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BENEFITS OF USING SOME VITAMINS ON THOMPSON SEEDLESS GRAPEVINE CV.

F. F. Ahmed; A. M. K. Abdel Aal and Rehab G. Ibrahiem

Hort. Dept., Fac. of Agric. Minia Univ. Egypt.

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ABSTRACT

The benefits of spraying the five vitamins namely K, E, A, C and B١٢ on Thompson seedless grapevines were investigated during ٢٠١٠ and ٢٠١١ seasons.

Results showed that single or combined applications of these vitamins was very effective in improving the leaf area, N and P as well as chlorophylls a &b in the leaves, yield and quality of the berries comparing with the check treatment. The promotion was associated with using vitamins K, E and A, in decreasing order. Using C vitamin surpassed the application of B١٢ vitamin in this respect. Combined application of C and B١٢ vitamins was superior than the application of each vitamin alone.

The best results with regard to yield and quality of Thompson seedless grapevines were obtained with using vitamins K, E, A, C and B١٢ three times at ١٠, ١٠, ١٠, ١٠٠٠ and ١٠ ppm, respectively.

INTRODUCTION

Improving physical and chemical characters of grape cv. Thompson seedless is considered an important target for grape growers in Minia region and other regions of Egypt. It could be

achieved through conducting new horticultural practices depend on using vitamins that safe for environment.

Vitamins have an auxinic action, since they have synergistic effect on growth, productivity and provided disease control against most fungi infection in most fruit trees. Their profitable effect on increasing shelf- life of fruits did not neglect (Prusky, ١٩٨٨; Galal and El- Sayed, ١٩٩٥ ; Rao *et al*., ٢٠٠٠; Ahmed and Seleem- Basma, ٢٠٠٨; El-Kady- Hanna, ٢٠١١; Refaai, ٢٠١١ and Uwakiem, ٢٠١١).

Recently, it was suggested that vitamins participate in plant growth and development indirectly by enhancing the endogenous levels of various growth factors such as 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. These studies have indicated that 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 and Tzeng and Devay, ١٩٨٩). Application of vitamins is accompanied with enhancing alpha keto glutaric acid biosynthesis which is united with ammonia to form amino acids and proteins (Robinson, ١٩٧٣; Karabanov, ١٩٧٧; Oretli, ١٩٨٧ and Buchala and Schmid, ١٩٩٧).

This study aimed to throw some lights on the effect of single and combined applications of some vitamins (K, E, A, $B_{١٢}$ and C) on vegetative growth characters, vine nutritional status, yield and quality of Thompson seedless grapes.

MATERIALS AND METHODS

This study was carried out during ٢٠١٠ and ٢٠١١ seasons on ninety- six uniform in vigour ١٦- years old head trained Thompson seedless grapevines grown in a private vineyard located at El-Faroukia village, Samalout district, Minia Governorate. The texture of the vineyard soil is silty clay and the soil is well drained and with a water table not less than two meters deep. Winter pruning during each season was conducted on the first week of Jan. by using head pruning

system leaving ٧٢ eyes (١٠ long fruiting spurs × six eyes plus six replacement spurs × two eyes). All the selected vines had the same vine load (٧٢ eyes) and planted at ٢.٠ × ٢.٠ m apart. Surface irrigation system was followed.

Except those dealing with the present treatments all the selected vines (٩٦ vines) received the usual horticultural practices which are common used in the vineyard.

This experiment included thirty- two treatments from two factors namely A& B. The first factor (A) included the following eight treatments from single and combined applications of three soluble in fats vitamins namely K, E and A.

a١) Spraying K, E and A vitamins each at ٠.٠ ppm.
a٢) Spraying K vitamins at ١٠ ppm.
a٣) Spraying E vitamins at ١٠ ppm.
a٤) Spraying A vitamins at ١٠ ppm.
a٥) Spraying K + E vitamins each at ١٠ ppm.
a٦) Spraying K + A vitamins each at ١٠ ppm.
a٧) Spraying E + A vitamins each at ١٠ ppm.
a٨) Spraying K + E + A vitamins each at ١٠ ppm.

The second factor (B) comprised from the following four treatments from single and combined applications of the two soluble in water vitamins namely $B_{١٢}$ and C:-

b١) Spraying C and $B_{١٢}$ vitamins each at ٠.٠ ppm.
b٢) Spraying C vitamin at ١٠٠٠ ppm.
b٣) Spraying $B_{١٢}$ vitamin at ١٠ ppm.
b٤) Spraying C + $B_{١٢}$ vitamins at ١٠٠٠ and ١٠ ppm, respectively.

Each treatment was replicated three times, one vine per each. These vitamins were sprayed three times during each season on (growth start) the second week of Mar., (just before bloom) the first week of April and (just after berry setting) the ٤^{th} week of April. All vitamins were solublized in ١٠ ml ethyl alcohol. Triton B as a wetting agent was added at ٠.٠٥ % to all the treatments including the control.

Spraying was done till the vines were covered completely with solutions (٢ liters/ vine).

Complete randomized block design in split plot arrangement was followed for statistical analysis of the present investigation. The eight vitamin K, E and A treatments occupied the main plots, while the four vitamins C and $B_{١٢}$ ranked the subplots.

At the first week of June, the leaf area (in $cm^{٢}$) was measured. by using the equation that outlined by Ahmed and Morsy (١٩٩٩).

Samples of five mature and fresh leaves from those leaves opposite to the basal clusters on each shoot were taken at the first week of May in both seasons to determine the plant pigments namely chlorophylls a and b as (mg/ ١٠٠g. Fresh weight).

Twenty leaves picked from those leaves opposite to the basal clusters (According to Balo *et al*., ١٩٨٨) for each vine were taken at the first week of May in both seasons to determine their content from N and P by different methods (according to Wilde *et al*., ١٩٨٥).

Harvesting took place when T.S.S./acid ratio in the berries of the check treatment reached at least ٢٥:١ (at the middle of July in both seasons) (according to Weaver, ١٩٧٦). The yield of each vine was recorded in terms of weight (in kg.) and number of clusters per vine.

Five clusters from each vine were taken at random for the determination of the following physical and chemical characteristics:-

١- Average berry weight (g.).
٢- Percentage of total soluble solids in the juice by using Handy refractometer.
٣- Percentage of total sugars in the juice by Lane and Eynon (١٩٦٥) volumetric method as described in A.O.A.C. (١٩٩٥).
٤- Percentage of total acidity (as g tartaric acid/ ١٠٠ ml juice) by titration against ٠.١ Na OH using phenolphthalein as an indicator (A.O.A.C., ١٩٩٥).

All the obtained data were tabulated and statistically analyzed using New L.S.D at ٥٪ for made all comparisons among the investigated treatment means (according to Mead *et al*., ١٩٩٣).

RESULTS AND DISCUSSION

١. Leaf area (cm^{٢})

It is clear from the obtained data in Table (١) that single and combined applications of the three vitamins namely K, E and A significantly were accompanied with enhancing the leaf area (cm^{٢}) rather than non- application (٠.٠ ppm vitamins). In descending order, application of vitamins K, E and A was significantly very effective in stimulating this growth character. Combined application (double and triple applications) was superior than application of each vitamin alone in this respect. Significant differences on the leaf area (cm^{٢}) were noticed among all vitamin treatments. The maximum values were recorded with using the three vitamins namely K, E and A together. The minimum values were recorded on untreated vines.

Table ١: Effect of spraying some vitamins on the leaf area (cm^{٢}) of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B$_{١٢}$ vitamins (B)									
	b$_{١}$ vit. at ٠.٠ ppm	b$_{٢}$ C vit. at ١٠٠٠ ppm	b$_{٣}$ B$_{١٢}$ vit at ١٠ ppm	b$_{٤}$ C+ B$_{١٢}$ vit.	Mean (A)	b$_{١}$ vit. at ٠.٠ ppm	b$_{٢}$ C vit. at ١٠٠٠ ppm	b$_{٣}$ B$_{١٢}$ vit at ١٠ ppm	b$_{٤}$ C+ B$_{١٢}$ vit.	Mean (A)
a$_{١}$ Vitamins at ٠.٠ ppm.	١٣٦.٠	١٣٩.٧	١٣٧.٧	١٤١.٨	١٣٨.٨	١٣٦.٨	١٤٠.٥	١٣٨.٦	١٤٢.٥	١٣٩.٦
a$_{٢}$ K vitamin at ١٠ ppm.	١٤٣.٣	١٤٧.٠	١٤٥.١	١٤٩.٠	١٤٦.١	١٤٤.٠	١٤٨.٠	١٤٦.٠	١٥٠.٠	١٤٧.٠
a$_{٣}$ E vitamin at ١٠ ppm.	١٤٠.٩	١٤٤.٨	١٤٢.٩	١٤٦.٩	١٤٣.٩	١٤١.٧	١٤٥.٧	١٤٣.٨	١٤٧.٧	١٤٤.٧
a$_{٤}$ A vitamin at ١٠ ppm.	١٣٨.٠	١٤٢.١	١٤٠.٠	١٤٤.١	١٤١.١	١٣٨.٩	١٤٢.٩	١٤١.٠	١٤٥.٠	١٤١.٩
a$_{٥}$ K + E vitamins.	١٥١.٩	١٥٦.١	١٥٤.٠	١٥٨.١	١٥٥.٠	١٥٢.٨	١٥٧.٠	١٥٤.٩	١٥٩.٠	١٥٥.٩
a$_{٦}$ K + A vitamins.	١٤٩.١	١٥٣.١	١٥١.٠	١٥٥.١	١٥٢.١	١٤٩.٨	١٥٣.٩	١٥١.٩	١٥٥.٩	١٥٢.٩
a$_{٧}$ E + A vitamins.	١٤٦.١	١٥٠.٠	١٤٨.٠	١٥٢.١	١٤٩.٠	١٤٥.٧	١٤٩.٩	١٤٧.٨	١٥١.٨	١٤٨.٨
a$_{٨}$ K + E + A Vitamins.	١٥٤.٦	١٥٨.٦	١٥٦.٧	١٦٣.٩	١٥٨.٤	١٥٥.٥	١٦٠.٠	١٥٨.٠	١٦٤.٠	١٥٩.٤
Mean (B)	١٤٤.٩	١٤٨.٩	١٤٦.٩	١٥١.٤		١٤٥.٦	١٤٩.٧	١٤٧.٧	١٥١.٩	
	A	B	AB			A	B	AB		

New L.S.D at ٥ %	١.٨	١.٥	٤.٢	١.٥	١.٣	٣.٧

It is evident from the obtained data in Table (١) that application of vitamins C and/ or $B_{١٢}$ significantly stimulated the leaf area ($cm^{٢}$) in relative to the control treatment. Single application of vitamin C was preferable than using vitamin $B_{١٢}$ alone in this respect. Combined application of vitamins C and $B_{١٢}$ was superior than using each vitamin alone in enhancing the leaf area ($cm^{٢}$).

The interaction between different vitamins namely K, E, A, C and $B_{١٢}$ had significant effect on the leaf area. The maximum values were recorded with using the five vitamins namely K, E, A, C and $B_{١٢}$ together. Untreating the vines with these vitamins gave the minimum values.

The promoting effect of these vitamins on growth characters might be attributed to one or more of the following reasons (according to Elade, ١٩٩٢; Sharma and Davis, ١٩٩٧ and Singh *et al*., ٢٠٠١),

١- They are responsible for stimulating rooting and reversing the effect of ABA on leaf abscission.
٢- They are provided disease control against most fungi and caused a prolongation in shelf- life of plant organs.
٣- They play an essential roles in building of most organic foods, biosynthesis of proteins and amino acids, synthesis of plant pigments and enhancing nutrient uptake.
٤- They are favourable for enhancing the formation of meristems through supplying of metabolites to the apex.
٥- They are important in enhancing the endogenous levels of various growth factors such as IAA, GA٣ and cytokinins.
٦- They act as the coenzymes for many enzymes that aid in promoting photosynthesis.

These results are in harmony with those obtained by Refaai (٢٠١١) and Uwakiem (٢٠١١) on Thompson seedless grapevines.

٢.Chlorophylls A and B in the leaves

Plant pigments namely chlorophylls a and b were significantly promoted with foliar application of vitamins K, E

and/ or A either applied alone or in different combinations comparing with the check treatment as shown in Tables (٢ & ٣).

Significant differences on these plant pigments were observed among all vitamin treatments. The best vitamins in this respect were A, E and K, in ascending order. Combined applications of these vitamins were superior than application of each vitamin alone in this connection. The best double application was using vitamins K + E. Using the three vitamins together gave the maximum values of such two pigments. Untreating the vines with these vitamins effectively minimized these pigments.

Table ٢: Effect of spraying some vitamins on chlorophyll a in the fresh leaves (mg/ ١٠٠ g F.W) of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B_{12} vitamins (B)									
	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)
a_1 Vitamins at ٠.٠ ppm.	١٩.٩	٢١.٣	٢٠.٧	٢٢.٣	٢١.٠	٢٠.٠	٢١.٩	٢٠.٩	٢٢.٩	٢١.٤
a_2 K vitamin at ١٠ ppm.	٢٢.٧	٢٤.١	٢٣.٤	٢٥.٠	٢٣.٨	٢٣.٣	٢٥.٢	٢٤.٢	٢٦.٣	٢٤.٧
a_3 E vitamin at ١٠ ppm.	٢١.٧	٢٣.١	٢٢.٤	٢٤.٠	٢٢.٨	٢٢.١	٢٤.٠	٢٣.٠	٢٥.٠	٢٣.٥
a_4 A vitamin at ١٠ ppm.	٢٠.٨	٢٢.٢	٢١.٥	٢٣.٠	٢١.٩	٢١.٠	٢٢.٩	٢١.٩	٢٣.٩	٢٢.٤
a_5 K + E vitamins.	٢٦.١	٢٧.٥	٢٦.٨	٢٨.٦	٢٧.٢	٢٦.٦	٢٨.٧	٢٧.٦	٢٩.٩	٢٨.٢
a_6 K + A vitamins.	٢٥.٠	٢٦.٥	٢٥.٨	٢٧.٥	٢٦.٢	٢٥.٥	٢٧.٥	٢٦.٥	٢٨.٦	٢٧.٠
a_7 E + A vitamins.	٢٣.٨	٢٥.١	٢٤.٥	٢٦.١	٢٤.٩	٢٤.٤	٢٦.٤	٢٥.٤	٢٧.٥	٢٥.٩
a_8 K + E + A Vitamins.	٢٧.٠	٢٨.٦	٢٧.٨	٣٠.٦	٢٨.٥	٢٧.٨	٢٩.٩	٢٨.٨	٣٢.١	٢٩.٦
Mean (B)	٢٣.٤	٢٤.٨	٢٤.١	٢٥.٩		٢٣.٨	٢٥.٨	٢٤.٨	٢٧.٠	
New L.S.D at ٥ %	A		B		AB	A		B		AB
	٠.٨		٠.٦		١.٧	٠.٩		٠.٧		٢.٠

Single and combined applications of vitamins C and B_{12} caused significant promotion on the two plant pigments comparing with non- application. Application of vitamin C surpassed the application of vitamin B_{12} in this respect. Combined application of vitamins C and B_{12} was preferable than using each vitamin alone in enhancing plant pigments. The check vines produced the minimum values.

Table ٣: Effect of spraying some vitamins on chlorophyll b in the fresh leaves (mg/ ١٠٠ g F.W) of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B_{12} vitamins (B)									
	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)
a_1 Vitamins at ٠.٠ ppm.	٧.١	٨.١	٧.٦	٨.٨	٧.٩	٧.٤	٨.٤	٧.٩	٩.١	٨.٢
a_2 K vitamin at ١٠ ppm.	٩.٠	١٠.١	٩.٥	١٠.٨	٩.٨	٩.٣	١٠.٤	٩.٨	١١.١	١٠.١
a_3 E vitamin at ١٠ ppm.	٨.٢	٩.٢	٨.٧	٩.٩	٩.٠	٨.٥	٩.٥	٩.١	١٠.٠	٩.٣
a_4 A vitamin at ١٠ ppm.	٧.٦	٨.٧	٨.١	٩.٤	٨.٤	٧.٩	٩.٠	٨.٥	٩.٨	٨.٧
a_5 K + E vitamins.	١٠.٦	١١.٦	١١.١	١٢.٣	١١.٤	١٠.٩	١١.٩	١١.٤	١٢.٦	١١.٧
a_6 K + A vitamins.	١٠.١	١١.١	١٠.٦	١١.٨	١٠.٩	١٠.٤	١١.٤	١٠.٩	١٢.١	١١.٢
a_7 E + A vitamins.	٩.٥	١٠.٧	١٠.١	١١.٥	١٠.٤	٩.٩	١١.١	١٠.٤	١١.٩	١٠.٨
a_8 K + E + A Vitamins.	١١.٢	١٢.٤	١١.٧	١٣.٩	١٢.٣	١١.٥	١٢.٨	١٢.١	١٤.٥	١٢.٧
Mean (B)	٩.٢	١٠.٢	٩.٧	١١.٠		٩.٥	١٠.٦	١٠.٠	١١.٤	
New L.S.D at ٥ %	A	B	AB			A	B	AB		
	٠.٥	٠.٤	١.١			٠.٦	٠.٤	١.١		

The interaction between various vitamins had significant effect on plant pigments. The two plant pigments were maximized with using all vitamins together. The lowest values were recorded on untreated with vitamin vines.

The benefits of spraying vitamins on thompson seedless grapevine

The essential role of these vitamins in enhancing the uptake of N and Mg could result in enhancing plant pigments (Oretili, ١٩٨٧).

The same trend was observed in Thompson seedless grapevines by Ahmed and Seleem- Basma (٢٠٠٨); Refaai (٢٠١١) and Uwakiem (٢٠١١)

٣. Percentages of N and P in the leaves:

It is clear from the data in Tables (٤ & ٥) that percentages of N and P in the leaves were significantly affected with varying vitamin treatments. They were significantly stimulated with using vitamins K, E and A either singly or in all possible combinations rather than non- application. Using vitamins K, E and A, in descending order was significantly very effective in stimulating the percentages of N and P in the leaves. Combined applications of these vitamins were superior than using each vitamin alone in increasing these nutrients. The maximum values were recorded on the vines that received all vitamins together.

Table ٤: Effect of spraying some vitamins on the percentage of N in the leaves of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B_{12} vitamins (B)									
	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)
a_1 Vitamins at ٠.٠ ppm.	١.٥٩	١.٧٥	١.٦٧	١.٨٤	١.٧١	١.٦٠	١.٧٧	١.٦٨	١.٨٧	١.٧٣
a_2 K vitamin at ١٠ ppm.	١.٨٦	٢.٠١	١.٩٤	٢.٠٩	١.٩٧	١.٨٨	٢.٠٣	١.٩٥	٢.١٢	١.٩٩
a_3 E vitamin at ١٠ ppm.	١.٧٩	١.٩٤	١.٨٦	٢.٠٥	١.٩١	١.٨١	١.٩٦	١.٨٧	٢.٠٨	١.٩٣
a_4 A vitamin at ١٠ ppm.	١.٦٨	١.٨٤	١.٧٦	١.٩٤	١.٨٠	١.٧٠	١.٨٦	١.٧٧	١.٩٧	١.٨٢
a_5 K + E vitamins.	٢.١٢	٢.٢٩	٢.٢٠	٢.٣٩	٢.٢٥	٢.١٤	٢.٣١	٢.٢٠	٢.٤٢	٢.٢٦
a_6 K + A vitamins.	٢.٠٤	٢.٢٠	٢.١٢	٢.٣٠	٢.١٦	٢.٠٦	٢.٢١	٢.١٣	٢.٣٣	٢.١٨
a_7 E + A vitamins.	١.٩٥	٢.١١	٢.٠٣	٢.٢١	٢.٠٧	١.٩٧	٢.١٣	٢.٠٥	٢.٢٣	٢.٠٩
a_8 K + E + A Vitamins.	٢.٢١	٢.٤١	٢.٣٠	٢.٦٣	٢.٣٨	٢.٢٣	٢.٤٣	٢.٣٠	٢.٧١	٢.٤١
Mean (B)	١.٩٠	٢.٠٦	١.٩٨	٢.١٨		١.٩٢	٢.٠٨	١.٩٩	١.٩٨	
	A	B	AB			A	B	AB		
New L.S.D at ٥ %	٠.٠٧	٠.٠٦	٠.١٧			٠.٠٦	٠.٠٥	٠.١٤		

Single and combined applications of vitamins C and B_{12} significantly was accompanied with enhancing percentages of N

and P in the leaves rather than non- application. Application of vitamin C surpassed the application of vitamin B_{12} in this connection. Combined application of both vitamins (C& B_{12}) was accompanied with maximizing these nutrients comparing with using each vitamin alone.

Table ٥: Effect of spraying some vitamins on the percentage of P in the leaves of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B_{12} vitamins (B)									
	b_1 B_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)	b_1 B_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)
a_1 Vitamins at ٠.٠ ppm.	٠.١١	٠.١٥	٠.١٣	٠.١٨	٠.١٤	٠.١٢	٠.١٧	٠.١٥	٠.٢٠	٠.١٦
a_2 K vitamin at ١٠ ppm.	٠.١٨	٠.٢٣	٠.٢٠	٠.٢٥	٠.٢١	٠.٢٠	٠.٢٤	٠.٢٢	٠.٢٥	٠.٢٣
a_3 E vitamin at ١٠ ppm.	٠.١٦	٠.٢١	٠.١٨	٠.٢٣	٠.١٩	٠.١٨	٠.٢٢	٠.١٩	٠.٢٤	٠.٢١
a_4 A vitamin at ١٠ ppm.	٠.١٣	٠.١٨	٠.١٥	٠.٢٠	٠.١٦	٠.١٥	٠.٢٠	٠.١٧	٠.٢٢	٠.١٨
a_5 K + E vitamins.	٠.٢٥	٠.٣٠	٠.٢٧	٠.٣١	٠.٢٨	٠.٢٧	٠.٣٢	٠.٢٩	٠.٣٥	٠.٣٠
a_6 K + A vitamins.	٠.٢٢	٠.٢٩	٠.٢٦	٠.٣٠	٠.٢٧	٠.٢٤	٠.٣١	٠.٢٨	٠.٣٢	٠.٢٩
a_7 E + A vitamins.	٠.٢٠	٠.٢٤	٠.٢٢	٠.٢٦	٠.٢٣	٠.٢٢	٠.٢٦	٠.٢٤	٠.٢٨	٠.٢٥
a_8 K + E + A Vitamins.	٠.٢٧	٠.٣٣	٠.٣٠	٠.٣٩	٠.٣٢	٠.٣٠	٠.٣٤	٠.٣٢	٠.٣٩	٠.٣٤
Mean (B)	٠.١٩	٠.٢٤	٠.٢١	٠.٢٦		٠.٢١	٠.٢٥	٠.٢٣	٠.٢٨	
	A	B	AB			A	B	AB		
New L.S.D at ٥ %	٠.٠٢	٠.٠٢	٠.٠٦			٠.٠٢	٠.٠٢	٠.٠٦		

The investigated interaction between different vitamins had significant effect on the percentages of N and P in the leaves. The maximum values were recorded with using all vitamins together. The minimum values were obtained with the neglection of using these vitamins.

The essential role of these vitamins in enhancing root development, nutrients uptake and plant pigments formations surely reflected on increasing nutrients in the leaves (Robinson, ١٩٧٣; Oretili, ١٩٨٧ and Tzeng and Devay, ١٩٨٩).

The same trend was observed in Thompson seedless grapevines by Ahmed and Seleem- Basma (٢٠٠٨); Refaai (٢٠١١); Uwakiem (٢٠١١) and El Kady- Hanna (٢٠١١).

٤. The yield

It is clear from the data in Tables (٦ & ٧) that single and combined applications of vitamins K, E and A significantly were accompanied with improving the yield expressed in number of clusters per vine and weight (kg.) comparing with non-application. Number of clusters/ vine in the first season of study did not significantly affect with the present vitamin treatments. Foliar application of A, E and K, in ascending order was significantly very effective in improving the yield. Combined application of these vitamins was favourable than using each vitamins alone in improving the yield.

Table ٦: Effect of spraying some vitamins on the number of clusters per vine of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B_{12} vitamins (B)									
	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)
a_1 Vitamins at ٠.٠ ppm.	١٨.٠	١٩.٠	١٩.٠	٢٠.٠	١٩.٠	١٩.٠	٢١.٠	٢٠.٠	٢٢.٠	٢٠.٥
a_2 K vitamin at ١٠ ppm.	١٩.٠	٢٠.٠	١٩.٠	٢٠.٠	١٩.٥	٢٠.٠	٢٢.٠	٢١.٠	٢٣.٠	٢١.٥
a_3 E vitamin at ١٠ ppm.	١٩.٠	٢٠.٠	١٩.٠	٢٠.٠	١٩.٥	٢٠.٠	٢٢.٠	٢١.٠	٢٣.٠	٢١.٥
a_4 A vitamin at ١٠ ppm.	١٩.٠	٢٠.٠	١٩.٠	٢٠.٠	١٩.٥	٢٠.٠	٢٢.٠	٢١.٠	٢٣.٠	٢١.٥
a_5 K + E vitamins.	١٩.٠	٢٠.٠	١٩.٠	٢٠.٠	١٩.٥	٢١.٠	٢٢.٠	٢٢.٠	٢٤.٠	٢٢.٢
a_6 K + A vitamins.	١٩.٠	٢٠.٠	١٩.٠	٢٠.٠	١٩.٥	٢١.٠	٢٢.٠	٢٢.٠	٢٣.٠	٢٢.٠
a_7 E + A vitamins.	١٩.٠	٢٠.٠	١٩.٠	٢٠.٠	١٩.٥	٢١.٠	٢٢.٠	٢٢.٠	٢٣.٠	٢٢.٠
a_8 K + E + A Vitamins.	١٩.٠	٢٠.٠	١٩.٠	٢٠.٠	١٩.٥	٢٢.٠	٢٤.٠	٢٣.٠	٢٤.٠	٢٣.٢
Mean (B)	١٨.٩	١٩.٩	١٩.٠	٢٠.٠		٢٠.٥	٢٢.١	٢١.٥	٢٣.١	
New L.S.D at ٥ %	A		B		AB	A		B		AB
	NS		NS		NS	١.٠		١.٠		٢.٥

Application of vitamins C and/ or B_{12} significantly was followed by improving the yield expressed in number of clusters

per vine and weight (kg.) rather than non- application. Application of vitamin C was preferable than using vitamin B_{12} in improving the yield. Combined application of vitamins C and B_{12} was favourable in improving the yield than using each vitamin alone. The present treatment had significant effect on number of clusters per vine in the first season of study.

Table ٧: Effect of spraying some vitamins on the yield/ vine (kg.) of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B_{12} vitamins (B)									
	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	B_4 C+ B_{12} vit.	Mean (A)	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)
a_1 Vitamins at ٠.٠ ppm.	٤.٩	٥.٨	٥.٥	٦.٢	٥.٦	٥.٢	٦.٥	٥.٩	٦.٩	٦.١
a_2 K vitamin at ١٠ ppm.	٦.٠	٧.١	٦.٤	٧.١	٦.٦	٦.٤	٧.٨	٧.١	٨.٣	٧.٤
a_3 E vitamin at ١٠ ppm.	٥.٩	٦.٩	٦.٣	٧.٠	٦.٥	٦.٣	٧.٧	٧.٠	٨.١	٧.٣
a_4 A vitamin at ١٠ ppm.	٥.٥	٦.٧	٦.٠	٦.٨	٦.٢	٥.٩	٧.٤	٦.٧	٧.٨	٦.٩
a_5 K + E vitamins.	٦.٨	٧.٩	٧.٢	٨.٠	٧.٥	٧.٦	٨.٥	٨.٤	٩.٤	٨.٥
a_6 K + A vitamins.	٦.٧	٨.٠	٧.١	٨.١	٧.٥	٧.٥	٨.٤	٨.٣	٨.٨	٨.٢
a_7 E + A vitamins.	٦.٤	٧.٤	٦.٧	٧.٥	٧.٠	٧.١	٨.٢	٧.٨	٨.٦	٧.٩
a_8 K + E + A Vitamins.	٧.٢	٨.٣	٧.٦	٨.٤	٧.٩	٨.٥	٩.٣	٨.٩	٩.٤	٩.٠
Mean (B)	٦.٢	٧.٣	٦.٦	٧.٤		٦.٨	٧.٩	٧.٥	٨.٤	
New L.S.D at ٥ %	**A**		**B**		**AB**	**A**		**B**		**AB**

It is evident from the obtained data that the investigated interaction had no significant effect on the number of clusters per vine in the first season of study. Treating the vines with all vitamins (A, E, K, C and B_{12}) gave the maximum yield (٨.٤ and ٩.٤ kg during both seasons, respectively). The lowest values (٤.٩ and ٥.٢ kg during both seasons, respectively) were observed on untreated vines.

These results regarding the promoting effect of these vitamins on the yield are mainly attributed to their positive action

on the biosynthesis of organic foods especially carbohydrates as well as their major effects on stimulating growth characters and the availability of different nutrients in favour of producing healthy plants greatly able to produce higher yields. These results are in agreement with those obtained by Refaai (٢٠١١); Uwakiem (٢٠١١) and El- Kady- Hanaa (٢٠١١).

٥. Physical and chemical characteristics of the berries:

It is clear from the data in Tables (٨ & ٩ &١٠ & ١١) that using the three vitamins namely A, E and K either singly or in all possible combinations significantly resulted in improving quality of the berries in terms of increasing berry weight (g), total soluble solids % and total sugars % and reducing acidity % rather than non- application.

Table ٨: Effect of spraying some vitamins on the average berry weight (g.) of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B_{12} vitamins (B)									
	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)
a_1 Vitamins at ٠.٠ ppm.	١.٤٧	١.٦١	١.٥٤	١.٧٠	١.٦٠	١.٤٨	١.٦٤	١.٥٦	١.٧١	١.٦٠
a_2 K vitamin at ١٠ ppm.	١.٧١	١.٨٦	١.٧٩	١.٩٦	١.٨٠	١.٧٢	١.٨٨	١.٨٠	١.٩٥	١.٨٠
a_3 E vitamin at ١٠ ppm.	١.٦٤	١.٧٨	١.٧١	١.٨٨	١.٧٠	١.٦٥	١.٨١	١.٧٣	١.٨٨	١.٨٠
a_4 A vitamin at ١٠ ppm.	١.٥٥	١.٦٩	١.٦٢	١.٧٩	١.٦٠	١.٥٥	١.٧١	١.٦٣	١.٧٨	١.٧٠
a_5 K + E vitamins.	١.٩١	٢.٠٥	١.٩٨	٢.١٥	٢.٠٢	١.٩٢	٢.٠٩	٢.٠١	٢.١٦	٢.٠٤
a_6 K + A vitamins.	١.٨٥	١.٩٩	١.٩٢	٢.٠٩	١.٩٠	١.٨٦	٢.٠٢	١.٩٤	٢.٠٨	١.٩٠
a_7 E + A vitamins.	١.٧٨	١.٩٢	١.٨٥	٢.٠٢	١.٩٠	١.٨٠	١.٩٦	١.٨٨	٢.٠٢	١.٩٠
a_8 K + E + A Vitamins.	٢.٠٠	٢.١٥	٢.٠٧	٢.٣٣	٢.١٠	٢.٠١	٢.١٥	٢.٠٩	٢.٣٤	٢.١٠
Mean (B)	١.٧	١.٩	١.٨	١.٩		١.٧	١.٩	١.٨	١.٩	
	A	B	AB			A	B	AB		
New L.S.D at ٥ %	٠.٠٧	٠.٠٦	٠.١٧			٠.٠٧	٠.٠٦	٠.١٧		

The promotion on fruit quality was associated with using vitamins A, E and K, in ascending order. Combined applications of these vitamins was preferable than using each vitamin alone in

improving both physical and chemical characteristics. The best results were obtained with using vitamins A, E and K together. Unfavourable effects on quality of the berries were obtained on untreated vines.

Table ٩: Effect of spraying some vitamins on the percentage of total soluble solids in the grapes of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B_{12} vitamins (B)									
	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)
a_1 Vitamins at ٠.٠ ppm.	١٨.٠	١٨.٦	١٨.٣	١٩.٠	١٨.٤	١٨.٠	١٨.٧	١٨.٤	١٩.١	١٨.٥
a_2 K vitamin at ١٠ ppm.	١٩.٠	١٩.٦	١٩.٣	٢٠.٠	١٩.٤	١٩.١	١٩.٧	١٩.٤	٢٠.١	١٩.٥
a_3 E vitamin at ١٠ ppm.	١٨.٦	١٩.٣	١٩.٠	١٩.٧	١٩.١	١٨.٧	١٩.٣	١٩.١	١٩.٨	١٩.٢
a_4 A vitamin at ١٠ ppm.	١٨.٣	١٨.٨	١٨.٥	١٩.٢	١٨.٦	١٨.٤	١٨.٨	١٨.٥	١٩.٢	١٨.٧
a_5 K + E vitamins.	٢٠.٠	٢٠.٦	٢٠.٣	٢١.٠	٢٠.٤	٢٠.٠	٢٠.٦	٢٠.٤	٢١.٠	٢٠.٥
a_6 K + A vitamins.	١٩.٧	٢٠.٣	٢٠.٠	٢٠.٦	٢٠.١	١٩.٨	٢٠.٣	٢٠.٠	٢٠.٦	٢٠.١
a_7 E + A vitamins.	١٩.٤	٢٠.٠	١٩.٧	٢٠.٣	١٩.٨	١٩.٥	٢٠.٠	١٩.٨	٢٠.٣	١٩.٩
a_8 K + E + A Vitamins.	٢٠.٣	٢٠.٩	٢٠.٦	٢١.٣	٢٠.٧	٢٠.٤	٢١.٠	٢٠.٧	٢١.٤	٢٠.٩
Mean (B)	١٩.٢	١٩.٨	١٩.٥	٢٠.١		١٩.٢	١٩.٨	١٩.٥	٢٠.٢	
New L.S.D at ٥ %	A: ٠.٣	B: ٠.٢	AB: ٠.٦			A: ٠.٣	B: ٠.٢	AB: ٠.٦		

Single and combined applications of vitamins C and B_{12} was significantly very effective in improving quality of the berries comparing with the check treatment. The promotion was associated with using both vitamins together rather than using each vitamin alone. The best results were recorded when both vitamins were applied together. Unfavourable effects on quality of the berries were observed on untreated vines.

The studied interaction had significant effect on both physical and chemical characteristics of the berries. Treating the vines with all vitamins gave the best results with regard to quality of the berries during ٢٠١٠ and ٢٠١١ seasons.

The benefits of spraying vitamins on thompson seedless grapevine

Table ١٠: Effect of spraying some vitamins on the percentage of total acidity in the grapes of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or B_{12} vitamins (B)									
	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)	b_1 vit. at ٠.٠ ppm	b_2 C vit. at ١٠٠٠ ppm	b_3 B_{12} vit at ١٠ ppm	b_4 C+ B_{12} vit.	Mean (A)
a_1 Vitamins at ٠.٠ ppm.	٠.٧١٠	٠.٦٧٣	٠.٦٩٠	٠.٦٥٣	٠.٦٨١	٠.٧٠٤	٠.٦٧٠	٠.٦٨٥	٠.٦٥٠	٠.٦٧٧
a_2 K vitamin at ١٠ ppm.	٠.٦٤٨	٠.٦١٠	٠.٦٢٧	٠.٥٩٠	٠.٦١٨	٠.٦٤٢	٠.٦٠٧	٠.٦٢٢	٠.٥٨٧	٠.٦١٤
a_3 E vitamin at ١٠ ppm.	٠.٦٧٠	٠.٦٣٣	٠.٦٥٠	٠.٦١٢	٠.٦٤١	٠.٦٦٤	٠.٦٣٠	٠.٦٤٥	٠.٦٠٩	٠.٦٣٧
a_4 A vitamin at ١٠ ppm.	٠.٦٩٠	٠.٦٥٢	٠.٦٧٠	٠.٦٣١	٠.٦٦٠	٠.٦٨٤	٠.٦٤٩	٠.٦٦٥	٠.٦٢٧	٠.٦٥٦
a_5 K + E vitamins.	٠.٥٨١	٠.٥٤٤	٠.٥٦١	٠.٥٢٤	٠.٥٥٢	٠.٥٧٧	٠.٥٤١	٠.٥٥٥	٠.٥٢١	٠.٥٤٨
a_6 K + A vitamins.	٠.٦٠٠	٠.٥٦٤	٠.٥٨١	٠.٦٤٤	٠.٥٩٧	٠.٥٩٦	٠.٥٦٠	٠.٥٧٦	٠.٦٤١	٠.٥٩٣
a_7 E + A vitamins.	٠.٦٢٧	٠.٥٩٠	٠.٦٠٧	٠.٥٧٠	٠.٥٩٨	٠.٦٢١	٠.٥٨٥	٠.٦٠٢	٠.٥٦٧	٠.٥٩٤
a_8 K + E + A Vitamins.	٠.٥٦١	٠.٥٢٤	٠.٥٤١	٠.٥٠١	٠.٥٣٢	٠.٥٥٥	٠.٥٢٠	٠.٥٣٦	٠.٤٩٧	٠.٥٢٧
Mean (B)	٠.٦٣	٠.٥٩	٠.٦١	٠.٥٩		٠.٦٣	٠.٥٩	٠.٦١	٠.٥٨	

	٥	٨	٥	٠		٠	٥	١	٧	
	A		B		AB	A		B		AB
New L.S.D at ٥ %	٠.٠١٨		٠.٠١٦		٠.٠٤٥	٠.٠١٩		٠.٠١٤		٠.٠٤٠

The essential role of vitamins on the biosynthesis of sugars and plant pigments explained the present results.

Similar results were obtained by Ahmed and Seleem-Basma (٢٠٠٨); Refaai (٢٠١١); Uwakiem (٢٠١١) and El- Kady-Hanaa (٢٠١١) on Thompson seedless grapes.

Table ١١: Effect of spraying some vitamins on the percentage of total sugars in the grapes of Thompson seedless grapevines during ٢٠١٠ and ٢٠١١ seasons.

K, E and/ or A vitamins (A)	٢٠١٠					٢٠١١				
	C and/ or $B_{١٢}$ vitamins (B)									
	$b_١$ vit. at ٠.٠ ppm	$b_٢$ C vit. at ١٠٠٠ ppm	$b_٣$ $B_{١٢}$ vit at ١٠ ppm	$b_٤$ C+ $B_{١٢}$ vit.	Mean (A)	$b_١$ vit. at ٠.٠ ppm	$b_٢$ C vit. at ١٠٠٠ ppm	$b_٣$ $B_{١٢}$ vit at ١٠ ppm	$b_٤$ C+ $B_{١٢}$ vit.	Mean (A)
$a_١$ Vitamins at ٠.٠ ppm.	١٦.٢	١٦.٧	١٦.٤	١٦.٩	١٦.٥	١٦.٤	١٦.٩	١٦.٧	١٧.٣	١٦.٨
$a_٢$ K vitamin at ١٠ ppm.	١٧.٠	١٧.٦	١٧.٣	١٧.٨	١٧.٤	١٧.٢	١٧.٨	١٧.٧	١٨.٢	١٧.٧
$a_٣$ E vitamin at ١٠ ppm.	١٦.٨	١٧.٤	١٧.١	١٧.٦	١٧.٢	١٧.٠	١٧.٦	١٧.٤	١٨.٠	١٧.٥
$a_٤$ A vitamin at ١٠ ppm.	١٦.٥	١٧.١	١٦.٨	١٧.٣	١٦.٩	١٦.٧	١٧.٣	١٧.١	١٧.٧	١٧.٢
$a_٥$ K + E vitamins.	١٧.٩	١٨.٥	١٨.٢	١٨.٨	١٨.٣	١٨.١	١٨.٧	١٨.٥	١٩.١	١٨.٦
$a_٦$ K + A vitamins.	١٧.٦	١٨.٣	١٨.٠	١٨.٥	١٨.١	١٧.٨	١٨.٥	١٨.٣	١٨.٩	١٨.٤
$a_٧$ E + A vitamins.	١٧.٣	١٨.٠	١٧.٦	١٨.٣	١٧.٨	١٧.٥	١٨.٣	١٨.٠	١٨.٧	١٨.١
$a_٨$ K + E + A Vitamins.	١٨.٣	١٩.٠	١٨.٦	١٩.٧	١٨.٩	١٨.٥	١٩.٣	١٨.٩	١٩.٨	١٩.١
Mean (B)	١٧.٢	١٧.٨	١٧.٥	١٨.١		١٧.٤	١٨.١	١٧.٨	١٨.٥	
	A		B		AB	A		B		AB
New L.S.D at ٥ %	٠.٣		٠.٢		٠.٦	٠.٣		٠.٢		٠.٦

Conclusion

Three sprays of vitamin mixture containing K, E, A, C and $B_{١٢}$ gave the beat results on yield and fruit quality of Thompson seedless grapevines.

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فوائد رش بعض الفيتامينات على العنب صنف طومسون سيدلس

فيصل فاضل احمد - احمد محمد كمال عبد العال - رحاب جمال إبراهيم
قسم البساتين– كلية الزراعة– جامعة المنيا– مصر

تم خلال موسمي ٢٠١٠، ٢٠١١ دراسة فوائد رش خمسة فيتامينات هي ك، هـ، أ، ج، ب١٢ على كرمات العنب طومسون سيدلس.

أشارت نتائج الدراسة الى أن الرش الفردي والمشترك لهذه الفيتامينات كان فعالا جدا فى تحسين مساحة الورقة ومحتوى الورقة من النيتروجين والفوسفور وكلوروفيل أ ، ب وكمية المحصول وخصائص الجودة للحبات وذلك بالمقارنة بمعاملة الكونترول وكان التحسن مرتبطا باستخدام فيتامينات ك، هـ ، أ مرتبة ترتيبا تنازليا ولقد تفوق استخدام فيتامين ج عن استخدام فيتامين ب ١٢ فى هذا الصدد وكان استخدام فيتامين ج مع فيتامين ب١٢ أفضل من استخدام كل فيتامين بمفردة.

أمكن الحصول على أفضل النتائج بخصوص كمية المحصول وجودة الحبات فى العنب طومسون سيدلس عند استخدام فيتامينات أ ، هـ ، ك، ج، ب١٢ بتركيز ١٠، ١٠، ١٠، ١٠٠٠، ١٠ جزء فى المليون على التوالي ثلاثة مرات.