each at 0.1 % was necessary for improving yield and fruit quality of Valencia orange trees.
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Key words: Valencia orange, Moringa oil, methylene urea, yield, fruit quality.

1. Introduction

Recently, many efforts were established for alleviating the adverse effects of chemicals on polluting of our environmental by using slow release N fertilizers that responsible for enhancing the efficiency of N uptake and extending the supplement of N to the trees (**Wang and Alva, 1996**). Plant extracts are essential for their own from antioxidants and vitamins **(Chevallier,2001).**

Previous studies showed that using plant extracts (**Ahmed *et al*,2013, Al-Wasfy et al, 2013, Ahmed et al,2014a and 2014b, Shoug,2015, Ahmed et al,2015 Ahmed,2016; Ahmed and Habasy- Randa,2017 Zagzog and Saied, 2017,) and slow releases fertilizers (Rouse; Hegab *et al 1999*; Wassel *et al* 2000, Youniss-Randa,2002; Mohamed and Ebeed-Sanaa,2006; Shaalan-Nashwh,2008 and Abd El- Kafy 2018).** was very effective in improving growth, nutritional status of the trees, yield and fruit quality in different evergreen fruit crops.

The target of this study was elucidating the effect of spraying Moringa oil and/or methylene urea on fruiting of Valencia orange trees.

2. Material and Methods

This study was carried out during two consecutive experimental 2016/ 2017 & 2017/ 2018 seasons on uniform in vigour Thirty 35- years old Valencia orange trees onto sour orange rootstock. The selected trees are grown in a private orchard located at Seds village, Bani Suef Governorate. The trees planted at a spacing of 5 x 6 meters a part. The soil of the orchard is well drained caly (Table 1) in texture with a water table not less than two meters deep. Surface irrigation system was carried out using Nile water. Soil analysis was carried out using the procedures outlined according to (**Wilde *et al*., 1985) as shown in Table (1).**

Table (1): Analysis of the soil at the trial location

Constituents	Values
Sand %	: 10.0
Silt %	: 15.0
Clay %	: 75.0
Texture	: Clay
O.M. %	: 0.24
pH (1:2.5 extract)	: 8.11
E.C (1:2.5 extract) (mmhos/ cm/ 25°C)	: 1.14
$CaCO_3$ %	: 1.22
Available N %	: 0.04
Available P (Olsen method, ppm)	: 1.5
Available K (ammonium acetate, ppm)	: 50.5

The selected trees were subjected to the normal horticultural practices that already applied in the orchard except those dealing with using Moringa oil and methylene urea.

This investigation consisted of ten treatments arranged as follows:

1. Control
2. Spraying moringa oil at 0.05 %
3. Spraying moringa oil at 0.1 %
4. Spraying moringa oil at 0.2 %
5. Spraying methylene urea at 0.05 %
6. Spraying methylene urea at 0.1 %
7. Spraying methylene urea at 0.2 %
8. Spraying both at 0.05 %
9. Spraying both at 0.1 %
10. Spraying both at 0.2 %

Each treatment was replicated three times, one tree per each. Moringa oil and methylene urea were sprayed three times at growth start (2nd of Mar.), just after fruit setting (last week of Apr.) and two months later (last week of June). Triton B as a wetting agent was added to all extracts at 0.05 % and spraying was done till runoff.

Chemical composition of moringa oil is shown in Tables (2).

Randomized complete block design (RCBD) was adopted which the experiment included ten treatments and each treatment was replicated three times, one tree per each.

Table (2): Chemical composition of moringa oil (*Moringa oleifera*)

Constituents	Values
a) Vitamins (mg/100 g D.W)	
Betacarotine	**149.2**
E	**50**
A	**90**
B_1	**88.9**
B_2	**1.1**
C	**19.0**
K	**25.6**
b) Minerals (mg/100 g D.W)	
Cu	**88.7**
K	**49.9**
N	**89.9**
P	**12.9**
Mg	**20.2**
c) Amino acids (mg/100 g D.W)	
Lysine	**8.3**
Leucine	**9.3**
Threonine	**6.6**
Isoleucine	**6.3**
Cysteine	**2.4**
Methionine	**3.6**
Tryptophan	**3.3**

Statistical analysis was done using randomized complete block design (RCBD) with three replicates, each with one Valencia orange tree. Each block contained ten treatments.

Generally, the following measurements were recorded during the two seasons of study.

Four branches for each tree were labeled (1st of Mar.) for measuring mean shoot length, number of leaves / shoot, shoot thickness (cm.) and leaf area (cm^2) in the spring growth flush.

Twenty leaves below panicles in the spring growth cycle (according to **Summer, 1985)** were taken in the first week of July for measuring the leaf area (cm^2) using the following equation as reported by **Ahmed and Morsy (1999).**

LA = 0.70 (L × W) - 1.06 where LA = leaf area (cm^2)

L = Maximum length of leaf (cm.) W = Maximum width of leaf (cm.)

Samples of five mature and fresh leaves from Spring growth cycle (1st week of July) per each replicate were taken. The leaves were cut at small pieces, homogenate and extracted by 25 % acetone in the presence of a little amount of Na_2CO_3 and silica quartz then filtered through central glass funnel G_4.

The optical density of the filtrate was determined using CarlZeis spectrophotometer at the wave length of 662, 644 and 440 om to determine chlorophylls (a and b) and carotenoids, respectively, Content of each pigments was calculated by using the following equations (according to **Von-Wettstein, 1957 and Hiscox and Isralstam, 1979)**.

Chl. A = (9.784 x E 662) - (0.99 x E 644) = mg/L.

Chl. B = (21.426 x E 644) - (4.65 x E 662) = mg/L.

Total carotenoids = (4.965 x E 440 - 0.268 (chlorophyll a + chlorophyll b)

E = Optical density at a given wave length.

The chlorophylls a and b as well as total carotenoids were calculated as mg/g fresh weight of leaves. Also total chlorophyll was estimated (mg/ g F/W.)

Total carbohydrates 5 in the dried leaves was detrained **(A.O.A.S 2000)**. The ratio between total carbohydrates and N in leaves was estimated.

In both seasons and in early April the fourth pair of leaves from the base non-fruiting of spring growth shoots were selected and tagged according to **Summer (1985).**

Ten tagged leaves from each tree were collected carefully at random at the end of September in (2016/2017 and 2017/2018) seasons. As soon as the leaf samples were picked, they were cleaned with cloth damp to remove any residues that might affect the results. The leaves were oven dried at 70 °C for 48 hours, ground and stored in small pockets prior analysis. Plant material (0.2 g) was digested using hydrogen peroxide and plus sulfuric acid as recommended by **(Wilde *et al.* 1985).**

The digested materials were transferred quantitatively to 50 m1 volumetric flash and raised up to the uniformity volume for determination of the following nutrients:-

1. Nitrogen % was determined by the modified micro kjeldahl method as described by **Wilde *et al.*, (1985).**
2. Phosphorus % was determined by using spectrophotometer **Chapman and Pratt (1975).**
3. Potassium % was determined by using Flame photometer according to the procedure reported by **Cottenie *et el* 1982** Magnesium %, Calcium % and S% were determined using atomic

absorption spectrophotometer Perkin Elmer model 5000 according to **Wilde *et al.*, (1985).**

The number of fruits per the tagged panicle (ten tagged panicles/ tree) was counted every week after full bloom to determine the initial number of fruits per panicle. Total number of setting fruits was calculated. Total number of fruits retained for each of the tagged panicle at the beginning of harvest was also estimated. Percentage of fruit retention was estimated by dividing total number of fruits retained by total number of setting fruits and multiplying the product by 100.

Harvesting was achieved during the regular commercial harvesting time under Beni Suef Governorate conditions (mid of Feb) in both seasons when the flesh of fruits become yellowish **(Hulme, 1971)**. The yield expressed in weight and number of fruits per tree was recorded.

Twenty fruits were taken randomly from the yield of each tree then transferred to the laboratory for determining the following physical and chemical characteristics of the fruits:-

1. Average fruit weight (g.)
2. Averages fruit dimensions (in cm) (height and diameter) by vernier caliper, then fruit shape was estimated.
3. Percentages of juice and fruit peel weight and fruit peel thickness (cm).

The flesh of fruit was well minced with an electric blender and the paste was squeezed and the total soluble solids were determined by using hand refractometer (according to **A.O.A.C., 2000).** The studied chemical characteristics of fruits included the following parameters:

1- Sugar content:

The percentages of the total and reducing sugars were determined according to **Lane and Eynon (1965)** volumetric method that outlined in **(A.O.A.C., 2000).**

2- Treatable acidty:

Twenty five grams of flesh was blended with 100 ml distilled water by an electric blender, the extract was filtrated and twenty ml. of it was titrated against 0.1 N sodium hydroxide using phenolphthalein as an indicator according to the **(A.O.A.C., 2000)**. Acidity was determined as g citric acid/ l00 g pulp.

3- Vitamin C:-

The pulp content of vitamin C (mg. L- Ascorbic acid/ 100 g pulp) was determined by titration with 2, 6 dichlorophenol indophenol dye according to **(A.O.A.C., 2000).**

All the obtained data during the course of this study in the TWO successive seasons, 2016/ 2017 and 2017/2018 were tabulated and subjected to the proper statistical analysis. The differences between various treatment means were compared using new L.S.D. parameter at 5 % (according to **Mead *et al.* 1993).**

3. Results

1- Vegetative growth aspects.

Data in Tables (4) show the effect of spraying moringa oil and/ormethylene urea on length and thickness of shoot, number of leaves per shoot and leaf and leaf area in the spring growth cycle of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is noticed from the obtained data that treating Valencia orange trees with moringa oil and/or methylene urea at 0.05 to 0.2% had significant stimulation on the four growth aspects namely length, and thickness of shoot, number of leaves/shoot, and leaf area relative to the control. Combined applications were significantly favourable than using each material alone in enhancing these growth aspects. There was a gradual stimulation on these growth traits with increasing concentrations of moringa oil and/or methylene urea from 0.05 to 0.2% without significant promotion among the higher two concentrations of each material. Using methylene urea significantly surpassed the application of moringa oil in enhancing growth aspects. The maximum values were detected on the trees that received moringa oil and methylene urea each at 0.2%. The untreated trees produced the minimum values. Similar trend was noticed during both seasons.

2- Leaf chemical composition:-

Data in Tables (5 to 9) show the effect of spraying moringa oil and/or methylene urea on chlorophylls a & b, total chlorophylls, total carbohydrates, C/N, N, P, K, Mg, Ca, S, Zn, Fe, Mn and Cu in the leaves of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is obvious from the obtained data that single and combined application of moringa oil and/or methylene urea each at 0.05 to 0.2% significantly enhanced chlorophylls a & b, total chlorophylls, total carbohydrates, C/N, N, P, K, Mg, Ca, S, Zn, Fe and Mn in the leaves relative to the control. The promotion on these pigments and nutrients was in proportional to the increase in concentrations of each matrial. Increasing concentrations of each material from 0.1 to 0.2 % failed to show significant promotion on these leaf components. Using methylene urea was significantly superior than using moringa oil in enhancing these leaf chemical contents. Combined applications were significantly superior than using each material alone in this respect. Values of C/N and Cu in the leaves were significantly unaffected by the present treatments.

Treating the trees three times with a mixture of moringa oil and/or methylene urea at 0.2 % gave the maximum values. The untreated trees produced the lowest values. These results were true during both seasons.

3. The percentage of initial fruit setting and fruit retention:-

Data in Table (10) show the effect of spraying moringa oil and/or methylene urea on the percentage of initial fruit setting and fruit retention of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is clear from the obtained data that subjecting Valencia orange trees three times with moringa oil and/ or methylene urea each at 0.05 to 0.2 % significantly improved the percentages of initial fruit setting and fruit retention relative to the control. The promotion on such two parameters was in proportional to the increase in concentration of the previous two materials.

Using methylene urea was significantly favourable than using moringa oil in enhancing the percentage of initial fruit setting and fruit retention. Combined applications of both materials. Insignificantly surpassed the application of each material alone in the connection. Significant differences on such two parameters were observed among the higher two concentrations of each material either applied alone or in combined. The Maximum values of initial fruit setting (17.1 & 17.6%) and fruit retention (1.24 & 1.27 %) were recorded on the trees that received moringa oil and methylene urea each at 0.2 % during both seasons, respectively. The lowest values of initial fruit setting (11.0 & 10.9%) and fruit retention (0.74 & 0.71%) were recorded on untreated trees during both seasons respectively. These results were true during both seasons.

4- Yield/Tree:-

Data in Table (10) show the effect of spraying moringa oil and/or methylene urea on the yield expressed in number of fruits / tree and weight (kg) of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is evident from the obtained data that yield expressed in number of fruits / tree and weight (kg) was significantly improved in response to treating the trees three times with moringa oil and /or methylene urea each at 0.05 to 0.2 %. Using methylene was significantly favourable than using moringa oil at the same concentrations on promoting the yield. Combined applications of such two materials were better than using each material alone in this respect. Increasing concentration of each material from 0.1 to 0.2 % failed to show significant promotion on the yield, therefore from economical point of view it is recommended to use the medium concentration of each material namely 0.1%. Moreover, the best treatment was using the mixture of both material at 0.1%. Under such promised treatment yield/tree expressed in weight reached 78.2 & 78.4% kg compared with the yield of the control which reached 49.8 and 47.9 kg during both seasons, respectively. The percentage of increment on the yield of the promised treatment over the check treatment reached 57.0 and 63,7 % during both seasons, respectively. The results were true during both seasons.

5- Physical and chemical characteristics of the fruits:-

Data in Tables (11 to 14) show the effect of spraying moringa oil and/or methylene urea on weight, height and dimension of fruit, fruit shape, juice and fruit peel weight %, fruit peel thickness, T.S.S %, total acidity %, T.S.S/acid, total and reducing sugars % and vitamins C (mg/100ml juice) in the fruits of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is clear from the obtained data that spraying moringa oil and /or methylene urea each at 0.05 to 0.2% significantly was very effective in improving fruit quality of Valencia orange trees in terms of increasing on weight, height and dimension of fruit, juice %, T.S.S %,, T.S.S/acid, Total and reducing sugars % and vitamins C and decreasing fruit peel weight and thickness and total acidity%. relative to the control. The promotion on both physical and chemical characteristics of the fruit was related to the increase in concentration of moringa oil and methylene urea. Using methylene urea significantly enriched fruit quality compared with using moringa oil.

Combined applications of both were significantly favorable than using each material alone in enhancing fruit quality. Increasing concentration of both moringa oil and methylene urea from 0.1 to 0.2 % failed to show significant promotion on fruit quality. Therefore, from economical point of view the best results were obtained when moringa oil and methylene urea were applied at 0.1 %. The untreated trees produced unfavourable effects on fruit quality. Fruit shape was significantly improved with the present treatment. These results were true during both seasons.

Statistical analysis was done using randomized complete block design (RCBD) with three replicates, each with one Valencia orange tree. Each block contained ten treatments.

Generally, the following measurements were recorded during the two seasons of study.

Four branches for each tree were labeled (1st of Mar.) for measuring mean shoot length, number of

leaves / shoot, shoot thickness (cm.) and leaf area (cm^2) in the spring growth flush.

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4- Sugar content:

The percentages of the total and reducing sugars were determined according to **Lane and Eynon (1965)** volumetric method that outlined in **(A.O.A.C., 2000).**

5- Treatable acidty:

Twenty five grams of flesh was blended with 100 ml distilled water by an electric blender, the extract was filtrated and twenty ml. of it was titrated against 0.1 N sodium hydroxide using phenolphthalein as an indicator according to the

(A.O.A.C., 2000). Acidity was determined as g citric acid/ l00 g pulp.

6- Vitamin C:-

The pulp content of vitamin C (mg. L- Ascorbic acid/ 100 g pulp) was determined by titration with 2, 6 dichlorophenol indophenol dye according to **(A.O.A.C., 2000).**

All the obtained data during the course of this study in the TWO successive seasons, 2016/ 2017 and 2017/2018 were tabulated and subjected to the proper statistical analysis. The differences between various treatment means were compared using new L.S.D. parameter at 5 % (according to **Mead *et al.* 1993).**

3. Results

Table (3): Effect of spraying Moringa oil and/or methylene urea on some vegetative growth aspects of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Shoot length (cm)		No. of leaves/shoot		Shoot thickness (mm)		Leaf area $(cm)^2$	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	4.0	3.9	3.0	2.9	1.4	1.4	16.0	15.9
Spraying moringa oil at 0.05 %	4.3	4.4	3.5	3.4	1.7	1.7	16.8	17.1
Spraying moringa oil at 0.1 %	4.6	4.7	4.0	4.0	1.9	2.0	17.9	18.2
Spraying moringa oil at 0.2 %	4.7	4.8	4.1	4.1	2.0	2.1	18.0	18.3
Spraying methylene urea at 0.05 %	5.0	5.2	4.5	4.6	2.2	2.3	18.9	19.3
Spraying methylene urea at 0.1 %	5.2	5.5	4.9	5.1	2.5	2.5	19.9	20.3
Spraying methylene urea at 0.2 %	5.3	5.6	5.0	5.1	2.6	2.6	20.0	20.4
Spraying both at 0.05 %	6.4	6.6	6.4	6.6	3.3	3.4	23.3	24.36
Spraying both at 0.1 %	7.1	7.2	6.8	7.0	3.5	3.6	24.9	25.3
Spraying both at 0.2 %	7.2	7.3	6.9	7.1	3.6	3.6	25.0	25.5
New L.S.D at 5%	**0.2**	**0.3**	**0.4**	**0.3**	**0.2**	**0.2**	**0.7**	**0.8**

Table (4): Effect of spraying Moringa oil and/or methylene urea on chlorophylls a & b and total chlorophylls in the leaves of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Chlorophyll a (mg/ g F.W)		Chlorophyll b (mg/ g F.W)		Total chlorophylls (mg/ g F.W)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	2.4	2.6	1.0	1.1	3.4	3.7
Spraying moringa oil at 0.05 %	3.0	3.3	1.4	1.5	4.4	4.8
Spraying moringa oil at 0.1 %	3.6	4.0	1.8	1.9	5.4	5.9
Spraying moringa oil at 0.2 %	3.7	4.1	1.9	2.0	5.6	6.1
Spraying methylene urea at 0.05 %	4.5	4.7	2.4	2.5	6.9	7.2
Spraying methylene urea at 0.1 %	5.5	5.4	3.0	3.0	8.5	8.4
Spraying methylene urea at 0.2 %	5.6	5.5	3.1	3.1	8.7	8.6
Spraying both at 0.05 %	8.9	8.6	4.3	4.5	13.2	13.1
Spraying both at 0.1 %	9.4	9.6	4.6	4.8	14.0	14.4
Spraying both at 0.2 %	9.5	9.7	4.7	4.9	14.2	14.6
New L.S.D at 5%	**0.3**	**0.4**	**0.2**	**0.3**	**0.4**	**0.5**

Table (5): Effect of spraying Moringa oil and/or methylene urea on total carotenoids, total carbohydrates and C/N in the leaves of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Total carotenoids (mg/1 g F.W)		Total carbohydrates %		Leaf C/N	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	0.9	1.0	13.9	14.0	8.63	8.81
Spraying moringa oil at 0.05 %	1.4	1.5	14.9	15.0	8.62	8.82
Spraying moringa oil at 0.1 %	1.8	1.9	15.5	15.5	8.71	8.66
Spraying moringa oil at 0.2 %	1.9	2.0	15.6	15.6	8.67	8.67
Spraying methylene urea at 0.05 %	2.3	2.4	16.3	16.4	8.76	8.77
Spraying methylene urea at 0.1 %	2.5	2.8	17.0	17.1	8.85	8.81
Spraying methylene urea at 0.2 %	2.6	2.9	17.1	17.2	8.86	8.82
Spraying both at 0.05 %	3.6	3.8	19.1	19.2	8.84	8.73
Spraying both at 0.1 %	4.0	4.1	19.8	19.9	8.92	8.77
Spraying both at 0.2 %	4.1	4.1	20.0	20.0	8.97	8.77
New L.S.D at 5%	**0.2**	**0.3**	**0.6**	**0.5**	**NS**	**NS**

1- Vegetative growth aspects.

Data in Tables (4) show the effect of spraying moringa oil and/ormethylene urea on length and thickness of shoot, number of leaves per shoot and leaf and leaf area in the spring growth cycle of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is noticed from the obtained data that treating Valencia orange trees with moringa oil and/or methylene urea at 0.05 to 0.2% had significant stimulation on the four growth aspects namely length, and thickness of shoot, number of leaves/shoot, and leaf area relative to the control. Combined applications were significantly favourable than using each material alone in enhancing these growth aspects. There was a gradual stimulation on these growth traits with increasing concentrations of moringa oil and/or methylene urea from 0.05 to 0.2% without significant promotion among the higher two concentrations of each material. Using methylene urea significantly surpassed the application of moringa oil in enhancing growth aspects. The maximum values were detected on the trees that received moringa oil and methylene urea each at 0.2%. The untreated trees produced the minimum values. Similar trend was noticed during both seasons.

Table (6): Effect of spraying Moringa oil and/or methylene urea on the percentages of N, P and K in the leaves of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Leaf N %		Leaf P %		Leaf K %	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	1.61	1.59	0.159	0.161	1.11	1.09
Spraying moringa oil at 0.05 %	1.69	1.70	0.167	0.170	1.18	1.20
Spraying moringa oil at 0.1 %	1.78	1.79	0.176	0.180	1.25	1.27
Spraying moringa oil at 0.2 %	1.80	1.80	0.177	0.181	1.26	1.28
Spraying methylene urea at 0.05 %	1.86	1.87	0.186	0.190	1.34	1.37
Spraying methylene urea at 0.1 %	1.92	1.94	0.194	0.197	1.42	1.46
Spraying methylene urea at 0.2 %	1.93	1.95	0.195	0.198	1.43	1.47
Spraying both at 0.05 %	2.16	2.20	0.225	0.235	1.71	1.69
Spraying both at 0.1 %	2.22	2.27	0.236	0.245	1.80	1.85
Spraying both at 0.2 %	2.23	2.28	0.237	0.246	1.81	1.86
New L.S.D at 5%	0.05	0.07	0.06	0.08	0.04	0.06

Table (7): Effect of spraying Moringa oil and/or methylene urea on the percentages of Mg, Ca and S in the leaves of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Leaf Mg %		Leaf Ca %		Leaf S %	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	0.59	0.61	2.39	2.37	0.79	0.80
Spraying moringa oil at 0.05 %	0.65	0.67	2.49	2.54	0.84	0.86
Spraying moringa oil at 0.1 %	0.71	0.73	2.61	2.66	0.89	0.93
Spraying moringa oil at 0.2 %	0.72	0.73	2.63	2.74	0.90	0.94
Spraying methylene urea at 0.05 %	0.77	0.86	2.82	2.86	0.96	0.99
Spraying methylene urea at 0.1 %	0.85	0.94	2.92	2.97	1.02	1.05
Spraying methylene urea at 0.2 %	0.86	0.95	2.94	2.99	1.05	1.06
Spraying both at 0.05 %	1.09	1.13	3.20	3.29	1.31	1.29
Spraying both at 0.1 %	1.18	1.18	3.24	3.38	1.98	1.36
Spraying both at 0.2 %	1.19	1.19	4.25	3.39	1.39	1.38
New L.S.D at 5%	0.04	0.05	0.07	0.09	0.05	0.04

Table (8): Effect of spraying Moringa oil and/or methylene urea on the leaf content of Zn, Mn, Fe and Cu (ppm) of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Leaf Zn (ppm)		Leaf Mn (ppm)		Leaf Fe (ppm)		Leaf Cu (ppm)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	50.1	49.3	55.3	56.0	58.9	59.0	1.11	1.13
Spraying moringa oil at 0.05 %	53.6	54.0	58.4	59.1	62.0	62.1	1.12	1.13
Spraying moringa oil at 0.1 %	57.6	58.0	61.5	62.2	66.0	66.1	1.12	1.13
Spraying moringa oil at 0.2 %	58.0	58.5	61.6	62.3	66.3	66.5	1.12	1.14
Spraying methylene urea at 0.05 %	62.0	61.9	65.9	66.6	70.0	69.9	1.13	1.14
Spraying methylene urea at 0.1 %	66.0	66.0	69.0	69.6	74.0	74.5	1.14	1.14
Spraying methylene urea at 0.2 %	66.1	66.3	69.3	70.0	74.5	75.0	1.14	1.14
Spraying both at 0.05 %	78.5	77.0	80.0	81.3	86.0	87.0	1.14	1.14
Spraying both at 0.1 %	82.6	80.0	83.0	84.0	89.0	90.9	1.14	1.15
Spraying both at 0.2 %	83.0	80.4	83.5	84.6	89.3	91.0	1.15	1.15
New L.S.D at 5%	3.1	2.8	0.5	2.4	3.0	2.9	NS	NS

2- Leaf chemical composition:-

Data in Tables (5 to 9) show the effect of spraying moringa oil and/or methylene urea on chlorophylls a & b, total chlorophylls, total carbohydrates, C/N, N, P, K, Mg, Ca, S, Zn, Fe, Mn and Cu in the leaves of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is obvious from the obtained data that single and combined application of moringa oil and/or methylene urea each at 0.05 to 0.2% significantly enhanced chlorophylls a & b, total chlorophylls, total carbohydrates, C/N, N, P, K, Mg, Ca, S, Zn, Fe and Mn in the leaves relative to the control. The promotion on these pigments and nutrients was in proportional to the increase in concentrations of each matrial. Increasing concentrations of each material from 0.1 to 0.2 % failed to show significant promotion on these leaf components. Using methylene urea was significantly superior than using moringa oil in enhancing these leaf chemical contents. Combined applications were significantly superior than using each material alone in this respect. Values of C/N and Cu in the leaves were significantly unaffected by the present treatments. Treating the trees three times with a mixture of moringa oil and/or methylene urea at 0.2 % gave the maximum values. The untreated trees produced the lowest values. These results were true during both seasons.

3. The percentage of initial fruit setting and fruit retention:-

Data in Table (10) show the effect of spraying moringa oil and/or methylene urea on the percentage of initial fruit setting and fruit retention of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is clear from the obtained data that subjecting Valencia orange trees three times with moringa oil and/ or methylene urea each at 0.05 to 0.2 % significantly improved the percentages of initial fruit setting and fruit retention relative to the control. The promotion on such two parameters was in proportional to the increase in concentration of the previous two materials.

Using methylene urea was significantly favourable than using moringa oil in enhancing the percentage of initial fruit setting and fruit retention. Combined applications of both materials. Insignificantly surpassed the application of each material alone in the connection. Significant differences on such two parameters were observed among the higher two concentrations of each material either applied alone or in combined. The Maximum values of initial fruit setting (17.1 & 17.6%) and fruit retention (1.24 & 1.27 %) were recorded on the trees that received moringa oil and methylene urea each at 0.2 % during both seasons, respectively. The lowest values of initial fruit setting (11.0 & 10.9%) and fruit retention (0.74 & 0.71%) were recorded on untreated trees during both seasons respectively. These results were true during both seasons.

4- Yield/Tree:-

Data in Table (10) show the effect of spraying moringa oil and/or methylene urea on the yield expressed in number of fruits / tree and weight (kg) of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is evident from the obtained data that yield expressed in number of fruits / tree and weight (kg) was significantly improved in response to treating the trees three times with moringa oil and /or methylene urea each at 0.05 to 0.2 %. Using methylene was significantly favourable than using moringa oil at the same concentrations on promoting the yield. Combined applications of such two materials were better than using each material alone in this respect. Increasing concentration of each material from 0.1 to 0.2 % failed to show significant promotion on the yield, therefore from economical point of view it is recommended to use the medium concentration of each material namely 0.1%. Moreover, the best treatment was using the mixture of both material at 0.1%. Under such promised treatment yield/tree expressed in weight reached 78.2 & 78.4% kg compared with the yield of the control which reached 49.8 and 47.9 kg during both seasons, respectively. The percentage of increment on the yield of the promised treatment over the check treatment reached 57.0 and 63,7 % during both seasons, respectively. The results were true during both seasons.

5- Physical and chemical characteristics of the fruits:-

Data in Tables (11 to 14) show the effect of spraying moringa oil and/or methylene urea on weight, height and dimension of fruit, fruit shape, juice and fruit peel weight %, fruit peel thickness, T.S.S %, total acidity %, T.S.S/acid, total and reducing sugars % and vitamins C (mg/100ml juice) in the fruits of Valencia orange trees during 2016/2017 and 2017/2018 seasons.

It is clear from the obtained data that spraying moringa oil and /or methylene urea each at 0.05 to 0.2% significantly was very effective in improving fruit quality of Valencia orange trees in terms of increasing on weight, height and dimension of fruit,, juice %, T.S.S %,, T.S.S/acid, Total and reducing sugars % and vitamins C and decreasing fruit peel weight and thickness and total acidity%. relative to the control. The promotion on both physical and chemical characteristics of the fruit was related to the increase in concentration of moringa oil and

methylene urea. Using methylene urea significantly enriched fruit quality compared with using moringa oil.

Combined applications of both were significantly favorable than using each material alone in enhancing fruit quality. Increasing concentration of both moringa oil and methylene urea from 0.1 to 0.2 % failed to show significant promotion on fruit quality. Therefore, from economical point of view the best results were obtained when moringa oil and methylene urea were applied at 0.1 %. The untreated trees produced unfavourable effects on fruit quality. Fruit shape was significantly improved with the present treatment. These results were true during both seasons.

Table (9): Effect of spraying Moringa oil and/or methylene urea on the leaf content of the percentages of initial fruit setting and fruit retention and yield/tree of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Initial fruit setting %		Fruit retention %		No. of fruits/tree		Yield/tree (kg.)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	11.0	10.9	0.74	0.71	311.0	301.0	49.8	47.9
Spraying moringa oil at 0.05 %	11.7	11.8	0.80	0.79	320.0	319.0	52.5	52.6
Spraying moringa oil at 0.1 %	12.5	12.6	0.86	0.86	331.0	329.0	55.9	55.9
Spraying moringa oil at 0.2 %	12.6	12.7	0.87	0.87	332.0	330.0	56.4	56.4
Spraying methylene urea at 0.05 %	13.4	13.6	0.92	0.92	342.0	343.0	59.5	60.0
Spraying methylene urea at 0.1 %	14.0	14.2	0.99	1.00	354.0	353.0	63.4	63.5
Spraying methylene urea at 0.2 %	14.1	14.3	1.00	1.01	355.0	354.0	63.9	63.5
Spraying both at 0.05 %	16.3	16.6	1.18	1.21	386.0	391.0	74.1	75.1
Spraying both at 0.1 %	17.0	17.5	1.23	1.26	395.0	399.0	78.2	78.4
Spraying both at 0.2 %	17.1	17.6	1.24	1.27	396.0	401.0	78.8	79.0
New L.S.D at 5%	0.5	0.6	0.04	0.05	8.1	8.3	0.7	0.8

Table (10): Effect of spraying Moringa oil and/or methylene urea on some physical characteristics of the fruits of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Fruit weight (g.)		Fruit height (cm)		Fruit diameter (cm)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	160.0	159.0	6.8	6.7	6.1	5.9
Spraying moringa oil at 0.05 %	164.0	165.0	7.0	7.0	6.3	6.2
Spraying moringa oil at 0.1 %	169.0	170.0	7.3	7.2	6.6	6.5
Spraying moringa oil at 0.2 %	170.0	170.8	7.4	7.3	6.7	6.7
Spraying methylene urea at 0.05 %	174.0	175.0	7.7	7.6	6.9	7.0
Spraying methylene urea at 0.1 %	179.0	180.0	8.0	8.0	7.3	7.3
Spraying methylene urea at 0.2 %	180.0	180.0	8.1	8.1	7.4	7.3
Spraying both at 0.05 %	191.9	192.0	9.0	9.0	8.2	8.2
Spraying both at 0.1 %	198.0	196.5	9.2	9.3	8.5	8.4
Spraying both at 0.2 %	199.0	197.0	9.2	9.3	8.6	8.4
New L.S.D at 5%	2.0	1.8	0.2	0.2	0.2	0.2

Table (11): Effect of spraying Moringa oil and/or methylene urea on some physical characteristics of the fruits of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Fruit shape		Juice %		Fruit peel weight %		Fruit peel thickness (cm)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	1.11	1.14	39.0	40.0	24.0	23.3	0.40	0.41
Spraying moringa oil at 0.05 %	1.11	1.13	40.	41.0	23.0	23.0	0.37	0.38
Spraying moringa oil at 0.1 %	1.11	1.11	40.9	42.0	22.0	21.9	0.33	0.36
Spraying moringa oil at 0.2 %	1.10	1.09	41.0	42.1	21.9	21.8	0.32	0.35
Spraying methylene urea at 0.05 %	1.12	1.09	42.0	43.0	20.0	19.9	0.29	0.33
Spraying methylene urea at 0.1 %	1.10	1.10	43.0	44.0	19.0	18.9	0.26	0.30
Spraying methylene urea at 0.2 %	1.09	1.11	43.3	44.2	18.9	18.8	0.26	0.29
Spraying both at 0.05 %	1.10	1.10	47.0	50.0	15.0	14.9	0.18	0.20
Spraying both at 0.1 %	1.08	1.11	49.0	50.9	14.0	13.9	0.18	0.19
Spraying both at 0.2 %	1.07	1.11	49.3	51.0	14.0	13.8	0.18	0.19
New L.S.D at 5%	NS	NS	0.8	0.7	1.0	0.8	0.03	0.03

Table (12): Effect of spraying Moringa oil and/or methylene urea on some chemical characteristics of the fruits of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	T.S.S.%		Total acidity%		T.S.S./acid	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	10.8	10.9	1.350	1.362	8.0	8.0
Spraying moringa oil at 0.05 %	11.0	11.1	1.330	1.320	8.3	8.4
Spraying moringa oil at 0.1 %	11.2	11.3	1.309	1.306	8.6	8.7
Spraying moringa oil at 0.2 %	11.3	11.4	1.307	1.305	8.6	8.7
Spraying methylene urea at 0.05 %	11.5	11.7	1.280	1.266	9.0	9.2
Spraying methylene urea at 0.1 %	11.8	11.9	1.255	1.250	9.4	9.5
Spraying methylene urea at 0.2 %	11.9	12.0	1.250	1.249	9.5	9.6
Spraying both at 0.05 %	13.3	13.4	1.170	1.140	11.4	11.8
Spraying both at 0.1 %	13.7	13.7	1.140	1.120	12.0	12.2
Spraying both at 0.2 %	13.8	13.8	1.137	1.118	12.1	12.3
New L.S.D at 5%	0.2	0.2	0.016	0.014	0.3	0.4

Table (13): Effect of spraying Moringa oil and/or methylene urea on some chemical characteristics of the fruits of Valencia orange trees during 2016 & 2017 and 2017/2018 seasons

Moringa oil and/or methylene urea	Total sugars %		Reducing sugars %		Vitamin C (mg/100 ml juice)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	7.3	7.0	3.0	2.9	44.5	44.9
Spraying moringa oil at 0.05 %	7.5	7.2	3.2	3.2	45.1	45.5
Spraying moringa oil at 0.1 %	7.7	7.4	3.4	3.4	45.7	46.1
Spraying moringa oil at 0.2 %	7.8	7.5	3.5	3.5	45.8	46.2
Spraying methylene urea at 0.05 %	8.0	7.8	3.6	3.6	46.5	47.0
Spraying methylene urea at 0.1 %	8.2	8.0	3.8	3.9	47.1	47.6
Spraying methylene urea at 0.2 %	8.3	8.1	3.9	4.0	47.2	47.7
Spraying both at 0.05 %	8.9	8.8	4.5	4.5	50.2	50.6
Spraying both at 0.1 %	9.1	9.0	4.5	4.7	50.9	51.6
Spraying both at 0.2 %	9.1	9.0	4.6	4.8	51.0	51.7
New L.S.D at 5%	0.2	0.2	0.2	0.2	0.4	0.4

4. Discussion

Plant oil and extracts:-:1-

The higher content of oil and plant extracts from different active substances. Volatiles, K, E, D, A and antioxidants (**Dhekney, 2016**).

These results are in agreement with those obtained by **Ahmed *et al*,2013); Al-Wasfy et al, 2013); Ahmed et al, (2014a) and (2014b); Shoug,2015), Ahmed,2016); Ahmed and Habasy-Randa,2017); and Zagzog and Saied, 2017).**

2- Effect of methylene urea:-

The Beneficial effects of methylene urea of fruiting of Valencia orange tress might be attributed to its effect in enhancing the efficiency of N uptake and extending the supplement of N to the trees **(Wang ana Alva 1996).**

These results are in harmony with those obtained by **((Rouse; Hegab *et al 1999)*; *(* Wassel *et al* 2000); Youniss-Randa (2002); Mohamed and Ebeed-Sanaa (2006); Shaalan-Nashwh, (2008) and Abd El- Kafy (2018).**

5. Conclusion:

Carrying out three sprays of a mixture of Moringa oil and methylene urea each at 0.1 % was necessary for improving yield and fruit quality of Valencia orange trees.

References

1. Abd El –Kafy, A. A; B (2018): Effect of replacing inorganic N fertilizers partially using slow releases N fertilizers as well as humic and fulvic acids on fruiting of Bartemuda date palms.ph.D.Thesis.Fac.of.Agric.Minia.univ.Egypt .
2. Ahmed, E.F.S. (2016): Impact of spraying Moringa oil and turmeric extract on fruiting of Barhee date palms J.Biol.Chem.Environ.Sci.11(3):359-365.
3. Ahmed, F. F. and Habasy-Randa, E.Y. (2017): Response of Balady mandarin trees to spraying some plant extracts.J.Biol.Chem.Environ.Sci.12(1):523-544.
4. Ahmed, F, F and Morsy, M. H (1999): Anew method for measuring leaf area in different fruit species. Minia J.of Agric.Res. & Develop., vol. (19): 97-105.
5. Ahmed, F. F.; Kamel, M.kh. and Ibrahim,. H.I.M. (2014a): The synergistic effects of using plant extracts and salicylic acid on yield and fruit quality of Keitte mango trees. Stem Cell,4;5(2):30-39.
6. Ahmed, F. F. Abdelaal, A. H. M.; El-Morsy, S. M. A.: and Shoug, M. A. F. (2015): Impact of spraying some plant extracts on fruiting of

storability of Balady Mandarin tress, World Rural Observation 7, (3):67-75.
7. Ahmed, F.F.; Ibrahim, M.I.H., Abada, M.A.M. and Osman, M.M.M. (2014b): Using plant extracts and chemical rest breakages for breaking dormancy and improving productivity of Superior grapevines growing under hot climates. World. Rural Observ.:6 (3): 8-18.
8. Ahmed, F.F.; Mansour, A.E.M.; Montasser, M.A.A.; Merwad, M.A. and Mostafa, E.A.M. (2013): Response of Valencia orange trees to foliar application of Roselle, turmeric and seaweed extracts. J. of Applied Science Research. 9 (1): 960-969.
9. Al- Wasfy, M.M.; Ahmed, F.F. and El- Masry, A.M. (2013): Behaviour of Washington Navel orange Trees to foliar application of some plant extracts. Hort. Science Journal of Suez Canal Univ. Vol. 1: 281-285.
10. Association of Official Agricultural Chemists (2000): Official Method of Analysis (A.P.A.C.) 15th Ed., Published by A.O.A.C. Washington, D.C. (U.S.A.) pp. 490-510.
11. Chapman, H. D. and Pratt P. F. (1975): Methods of Analysis for Soil. Plant and Water. Univ. of California. Division of Agric., Sci. pp. 172-173.
12. Chevaller, A (2001): Encyclopedia of medicinal plants Great Britain Dorling kindersleyltd.
13. Cottenie, A.; Verloo, M.; Velghe, M. and Camerlynck, R. (1982): Chemical Analysis of Plant and Soil. Ghent, Belgium, Laboratory of Analytical and agro-vhemistry. State Univ. pp. 200-210.
14. Hegab, M.Y. and Ali, A.H, and El-Dawwey, G.M. (1999): Behavior of Balady mandarin trees (Citrus reticulate) grown in sandy soil to some low release nitrogen fertilizers. Minia. J. of Agric. Res. & Develop. Vol.19: 81-96.
15. Hiscox, A. and Isralstam B. (1979): Method for the extraction of chlorophyll from leaf tissue without maceration. Can. J. Bot. 57:1332-1334.
16. Hulme, A. C. (1971): The Mango. Biochemistry of Fruits and their Products. CABI Publishing Vol. 1, London pp 95 – 103.
17. Lane, J. H. and Eynon, L. (1965): Determination of reducing sugars by means of Fehlings solution with methylene blue as indicator A.O.AC. Washington D.C.U.S.A. pp.490- 510.
18. Mead, R.; Currnow, R. N. and Harted, A. M. (1993): Statistical Methods in Agricultural and Experimental Biology. 2nd Ed. Chapman and Hall, London pp. 10- 44.
19. Mohamed, A.Y; and, Ebeed-Sanaa, S. (2006): Effect of some slow release N fertilizers on growth and fruiting of two mango cvs Fagri kalan and Keitt. Arab. Uni. J. Agric.Sci. Ain-Shams. Univ.Cairo 14(1):321-335.
20. Nijjar, G. S. (1985): Nutrition of Fruit Trees. Kalyani Publishers, New Delhi, India, p. 100.
21. Rouse, R, E; Obreza, T. A and Sherrod, J. b. (1999): Yield and relative cost of controlled release fertilizer on young bearing Citrus trees. proc of the florida state Hort. Soc. No.112: 46-50.
22. Shaalan-Nashwa, G.M. (2008): Response of Balady mandarin trees to application of some bio, organic, inorganic and slow release N fertilizers. Ph. D. Thesis, Fac. of Agric. Minia Univ. Egypt.
23. Shoug, M.A.F (2015): Effect of spraying some plant extract on fruiting storage of Balady mandarin fruits on the the trees of Balady mandarin fruits on the trees M.Sc,. Thesis Fac. of Agric, Al-Azhar Univ.Assuit branch, Egypt.
24. Summer, M.E. (1985): Diagnosis and recommendation Integrated system (DRIS) as a guide to orchard fertilization. Hort. Abst. 55(8): 7502.
25. Von- Wettstein, D. V. (1957): Chlorophyll-Lethale under submikroshopische formilkechrel der plastiden celi, prp. Trop. Res. Amer. Soc. Hort. Sci. 20 pp. 427 – 433.
26. Wang, F.F. an Alva, A.K. (1996): Leaching of nitrogen from slow release urea sources in sandy soil. Soil Sci. Am. J. 60: 1454-1458.
27. Wassel, A. M.; Ahmed, F. F. and Ebrahiem, T. A. (2000): Nitrogen better management for high and quality of Balady mandarin trees grown in sandy soil. - The 2nd Sci. Conf. of Agric. Assiut, Oct. 293 - 300.
28. Wilde, S. A.; Corey, R. B.; Layer, J. G. and Voigt, G. K. (1985): Soils and Plant Analysis for Tree Culture. Oxford, and 1131-1, publishing Co., New Delhi, pp. 96-106.
29. Youniss-Randa, E. (2002): Effect of different sources and methods of nitrogen application on vegetative growth and fruiting of Valencia orange trees (Citrus sinuses) Phd. Thesis.Fac.of Agric.Minia.Univ.Egypt.
30. Zagzog.O.A. and Said, H.M.M. (2017): Insight onto the effect of fourteen plant extracts on fruiting of Sakkoti date palms. Current Sci.Inter.06 (03) 552-559.

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