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RESPONSE OF VALENCIA ORANGE TREES TO FOLIAR APPLICATION OF SOME VITAMINS, SALICYLIC ACID AND TURMERIC EXTRACT

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ABSTRACT

Valencia orange trees were treated during ٢٠١١ and ٢٠١٢ seasons four times with vitamins A + E + K each at ١٠ ppm, salicylic acid at ١٠٠ ppm and turmeric extract at ١٠٠٠ ppm either singly or in all possible combinations. Leaf area and its content of N, P, K, Mg & Ca (as percentages) as well as Zn, Fe, Mn and Cu (as ppm), plant pigments, yield as well as physical and chemical characteristics of the fruits in response to the present treatments were investigated.

The results showed that single and combined applications of these compounds were very effective in enhancing leaf area, nutrients in the leaves (N, P, K, Mg, Ca, Zn, Fe, Mn and Cu), plant pigments (chlorophylls a & b, total chlorophylls and total carotenoids), yield as well as physical and chemical characteristics of the fruits c to the check treatment. The promotion in these parameters was associated with using vitamins A + E + K, salicylic acid and turmeric extract, in ascending order.

For promoting yield and fruit quality of Valencia orange trees, it is suggested to use four sprays of a mixture containing vitamins A+ E + K each at ١٠ ppm, salicylic acid at ١٠٠ ppm and turmeric acid at ١٠٠٠ ppm.

INTRODUCTION

Valencia orange is one of orange 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 Minia region. This problem possibly due to the poor setting and/ or to the 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 (Karabanov, ١٩٧٧). 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 (Robinson, ١٩٧٣; Oertili, ١٩٨٧ and Singh *et al*., ٢٠٠١).

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; Hamad, ٢٠٠٤; Mohamed, ٢٠٠٥; Gamal, ٢٠٠٦; Ahmed *et al*., ٢٠٠٧; Mahfouz, ٢٠٠٧; Ali- Ragaa, ٢٠٠٨; Hamad, ٢٠٠٨; Zagzog, ٢٠٠٩ and Hegab and Hegab, ٢٠١١).

Plant growth and development are affected by various biotic and abiotic stress factors. Detection of compounds capable of reducing these stresses are of great important from both theoretical and practical points of view. Salicylic acid compounds play an important role in the developmental process and some of them have a key roles in the mechanism leading to acclimation for changing environments. Salicylic acid has long been known as a signal molecule in the induction of defense mechanisms in plants (Prusky, ١٩٨٨; Raskin,

١٩٩٢; Rao *et al*., ٢٠٠٠ and Shah, ٢٠٠٣). Recent studies suggested that it also participates in signaling during abiotic stresses (Harvath *et al*., ٢٠٠٧). Previous results reported that salicylic acid could be a promising compound for the reduction of abiotic stress sensitivity in plants, since under certain conditions it was found to mitigate the damaging effects of various stress factors in plants (Tzeng and Devay, ١٩٨٩ and Harvath *et al*., ٢٠٠٧) such as heavy metals, high temperature, chilling or salinity (Szepesi *et al*., ٢٠٠٩) by inducing a wide range of processes involved in stress tolerance mechanisms. It was also, shown to influence a number of physiological processes including flowering, ion uptake and transport, photosynthesis rate and stomatal conductance (Elade, ١٩٩٢ and Raskin, ١٩٩٢).

Previous studies showed that application of salicylic acid as an important antioxidant was essential in improving growth and fruiting in different evergreen fruit crops (Gobara, ٢٠٠٤; Ragab, ٢٠٠٤; Mahmoud *et al*., ٢٠٠٧; Badran and Ahmed, ٢٠٠٩; Eshmawy, ٢٠١٠; Saied, ٢٠١١ and Ahmed, ٢٠١١).

Since ancient times, plant extracts were used in many ways. Recently, public health and environmental safety concerns encouraged the use of these natural products for improving growth, nutritional status, production and against most insect pests. The higher content of plant extracts from phenolic and another chemical constituents seem to have synergistic effects on growth and mortality of most fungus. Out of the important plant extracts is turmeric. *Turmeric curcuma longa* L. is a herbaceous perennial plant belonging to the Zingiberaceous family. Curcuma genus contains about ٣٠ species. It originates from India and South East Asia and cultivated in the majority of tropical counties. It is obtained from the rhizome of *Curcuma longa*. It contains ٢ to ٩ % curcuminiods which contains ٦٠ % curcumin, desmethoxycurcumin, monodemethoxycurcumin, bisdemethoxycurcumin, dihydrocurcumin and cyclocurcumin. Cucumins oxidation yield vanillin. Turmeric extract is rich in carbohydrates, (٥٠ % starch), arabinogalacton, potassium salt, essential oils. It is known for its anti- inflammatory, anti- oxidant and anti- microbial properties. Curcumin has a free radical scavenger

activity namely hydroxyl radical that is responsible to protect DNA from damage and inhibit lipid peroxidation (Srimal, ١٩٩٧ and Alonso, ٢٠٠٤).

Positive action on fruiting of field crops was recorded due to using plant extracts especially turmeric (Khanna and Chandra, ١٩٨٩; Ammon and Wehl, ١٩٩١; NRC, ١٩٩٢; Osawa, ١٩٩٤; Srivastava and Lal, ١٩٩٧; Obagwu *et al*., ١٩٩٧; Paik and Chung, ١٩٩٧; Purohit, ٢٠٠٠; Bruneton, ٢٠١١; Parakash and Majeed, ٢٠٠٣; Okigbo and Emoghene, ٢٠٠٣; Pons, ٢٠٠٣; Chawdhury *et al*., ٢٠٠٧; Bhudwaj *et al*., ٢٠١٠ and Hanafy *et al*., ٢٠١٢).

The objective of this study was examining the effect of spraying some vitamins, salicylic acid and turmeric extract on fruiting of Valencia orange trees growing under Minia region.

MATERIALS AND METHODS

This study was carried out during ٢٠١١ and ٢٠١٢ seasons on twenty four ١٤ -years old Valencia orange trees onto sour orange rootstock grown. The experimental trees were in a private orchard located at Bani- Mazar district, Minia Governorate. The soil of the farm is silty clay and well drained and 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.

This investigation included the following eight treatments from single and combined applications of some vitamins (A, E and K), salicylic acid and turmeric extract:-

١- Control (spraying with water trees).
٢- Spraying vitamins A + E + K each at ١٠ ppm.
٣- Spraying salicylic acid (SA) at ١٠٠ ppm.
٤- Spraying turmeric extract at ١٠٠٠ ppm.
٥- Spraying vitamins A + E + K each at ١٠ ppm + SA at ١٠٠ ppm.
٦- Spraying vitamins A + E + K each at ١٠ ppm + turmeric extract at ١٠٠٠ ppm.
٧- Spraying SA at ١٠٠ ppm + turmeric extract at ١٠٠٠ ppm.

٨- Spraying vitamins A + E + K each at ١٠ ppm + SA at ١٠٠ ppm + turmeric extract at ١٠٠٠ ppm.

Each treatment was replicated three times, one tree per each. All vitamins, SA and turmeric extracts were sprayed four times during each season, at growth start (١st week of Mar.), just after fruit setting (٢nd week of Apr.) and at two month intervals (٢nd week of June and August). It is worth to mention that all substances were dissolved in ٥ ml Ethyl alcohol for ensuring the solubility of these compounds. Triton B as a wetting agent was used at ٠.٠٥ %. Each tree received twenty liters from these substances. Spraying was done till runoff.

The selected trees received the same horticultural practices that were applied in the orchard except the use of any vitamins or antioxidants as well as plant extracts. Randomized complete block design was followed:

Twenty mature leaves (٧ months old) were picked from non-fruiting shoots of spring cycle for measuring the leaf area (cm^2) using the following equation reported by Ahmed and Morsy (١٩٩٩). LA = ٠.٤٩ (L × 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 washed with tap water, then with distilled water, then dried at ٧٠ °C and digested using H_2SO_4 and H_2O_2 (Chapman and Pratt, ١٩٦٥). The digested solutions percentages of N, P, K, Mg and Ca as well as leaf contents of Fe, Zn, Mn and Cu (ppm) on dry weight basis were determined using the procedures that outlined by Chapman and Pratt (١٩٦٥) and Wilde *et al*. (١٩٨٥). Plant pigments namely chlorophylls a & b and total chlorophylls as well as total carotenoids in the fresh leaves were determined (mg/ ١٠٠ g. F.W), then total chlorophylls were estimated (mg/ ١٠٠ g. F.W) according to the procedures outlined by Wettstein (١٩٥٧).

Harvesting was carried out during the regular commercial harvesting time under Minia Governorate conditions (١st week of April) in both seasons when T.S.S/ acid reached at least ٨: ١. Yield was expressed in number of fruits and weight (kg.) per tree. 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), total and reducing sugars using Lane and Eynon (١٩٦٥) volumetric method that outlined in A.O.A.C, (١٩٩٥) and vitamin C content (as mg ascorbic acid/ ١٠٠ ml juice) as reported in (A.O.A.C, ١٩٩٥).

All the obtained data were tabulated and statistically analyzed according to the procedure of **Gomez and Gomez (١٩٨٤).** The individual comparisons among the ten treatments were compared by using new L.S.D test at ٠.٠٥ %.

RESULTS AND DISCUSSION

١- Leaf area and different nutrients and plant pigments in the leaves:

It is clear from the data in Tables (١ & ٢) that single and combined applications of the three substances namely vitamins A + E + K each at ١٠ ppm, salicylic acid (SA) at ١٠٠ ppm and turmeric extract at ١٠٠٠ ppm were significantly increased the leaf area and leaf content of N, P, K, Mg, Ca, Zn, Fe, Mn, Cu and plant pigments (chlorophylls a & b, total chlorophylls and total carotenoids) in comparison to the check treatment. The promotion was associated with using vitamins A + E + K, salicylic acid and turmeric extract, in ascending order. Combined applications of these substances were significantly superior than using each compound alone in this respect. Triple application showed a positive effect than using double one in this respect. The maximum values were recorded on the trees that sprayed four times with all substances. The lowest values were recorded on the untreated trees. Similar trend was noticed during both seasons.

The essential roles of vitamins, salicylic acid and turmeric on stimulating cell division, the biosynthesis of organic foods and the resistance of plants to all stresses (Rao *et al.*, ٢٠٠٠; Singh *et al.*, ٢٠٠١ and Alonso, ٢٠٠٤) could explain the present results.

These results are in approval with those obtained by Hamad (٢٠٠٨); Zagzog (٢٠٠٩) and Hegab and Hegab (٢٠١١) who worked on vitamins; Eshmawy (٢٠١٠); Saied (٢٠١١) and Ahmed (٢٠١١) who

worked on salicylic acid as well as Bruneton (٢٠١١) and Hanafy *et al*., (٢٠١٢) who worked on turmeric and other plant extracts.

Table ١: Effect of single and combined applications of vitamins, salicylic acid and turmeric extract on leaf area and its content of N, P, K, Mg, Ca and Mn of Valencia orange trees during ٢٠١١ and ٢٠١٢ seasons.

Vitamins, SA and turmeric	Leaf area (cm^2)		Leaf N %		Leaf P %		Leaf K %		Leaf Mg %		Leaf Ca %		Leaf Mn (ppm)	
	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢
Control	١٥.٠	١٥.٣	١.٨٠	١.٨٤	٠.١٦	٠.١٧	١.٣٠	١.٣١	٠.٣١	٠.٣٠	٢.٩٤	٢.٩٩	٢١.٢	٢١.٠
Vitamins A + E + K each at ١٠ ppm	١٥.٦	١٥.٩	١.٨٧	١.٩١	٠.١٩	٠.٢٠	١.٣٩	١.٤٤	٠.٣٥	٠.٣٥	٣.٠٤	٣.١٤	٢٢.٥	٢٢.٨
Salicylic acid at ١٠٠ ppm	١٦.٤	١٦.٦	١.٩٤	١.٩٩	٠.٢٣	٠.٢٣	١.٤٦	١.٥١	٠.٤١	٠.٤٢	٣.١٤	٣.٢٥	٢٣.٨	٢٤.١
Turmeric extract at ١٠٠٠ ppm	١٤.١	١٧.٤	٢.٠٠	٢.١٠	٠.٢٤	٠.٢٤	١.٥٥	١.٦٠	٠.٤٦	٠.٤٧	٣.٢٥	٣.٣٥	٢٤.٩	٢٥.٢
Vitamins + salicylic acid	١٧.٨	١٨.١	٢.١٠	٢.١٩	٠.٢٥	٠.٢٦	١.٦٤	١.٦٩	٠.٥١	٠.٥٢	٣.٣٦	٣.٤٧	٢٦.٠	٢٦.٣
Vitamins + turmeric extract	١٨.٥	١٨.٨	٢.٢٠	٢.٢٩	٠.٢٩	٠.٣٠	١.٧٣	١.٧٨	٠.٥٥	٠.٥٨	٣.٤٩	٣.٦٠	٢٧.١	٢٧.٥
Salicylic acid + turmeric extract	١٩.٠	١٩.٢	٢.٢٩	٢.٣٧	٠.٣٣	٠.٣٣	١.٨٠	١.٨٦	٠.٦٠	٠.٦١	٣.٦١	٣.٧٢	٢٨.٢	٢٨.٥
All substances	١٩.٤	١٩.٧	٢.٤١	٢.٤٥	٠.٣٦	٠.٣٧	١.٨٧	١.٩٢	٠.٦٥	٠.٦٨	٣.٧٢	٣.٨٤	٢٩.٣	٢٩.٦
New L.S.D at ٠.٠٥	٠.٤	٠.٥	٠.٠٥	٠.٠٥	٠.٠٣	٠.٠٣	٠.٠٦	٠.٠٦	٠.٠٤	٠.٠٤	٠.٠٩	٠.٠٩	١.٠	٠.٩

Table ٢: Effect of single and combined applications of vitamins, salicylic acid and turmeric extract on leaf content of Zn, Fe & Cu as well as plant pigments of Valencia orange trees during ٢٠١١ and ٢٠١٢ seasons.

Vitamins, SA and turmeric	Leaf Zn (ppm)		Leaf Fe (ppm)		Leaf Cu (ppm)		Chlorophyll a (mg/ ١٠٠ g. F.W)		Chlorophyll b (mg/ ١٠٠ g. F.W)		Total chlorophylls (mg/ ١٠٠ g. F.W)		Total carotenoids (mg/ ١٠٠ g. F.W.)	
	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢
Control	٢٥.٢	٢٧.٠	٤١.٠	٤١.٩	٢.٤	٢.٦	٥٠.١	٥٢.٠	٣١.٠	٣٢.٢	٨١.١	٨٤.٢	٢٨.٠	٢٨.٥
Vitamins A + E + K each at ١٠ ppm	٢٨.٠	٢٩.٩	٤٤.٥	٤٥.٤	٣.٠	٣.٢	٥٣.٥	٥٥.٥	٣٣.٣	٣٤.٥	٨٦.٨	٩٠.٠	٣٠.٠	٣٠.٧
Salicylic acid at ١٠٠ ppm	٣١.٠	٣٣.٠	٤٨.٠	٤٨.٨	٣.٧	٣.٩	٥٧.٠	٥٩.٢	٣٦.٠	٣٧.٣	٩٣.٠	٩٦.٥	٣١.٩	٣٢.٥
Turmeric extract at ١٠٠٠ ppm	٣٣.٩	٣٥.٨	٥١.٠	٥١.٨	٤.٥	٤.٧	٦٠.٠	٦٢.٠	٣٩.٠	٤٠.٥	٩٩.٠	١٠٢.٥	٣٤.٠	٣٤.٦
Vitamins + salicylic acid	٣٧.٩	٤٠.٠	٥٥.٠	٥٦.٠	٥.٠	٥.٢	٧٠.٠	٧١.٩	٤٢.٠	٤٣.٣	١١٢.٠	١١٥.٢	٣٥.٩	٣٦.٤
Vitamins + turmeric extract	٤١.٠	٤٣.٠	٥٩.٠	٦٠.٣	٥.٥	٥.٧	٧٤.٠	٧٦.٠	٤٤.٨	٤٦.٠	١١٨.٨	١٢٢.٠	٣٨.٢	٣٩.١
Salicylic acid + turmeric extract	٤٥.٠	٤٨.٠	٦٤.٠	٦٥.٣	٦.١	٦.٣	٧٧.٠	٧٩.٠	٤٧.٩	٥٠.٠	١٢٤.٩	١٢٩.٠	٤١.٠	٤١.٨
All substances	٥١.٠	٥١.٥	٧١.٠	٧٢.٨	٧.٢	٧.٥	٨٠.٠	٨٢.٠	٥٠.٠	٥٢.٣	١٣٠.٠	١٣٤.٣	٤٣.٠	٤٤.٠
New L.S.D at ٠.٠٥	٢.١	٢.٠	٢.٢	٢.٢	٠.٤	٠.٤	٢.٥	٢.٥	١.٩	٢.٠	٢.٧	٢.٨	١.٧	١.٨

٢- Yield/ tree:

Results of Table (٣) showed that yield expressed in number of fruits and weight (kg.) per tree was significantly improved in response to foliar application of vitamins A + E + K, salicylic acid and turmeric extract either alone or in all possible combinations comparing with the control treatment. Using vitamins A + E + K, salicylic acid and turmeric extract, was significantly followed by enhancing yield in

ascending order. Double and triple applications of these substances were preferable than using each substance alone in this respect. Triple application (i.e. using all substances together) of these substances was superior than using double one in this respect. The maximum yield expressed in weight (٦٠.٣ and ٦١.٠ kg) was recorded on the trees that received four sprays of vitamins A + E + K, salicylic acid and turmeric extract together during both seasons, respectively. The lowest values (٣٤ and ٣٤.٥ kg/ tree) during both seasons, respectively were recorded on untreated trees. Similar trend was noticed during both seasons.

The promotive effects of these stimulants on growth and tree nutritional status in favour of enhancing C/N ratio and producing higher number of flowers could result in improving the yield.

These results are in approval with those obtained by Hamad (٢٠٠٨); Zagzog (٢٠٠٩) and Hegab and Hegab (٢٠١١) who worked on vitamins; Eshmawy (٢٠١٠); Saied (٢٠١١) and Ahmed (٢٠١١) who worked on salicylic acid as well as Bruneton (٢٠١١) and Hanafy *et al*. (٢٠١٢) who worked on turmeric and other plant extracts.

٣- Some physical and chemical characteristics of the fruits:

Table (٣) reveals that single and combined applications of vitamins A + E + K each at ١٠ ppm, salicylic acid at ١٠٠ ppm and turmeric extract at ١٠٠٠ ppm significantly improved fruit quality in terms of increasing fruit weight, total soluble solids, total and reducing sugars and vitamin C content and decreasing total acidity rather than non- application. A significant promotion was observed on fruit quality in ascending order due to foliar application of vitamins A + E + K, salicylic acid and turmeric extract. Combined applications were favourable than using single ones in this respect. The best results with regard to fruit quality were obtained when the three stimulants were applied together. Untreated trees showed low on fruit quality. These results were similar during both seasons.

The beneficial effects of these stimulants on enhancing nutrients especially Mg, Zn, Fe and Cu as well as plant pigments often were accompanied with enhancing as well as promoting fruit quality.

Table ٣: Effect of single and combined applications of vitamins, salicylic acid and turmeric extract on yield/ tree (kg.) as well as some physical and chemical characteristics of fruits of Valencia orange trees during ٢٠١١ and ٢٠١٢ seasons.

Vitamins, SA and turmeric	Number of fruits/ tree		Yield/ Tree (kg.)		Fruit weight (g.)		T.S.S %		Total sugars %		Reducing sugars %		Total acidity %		Vitamin C (mg/ ١٠٠ ml juice)	
	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢	٢٠١١	٢٠١٢
Control	٢١١.٠	٢١٢.٠	٣٤.٠	٣٤.٥	١٦١.٠	١٦٢.٧	١١.٥	١١.٦	٧.١	٧.٢	٣.٠	٣.١	١.٤٣٠	١.٤٢٨	٤٠.٠	٤١.٨
Vitamins A + E + K each at ١٠ ppm	٢٢٠.٠	٢٢٢.٠	٣٧.٦	٣٨.٤	١٧١.٠	١٧٢.٨	١١.٨	١٢.٠	٧.٤	٧.٥	٣.٣	٣.٣	١.٤٠٠	١.٣٩١	٤٣.٠	٤٤.٧
Salicylic acid at ١٠٠ ppm	٢٢٩.٠	٢٣٣.٠	٤١.٧	٤٢.٨	١٨٢.٠	١٨٣.٨	١٢.٢	١٢.٣	٧.٧	٧.٨	٣.٥	٣.٦	١.٣٨١	١.٣٧٠	٤٤.٨	٤٦.٨
Turmeric extract at ١٠٠٠ ppm	٢٣٨.٠	٢٤١.٠	٤٥.٥	٤٦.٤	١٩١.٠	١٩٢.٧	١٢.٦	١٢.٨	٨.١	٨.٢	٣.٧	٣.٩	١.٣٦٠	١.٣٥٠	٤٧.٠	٤٨.٨
Vitamins + salicylic acid	٢٤١.٠	٢٤٤.٠	٤٨.٢	٤٩.٢	٢٠٠.٢	٢٠١.٥	١٣.٠	١٣.٢	٨.٤	٨.٥	٤.٠	٤.٢	١.٣٤١	١.٣٢٨	٤٨.٠	٤٩.٩
Vitamins + turmeric extract	٢٤٦.٠	٢٥٠.٠	٥١.٧	٥٣.٠	٢١٠.٠	٢١١.٩	١٣.٤	١٣.٥	٨.٦	٨.٧	٤.٢	٤.٦	١.٣٢٠	١.٣٠٠	٥٠.٠	٥١.٧
Salicylic acid + turmeric extract	٢٥٢.٠	٢٥٣.٠	٥٥.٢	٥٥.٩	٢١٩.٠	٢٢٠.٩	١٣.٦	١٣.٨	٨.٩	٩.٠	٤.٥	٤.٨	١.٣٠٠	١.٢٧٩	٥٢.٠	٥٣.٨
All substances	٢٦١.٠	٢٦٢.٠	٦٠.٣	٦١.٠	٢٣١.٠	٢٣٢.٧	١٤.١	١٤.٢	٩.٢	٩.٣	٤.٨	٥.٠	١.٢٨٠	١.٢٥٩	٥٣.٩	٥٥.٦
New L.S.D at ٠.٠٥	٨.١	٨.٠	٢.٥	٢.٢	٩.١	٩.٤	٠.٣	٠.٣	٠.٢	٠.٢	٠.٢	٠.٢	٠.٠١٩	٠.٠١٨	١.١	١.٢

These results are in harmony with those obtained by Hamad (٢٠٠٨); Zagzog (٢٠٠٩) and Hegab and Hegab (٢٠١١) who worked on vitamins; Eshmawy (٢٠١٠); Saied (٢٠١١) and Ahmed (٢٠١١) who worked on salicylic acid as well as Bruneton (٢٠١١) and Hanafy *et al*. (٢٠١٢) who worked on turmeric and other plant extracts.

As a conclusion, it is clear from the obtained data that treating Valencia orange trees grown under Minia region four times (at growth start, just after fruit setting and at two month intervals) with a mixture of vitamins A + E + K each at ١٠ ppm, salicylic acid at ١٠٠ ppm and turmeric extract at ١٠٠٠ ppm was responsible for promoting yield quantitively and qualitatively.

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Response of Valencia orange trees to foliar application

"استجابة أشجار البرتقال الفالنشيا للرش الورقي لبعض الفيتامينات وحامض السلسليك ومستخلص الفيتامينات"

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تم معاملة أشجار البرتقال الفالنشيا خلال موسمي ٢٠١١ ، ٢٠١٢ أربعة مرات بفيتامينات أ + هـ + ك بتركيز ١٠ جزء في المليون لكل منهم ، حامض السلسليك بتركيز ١٠٠ جزء في المليون ، مستخلص الكركم بتركيز ١٠٠٠ جزء في المليون إما بصورة فردية أو بجميع التوليفات المختلفة ولقد تم دراسة درجة استجابة مساحة الورقة ومحتواها من عناصر النيتروجين والفوسفور والبوتاسيوم والماغنيسيوم والكالسيوم (كنسبة مئوية)، الزنك والحديد والمنجنيز والنحاس (جزء في المليون) والصبغات النباتية وكمية المحصول والخصائص الطبيعية والكيميائية للثمار لهذه المعاملات.

كان الاستخدام الفردي والمشترك لهذه المواد فعالا جدا في تحسين مساحة الورقة والعناصر الغذائية في الورقة (نيتروجين – فوسفور – بوتاسيوم – ماغنيسيوم – كالسيوم ، الزنك ، الحديد ، المنجنيز ، النحاس) والصبغات النباتية (كلوروفيل أ، ب ، الكلوروفيل الكلي ، الكاروتينات الكلية) وكمية المحصول والخصائص الطبيعية والكيميائية للثمار وذلك بالمقارنة بمعاملة الكونترول وكان التحسن في هذه الصفات متعلقا باستخدام فيتامينات أ + هـ + ك، حامض السلسليك ، مستخلص الكركم مرتبة ترتيبا تنازليا.

لأجل تحسين كمية المحصول وخصائص الجودة للثمار في أشجار البرتقال الفالنشيا فإنه يقترح استخدام أربعة رشات من مخلوط يحتوى على فيتامينات أ + هـ + ك بتركيز ١٠ جزء في المليون لكل منهم جنبا إلى جنب مع حامض السلسليك بتركيز ١٠٠ جزء في المليون ومستخلص الكركم بتركيز ١٠٠٠ جزء في المليون.