2017 274 – 262: (3) 9 Kufa Journal For Agricultural Sciences

Effect of some organic and non-Organic fertilizers on some parameters of growth and berries quality of grape cv. Kamali

Hussein Moho Sulaiman Birjely* Shawkat Mustafa Mohammed Al- Atrushy **

*Department of Horticulture, College of Agriculture, University of Duhok - Kurdistan Region - Republic of Iraq

Abstract:

The current study was conducted to determine the effect of using different organic and non-organic fertilizers on the leaf area, leaf dry weight, total chlorophyll %, petiole NPK content and yield as well as chemical properties of the berries of grape cv. Kamali grown under drip-irrigated system during growing season 2012. Results showed that Ammonium sulfate + Organic manure + Humic acid caused a stimulation of growth characters measured yield as well as berries quality parameters compared to control treatment. Total acidity percentage in the juice tended to reduce with using Ammonium sulfate + Organic manure + humic acid treatments. Application of Ammonium sulfate + Organic manure, Ammonium sulfate + Humic acid or Organic manure + Humic acid caused a significant increase leaf area, in leaf dry weight, total chlorophyll, mineral content (NPK) and as well bunch weight, No. of bunches per vine, Yield per vine and chemical properties (TSS, Total sugars and Juice density) compared to the application of Ammonium sulfate, Humic acid and Organic manure alone.

Keywords: Ammonium sulfate, Organic manure, humic acid, grape, Kamali.

Introduction

Grape (*Vitis vinifera* L.) belongs to Vitaceae family, is perhaps the most widely cultivated fruit crop of the world in varying climatic zones extending from the temperate to the tropical zone. The berries are good source of minerals and vitamins (B1, B2 and C). The fruits are consumed in fresh form as a table grape and in the processed form as raisin and fresh juice [1].

Mineral fertilization causes the accumulation of harmful residual substances like nitrate and nitrite in the edible portion in berries or leaves of grapevines [2, **3].** So a great attention is focused on minimizing the intensive amounts of mineral fertilization [4]. In this respect, the organic fertilization improved vegetative growth, nutritional status and reduced the residuals of nitrate and nitrite in grape berries and the continuous fertilization with organic fertilizer is helpful in the long run for grapevine [5, **6]**. Organic fertilization is beneficial for improving the efficiency of nutrients uptake and soil fertility [7]. On the other hand, many commercial products containing humic acid (HA), including K-humate (KH) have been promoted for use on various crops [8]. Benefits attributed to the use of humic acid, particularly in low organic matter, alkaline soil, include increased nutrient uptake, tolerance to drought and temperature extreme, activity of beneficial soil microorganisms and availability of soil nutrients [9]. Organic materials may also increase root growth in a manner similar to auxins [10, 11].

Hassan and Fatma [12] Deliberate the effect of 15 nitrogen fertilization treatment on Thompson seedless grapevines, 18 year old, the best fruiting and leaf characteristics were obtained by the highest rate (100 g N/vine) from the following nitrogen sources urea + AM (Nitrification inhibitor), AN(Ammonium nitrate) and AN + AM. Gabara *et. al*.[13] investigated the effect of varying N and Mg application ratios on growth, leaf chemical composition, yield as well as physical and chemical characteristics of Banaty

grapes, results showed that there were an marvelous influence on growth characters, leaf N, Mg and K, yield as well as cluster weight, berry weight, TSS and total acidity. George *et. al*.[14] Investigated the influence of three levels of organic manures (10, 20, 40 $t.ha^{-1}$) of cow and sheep manures, and (5, 10, 20 $t.ha^{-1}$) of poultry manures, in addition to the control, on some qualitative properties of the grapevine's cultivar Al-Baladi, results indicated that the use of the low level of poultry manure (5 $t.ha^{-1}$) had the best results in the most of the studied parameters. Ferrara *et. al*.[15] studied the effects of foliar applications of humic acids and a compost on vegetative and qualitative parameters of 'Italia' table grape. At harvest, the application of humic acids showed to have increased total soluble solids, TSS/acidity ratio and pH but decreased titratable acidity. Generally, treatments with humic acids significantly increased berry size, and as a consequence, a general increase in the yield was observed. Eman *et. al*.[16] studied the minimizing of mineral nitrogen fertilization through using Humic acid (HA) on leaf mineral content, yield, fruit quality and the residual P, K, NO_3 and NO_2 in berry juice of Thomson seedless grapevines. Results indicated that humic acid reduced N content in the leaves, whereas there were no differences between the other treatments, while, P and K content were not affected. On the other hand, results did not show any differences between treatments in respect to number of bunches/plant, bunch weight, TSS and acidity percentage compared with the control (100% mineral N).

Therefore, this investigation was carried out to evaluate mineral nitrogen, organic and Humic acid treatments on leaf NPK content, yield, fruit quality and the residual minerals in Kamali grapevine.

Materials and Methods

This study was carried out during the growing seasons of 2012 on 12 years old kamali grapevine planted on clay soil under drip irrigation system in a private vineyard located at Bara-Buhar, Duhok governorate, Kurdistan region, Iraq. The vines

were trained as T-trellis system, winter pruning was done at the second week of March, and vine load was 78 buds (7 fruiting canes each with 10 buds and four renewal spars × 2 buds).

Eight treatments were applied to compare soil application of ammonium sulfate (100 $g.vine^{-1}$) fertilization, Organic manure (sheep manure, 6 kg/vine) and humic acid (4 g/vine) as organic fertilization and their interactions. The treatments were as follow:

1- T1 = Control.
2- T2 =Ammonium sulfate (100 $g.vine^{-1}$).
3- T3 = Organic manure (6 $kg.vine^{-1}$).
4- T4 = Humic acid (4 $g.vine^{-1}$).
5- T5 = Ammonium sulfate (50 $g.vine^{-1}$) + Organic manure (3 $kg.vine^{-1}$).
6- T6 = Ammonium sulfate (50 $g.vine^{-1}$) + Humic acid (2 $g.vine^{-1}$) .
7- T7 = Organic manure (3 $kg.vine^{-1}$) + Humic acid (2 $g.vine^{-1}$).
8- T8 = Ammonium sulfate (33.3 $g.vine^{-1}$) + Organic manure (2 $kg.vine^{-1}$) + Humic acid (1.33$g.vine^{-1}$).

Each treatment was replicated three times with two vines per treatments were arranged in randomized complete block design.

For mineral fertilization treatment, 100 g N as ammonium sulfate (20.5% N) was added for each vine and placed 10 cm beneath soil surface on both sides of the vine rows (30 cm from the trunk) at two equal doses (two week after bud burst and after berry set). Vines treated with Organic manure received 6 kg per vine which was placed 10 cm beneath soil surface on both sides of the vine rows (30 cm from the trunk). The organic manure(O.M) was added once at the first week of January. Humic acid was added as 4 g per vine in the same way of mineral fertilization at two equal doses (two weeks before and after berry set). All vines under taken in this study received the same horticultural practices that usually carried out in the vineyard. Data were analyzed using SAS program [17].

Experimental measurements were as follows:

1-vegetative characteristics: Leaf area (cm^2), Leaf dry weight (g), Leaf chlorophyll content (SPAD) and leaf Petiole NPK content.

2 - Yield characteristics**:** Bunch weight (g), Number of bunches per vine and Yield per vine (kg).

3- Chemical characteristics**:** Total soluble solid (TSS) %, Total sugars (%), Juice density (D.) and Total acidity (%).

Results and discussion

Vegetative growth characteristics:

Data in Table (1) clearly showed that the best results were obtained from plants received A. sulfate + Organic manure + humic acid, this treatment was significantly increased single leaf area, leaf dry weight and leaf chlorophyll percentage compared to the most of other treatments.

Table (1): Effect of different fertilizer treatments on some vegetative growth characteristics of grape cv. Kamali.

Fertilizer's treatment	Vegetative growth characteristics		
	Leaf area (cm^2)	Leaf dry weight (g).	Total chlorophyll (SPAD.)
Control	130.60 d	0.576 d	33.267 d
Ammonium sulfate	136.19 cd	0.613 c	39.667 bc
Organic manure	145.01 c	0.652 b	41.51 bc
Humic acid	140.81 c	0.608 c	37.733 cd
A. sulfate + Organic manure	155.13 b	0.655 b	39.84 b
A. sulfate + Humic acid	151.02 b	0.640 b	42.97 b
Organic manure + Humic acid	166.08 ab	0.697 a	43.07 b
A. sulfate + Organic manure + Humic acid	176.25 a	0.720 a	56.84 a

Means with the same letters in the same column are not significantly different at 5% level based on Duncan multiple Rang Test

The lowest value was obtained with control. Application of each fertilizer alone also caused significant increase compared to the untreated vines.

Leaf NPK content:

Regarding leaf NPK content, Table (2) indicates that it was significantly affected by all treatments. The application of Ammonium sulfate + Organic manure + Humic acid recorded the highest N content. All treatments. were significantly differed compared to control. As for phosphors and potassium percentage in the leaf-petiole, the results indicated that the highest value was obtained from the treatment of A. sulfate + Organic manure + Humic acid.

Table (2): Effect different fertilizer treatments on NPK content of leaves petiole of grape cv. Kamali.

Treatment	Mineral content		
	N (%)	P (%)	K (%)
Control	0.671 e	0.089 c	1.244 d
Ammonium sulfate	0.784 d	0.102 b	1.351 c
Organic manure	0.956 c	0.103 b	1.315 c
Humic acid	0.883 cd	0.120 ab	1.479 b
A. sulfate + Organic manure	1.058 b	0.138 a	1.489 b
A. sulfate + Humic acid	1.094 b	0.116 b	1.386 bc
Organic manure + Humic acid	1.127ab	0.137 a	1.606 a
A. sulfate + Organic manure + Humic acid	1.191 a	0.151 a	1.705 a

Means with the same letters in the same column are not significantly different at 5% level based on Duncan multiple Rang Test

Yield characteristics:

Table (3) showed that bunch weight and number of clusters/vine were significantly affected by the fertilizer treatments. As for yield (kg)/vine, although there were significant

differences between fertilizer treatments, no constant trend was detected; however (A. sulfate + Organic manure + humic acid) recorded the highest value followed by (Ammonium sulfate + Organic manure) then (Organic manure + humic acid).

Application of Organic manure or humic acid alone also caused a significant increase in the yield compared to the control. Highest bunch weight (1032 g.) was with application of ammonium sulfate + Organic manure.

Table (3) Effect different fertilizer treatments on some yield characteristics of grape cv. Kamali.

Treatment	Yield characteristics		
	Bunch weight (g).	No. of bunches per vine	Yield per vine (kg).
Control	742.01 c	43.3 d	32.151 c
Ammonium sulfate	749.59 c	46.67 cd	34.983 c
Organic manure	968.76 b	50.33 bc	48.757 b
Humic acid	1004.1 ab	48.67 bc	48.867 b
A. sulfate + Organic manure	1032.4 a	54.00 ab	55.748 a
A. sulfate + Humic acid	958.86 b	52.3 ab	50.177 ab
Organic manure + Humic acid	983.99 ab	53.33 ab	52.476 ab
A. sulfate + Organic manure + Humic acid	1018.5 a	58.67 a	59.755 a

Means with the same letters in the same column are not significantly different at 5% level based on Duncan multiple Rang Test

Chemical characteristics of the berries:

Regarding berries chemical characteristics, TSS, total sugar and Juice density (Table,4) were significantly affected by the fertilizer treatments, where the application of Ammonium sulfate + Organic manure + Humic acid gave the highest values of the three

Table (4). Effect different fertilizer treatments on some chemical characteristics of the berries of grape cv. Kamali.

Treatments	Chemical characteristics			
	TSS (%)	Total sugars (%)	Juice density (D.).	Total acidity (%).
Control	14.96 bc	12.41 f	0.99 d	1.15 a
Ammonium sulfate	14.57 c	13.86 d	1.07 b	1.07 cd
Organic manure	15.35 b	14.75 cd	1.03 cd	1.03 bc
Humic acid	15.52 b	14.96 cd	1.03 cd	1.03 cd
A. sulfate + Organic manure	15.10 bc	15.59 bc	0.99 d	1.06 b
A. sulfate + Humic acid	15.28 b	16.61 b	1.06 b	0.99 d
Organic manure + Humic acid	16.10 a	16.05 b	1.05 bc	0.95 d
A. sulfate + Organic manure + Humic acid	16.08 a	18.46 a	1.15 a	0.99 d

Means with the same letters in the same column are not significantly different at 5% level based on Duncan multiple Rang Test

parameters,: All treatments were significantly differed compared to control treatment. As for total acidity percentage in the berry juice, same table indicates that the highest value obtained from the control, it was clear that the application of A. sulfate + Organic manure + Humic acid significantly reduced the total acidity in the berry juice. Application of A. sulfate + Humic acid and Organic manure + Humic acid also significantly increased the TSS, total sugars and juice density and reduced total acidity percentage. Maximum TSS (16.10 %) was recorded from application of organic manure + humic acid, whereas the total sugars (18.46%) and juice densities (1.15D.) were resulted from the

application of Ammonium sulfate + Organic manure + Humic.

The significant effect of ammonium sulfate may be due to the role of nitrogen in the synthesis of protein and enzymes which are an important compounds in the synthesis of chlorophyll and cytochrome and their role in the processes of photosynthesis and respiration that lead to increase cell division and elongation [18 and 19]**.**

The stimulation of growth aspects in response to application of humic acid might be ascribed to the positive action of humic acid in the increase of uptake of macro and microelements influenced by humic substances which have been shown in different plant species [20]**.** Also Humic fertilizers activated the biochemical processes in plants such as respiration, photosynthesis and chlorophyll content **[21].** Furthermore, the growth promoting by Humic substances may be related to plant hormone-like materials contained in the Humic substances [22], the presence of iron in the Humic acids or their colloidal nature have a positive effect on the growth of various groups of microorganisms which may excrete a range of vitamins, growth substances and antibiotics and these can promote plant growth [23, **24**, **25, 26]**. In conclusion, the positive effect of organic manures on the vegetation growth and yield and its physical and chemical characteristics could be attributed to their effects on supplying the vines with their requirements of various nutrients as a relatively long times, as well as their effect on lowering soil pH in Rizospher which could aid in facilitating the availability of some nutrients in the soil and improving physical characters of soil in favor of root development [27]**.**

References

[1] Al-Saidi, I. H. 2000. Grape production. Mosul University Press. Ministry of High Education and Scientific Research. Iraq.

[2] Ibraheem, T., 1994. Water pollution. Part I. Science and life series. Egyptian

Organization for Books, Cairo, Egypt, pp: 58-61. (In Arabic).

[3] Montasser, A.S.; N. El-Shahat, G.F. Ghobreial and El-Wadoud, M. Z. 2003. Residual effect of nitrogen fertilization on leaves and fruits of Thompson Seedless Grapes. J. Environ. Sci., 6(2): 465-484.

[4] Sangakkora, U.R. and P. Weerakera, 1999. Impact of effective Micro-organisms on nitrogen utilizationefficiency of selected food crops. Six International Conference on Kyusei Nature Farming. Conference Center, Univ. of Pretoria, Pretoria, South Africa.

[5] Kassem, H.A. and H.A. Marzouk, 2002. Effect of organic and/or mineral nitrogen fertilization on the nutritional status, yield and fruit quality of Flame seedless grapevines grown in calcareous soils. J. Adv. Res., 7(3): 117-126.

[6] Farag, S.G., 2006. Minimizing mineral fertilizers in grapevine farms to reduce the chemical residuals in grapes. M.Sc. Thesis, Institute of Environmental Studies & Research, Ain Shams University, Egypt, pp: 67.

[7] Nijjar, G.S., 1985. Nutrition of fruit trees. Mrs Usha Raj Kumar for Kalyani. Publishers. New Delhi India, pp: 1-89.

[8] Liu, C.; R.J. Cooper and Bowman, D. C. 1998.Humic acid application effects photosynthesis, root development and nutrient content of creeping bent grass. HortScience, 33(6): 1023-1025.

[9] Russo, R. O. and G. P. Berlyn. 1990. The use of organic biostimulants to help low input sustainable agriculture. J. Sus. Agric. 1(2): 9 – 42.

[10] Tatini, M.; P. Bertoni; A. Landi and Traversi, M. L. 1991. Effect of humic acids on growth and biomass portioning of container-grown olive plants. Acta Hort, 294: 75-80.

[11] AL-Niemi, S. N. A. 1999. Fertilizers and soil fertility Dar- AL- kutub publication. Mosul Univ. Iraq (in Arabic).

[12] Hassan, A. S. A. and A. A. Fatma. 2005. Rates of nitrogen fertilizer on productivity and seedless grapevines. Hort. Dept; Fac. Agric; Zagazig Univ. Egypt. 1; 1-26.

[13] Gabara, G.; E. Loffredo and Senesi, N. 2001. Antimutagenic and antitoxic actions of humic substances on seedlings of monocotyledon and dicotyledon plants. In: Humic substances: structures, models and functions (Ghabbour E.A., Davies G., eds). Royal Soc Chem Press, Cambridge, UK. pp. 361-371.

[14] George, T. D. I. Issa ; and Oude, M. 2009. Effect of Different Kinds of Organic Manures on Some Qualitative Characteristics of the Berries of the Grapevine's Cultivar Al-Baladi. Damascus Univ. J. of Agri. Sc.,25(2):249-264.

[15] Ferrarra, G.; A. Pacifico; P. Simeone and Ferrara, E. 2008. Preliminary study on the effects of foliar applications of Humic acid on 'Italia' table grape. Dipartimento di Sc. delle produzioni vegetali, Univ. of Bari via Amendola 165/A, 70126 Bari.

[16] Eman, A.A. Abd El-Monem, M.1 2 M.S. Saleh and Mostafa, E. A. M. 2008. Minimizing the quantity of mineral nitrogen fertilizers on grapevine by using humic acid, organic and biofertilizers. Res. J. Agric. & Biol. Sci., 4(1): 46-50.

[17] SAS. 2003. Statistical Analysis System. SAS Institute Inc. Cary Nc. 27511, USA.

[18] Usha, K. and B. Singh. 2002. Effect of Macro and micro Nutrient spray on Fruit, Yield and Quality of Grapes (*Vitis vinifera* L.) cv. Perlette. IS on Foliar Nutrition. Acta Hort., *594*.

[19] Mohammed, S. M. and S. M. Abdulqader. 2007. Effect of foliar application of Nitrogen and Magnesium on Grapevine CV. Taifi under non- irrigated

condition. Dohuk Uni., Vol. 10, No.2, pp 70-74.

[20] Chen, Y. and T. Avid. 1990. Effects of humic substances on plant growth. p.161-186.

[21] Ferrara, G. and G. Brunetti. 2010. Effects of the times of application of a soil humic acid on berry quality of table grape (*Vitis vinifera* L.) cv Italia. Spanish Journal of Agricultural Research 8(3): 817-822

[22] Donnell, R.W., 1973. The auxin-like effects of humic preparations from leonardite. Soil Sci., 116: 106-112.

[23] Zhang, X. and R.E. Schmidt. 2000. Hormone- containing products impact on antioxidant status of tall fescue and creeping bent grass subject to drought. Crop Sci. 40: 1344-1349.

[24] Zhang, X.; E.H. Ervin and Schmidt, R. E. 2003. Plant growth regulators can enhance the recovery of Kentucky bluegrass from heat injury. Crop Sci. 43: 952-956.

[25] Zhang, X. and E.H. Ervin. 2004. Cytokinin- containing seaweed and humic acid extracts associated with creeping bent grass leaf cytokinins and drought resistance. Crop Sci. 44: 1737-1745

[26] Hafez, M. M. 2004. Effect of some sources of Nitrogen fertilizer and concentration of humic acid on the productivity of squash plant. Egypt. J. Appli. Sci. 19 : 293-309.

[27] Gamal, A. M. and M. A. Ragab. 2003. Effect of organic manure source and rate on growth, nutritional status of the trees and productivity of balady mandarin trees. Assiut J. Agric. Sci., 4: 253-264.

2017 274 – 263: (3) 9 Kufa Journal For Agricultural Sciences

تأثير بعض الأسمدة العضوية وغير العضوية في بعض مؤشرات النمو والصفات الكيميائية لثمار العنب صنف كمالي

وحسين محو سليمان البرجيلي* شوكت مصطفى محمد الاتروشي **

*قسم البستنة- كلية الزراعة - جامعة دهوك – اقليم كوردستان - جمهورية العراق

المستخلص

أجريت الدراسة الحالية لمعرفة تأثير استعمال أسمدة عضوية وغير عضوية مختلفة في مساحة الورقة والوزن الجاف للورقة ونسبة الكلوروفيل الكلي ومحتوى الأعناق من عناصر NPKوالحاصل ، بالإضافة إلى دراسة الصفات الكيميائية للعنب من صنف كمالي المزروع تحت نظام الري . بالتنقيط خلال موسم النمو2012 وقد بينت النتائج بأن إضافة سماد سلفات الأمونيوم + السماد العضوي + حامض الهيوميك قد سببت تحفيزا واضحا في صفات النمو والحاصل ، وكذلك الصفات النوعية للحبات مقارنة بمعاملة المقارنة، كما انخفضت نسبة الحموضة الكلية باستعمال سماد سلفات الأمونيوم +السماد العضوي + حامض الهيوميك .وقد سببت إضافة سلفات الأمونيوم + السماد العضوي و سلفات الامونيوم + حامض الهيوميك او السماد العضوي + حامض الهيوميك زيادة معنوية في مساحة الورقة وواوزن الجاف للورقة والمحتوى الكلي للكلوروفيل في الورقة ومحتوى اعناق الاوراق من (NPK) وكذلك وزن وعدد العناقيد في الكرمة وزحاصل الكرمة الواحدة والصفات الكيميائية للحبات (النسبة المئوية للمواد الصلبة الذائبة والسكريات الكية وكثافة العصير) مقارنة بإضافة سلفات الأمونيوم أو حامض الهيوميك أو السماد العضوي كل على حدة.

.الكلمات المفتاحية: سلفات الامونيوم، سماد عضوي، حامض الهيوميك، عنب، كمالي