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RESPONSE OF VALENCIA ORANGE TREES FOR SPRAYING SOME VITAMINS

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ABSTRACT

Growth characters, nutritional ge trees and fruits in response to single and combined applicationstatus, yield, physical and chemical characteristics of Valencia orans of six vitamins namely $B_{١٢}$, C, K, E, D and A applied three times were studied during ٢٠٠٩ and ٢٠١٠ seasons.

Results showed that single or combined application of the vitamins each at ١٠٠٠ ppm was very effective in improving all growth traits, most nutrients in the leaves, yield as well as physical and chemical characters of the fruits compared with the control treatment. The promotive effect of the vitamins could be arranged on the following ascending order K, E, D, A, $B_{١٢}$ and C. Combined application of these vitamins was superior than the application of each vitamin alone in enhancing all investigated characters.

It can be suggested that treating Valencia orange trees grown under Bani- Suef region conditions three times with a mixture of vitamins containing vitamins $B_{١٢}$, C, K, E, D and A each at ١٠٠٠ ppm is advisable for improving yield quantitively and qualitatively.

INTRODUCTION

Valencia orange is one of oranges cvs that its production was developed in a high rate during the last years in Egypt. There is a great

hope that Egyptian Valencia orange fruits can take the lead in the Egyptian exportation to Europe and Arab markets.

However poor cropping is considered to be a serious and major problem that faces Valencia orange growers in Bani- Suif region. This problem possibly due to poor setting and/ or to extensive dropping of flowers and fruits. On the other hand, Recently, it was suggested that all vitamins participate in plant growth by enhancing the endogenous levels of various growth factors such as IAA, cytokinins and gibberellins. Most vitamins are synthesized in the leaves and translocated in the phloem. For more than two decades study of the role of vitamins in plants has attracted sporadic attention. Various physiological processes such as nutrient uptake, respiration, photosynthesis as well as chlorophyll and protein synthesis depend more or less on the availability of vitamins (Samiullah *et al*., ١٩٨٨). Vitamins with their antioxidant properties play an important role in plant defense against oxidative stress induced by surfactants and selected pesticides (Oretili, ١٩٨٧) by several researchers.

It has been postulated that application of different vitamins was responsible for improving yield and fruit quality of citrus and various evergreen fruit crops (Ahmed *et al*., ١٩٩٨; Hegab, ٢٠٠٠; Ragab, ٢٠٠٢ and ٢٠٠٤; Gobara, ٢٠٠٤; Hamad, ٢٠٠٤; Mohamed, ٢٠٠٥; Gamal, ٢٠٠٦; Ahmed *et al*., ٢٠٠٧; Mahmoud *et al*., ٢٠٠٧; Mahfouz, ٢٠٠٧; Hamad, ٢٠٠٨; Ali- Ragaa, ٢٠٠٨; Zagzog, ٢٠٠٩; Badran and Ahmed, ٢٠٠٩ and Eshmawy, ٢٠١٠).

The present study was designed examine the effect of some vitamins on fruiting of Valencia orange trees grown under Bani- Suif conditions.

MATERIALS AND METHODS

This study was conducted during ٢٠٠٩ and ٢٠١٠ growing seasons on thirty (١٥ -years old) Valencia orange trees onto sour orange rootstock grown in a private orchard located at Bani- Suif district, Bane- Suif Governorate. The orchard soil is silty clay and well drained with a water table not less than two meters deep. The uniform in vigour trees were planted at a spacing of ٥ × ٥ meters apart. The trees were irrigated through surface irrigation system. Soil analysis was made according to the procedures that outlined by Wilde *et al*., (١٩٨٥) and the obtained data are shown in Table ١.

Table ١: Analysis of the tested soil.

Constituents	Values
Sand %	**: ٨.١**
Silt %	**: ٦١.٩**
Clay %	**: ٣٠.٠**
Texture grade	**: Silty clay**
pH (١ : ٢.٥ extract)	**: ٧.٧٠**
E.C (١: ٢.٥ extract) (mmhos/ ١cm/ ٢٥° C)	**: ٠.٩٢**
O.M. %	**: ٢.٠**
CaCO٣ %	**: ١.٦٤**
Total N %	**: ٠.١١**
Available P (ppm, Olsen)	**: ٦.٣**
Available K (ppm, ammonium acetate)	**: ٤١١**

The following ten treatments from six vitamins namely $B_{١٢}$, C, K, E, D and A. were applied.

١- Control.
٢- Spraying with vitamin B١٢ at ١٠٠٠ ppm.
٣- Spraying with vitamin C at ١٠٠٠ ppm.
٤- Spraying with vitamin K at ١٠٠٠ ppm.
٥- Spraying with vitamin E at ١٠٠٠ ppm.
٦- Spraying with vitamin D at ١٠٠٠ ppm.
٧- Spraying with vitamin A at ١٠٠٠ ppm.
٨- Spraying with B١٢ + C vitamins each at ١٠٠٠ ppm.
٩- Spraying with K + E + D + A vitamins each at ١٠٠٠ ppm.

١٠- Spraying with B١٢ + C + K + E + D + A vitamins each at ١٠٠٠ ppm.

Each treatment was replicated three times, one tree per each. All vitamins were sprayed three times during each season; at growth start (١st week of Mar.), just after fruit setting (٢nd week of Apr.) and at two months later (٢nd week of June). Triton B as a wetting agent was used at ٠.٠٥ %. Each tree received twenty liters from vitamin solutions. Spraying was done till runoff.

The selected trees received the horticultural practices that applied in the orchard except the use of any vitamins or antioxidants. Completely randomized block design was followed:

Four branches one year old were chosen from each tree direction. Four shoo-s from the current spring growth cycle/ branch were labeled for measuring average shoot length (cm.) and number of leaves per shoot. Twenty mature leaves (٧ month old) were picked from non-fruiting shoots of such cycle for measuring the leaf area (cm^2) using the following equation reported by Ahmed and Morsy (١٩٩٩).

$LA = ٠.٤٩ (L \times W) + ١٩.٠٩$ where LA = leaf area (cm^2), L and W were the maximum length and width of leaf (cm.), respectively.

The leaves taken for measuring the leaf area were dried at ٧٠ ° C and digested using H_2SO_4 and H_2O_2 (Chapman and Pratt, ١٩٦١). In the digested solutions percentages of N, P, K and Mg as well as leaf contents of Fe, Zn, Mn and Cu (ppm) or dry weight basis were determined using the procedures that outlined by Wilde *et al*., (١٩٨٥). Total carbohydrates was determined in the dried leaves according to A.O.A.C (١٩٩٥). Ratio of C/ N was calculated by dividing total carbohydrates % by N %.

Harvesting was carried out during the regular commercial harvesting time under Bani- Suif Governorate conditions (١st week of April) in both seasons when T.S.S/ acid reached at least ٨: ١. Yield was expressed in weight (kg.). Twenty fruits were taken randomly from the yield of each tree and from all directions for determining fruit weight (g.), total soluble solids %, total acidity % (as citric acid/ ١٠٠ ml juice), T.S.S/ acid, total and reducing sugars using the volumetric

method outlined in A.O.A.C, ١٩٩٥) and vitamin C content (as mg ascorbic acid/ ١٠٠ ml juice) (A.O.A.C, ١٩٩٥).

All obtained data were tabulated and statistically analyzed according to Gomez and Gomez (١٩٨٤). The individual comparisons among the ten treatments were compared by using new L.S.D test at ٥ %.

RESULTS AND DISCUSSION

Growth characters:

It is clear from the data in Table ٢ that vitamins type significantly affected growth characters namely main shoot length, number of leaves/ shoot and leaf area. Single or combined application of the six vitamins (C, $B_{١٢}$, K, E, D and A) each at ١٠٠٠ ppm significantly improved these growth characters rather than non- application. Spraying the trees with vitamins K, E, D, A, $B_{١٢}$ and C, in ascending order significantly stimulated those growth characters. Thus, combined application of vitamins was preferable than using each vitamin alone in enhancing all growth traits. Using vitamins $B_{١٢}$ and C together surpassed the combined application of K, E, D and A in that respect. Using the six vitamins together was accompanied with maximizing these growth characters. The minimum values were recorded on the untreated trees. These results were true during the two experimental seasons.

The essential role of vitamins on stimulating cell division and the biosynthesis of most organic foods (Oretili, ١٩٨٧) could result in enhancing growth characters.

These results are in agreement with those obtained by Ragab (٢٠٠٢ and ٢٠٠٤), Gamal (٢٠٠٦) and Ali- Ragaa (٢٠٠٨).

Nutrients in the leaves and C/ N:

Obtained data in Tables ٢ and ٣ cleanly show that using vitamins either individually or in combinations significantly improved N, P, K, Mg, Zn, Fe, Mn, total carbohydrates and C/ N in the leaves compared with non- application. The promotion on these nutrients and C/ N was associated with using K, E, D, A, $B_{١٢}$ and C, in ascending order.

Response of valencia orange trees to vitamins

Combined application was favourable than using each vitamin alone. Combined application of B_{12} + C was superior than the application of K + E + D + A. Significant differences on these nutrients and C/ N were observed among all vitamins treatments. However, vitamin treatments had no effect on leaf content of Cu. The maximum values were recorded on the trees that received three sprays of a mixture containing all vitamins. Untreated trees produced the minimum values. Similar tend was noticed during both seasons.

The beneficial effect of vitamins on root development as well as enhancing nutrient uptake could explain the present results (Oretili, ١٩٨٧).

These results are in agreement with those obtained by Hamad (٢٠٠٤); Mohamed (٢٠٠٥); Ahmed *et al.*, (٢٠٠٧); Mahmoud *et al.*, (٢٠٠٧) and Zagzog (٢٠٠٩).

Yield/ tree:

Data in Table ٣ reveal that yield per tree was significantly affected by varying vitamin treatments. Single or combined application of C, B_{12}, A, D, E and K vitamins significantly improved the yield per tree comparing with the control treatment. Supplying the trees with C, B_{12}, A, D, E and K vitamins, in descending order had announced promotion on the yield. The superior yield was obtained as a result of using combined application of vitamins comparing with using one vitamin. The maximum yield (٥٥.٠ and ٥٩.٦ kg) was presented in the trees received the six vitamins (C, B_{12}, A, D, E, K) together. While the minimum yield (٣٦.٦ and ٤١.٦ kg) was recorded on untreated trees. Similar trend was noticed during ٢٠٠٩ and ٢٠١٠ seasons

The promoting effect of vitamins on growth characters, nutritional status of the trees and C/ N ratio in favour of producing more fruits could explain the present results.

These results are in agreement with those obtained by Mahfouz (٢٠٠٧), Hamad (٢٠٠٨); Zagzog (٢٠٠٩) and Eshmawy (٢٠١٠).

Physical and chemical characteristics of the fruits:

It is clear from the data in Table ٤ that single or combined application of C, $B_{١٢}$, K, E, D and A vitamins caused a significant promotion on fruits quality in terms of increasing fruit weight, total soluble solids, total and reducing sugars and decreasing total acidity compared with the control treatment. The promotion was associated with using C, $B_{١٢}$, A, D, E and K, in descending order. Combined application of these vitamins was favourable in enhancing fruits quality compared with single application. Using C + $B_{١٢}$ vitamins was superior than using the four vitamins namely K, E, D and A together. Untreated trees gave unfavourable results on quality of the fruits. These results were true during the two seasons.

The beneficial effect of these vitamins on building and translocation of sugars and plant pigments may be reflected on the advance of maturity and improving fruits quality (Oretiti, ١٩٨٧).

Similar results were reported by Hegab (٢٠٠٠); Ragab (٢٠٠٤), Zagzog (٢٠٠٩) and Badran and Ahmed (٢٠٠٩).

As a conclusion, spraying a mixture of six vitamins and C, $B_{١٢}$, K, E, D and A each at ١٠٠٠ ppm three times per year is preferable for improving yield and fruit quality of Valencia orange trees under similar conditions.

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استجابة أشجار البرتقال الفالنشيا لرش بعض الفيتامينات

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تم دراسة استجابة صفات النمو الخضري والحالة الغذائية للأشجار وكمية المحصول وكذلك الخصائص الطبيعية والكيميائية لثمار البرتقال الفالنشيا للاستخدام الفردي والمشترك لستة فيتامينات هي فيتامين ب ١٢ ، ج ، ك ، هـ ، د ، أ بتركيز ١٠٠٠ جزء في المليون ثلاثة مرات وذلك خلال موسمي ٢٠٠٩ ، ٢٠١٠.

أشارت نتائج الدراسة أن الاستخدام الفردي والمشترك للفيتامينات ب ١٢ ، ج ، ك ، هـ ، د ، أ بتركيز ١٠٠٠ جزء في المليون كان فعالا جدا في تحسين جميع صفات النمو الخضري ومعظم العناصر الغذائية في الاوراق وكمية المحصول وكذلك الخصائص الطبيعية والكيميائية للثمار وذلك بالمقارنة بمعاملة الكونترول وكان التحسن في هذه الصفات يعود الي استخدام فيتامينات ك ، هـ ، د ، أ ، ب ١٢ ، ج مرتبة ترتيبا تصاعديا ولقد تفوق الاستخدام المشترك لهذه الفيتامينات عن الاستخدام الفردي لها في تحسين جميع الصفات تحت الدراسة.

معاملة أشجار البرتقال الفالنشيا النامية تحت ظروف منطقة بني سويف ثلاثة مرات بمخلوط من الفيتامينات يتكون من فيتامين ب ١٢ ، ج ، ك ، هـ ، د ، أ بتركيز ١٠٠٠ جزء في المليون يكون مفيدا لأجل تحسين المحصول كما ونوعا.