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EFFECT OF NUMBER EYES LEFT AFTER PRUNING, FERTILIZATION WITH HUMIC ACID AND SPRAYING WITH GIBBERELLIC ACID IN SOME MINERAL CONTENT OF VINEYARDS THOMPSON cv. *VITIS VINIFERA* L.

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Abstract

This study was conducted in the grape orchard of Agricultural Research Center, Ainkawa, Erbil. The similar vineyards were selected in growth force, which were brought up in a lunar way and were planted on lines and from north to south. To study the effect of number eyes left after pruning (let 8 canes.vine^{-1}) (the first level 6 eyes.cane^{-1}, second level 8 eyes.cane^{-1} and third level 10 eyes.cane^{-1}), humic acid was added in three concentrations (0, 4.5 and 9 mg.vine^{-1}) and sprayed with Gibberellic acid (GA3) with two concentrations (0 and 50 mg.l^{-1}) in the some mineral content of the leaves of seedless Thompson cultivar. Using the randomized complete block design (RCBD) with three replicates. The results showed that by increasing the level of pruning nitrogen percentage was increased significantly, however, phosphor percentage, potasium percentage, zinc and iron content in leaves were decreased. While, the data showed that the highest level of humic acid owing to decrease significantly the nitrogen, phosphorus, potassium percentage and zinc content in the leaves. On other hand, the spraying with 50 mg.l^{-1} of gibberellic acid led to decreasing in all of the studied elements in the leaves significantly except the iron content in the leaves.

Key words : Pruning, humic acid, gibberelic acid, Thompson.

Introduction

Grape is the most flavor, high nutritional value and likeable fruit crops in the world (Shaheen *et al*., 2012). It has a delicious taste and a good source of sugar, acids, minerals, vitamins, tannins and possesses a sweet flavor (Isbat and Zeba, 2011). Grapes are adapted to a wide range of climates and they have been distributed in the tropics, subtropics and the temperate regions. There are now 75 cultivars grown in Iraq. They are generally seeded cultivars and few cultivars are seedless. Most of these cultivars are grown in Kurdistan Region of Iraq (Al-Rawi, 2005; Alsaidi, 2014).

The number of cultivated cultivars in Iraq was estimated to approxmately 245 cultivars, mostly in northern Iraq (Abdul-Qader, 2006). According to the statistics of the Food and Agriculture Organization, the world's cultivated areas with vineyard were reached 8800000 ha, while the production amount reached 68.901.744 tons of grapes (FAO, 2012). The cultivated area in Iraq reached 48000 thousand hectares and the production reached 241842 tons annually. This estimation depends on the number of fruitful trees and the average production of one tree produced (Central Office of Statistics, 2012).

Ahmad *et al*. (2004) have noted that the pruning severity of the Perlette grape vine recorded the highest mineral content in the leaves to the nitrogen, phosphorus and potassium elements when leaving 6 eyes.cane^{-1} compared to leaving 8 and 10 eyes.cane^{-1}. Shalan (2013) mentioned that leaving a number of eyes in cm^2 in the Flame Seedless and its effect on the mineral content in the leaves, also found that leaving two eyes. cm-2 resulted in giving the highest content of the element of nitrogen, phosphorus and potassium in the leaves compared to leaves 3, 4 and 5 eyes. cm-2 during two season of the

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study.

Humic acid is a nutrient transport medium from soil to plant and it is able to chelate positive ions, Humic acid can give a chelate compound that recaptures cations by which these absorbable by plant roots (Phelps, 2000). It stimulates the releasing of oxidants involving water insoluble substances such as tannins and beta-carotene. It contains some important nutrients, especially nitrogen and potassium, and improves soil structure, physical and chemical properties (Anonyme, 2005). While, Eman *et al*. (2008) asserts that the use of humic acid as an alternative to nitrogenous mineral fertilizer on Thompson Seedles resulted in a reduction of nitrogen level in leaf content and without effecting on the phosphorus and potassium contents in leaves. Zoffoli *et al*. (2009) have shown that the use of foliar spray with the growth regulator GA_3 and the adding of humic acid to the soil and performing the organized winter pruning yearly so as to overcome some of the fundamental problems and the reduction of yield and it is quality.

The aim of the present study is to know the effect of the number of eyes left at the pruning, fertilization with the humic acid and the role of gibberellic acid and their interaction in the mineral content of some nutrients of Thomson seedless cultivar.

Materials and Methods

This experiment was carried out in the grape orchard of the Agricultural Research Center in Ankawa, Erbil, located northwest of Arbil (6 km), at an altitude of 434 m above sea level and at a latitude 36, 13° north of the equator and on line Length 44 degrees east, laboratory analysis to estimate nutrients were done in soil and water department and horticulture department laboratories - Faculty of Agriculture - Ankara University/Turkey. The similar vineyards were selected in growth force. They were brought up in a lunar way and were planted on lines (2m between the vines and 4m between the lines) and from north to south. They were vines at the age of 10 years. To study the effect of number eyes left after pruning (let 8 canes.vine^{-1}) the first level 6 eyes.cane^{-1}, second level 8 eyes.cane^{-1} and third level 10 eyes.cane^{-1} (P_1, P_2 and P_3, respectively), humic acid was added in three concentrations 0, 4.5 and 9 mg.vine^{-1} (H_0, H_1 and H_2 respectively), (using Dosper Humic as a source of humic acid 85% and was added at three times, the first one was on 1 April and the second at full bloom on 30/4 / 2013 and the third after a weeks from the berries set 28/5/2013) and spraying with Gibberellic acid (GA_3) with two concentrations (0 and 50 mg.l^{-1}) (G_0 and G_1, respectively). The vineyards were sprayed after two weeks from the berries set on 5/6/2013 in the early morning, while the control vineyard was sprayed only with water, some of the mineralsin the leaves of seedless Thompson cultivar. All horticultural operations were carried out in similar manner (from control of bush, diseases, insects, irrigation) and other horticultural operations) in the orchard.

Statistical analysis

Statistic analysis was done by using the randomized complete block design (RCBD) with three replicates. The single grape vine was used as experimental unit for each replicator. Data were exposed to the analysis of variance (Al-Rawi and Khalafalla, 1980). Mean comparison and analysis of variance (Duncan test, at 0.05) were performed using SAS program version 9.1 (SAS, 2002).

Study of metallic content in leaves

The mature leaves were collected from the main branches fruitful and the leaf petiole was separated from the leaves in front of the clusters (Winkler *et al*., 1974). The leaves were cleaned and washed with tap water first and then with distilled water. They were dried in an overhead and placed in perforated paper bags. Then, they were placed in an oven at 65-70°C until the weight was proven. The 0.5 g of each sample was grindedusing an electric mill, and digested with H_2SO_4 and $HClO_4$, at this stage colorless extracts were obtained which they were ready for mineral estimation. Total nitrogen was estimated by using the Microkjeldahl, as reported by A.O.A.C. (1985). Phosphorus was measured by using (UV-VIS Spectrophotometer), as recommended by Bhargava and Raghupathi (1999). Whereas, potassium measurement was performed by using Flame Photometer, according to Pratt (1965). Concerning of the estimation of zinc and iron, were estimated by using an Atomic Absorption device, according to Chapman and Pratt (1962).

Results and Discussion

Percentage of nitrogen in leaves

Results in table 1 showed that the levels of pruning had a significant effect on increasing of nitrogen level in the leaves, the nitrogen percentage increments with the decreasing the level of pruning. Also, noticed that adding of humic acid (4.5) gm.vine^{-1} led to increasing nitrogen percentage 2.472% in the leaves significantly compared to the other treatments. While, spraying with (50)mg.l^{-1} GA_3 significantly decreased the nitrogen percentage (2.265%) in the leaves compared to the control treatment (2.326%). The results showed that all interactions studied which were significantly affected on the increase of nitrogen percentage in the leaves. Vines treated with

(P_2+H_1) obtained significant and higher nitrogen percentage compared to other interaction treatments. However, the vines treated with the interaction between (P_3 and G_1) had significant and the highest nitrogen percentage (2.414%) compared to the lowest percentage recorded in vines treated with (P_1+G_1) (2.098%). Concerning the effect of the interaction between different concentrations of humic acid and GA_3, it was found the significant and maximum percentage in vines treated with H1+G0 (2.514%) as compared with of all other interaction treatments. Whilst, triple interaction between P_2+H_1+G_1 orG_0(2.707%) and (2.670%) respectively superior on all other tri-interaction treatments, whereas, minimum percentage was recorded in the tri-interaction between P_1+H_2+G_1(1.840%).

Percentage of phosphor in leaves

Table 2 shows phosphor percentage is significantly increased in 8 eyes left per cane (P_2) 0.114% comparing to the 10 eyes left per cane (P_3) 0.074%, but non-significant different with 6 eyes left per cane (P_1) 0.104%. However, by increasing the amount of humic acid phosphor percentage in leaves was significantly decreased. Likewise, spraying with (50) mg.l^{-1} GA_3 this percentage was dramaticly decreased comparing to the control treatment. The data in table 2 showed significant influence on phosphor percentage. The maximum percentage (0.132%) was recorded in the interaction treatment between P_2 and H_0, whereas, the minimum percentage (0.038%) was found in the interaction between P_3 and H_2. With regard to the interaction between pruning levels and GA_3, the highest phosphor percentage 0.127% was found in P_1 and G_0, but the lowest percentage (0.073%) was found in P_3 and G_1. With respect to the interaction between humic acid and GA_3, a significant effect was found, all other interaction treatments were superior on the minimum percentage (0.052%) in H_2+G_1. In concection with the tri-interaction, the highest phosphor percentage (0.155%) was in vines treated with P_2+H_1+G_0, However, minimum percentage (0.036%) was found in the tri-interaction between P_1+H_2+G_1.

Percentage of potassium in leaves

The data presented in table 3 proved that 10 eyes.cane^{-1} significantly decreased amount of potassium in leaves comparing to other levels of pruning. However, significant decrease was noticed in potassium percentage with increasing of humic acid concentrations. This was on a par with GA3 spraying; the highest percentage was noticed in the control treatment. Concerning of the double interaction treatments, the results showed the significant different were found between them, the maximum potassium percentage recorded in the interaction treatment between P_1 and H_0, P_1 and G_0 and H_0 and G_1 0.424%, 0.410% and 0.411%, respectively. Whereas, the minimum percentage was reported in the interaction between P_3+H_2, P_3+G_0 and H_1+G_1 0.318%, 0.342% and 0.328%, respectively. The tri-interaction between P3+H0+G1 was significantly increased potassium percentages as comparing to the minimum percentage which was recorded in the tri-interaction between P_3+H_2+G_1.

Amount of znicin leaves (mg.kg^{-1})

With decreasing levels of pruning amount of zinc was significantly decreased (table 4). However, in relation to the humic acid influence, maximum value 34.085 gm.kg-1 was recorded in vines which were treated with (4.5) gm.vine^{-1} and superior on other treatments. Whilst, the spraying with (50) mg.l^{-1} GA_3 significantly decreased the amount of zinc in the leaves (31.313 gm.kg^{-1}) comparing to the control treatment (33.369 gm.kg^{-1}). The results also reported that all studied interactions were significantly influenced on the zinc content in the leaves. Concerning of the interaction between levels of pruning and humic acid, the interaction between P_1 and H_1 caused to obtain the significant and highest value (37.808 gm.kg^{-1}) in leaves, but the lowest value (24.372 gm.kg^{-1}) was in P_3+H_2. However, in relation to the double interaction between levels of pruning and GA_3, all interaction treatments superior on the lowest value was reported in the interaction between P_3 and G_1(26.964 gm.kg^{-1}). In regarding with the role of the interaction between different concentrations of humic acid and GA_3, vines treated with H1+G0 (40.940 gm.kg^{-1}) superior on all other interaction treatments. While, the tri-interaction between P3+H1+G0 (48.450 gm.kg^{-1}) was superior on all other tri-interaction treatments except the tri-interaction between P_1+H_1+G_0, whereas, minimum value was obtained in the tri-interaction between P3+H1+G0 (48.450 gm.kg^{-1}).

Amount of iron in leaves (mg.kg^{-1})

Concerning the effect of pruning levels, humic acid concentrations and spraying with GA_3, non-significant difference were between levels of each factors (table 5). However, significant difference was found between interaction treatments of prouning levels and humic acid concentrations. The maximum value was recorded in the interaction treatment between P_1 and H_2 (1053.417gm.kg^{-1}). Whereas, the minimum value was reported in the interaction between P_2 and H_1(293.167 gm.kg^{-1}). Regarding to the interaction between pruning levels and GA_3, then is no significant influence on ironcontent of

Table 1 : Effect of level of pruning and addition of humic acid and spray of gibberellic acid in leaf content of the percentage of nitrogen of the grape varieties.

Levels of pruning (P)	Humic acid (mg.vine^{-1})	Gibberellic acid (GA_3)(mg.l^{-1})		Effect of Px H	Effect of pruning (P)
		(G_0) 0	(G_1) 50		
6 (P_1)	0 (H_0)	2.223 de	2.227 de	2.225 de	2.171 c
	4.5 (H_1)	2.410 bc	2.227 de	2.318 cd	
	9 (H_2)	2.097 ef	1.840 g	1.968 g	
8 (P_2)	0 (H_0)	2.153 e	1.990 f	2.072 f	2.319 b
	4.5 (H_1)	2.670 a	2.707 a	2.688 a	
	9 (H_2)	2.243 de	2.153 e	2.198 e	
10 (P_3)	0 (H_0)	2.430 bc	2.530 b	2.480 b	2.397 a
	4.5 (H_1)	2.463 bc	2.357 cd	2.410 bc	
	9 (H_2)	2.243 de	2.357 cd	2.300 d	
Effect of P x G	6 (P_1)	2.243 c	2.098 d	Effect of humic acid	
	8 (P_2)	2.356 ab	2.283 bc		
	10 (P_3)	2.379 a	2.414 a		
Effect of H x G	0 (H_0)	2.269 c	2.249 c	2.259 b	
	4.5 (H_1)	2.514 a	2.430 b	2.472 a	
	9 (H_2)	2.194 c	2.117 d	2.156 c	
Effect of (GA_3)		2.326 a	2.265 b		

Means within each factor or their interactions followed the same letters are not significantly different from each other according to Duncan's multiple range test at 0.05 level.

Table 2 : Effect of level of pruning and addition of humic acid and spray of gibberellic acid in leaf content of the percentage of Phosphor of the grape varieties.

Levels of pruning (P)	Humic acid (mg.vine^{-1})	Gibberellic acid (GA_3)(mg.l^{-1})		Effect of Px H	Effect of pruning (P)
		(G_0) 0	(G_1) 50		
6 (P_1)	0 (H_0)	0.121 abcd	0.132 abc	0.127 a	0.104 a
	4.5 (H_1)	0.125 abcd	0.074 efg	0.099 bc	
	9 (H_2)	0.135 abc	0.036 h	0.085 cd	
8 (P_2	0 (H_0)	0.124 abcd	0.140 ab	0.132 a	0.114 a
	4.5 (H_1)	0.155 a	0.099 cde	0.127 a	
	9 (H_2)	0.081 ef	0.087 def	0.084 cd	
10 (P_3	0 (H_0)	0.123 abcd	0.107 bcd	0.115 ab	0.074 b
	4.5 (H_1)	0.058 fgh	0.078 efg	0.068 d	
	9 (H_2)	0.044 gh	0.033 h	0.038 e	
Effect of P x G	6 (P_1)	0.127 a	0.080 b	Effect of Humic acid	
	8 (P_2)	0.120 a	0.109 a		
	10 (P_3)	0.075 b	0.073 b		
Effect of H x G	0 (H_0)	0.123 a	0.126 a	0.125 a	
	4.5 (H_1)	0.113 a	0.084 b	0.098 b	
	9 (H_2)	0.087 b	0.052 c	0.069 c	
Effect of (GA_3)		0.107 a	0.087 b		

Means within each factor or their interactions followed the same letters are not significantly different from each other according to Duncan's multiple range test at 0.05 level.

Table 3 : Effect of level of pruning and addition of humic acid and spray of gibberellic acid in leaf content of the percentage of Potassium of the grape varieties.

Levels of pruning (P)	Humic acid (mg.vine^{-1})	Gibberellic acid (GA_3)(mg.l^{-1})		Effect of Px H	Effect of pruning (P)
		(G_0) 0	(G_1) 50		
6 (P_1)	0 (H_0)	0.430 ab	0.418 abc	0.424 a	0.388 a
	4.5 (H_1)	0.414 abc	0.320 de	0.367 bc	
	9 (H_2)	0.386 abcd	0.358 bcde	0.372 b	
8 (P_2)	0 (H_0)	0.357 bcde	0.375 abcde	0.366 bc	0.378 a
	4.5 (H_1)	0.422 abc	0.352 bcde	0.387 ab	
	9 (H_2)	0.415 abc	0.346 cde	0.381 ab	
10 (P_3)	0 (H_0)	0.322 de	0.440 a	0.381ab	0.347 b
	4.5 (H_1)	0.370 abcde	0.312 de	0.341 bc	
	9 (H_2)	0.334 cde	0.302 e	0.318 c	
Effect of P x G	6 (P_1)	0.410 a	0.365 bc	Effect of Humic acid	
	8 (P_2)	0.398 ab	0.358 bc		
	10 (P_3)	0.342 c	0.351 c		
Effect of H x G	0 (H_0)	0.369 bc	0.411 a	0.390 a	
	4.5 (H_1)	0.402 ab	0.328 d	0.365 ab	
	9 (H_2)	0.378 ab	0.336 cd	0.357 b	
Effect of (GA_3)		0.383 a	0.358 b		

Means within each factor or their interactions followed the same letters are not significantly different from each other according to Duncan's multiple range test at 0.05 level.

Table 4 : Effect of level of pruning and addition of humic acid and spray of gibberellic acid on leaves content of Zinc of the Thompson grape vine.

Levels of pruning (P)	Humic acid (mg.vine^{-1})	Gibberellic acid (GA_3)(mg.l^{-1})		Effect of Px H	Effect of pruning (P)
		(G_0) 0	(G_1) 50		
6 (P_1)	0 (H_0)	29.653 fg	33.450 ef	31.552 cd	35.169 a
	4.5 (H_1)	44.197 ab	31.420 fg	37.808 a	
	9 (H_2)	34.010 def	38.287 cd	36.148 ab	
8 (P_2)	0 (H_0)	31.100 fg	40.947 bc	36.023 ab	32.637 b
	4.5 (H_1)	30.173 fg	27.220 gh	28.697 de	
	9 (H_2)	36.780 cde	29.600 fg	33.190 bc	
10 (P_3)	0 (H_0)	26.757 gh	28.303 g	27.530 e	29.217 c
	4.5 (H_1)	48.450 a	23.050 hi	35.750 ab	
	9 (H_2)	19.203 i	29.540 fg	24.372 f	
Effect of (P x G)	6 (P_1)	35.953 a	34.386 ab	Effect of Humic acid	
	8 (P_2)	32.684 bc	32.589 bc		
	10 (P_3)	31.470 c	26.964 d		
Effect of (H x G)	0 (H_0)	29.170 de	34.233 b	31.702 b	
	4.5 (H_1)	40.940 a	27.230 e	34.085 a	
	9 (H_2)	29.998 cd	32.476 bc	31.237 b	
Effect of (GA_3)		33.369 a	31.313 b		

Means within each factor or their interactions followed the same letters are not significantly different from each other according to Duncan's multiple range test at 0.05 level.

Table 5 : Effect of level of pruning and addition of humic acid and spray of gibberellic acid on leaves content of Iron of the Thompson grape vine.

Levels of pruning (P)	Humic acid (mg.vine^{-1})	Gibberellic acid (GA_3)(mg.l^{-1})		Effect of Px H	Effect of pruning (P)
		(G_0) 0	(G_1) 50		
6 (P_1)	0 (H_0)	313.833 b	494.133 b	403.983 ab	591.400 a
	4.5 (H_1)	320.400 b	313.200 b	316.800 b	
	9 (H_2)	486.933 b	1619.900 a	1053.417 a	
8 (P_2)	0 (H_0)	478.633 b	386.100 b	432.367 ab	375.483 a
	4.5 (H_1)	254.133 b	332.200 b	293.167 b	
	9 (H_2)	386.100 b	433.067 b	400.917 ab	
10 (P_3)	0 (H_0)	532.267 b	536.200 b	534.233 ab	426.261 a
	4.5 (H_1)	389.900 b	389.900 b	380.450 ab	
	9 (H_2)	460.733 b	267.467 b	364.100 ab	
Effect of (P x G)	6 (P_1)	373.722 a	809.078 a	Effect of Humic acid	
	8 (P_2)	367.178 a	383.789 a		
	10 (P_3)	454.667 a	397.856 a		
Effect of (H x G)	0 (H_0)	441.578 a	472.144 a	456.861 a	
	4.5 (H_1)	315.178 a	345.100 a	330.139 a	
	9 (H_2)	438.811 a	773.478 a	606.144 a	
Effect of (GA_3)	398.522 a	530.241 a			

Means within each factor or their interactions followed the same letters are not significantly different from each other according to Duncan's multiple range test at 0.05 level.

leaves. Likewise, non-significant difference was founded between the interaction between humic acid and GA_3. With respect to the tri-interaction the highest value was recorded in vines treated with P_1+H_2+G_1(1619.900 gm.kg^{-1}) was superior on all of the tri-interaction treatments.

The reason why increasing of nutrients in the leaves of grapevines that left (6) eyes.cane^{-1} may be due to pruning that reduces the vegetative growth, whereas the total of roots has not been effected. Thus, the level of water and nutrients absorbed by the roots becomes high and increases its share of plant hormones resulting from tops of roots such as cytokinines that helps to stimulate vegetative growth, consequence of that led to increment the nutrients in leaves content. The results are supported by the finding of Ahmad *et al*. (2004).

The results pretended to be there were of the humic acid negative effect on the mineral content in the leaves, this might be connected to levels of humic acid. On the other hand, spraying of very high level of humic acid is less effective (Lee and Bartlett, 1976). According to many researches, results were changing owing to the levels of treatment, growing media and origin of humic materials (Chen and Aviad, 1990; Arancon *et al*., 2006). In addition of that, humic acid might increase level of the vegetative growth of vineyards and cause decreasing of the nutrients content in leaves, or due to the pull of nutrients by the berries and thus reduced the content of the leaves from these nutrients.

The reason behind of the decreasing of nutrients in leaves may be due to the role of GA_3 in increasing cluster weight, cluster size, berry weight and berry size (Abdul-Qader, 2008). This may be led to decrease these nutrients in leaves, because it transfers from the leaves to the berries when they are necessary. The berries also consider pull sites to the water and nutrients. Since the fruits are in a state of continuous growth and activity, these nutrients will be transported to the fruits without any hindrance (Al-Dulaimy, 1999).

Conclusion

Increasing the pruning level was significantly increased the nitrogen percentage. In contrast, phosphor percentage, potasium percentage, zinc and iron content in leaves was decreased. While, the highest level of humic acid owing to significantly decrease the nitrogen, phosphorus, potassium percentage and zinc content in the leaves. In addition, spraying with 50 mg.l^{-1} of Gibberellic acid led to decreasing all elements significantly except the iron content in leaves.

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