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EFFECT OF WINTER SPRAYING OF UREA ON VALENCIA ORANGE TREES

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ABSTRACT

This study was carried out during 2018/2019 and 2019/ 2020 seasons to examine the effect of urea winter spraying at 2.0% and 3.0% on initial fruit setting, yield and fruit quality of Valencia orange trees grown under Minia climatic conditions. Spraying was carried out once at first of November, twice at first and mid of November or thrice at first, mid and last of November. Increasing in urea concentrations and frequencies were of promotion effect on fruit set and the yield as well as the physical and chemical properties of the fruits. Spraying urea at 3.0% was more effective than spraying it at 2.0% on the yield and the quality of valencia orange fruits. The difference between spraying it at 2.0% and 3.0% was statistically of significant difference on all of the properties of valencia orange fruits. The best results were obtained by spraying valencia orange trees with urea at 3.0% thrice annually at first, mid and last of November.

Key words: Urea- Foliar application- Valencia orange.

INTRODUCTION

Producing high production for citrus trees are in requires for adequate amounts of essential nutrients. Most growers need to add nitrogen on an annual basis. Nitrogen may be applied to the soil in granular form through irrigation system or sprayed on the foliage. Nitrogen fertilizer are usually split into three or more applications. Adequate nitrogen is important during the period for development of growth flowers and fruit set. Winter application of urea increased the number of flowers, and fruit setting. Concerning the time of application, urea spray nine weeks before full bloom had the highest effect on flowering but urea spray six weeks before full bloom resulted in higher ovary diameter and fruit set. (Chermahini, *etal* 2010).

Other authors studied the effect of spraying urea on citrus trees to study its effect on increasing fruit yield per tree

Sahota and Arora (1981) on Hamlin sweet orange ,**Saleem, *etal* (2008)** on sweet orange, **Abdel-Aziz and El-Azazy (2016)** on Valencia orange trees and **Mekki, *etal* (2016)** on Sinnari sweet orange.

Other authors showed the influence of urea in improving the physical and chemical properties of different citrus cultivars **El-Otmani, *etal* (2004)** on Clementine mandarin, **Chermahini, *etal.* (2010)** on Valencia orange trees, **El-Tanany, (2018)** on Washington Navel orange, **Hamed, (2018)** on Valencia orange trees and **Hendre, *etal* (2020)** on sweet orange.

The target of this work was elucidating the effect of different concentrations and frequencies of spraying urea at 2% and 3% on initial fruit setting, yield and fruit quality of Valencia orange trees grown under Minia governorate conditions.

MATERIALS AND METHODS

This study was carried out during 2018/2019 and 2019/2020 seasons on 21 valencia orange trees budded onto sour orange rootstock, 52 years old and spaced at 6x6 meters apart. Trees devoted for this study were grown at Mallawy Res. Station, Minia Governorate, Egypt and selected to be as uniform as possible. The soil of the orchard is clay in texture, well drained with a water table not less than two meters deep. Surface irrigation system was carried out using Nile water.

Experimental work:

Seven treatments from concentrations and frequencies of spraying urea was carried out as follows :

1- Control spraying only with water.

2- Spraying urea at 2% once at first of November.

3- Spraying urea at 3% once at first of November

4- Spraying urea at 2% twice at first and mid of November.

5- Spraying urea at 3% twice at first and mid of November.

6- Spraying urea at 2% thrice at first, mid and last of November.

7- Spraying urea at 3% thrice at first, mid and last of November.

Each treatment consisted from three replicates, one tree per each. Triton B was added as a wetting agent to all spray solution at 0.05%. Spraying was done till run off. The experiment was set in complete randomized block design (CRBD) (**Rangaswamy, 1995**).

The following measurements were carried out during the two experimental seasons:

- Percentages of initial fruit setting.
- Number of fruits per tree and yield per tree (kg).
- Physical character of fruits namely fruit weight (g) was achieved by using analytical balance.
- Total soluble solids (T.S.S)% of the juice was done by using handy rafractometer.
- Total acidity % was determined by titration with sodium hydroxide of a known normality (0.1 N) (**A.O.A.C. 2000**).
- Reducing sugars% was achieved as outlined by (**Lane and Eynon, 1965**), volumetric method.
- Ascorbic acid in the juice% (vitamin c) was determined by using 2.6 di cholorophenol indophenol.

Statistical analysis was done using new L.S.D. at 5% for making all comparisons among the seven treatments means (**Mead, *etal.* 1993**).

RESULTS AND DISCUSSION

1-Effect of spraying valencia orange trees with urea on initial fruit setting , number of fruits and the yield per tree in 2018/ 2019 and 2019/ 2020 seasons .

Data presented in table (1) indicated that spraying valencia orange trees with urea at any concentration used 2% and 3% either spraying was carried out once or twice or thrice, resulted in increasing the initial fruit setting as compared with the control. This was true in the two experimental seasons. Furthermore, results in the same table showed that number of spraying trees with urea had the same positive effect is increasing initial fruit setting. The highest initial fruit setting in the two experimental seasons was presented due to spraying valencia orange trees with urea at a concentration of 3% for three times. The previous treatment was effective than any other treatment including the control in increasing the initial fruit setting in the two years of the experiment.

These results are confirmed with those obtained by **Chermahini, *etal* (2010)** on Valencia orange trees, **El-Tanany, (2011)** on Lime trees, **Nirgude, *etal* (2016)** on citrus sinensis osbeck cv. Mosambi and **El-Tanany, (2018)** on Washington Navel orange.

Concerning the effect of spraying valencia orange trees with urea on number of fruits per tree. Data showed that the lowest number of fruits per tree was presented in the control trees. The vice versa was noticed by spraying urea either at 2% or 3%. Spraying the trees with urea once or twice or thrice had similar effect in increasing the number of fruits per tree. The differences between treatments were proved statistically in the first and the second experimental seasons. Results in the same table demonstrated that raising urea concentration increased the number of fruits per tree. In the same time the number of sprays were of positive effect concerning their influence on the number of fruits per tree. The highest number of fruits per tree was 349.34 and 355.00 in the first and second years of the experiment ,respectively. This was the result of spraying valencia orange trees with urea at 3% for three times annually compared with the 286.00 and 291.67 for the control in the first and second years of the experiment ,respectively. It is worth to mention that the previous treatment was significantly effective in increasing the number of fruits per tree as compared with any other treatment.

The present results are in accordance with the findings of **El-Otmani, *etal* (2004)** on Clementine mandarin and **Zaghloul and Knany (2012)** on Washington Navel orange.

Regarding the effect of urea on yield per tree, results in the same table (1) indicated that the yield per tree was increased by spraying valencia orange trees with urea either at 2% or 3% . In the same time increasing the number of spraying increased the yield per tree. All treatments were of highly yield than the control. The highest yield presented by spraying urea at 3% three times annually. This was existed by 70.33 and 71.67 kg/ tree compared by 48.67 and 50.67 kg/ tree for the control in the two experimental seasons. This treatment was significantly of positive effect on the yield per tree as compared with any other treatment including the control.

Our results concerning the effect of urea on the yield per tree are in accordance with those obtained by **Sahota and Arora (1981)** on Hamlin sweet orange, **Saleem, *etal* (2008)** on sweet orange, **Abdel-Aziz and El-Azazy(2016)** on Valencia orange trees as well as **Mekki, etal (2016)** on Sinnari sweet orange.

2- Effect of spraying valencia orange trees with urea on fruit weight in 2018/ 2019 and 2019/ 2020 seasons .

The results showed that there was a progressive increase in fruit weight of valencia orange trees as a result of spraying them with urea at 2% or 3% . Similar results were noticed due to the number of urea application. The lowest fruit weight was of those of the control with significant different compared with those of any other treatment. The highest fruit weight was obtained from valencia orange trees sprayed with urea 3% for three times annually. The weight of fruits in this treatment differ statistically than that of the rest treatments, in the two experimental seasons.

The previous results are confirmed by those of **Elhamz-Abdel Motty, *etal* (2006)** on troyer citrange, **Saleem, *etal* (2008)** on sweet orange and **Hamed, (2018)** on Valencia orange trees.

3- Effect of spraying valencia orange trees with urea on total soluble solids, total acidity, reducing sugars and vitamin c in 2018/ 2019 and 2019/ 2020 seasons .

Data in table (2) indicated that the total soluble solids (T.S.S)% in the juice of control fruits were less than any other treatment. The difference between them was proved statistically. In other words, the total soluble solids in the juice of fruits from trees sprayed with urea was higher than that of the control. Increasing urea concentration and number of sprays per year resulted in raising the total soluble solids in the juice of fruits. The vice versa was noticed in the acidity of the juice since, the acidity in the juice of control fruits was higher than that of the other treatments. Reducing sugers took the same trend of total soluble solids. The control fruits were of less reducing sugars than that of any other treatment. Otherwise, all treatments improved the chemical properties of the juice of fruits compared with the control in valencia juice fruits during the two experimental seasons.

Ascorbic acid content in the juice of valencia orange fruits took the same trend mentioned previously since, all treatments were of higher ascorbic acid than the control in the two years of the experiment.

These results are in accordance with those of **Obreza and Rouse (1993)** on Hamlin orange trees ,**Mudau, *etal* (2005)** on citrus spp. **,El-Tanany, (2018)** on Washington Navel orange and **Hendre, *etal* (2020)** on sweet orange.

As a conclusion, Spraying valencia orange trees in winter with urea at 3% three times annually at first, mid and last of November is recommended to obtained high yield of valencia orange trees with good quality.

Table (1): Effect of different concentrations and frequencies of urea on the percentages of Initial fruit setting, Number of fruits/ tree, yield/ tree and Av. fruit weight of Valencia orange trees during 2018/ 2019 and 2019/2020 seasons.

Treatments	Initial fruit setting %		Number of fruits per tree		Yield per tree (kg.)		Av. Fruit weight (g.)	
	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
Control	11.43	11.63	286.00	291.67	48.62	50.55	170.00	173.33
Spraying urea at 2% once.	12.13	12.27	303.67	308.33	53.14	54.78	175.00	177.67
Spraying urea at 3% once.	12.53	12.70	310.67	314.33	55.19	57.20	177.67	182.00
Spraying urea at 2% twice.	12.80	12.90	321.00	325.00	58.42	59.80	182.00	184.00
Spraying urea at 3% twice.	13.40	13.63	323.33	325.00	61.43	60.88	185.33	187.33
Spraying urea a 2% thrice.	13.83	13.93	335.33	341.00	63.71	65.70	190.00	192.67
Spraying urea at 3% thrice	14.33	14.43	349.33	355.00	69.86	71.59	200.0	201.67
L.S.D. at 5%	0.37	0.32	7.57	7.79	2.63	1.37	5.47	5.32

Table (2): Effect of different concentrations and frequencies of urea on total soluble solids, total acidity, reducing sugars and vitamin c content of the fruits of Valencia orange trees during 2018/ 2019 and 2019/2020 seasons.

Treatments	T.S.S. %		Total acidity %		Reducing sugars %		Vitamin C %	
	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020	2018/2019	2019/2020
Control	10.67	10.73	1.46	1.44	3.70	3.80	44.57	44.67
Spraying urea at 2% once.	10.93	11.03	1.42	1.43	4.00	4.10	45.37	45.53
Spraying urea at 3% once.	11.30	11.40	1.39	1.37	4.27	4.37	45.73	45.93
Spraying urea at 2% twice.	11.47	11.57	1.36	1.35	4.33	4.43	46.20	46.40
Spraying urea at 3% twice.	11.63	11.73	1.34	1.29	4.60	4.70	46.87	47.07
Spraying urea at 2% thrice.	11.87	11.97	1.28	1.27	4.87	4.97	47.53	47.93
Spraying urea at 3% thrice.	12.00	12.13	1.26	1.23	4.97	5.07	48.07	48.47
L.S.D. at 5%	0.15	0.16	0.02	0.02	0.19	0.19	0.39	0.43

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الملخص العربي

تأثير رش اليوريا شتاءا علي اشجار البرتقال الفالنشيا

عبدالحميد واصل – فاروق عبدالعزيز – هدي اسماعيل– فاطمة احمد عبدالحميد

قسم البساتين – كلية الزراعة – جامعة المنيا

اجريت هذه الدراسه خلال موسمي متتاليين 2019/2018 و 2020/2019 علي 21 شجره برتقال فالنشيا عمرها 52 سنه عند بداية التجربة مطعومه علي أصل النارنج ومنزرعه في مزرعه بمحطه البحوث الزراعيه بمركز ملوي محافظه المنيا جمهوريه مصر العربيه.

وقد تم اجراء سبعه معاملات كانت علي الوجه التالي:

1 . الكنترول رش بالماء فقط.
2 . رش اليوريا بتركيز 2% مرة واحدة (الاسبوع الاول من شهر نوفمبر).
3 . رش اليوريا بتركيز 3% مرة واحدة (الاسبوع الاول من شهر نوفمبر).
4 . رش اليوريا بتركيز 2% مرتان (الاسبوع الاول من شهر نوفمبر ومنتصف شهر نوفمبر).
5 . رش اليوريا بتركيز3% مرتان (الاسبوع الاول من شهر نوفمبر ومنتصف شهر نوفمبر).
6 . رش اليوريا بتركيز 2% ثلاثة مرات (الاسبوع الاول من شهر نوفمبر ومنتصف شهر نوفمبر والاسبوع الاخيرمن شهر نوفمبر).
7 . رش اليوريا بتركيز 3% ثلاثة مرات (الاسبوع الاول من شهر نوفمبر ومنتصف شهر نوفمبر الاسبوع الاخير من شهر نوفمبر).

وفيما يلي اهم النتائج المتحصل عليها خلال عامي الدراسه :

1 . أدي رش الاشجار مرة واحدة ومرتان وثلاثه مرات الي تحسين وزيادة نسبة عقد الثمار علي اشجار البرتقال الفالنشيا في عامي الدراسة.
2 . أدي رش اشجار البرتقال الفالنشيا باليوريا الي زيادة كمية محصول الشجرة وكانت هناك زيادة مضطردة في محصول الشجرة بزيادة تركيز اليوريا و زيادة عدد مرات الرش.
3 . زاد وزن الثمرة زيادة مضطردة بزيادة عدد مرات رش اشجار البرتقال الفالنشيا وكذلك بزيادة تركيز اليوريا .
4 . أدي رش اشجار البرتقال الفالنشيا باليوريا بتركيزاتها المختلفه الي تحسين جوده الثمار وذلك بزيادة نسبة المواد الصلبة الذائبة الكلية وفيتامين ج وتقليل نسبة الحموضة.

بناءا علي النتائج السابق ذكرها فانه لزياده انتاجيه اشجارالبرتقال الفالنشيا كما ونوعا يوصي برش الاشجار باليوريا خلال فترة الشتاء بتركيز 3% ثلاثه مرات سنويا الاسبوع الاول من شهر نوفمبر ومنتصف شهر نوفمبر والاسبوع الاخير من شهر نوفمبر.