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Effect of different agricultural media and wounding on rooting and growing of Grapes *(Vitis vinifera* L.) semi wood cutting

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ABSTRACT

The study was conducted in Collage of Agriculture / Kirkuk University –Iraq during period of 15/12/2019 to 1/5/2020. The study included influence of two type of cultural media (Peat moss, river soil) and wounding three levels (without wounding, mono-wounds,di-wounds) of European grape cutting under plastic house condition. The factorial experiment arranged using randomized complete block design (R.C.B.D.) with triplicates and five seedlings for each experimental unit. The results were analyzed by using SAS V 9.0 software and the variation of means compared depending on Duncan test for significant level of 0.05. The obtained results can be summarized that Peat mossmedia significantly increased most of roots and shoots characteristics (percentage of rooted cutting, roots length, dry weight of shoots and roots systems, length and diameter of cutting, numbers of leaves and new branches, branches length and leaf area) on river soilmedia. While, mono-woundsexhibited a significant superiority on other wounding levels in following characteristics (percentage of rooted cutting, roots length, dry weight of shoots and roots systems, diameter of cutting, numbers of leaves and new branches, branches length, leaf area, total chlorophyll and percentage of Nitrogen).

Key words : *Wounding, Cultural media, Vitis vinifera* L.

Introduction

European grapes (*Vitis vinifera* L.) is one of fruit trees native to the temperate zone. They belong to Vitaceae family which contains 14 species and more than 100 species (Moore and Jules, 1996). It is believed that the native zone for grape is the area between middle Asia and south of The Black Sea and The Caspian Sea in. In this zone, the well-known grape species emerged before the discovery of North American continent. Then, its growth spread to all parts of the world (Khadam *et al.,* 2020). Grape is considered one of the important fruit and the most prevalent in Iraq and worldwide. It is important because of its fruit nutritional value which includes a high ratio of Monosaccharide and organic acid. The latter contains Tartaric acid, Malic acid and Citric acid. In addition, grape fruits include some vitamins, mineral salts such as Potassium, Magnesium and Calcium. They are different from other fruits in that they are rich with vitamin P Citrinp whose deficiency causes weakness in the blood vessels. Furthermore, there are several elements in grape which activate enzymes and hormones (Al-Saidi, 2000; Hasan *et al.*,2019).Grape is also mentioned in The Holly Quran in ten verses and eleven Ayas (Al- Al-Mayesary, 2002). Grape planting is as ancient in Iraq as the civilization and

grape trees are well-known by the ancient Iraqis before Christ (Al-Saidi, 2000). Grape is characterized by its diverse classes which exceed 10000 worldwide and in Iraq there are about 75 classes today most of which are seed grapes. A few numbers of grapes are seedless and their planting did not spread commercially (Al-Saidi, 2000 and AL-Malaki, 2001). Grapes are economically important because they are highly profitable, its fruiting continuity for ten years, its nutritional value and its widespread use in medical applications as a treatment for many diseases. Fresh grapes include the Resveratrol compound that protects the body from prostate cancer cells (Hudson *et al*., 2007). Moreover, grape has become an intrinsic part of human life because of the increase of its fruit needs and their production such as wine, resin and fruit. It becomes a major source of income for a large group of nations and people who are producing, marketing and selling it (Al-Dujaili, 1989).

Propagation by cutting is one of the important and widespread fruit reproduction because there are a large number of seed classes of grape and seedless ones. In this way, the new saplings are the exact match of the source plant in terms of features. Therefore, the required species can preserve the same genetic structure and this method is common in reproducing grapes in particular in regions with zero vulnerability to Phylloxra insect such as Iraq. Also, a large number of plants can be produced from small number in a small area (Abo-Aziz and Alwan, 1984).

There are a number of factors affecting vegetative reproduction, the most important of which is the culture medium which affects the ability to root the fragment of the source plant (Hasan *et al.,* 2020). Therefore, determining the best suited medium is important to increase the rate to develop adventitious roots and to get a high quality root and shoot systems (Salaman, 1988). The high rate of amorphous and non-amorphous calcium in the Iraqi soil, as individual particles mixed with soil or enveloping the mud or fine silt affects the structure of the sand. This rate prevents the formation of (grain) mass that reduce pores in the sand (Mahmood *et al*., 2020). The lack of pores causes ventilation and preserving moisture deficits (Al-Ubaidi, 2001). In this way, the critical calcium role can be controlled by the addition of an organic substance or humic acids which improves the structure and pores of soil to form bonds of calcium humate and fulvate (AL-Taey *et al*., 2019). It also helps to reduce bulk density and ion exchange capacity, improve the temperature of environment and provides the nutrition elements slowly (Burhan and AL-Taey, 2018). Hatrmann *et al*. (2002) state that the Sclerenchyma Tissue between the bark and the crust of the cutting is an obstacle to the appearance and growing of the roots. Therefore, following the process of wounding, the callusis formed and when the cutting lixiviates, the root sprout develops and the wounded tissues are stimulated to cell division. This happens according to natural cumulative of auxins and carbohydrate and other substances in the wounded stimulated region which increases the speed of ventilation. In addition, the wound-damage tissues are also stimulated to produce ethylene which plays a big role in the cell division and accelerates the formation of adventitious roots (Abdulwahab and Al-Al-Dujaili, 2001). In this field, in his study of the effect of the agricultural media and related factors on the rooting of the cutting, Al-Ali (2007) finds out an excellent mean rate of the rooted olive cutting in wounding process 61.93 % in comparison to the normal cutting which is 37.13 %. In addition, the average length of the roots is 16.08 cm. In the same study, he adds the culture media of Peat moss mixed with river grit in a rate of 1:1 has a clear mean effect in the feature of the adventitious roots (the rate of the adventitious roots and the average of root lengths) in comparison with other media. Because of the lack of the studies on this topic, the study is conducted and aims to find the suitable media and the best wounding method to get a high rate of rooting and growth of grape.

Materials and Methods

The work is conducted at the canopy house at The College of Agriculture at the University of Kirkuk from 15/12/2019-1/5/2020. A semi-hardwood cutting containing 2-3 samples of the parent plants at the age of 6-7 years is taken. All the leaves are removed from the plant following a longitudinal wounding (0,1,2) at the base of the cutting. The samples are then put in black Polly ethylene backs containing culture media (Peat moss, river soil). The study concentrates on three aspects according to the randomized complete block designs (R.C.B.D). Each replicate contains five cuttings, thus the number of cuttings are 30 per replicate and the total number of cuttings are 90 in the experiment. The physic and

Table 1. Some physic and chemical features of the used rive soil

Analysis type	Sand $g.kg^{-1}$	Glowing $g.kg^{-1}$	Clay $g.kg^{-1}$	Texture	pH
Analysis result	60	590	350	Siltyglay	7.89
Analysis type	$ECds.m^{-1}$	Organic materials $g.kg^{-1}$	Available Nitrogen $g.kg^{-1}$	Available Phosphorus $g.kg^{-1}$	Available Potassium $g.kg^{-1}$
Analysis result	1.34	9.56	1.10	0.15	1.00

Analyses are conducted at the laboratory of Kirkuk Directorate for Agriculture.

Table 2. Some physic and chemical features of Peat moss

PH	$ECds.m^{-1}$	Organic materials $g.kg^{-1}$	N%	Mg %	P_2O %	K_2O %	KCl %
6.00	1.3	8.7	1.5	8	17	20	14

chemical characteristics for the river soil and peat moss used in the schedule as in Table 1 and 2.

Manufactured by the Holland Company Pokon

The following readings are taken at the end of experiment 1/5/2020:

1. The percentage for the root cutting (%): This percentage is read at the end of the experiment according to the following equation: Rooting percentage= number of rooting cutting/ number of planted cuttings x 100
2. Length of root (cm) and length and diametric of the cutting (cm), number of leafs and the newly formed branches on the cutting and their lengths, dried weight for the sum of the adventitious root and root system (kg). The roots and buds are dried at a furnace at 75° until the weight becomes constant and are weighed again using sensitive digital scale
3. The leaf survey for the saplings (cm^2): The leaves of the plants are surveyed by the use of a computer program designed for this purpose. The software scans the leaves by a scanner through placing the scale ruler to quantify the area and read it (Zainal, 2014).
4. Chlorophyll Content Index (CCI): The content of chlorophyll in leaves is measured by CCM-200 Chlorophyll meter after standardizing the machine (Biber, 2007).
5. Percentage of leaf nitrogen (%): Nitrogen was measured by Micro_Kjeldahl according to A.O.A.C (1980) method. That is after drying, grinding and digesting the leaves by distilled H_2SO_4 and $HClO_4$ in a ratio of 1:4 ml for each one respectively (Johnson and Ullrich, 1959).

The data are analyzed statically according to

Table 3. The influence of different agricultural media on rooting and growing the semi-hardwood cut of *Vitis vinifera* L.

Studied Characteristics / Agricultural media	Percentage for the root cutting (%)	Length of root (cm)	Weight of dried root (km)	Length cutting (cm)	Diametric cutting (cm)	Number of new leaves (leave. $Cutting^{-1}$)
Peat moss	71.33 a	17.33 a	12.55 a	53.55 a	0.85 a	54.89 a
River soil	55.11 b	12.44 b	11.78 b	39.55 b	0.55 b	40.67 b
Studied Characteristics / Agricultural media	Number of new branch (branch. $Cutting^{-1}$)	Lengths of branches (cm)	Weight of shot systems (km)	Leaf area (cm^2)	Chlorophyll Content Index (CCI)	Percentage of nitrogen (%)
Peat moss	14.89 a	34.78 a	27.89 a	25.65 a	75.90 b	4.87 b
River soil	13.11 b	31.44 b	25.55 b	25.23 b	78.95 a	5.45 a

Means not sharing the same letter (s) within each column for each are significantly different at 0.05 level of probability.

ANOV TABLE by SAS ¡V 9.0 (2001) usually used for the analysis of agricultural experiments. The averages are compared by the use of Duncan's Multiple Range under the possibility of Roger Mead and Hasted (2003).

Results and Discussion

The effect of agricultural setting

It is clear in Table 3 that there are clear mean differences in the vegetative and root growth characteristics when using different agricultural media for the reproduction of the cutting. Peat moss agriculture exceeds the river soil (in mean terms) in the percentage for the rooting cutting (29.4), the root lengths (39.3), the weight of dried root (6.53) and shot systems (9.15), length (35.3) and diameter (54.5) of the cutting, number of leaves (34.9), the new branch of the cutting (13.5), lengths of branches (10.6) and leaf area (1.66). In contrast, the river soil agriculture media surpassed the Beat moss in mean terms on river sands in the features chlorophyll (4.01) and percentage of nitrogen (11.9).

The effect of wounding

Table 4 shows that wounding has a clear mean effect on the characteristic of the root and shoots systems and vegetate growth. The mono-wound mean surpasses other wound types the percentage for the rooting cutting (80.9), the root lengths (37.1), the weight of dried root (15.9) and shot systems (22.2), and diameter of the cutting (73.0), number of leaves (75.7), the new branch of the cutting (68.1) and lengths of branches (83.8), leaf area (9.30), the whole chlorophyll (17.9) and the percentage of nitrogen in the leafs (96.82). However, there are no clear mean differences between the length of the cutting in mono-wounds with di-wounds ones which are 49.67 and 49.50 respectively which suppressed the comparison factor (40.50 cm) in an increase rate of 22.6 and 22.3 respectively.

The influence of interference

Table 5 shows that the interference factors (the agricultural media and wounding) have mean influence on the studied characteristic of the cutting. The mono-wound and Peat moss supersede all other factors of growth such as the percentage for the root cutting (91.00), the root lengths (21.00), the weight of dried root (15.67 kg) and shot systems (31.67 kg), length (58.67cm) and diameter (1.13cm) of the cutting, number of leaves (88.33 leaf/cutting^{-1}), the new branch of the cutting (22.33cm branch/cutting $^{-1}$) and lengths of branches (48.67). However, the river soil with mono-wound exceeds other media the total Chlorophyll and the nitrogen percentage in leafs 87.73 CCI and 6.01% respectively while the leaf area 26.87 cm ^{2} in in the river sand with dewpond exceeds other factors.

The study findings can be interpreted through the role of the agricultural media ensures the provision of suitable moisture and ventilation to the bases in addition to stabling the cuttings during tooting. It also supplies oxygen to the bases of the cutting to

Table 4. The influence of different wounding factors on rooting and growing the semi-hardwood cut of *Vitis vinifera* L.

Studied Characteristics / Wounding factors	Percentage for the root cutting (%)	Length of root (cm)	Weight of dried root (km)	Length cutting (cm)	Diametric cutting (cm)	Number of new leaves (leave. Cutting^{-1})
Without wounding	71.67 b	13.83 b	11.50 b	40.50 b	0.52 c	35.00 c
Mono-wounds	76.00 a	17.83 a	13.33 a	49.50 a	0.90 a	61.50 a
Di-wounds	42.00 c	13.00 b	11.67 b	49.67 a	0.70 b	46.83 b
Studied Characteristics / Wounding factors	**Number of new branch (branch. Cutting^{-1})**	**Lengths of branches (cm)**	**Weight of shot systems (km)**	**Leaf area (cm^2)**	**Chlorophyll Content Index (CCI)**	**Percentage of nitrogen (%)**
Without wounding	11.00 c	22.67 c	26.83 b	24.19 c	70.47 c	4.98 c
Mono-wounds	18.50 a	41.67 a	29.33 a	26.44 a	83.10 a	5.32 a
Di-wounds	12.50 b	35.00 b	24.00 c	25.70 b	78.72 b	5.18 b

Means not sharing the same letter (s) within each column for each are significantly different at 0.05 level of probability.

Table 5. The influence of interference among the agricultural media and wounding on rooting and growing the semi-hardwood cut of *Vitis vinifera* L.

Studied Characteristics Treatments		Percentage for the root cutting (%)	Length of root (cm)	Weight of dried root (km)	Length cutting (cm)	Diametric cutting (cm)	Number of new leaves (leave. Cutting^{-1})
Peat moss	Without wounding	81.33 b	17.00 b	11.33 c	47.33 c	0.57 c	33.33 f
	Mono-wounds	91.00 a	21.00 a	15.67 a	58.67 a	1.13 a	83.33 a
	Di-wounds	41.67 d	14.00 c	10.67 c	54.67 b	0.87 b	49.00 b
River soil	Without wounding	62.00 c	10.67 e	11.67 c	33.67 f	0.47 d	36.67 e
	Mono-wounds	61.00 c	14.67 c	11.00 c	40.33 e	0.67 c	40.67 d
	Di-wounds	42.33 d	12.00 d	12.67 b	44.67 d	0.53 d	44.67 c

Studied Characteristics Treatments		Number of new branch (branch. Cutting^{-1})	Lengths of branches (cm)	Weight of shot systems (km)	Leaf area (cm^2)	Chlorophyll Content Index (CCI)	Percentage of nitrogen (%)
Peat moss	Without wounding	10.33 d	24.00 e	27.67 b	25.98 c	72.27 e	4.83 d
	Mono-wounds	22.33 a	48.67 a	31.67 a	26.45 b	78.47 c	4.63 e
	Di-wounds	12.00 c	31.67 d	24.33 d	24.53 d	76.97 d	5.13 c
River soil	Without wounding	11.67 c	21.33 f	26.00 c	22.40 e	68.67 f	5.12 c
	Mono-wounds	14.67 b	34.67 c	27.00 b	26.43 b	87.73 a	6.01 a
	Di-wounds	13.00 c	38.33 b	23.67 d	26.87 a	80.47 b	5.23 b

Means not sharing the same letter (s) within each column for each are significantly different at 0.05 level of probability.

ensure oxidation of the nutrition in the cutting to produce the internal energy required for cell division and for the formation of the root tips (Hamudy and Dewab, 1986). Therefore, the rate of rooting cutting increases (Table 3). Beat moss is considered one of the most famous organic materials that improve drainage and ventilation. The organic material is also characterized by its influence on the agricultural media, works to decompose the soil, open the pores for drainage so that air can enter. This material prevents the formation of masses or soil grain compaction and this improve water conservation (Touban, 1987 and Lateef *et al.*, 2018). As a consequence, the characteristics of the root growth improve vegetative growth of the plant. Furthermore, this material affects the degree of soil reaction which results in the decomposition of the organic acid which reduces the degree of acidity. The chemical, physic and biological properties of the soil improve. These properties are nutrition sources such nitrogen, phosphorus and sulfur. The organic substance tends to form chelating compounds with cations of the special microelements and protects the soil from sedimentation (Abo-Dahi and Younis, 1988).

One of the advantages of wounding (Table 4) is that it can increase the absorption surface area of the tissue bases of the cutting which leads to the absorption of melted and nutrition elements and the added hormones by the roots. This is positively reflected on the growth of pants in addition to making the wounds at the base of the cutting facilitates the process of roots sprouting formed by these wounds and reduces the depletion of energy used for it. It is believed that wounding stimulates cell division and forms wound tissue of or callus when the plant is wounded. The process of callus is important in the reduction of water loss and reduces disease caused while propagating by cutting. Moreover, the formation of callus is important to root of the cutting (Mohamed, 1985 and Noori *et al*. (2018).

It is inferred from this study that grapes can be propagated by semi-wood cutting in a high success rate in the agriculture media of Beat moss following the mono-wounding of the cutting.

References

A.O.A.C. 1980. Official methods of analysis 13th of association of ficial analytical chemists – Washington,dc.

Abdel Wahab, S.A.S. and Jabbar, A.H. Al-Dujaili, 2001. The effect of pens taking, deformation and treatment dates on indole butyric acid on rooting apple apples. *Al-Rafidain Agriculture Journal.* 32 (3) : 71-78.

Abu Aziz, Ab. B. and Th. F. F. Alwan, 1984. The science of cultivating the grapes of the year. Ministry of Higher Education and Scientific Research. Baghdad University.

Abu Dahi, Y. M. and Al Younis, M.A. 1988. Guide to Plant Nutrition. Ministry of Higher Education and Scientific Research. Baghdad University.

Al-Ali, H. H. 2007. The effect of indole butyric acid, culture medium and certain treatments on rooting of the olive branch (*Olea europaea* L.). *Al-Anbar Journal of Agricultural Sciences.* 5 (1).

Al-Dujaili, J. A. and Salman, M.A. 1989. Grape production, Ministry of Higher Education and Scientific Research - University of Baghdad.

AL-Malaki, A. R. A. A. A. 2001. Study the specifications of some seedless grape varieties in the central region of Iraq. Unpublished Master Thesis: Baghdad University.

Al-Mayesary, M. A. S. 2002. The effect of soaring and spraying ethyl on grape *vitisvinifera*. Classify the grapes of black and ruby. Unpublished Master Thesis. Baghdad University.

Al-Saidi, I. H. M. 1982. Cultivation and production of vineyards. Ministry of Higher Education and Scientific Research. University of Al Mosul: Dar Al Kutub Printing and Publishing Corporation.

Al-Saidi, I. H. M. 2000. Grape production. Part one, Ministry of Higher Education and Scientific Research - University of Mosul.

Al-Taey, D.K.A., Al-Shareefi, M.J.H., MijweL, A.K., Al-Tawaha, A. RZ. and Al-Tawaha, A. RM. 2019. The beneficial effects of bio-fertilizers combinations and humic acid on growth, yield parameters and nitrogen content of broccoli grown under drip irrigation system. *Bulgarian Journal of Agricultural Science.* 25 (5): 959–966.

Al-Ubaidi, B. Sh. U. 2001. Various organic sources are drained in the soil and its relationship to limestone. Unpublished Master Thesis. Baghdad University.

Biber, P.D. 2007. Evaluating a chlorophyll content meter on three coastal wetland plant species. *Journal of Agricultural Food and Environmental Science.* 1(2) : 1–11.

Burhan A. K. and AL-Taey, D. K. A. 2018. Effect of Potassium humate, humic acid, and compost of rice wastes in the growth and yield of two cultivars of Dill under salt stress conditions. *Advances in Natural and Applied Sciences.* 12 (11): 1-6

Hammoudi, M. R. and Dayoub, A.H. 1986. *Fundamentals of Vegetables and Fruits.* Aleppo University Publications: Ibn Khaldun Press. 468 pages.

Hartmann, H. T., Kester, D. E., Davies, F.T. and Geneve, R.L. 2002. *Plantpropagation, Principles & Practices*. 7th edition Prentice upper saddle river- Hall, iac,. New Jersey.

Hasan, A.M., Mohamed Ali, T.J. and Al-Taey, D.K.A. 2019. Effects of Winter Foliar Fertilizing and Plant Growth Promoters on Element and Carbohydrate Contents on the Shoot of Navel Orange Sapling. *International Journal of Fruit Science*. 19 (1) : 1-10.

Hasan A.M., Al-Falahy T.H.R. and Al-Taey, D. K.A. 2020. The effect of cutting diameter and storage method on the rooting and growth of Pomegranate cuttings (Salimi and Rawa Cultivars). *Int. J. Agricult. Stat. Sci.* 16 Supplement 1: 1457-1463.

Hasan, J. A. and Salman, M.A. 1989. Grape production. Ministry of Higher Education and Scientific Research. Baghdad University: House of Hikam.

Hudson, T. S., Hartle, D. K., Hursting, S. D., Nunez, N. P., Wang, T. T.Y., Young, H. A., Arany, P. and Green, J.E. 2007. Inhibition of Prostate Cancer Growth by Muscadine Grape Skin Extract and Resveratrol through Distinct Mechanisms. *Cancer Res.* 67 (17) : 8396- 8405.

Hulme, A.C. 1970. *The Biochemistry of Fruit And Their Products*, Vol. 1. Academic press, N.Y., USA.

Johnson, C. M. and Ullrich, A 1959. Analytical Method for Use in Plant Analysis Bulletin 766. University of California Agriculture Experiment station, Berkeley CA.

Jules, J. and Moore, J.N. 1996. *Fruit Breeding*. Volume II: Vine and small fruitcrops. John Wiley & Sons. Inc.

Khadam, A.A., Hasan, A.M. and Altaee, N.H. 2020. Effect of spray with Phenylalanine and Magnesium sulfate on growth and gene expression level of MYBA2 gene for black Grapevine Cv. Dase Al-Enz. *Int. J. Agricult. Stat. Sci.* 16, Supplement 1: 1689-1700.

Lateef, Mohammed Abdul Aziz, Noori, Ali Mohammed, Al-Qadi, Raghad and Mahdi Hadi Muhsin, 2018. Theroleof nitrogen and boron fertilizers on growth and yield in pomegranate (*Punica granatum* L.). *Plant Archives*. 18 : 1957-1960

Mahmood, S.S., Taha, S. M,. Taha, A.M. and AL-Taey, D. K.A. 2020. Integrated Agricultural Management Of Saline Soils Of sowaira, Wasit Governorate. nt. *J. Agricult. Stat. Sci.* 16 (1) : 113-119.

Mohamed, A. K. 1985. *Plant Physiology*. Part Two. University of Mosul: Higher Education Press.

Noori, Ali Mohammed, Lateef, Mohammed Abdul Aziz and Mahdi Hadi Muhsin, 2018. Effect of phosphorus and gibberellic acid on growth and yield of grape (*Vitis vinifera* L.). *Res. on Crops*. 19 (4) : 643-648

Perl, A. and Eshdat, Y. 1998. DNA transfer and gene expression in transgenicgrapes. In: Tombs, M.P. (ed) *Biotechnology And Genetic Engineering Reviews*, vol.15. Intercept, Andover, pp 365–386.

Roger Mead, R.N.C. and Hasted, A.M. 2003. *Statistical Methods in Agriclture and Experimental Biology.* Champan. Hall, CRC, A CRC Press Co., Washington, D. C.

Salman, M. A. 1988. *Horticulture Propagation*. University of Mosul: Directorate of Dar Al-Kutub for Printing and Publishing.

Touban, A. M. M. 1987. Decoration plants. Basra University, Ministry of Higher Education and Scientific Research.

Touban, A. M. M. 2004. The effect of indole butyric (IBA) and its pen type on the ratio of pen rooting and growth to three types of infernal. *Bougainvillea* spp. *Basra Journal of Agricultural Sciences.* 17 (1) : 45—55.

Zainal, A. M. N. 2014. The effect of Agrihumate and urea spray on some growth characteristics and nutritional content of three seedlings of olives (*Olea europaea* L.). Unpublished Master Thesis. University of Kirkuk, Iraq.