

DIFFERENT MEDIA EFFECT ON VARIOUS CULTIVARS OF GRAPES (*Vitis vinifera*) CUTTINGS

Muhammad Amir*, Sayed Hussain*, Solevo Martin***, Muhammad asad latif*****,
Abdul basit**, Naseer Ahmad**, Firdos khan**, Waqar ullah**, Raza ullah****,
Muhammad Abbas*

*Department of Horticulture, Abdul Wali Khan University Mardan, Khyber Pakhtunkhwa,
Pakistan

**Department of Horticulture, The University of Agriculture Peshawar, Khyber Pakhtunkhwa,
Pakistan

***Center of research, production and conservation of ornamental plants and vegetables, SIBI
planning and environmental company, Benin.

****Jilin Agriculture University, China

*****Department of plant pathology, University of Agriculture Faisalabad, Pakistan

ABSTRACT

The experiment was planned to study “Different media effect on various cultivars of grapes (*Vitis vinifera*) cuttings” at Fruit Crops Research Program, Horticultural Research Institute (HRI), National Agricultural Research Centre (NARC), Islamabad, during summer season (July and August), 2019. Different growing media such as M₁ (Sand), M₂ (Garden Soil), and M₃ (1:1 mixture of sand + garden soil) were applied as treatments to check the performance of cuttings of different grapes cultivars (NARC black, Early Round, and Perlette) named as V₁, V₂ and V₃ respectively. All the cuttings utilized in the experiment were treated with 3000 ppm Indole butyric acid (IBA) and grown in polyethene bags having different growing media. Total 135 cuttings were used in this experiment and the trial was performed by complete randomized design (CRD) with three replications. The got discoveries demonstrated that cuttings of grape variety NARC Black (V₁) delivered greatest (16.2) number of roots and root length (8.5 cm) treated with M₃ (1:1 mixture of sand + garden soil). However, cuttings of Perlette (V₃) produce least number of roots (2.2) and root length (3.5 cm). Furthermore, the results related to shoot length and shoot diameter were significantly influenced by M₃ (1:1 mixture of sand + garden soil) in cuttings of NARC Black (V₁). The maximum shoot length (9.5cm) and shoot diameter (2.23mm) were recorded in V₁ (NARC Black) planted in 1:1 mixture of sand + garden soil (M₃). Moreover, maximum number of leaves (6.73) were also recorded in V₁ (NARC Black) planted in M₃ (1:1 mixture of sand + garden soil) while minimum number of leaves (1.45) were recorded in V₃ (Perlette) planted in M₁ (sand). It can be concluded from the above findings that the treatment of (1:1 mixture of sand + garden soil) can improve root length, root diameter, shoot length, shoot diameter and number of leaves per cutting in graph cultivar NARC Black under the agro-climatic conditions of Islamabad.

Keywords: Garden soil, Graph cultivar, Indole butyric acid, Leaf length, pure sand, Root diameter, Root length.

I. INTRODUCTION

Grape (*Vitis vinifera*) belongs to family *Vitaceae*, is fruit, originally it is a berry, it belongs to the woody vines of the blooming plants genus *Vitis*. They can be used for eating fresh or can also be used to make different products such as jam, wine, grape seed extract, vinegar, juice, jelly, and grape oil etc. Grapes is non-climacteric fruit as it does not produce and release ethylene gas. Grapes are commonly produced in clusters. Growing grapes is viticulture and it is considered as one of the oldest cultivations in the world. The history of grapes goes back almost to the dawn of agriculture (McGovern *et al.*, 2013). As grape is pure summertime fruit crop it basically belongs to the hot temperate zone between 34degree North and 49degree South scope. For grapes cultivation mountainous and sub-mountainous zones up to 2000 m altitude are more appropriate (Khan *et al.*, 2011). In view of their future utilization strategy grapes can be arranged as either table or wine grapes. Table grapes are essentially used for its crude eating reason and wine grapes are utilized to make wine. Table and wine grapes have clear differences brought in them through selective breeding while all of them belong to the same species, *Vitis vinifera*. Mostly table grapes have big fruit without seed having thin skin. While on the other hand wine grape have small fruit with thicker skin and this property of grape make it suitable for making wine as the specific aroma in wine comes from its skin. Wine grapes if left for more time in plant they tend to be very sweet therefore care should be taken during its harvesting time. When their fruit have 24% sugar by weight they should be harvested. Commercially made 100% grape Juice produced from table grapes is usually contain 15% sugar by weight (Peterson *et al.*, 2008). In 2017 the world production for grapes was 74,2745,583 metric tons, put down 1.0% from 74,992,047 tons in (2016). China was the leading producer of grapes, accounting for 16.8% of worldwide production. And with 10.9% Italy is on second position followed by the United States at 9.6%. (GOP, 2010). Grapevines can be developed on a broad range of soil types ideally a marginally acidic soil with PH of 6.0-6.5 and require roughly 1 inch of water for each week through the main developing season. Generally utilized establishing triggers are the auxin and indole butyric corrosive (IBA). It has a weak auxin movement and is annihilated moderately gradually auxin-crushing catalyst (enzyme) systems. Further IBA translocate poorly and stays longer duration near the site of application. Because of these properties, it is more effective in stimulating rooting than any other root promoters. Growth regulators that readily translocate may cause undesirable growth effects in the propagated plant (Batiuk *et al.*, 2013). The climatic factors for example, temperature,

snowfall, precipitation and relative humidity assume an imperative function in production and development of grapes. By and large grape requires a warm dry atmosphere. Zones with high precipitation and stickiness are not good for grape development. Grape is effectively developed in locales with a temperature scope of 15°C to 40°C and precipitation of 50 to 60 cm should be clear for around 3-4 months during the growing time frame. Overcast climate, high dampness, low temperature and downpour during blossoming and berry improvement are harming as they support spread of diseases. Grapevines are adjusted to a far-reaching type of soil types. Nonetheless, weighty mud soil, shallow, sodic, or inadequately depleted soils ought to be stayed away from. Grapes require adequate soil dampness during the developing seasons either from precipitation or water system (singleton., 1964). Grapes are generally proliferated from hard-wood stem cuttings. Cuttings 30-40cm long are made in pre-spring when vines are pruned. For better establishing the cuttings are callused by covering them topsy truly in sodden soil in conceal, yet they can likewise be planted legitimately in solid and steady beds. Further methods for engendering are layering and joining. Bugs and different nuisances unsafe to grapevines and natural product incorporate the grape leaf container, grape leaf envelope, omnivorous leaf roller, bug parasites, grape coarse bugs, grape bud scarab, grasshopper, nematodes and phylloxera (Ensect and Pratt, 1975). Grapes contain strong antioxidants identified as polyphenols. These are considered to have antioxidant and anti-inflammatory abilities. Research Laboratory findings have suggested that resveratrol may be capable to decelerate or avoid the production of tumors in lymph, liver, stomach, breast, colon, skin cancer, and leukemia. Resveratrol is similarly appearing in red wine. Few findings have studied at the relationship among red wine and cancer threat in human beings, but it has been discovered that excessive consumption of alcohol on a routine basis can boost the threat of cancer. One More pure anti-inflammatory that appears in grapes is the flavonoid quercetin. According to the U.S. department of agriculture (USDA), one cup of red or green grapes weighting about 151 grams comprises: 104 kilocalories, 1.09 gram of proteins, 0.24 g of fat, 27.33 gram of carbohydrates, of which 23.37 gram is sugars, 1.4 gram of fibers, 288 mg of potassium, 15 milligrams (mg). Grapes additionally consist of vitamins B and A, and they are high in water content. A cup of grapes contains over 121 g of water. They are also high in antioxidants, like as lutein and zeaxanthin (Wikipedia, 2008).

II. MATERIALS AND METHODS

Experiment was carried out to study “Different media effect on various cultivars of grapes (*vitis vinifera*) cuttings” at Fruit Crops Research Program (FCRP), Horticultural Research Institute(HRI), National Agricultural Research Centre(NARC) Islamabad, during summer season (July and august), 2019.

Experimental geographical location

The experiment work was conducted at the experimental field of Fruit Crop Research Program (FCRP), Horticultural Research Institute (HRI), National Agricultural Research Centre (NARC), Islamabad, during (July-august), 2019. The site of the experiment is situated at longitude 73.08° east and latitude 33.42° North on the Globe scale. Altitude of location was 683 MSL (Mean Sea Level) and the annual rainfall in this area is about 1000 mm.

Experimental design

The experiment was performed by completely randomized design (CRD) with three replications. Each replication was consisted of three (3) experimental units and each unit was divided into three sections having one treatment each, so the total 9 units were made in this experiment having three treatments each. Each unit size was 1.5f x 1.5f (1.5f²) separated by keeping bricks in between two replications, and the distance maintained between the two units and two blocks were 5 inches and 5 inches, respectively.

Grape cuttings of different cultivars

Grapes cuttings were taken from the mother plants at Horticultural Research Institute (HRI). NARC, Islamabad. The cuttings were taken from mature wood of pencil thickness varying from 6-8 inches in length. Upper cut was given little slanting above the bud and basal cut was given just below the lower bud. Each cutting had about 4-5 nodes.

In this experiment three different cultivars (NARC black, Early Round, and Perlette) were used. All the cuttings utilized in the experiment were treated with 3000 ppm IBA initially and dipped in polythene bags having different media to check different media effect on various cultivars of grapes cuttings.

Materials used in the experiment

Different materials such as polythene bags, secateurs for cutting preparation, different media, grape cuttings, gloves, spade, wood sticker, water, scale, auxin (IBA), bricks, tags, bottles, sprinkler, weight scale, chalk powder, knife, marker, pruning scissor, hand barrow, pencil and rubber were used in the whole experiment.

Procedure to conduct experiment

First of all, polythene bags were filled with three different media including: sand, garden soil and sand + garden soil (1:1). Before filling polythene tubes, small holes were made in them to drain the extra water to prevent rotting of roots. The tubes were then placed according to the layout of the experiment and separated every replication by keeping bricks between them. Cuttings were treated with 3000 ppm IBA and planted in these bags as per lay-out and watered to saturation point.

Treatments or media

M_1 = sand

M_2 = garden soil

M_3 = sand + garden soil (1:1) mixture

Parameters studied: The data were collected to study the following parameters:

No. of leaves per cutting: The data for number of leaves was collected from every unit of replication by counting the number of leaves in each cutting.

No. of roots per cutting: Number of roots were counted in every experimental unite for every cutting.

Root length (cm): Root length was measured in centimeters (cm) from every unit with the help of measuring tape.

Rooting percentage: Rooting percentage was also calculated for every cutting.

Shoot diameter (cm): Shoot diameter was measured for every cutting in millimeters (mm) using Vernier caliper.

Statistical Analysis

Analysis of the data for all the parameters were performed according to the completely randomized design (CRD). Means of examined traits were categorized according to least significance difference (LSD) test (steel *et al*, 1997) by using Microsoft excel and statistical software statistic-8.1.

III. RESULTS AND DISCUSSION

The results of the present study are briefly discussed in this chapter. The average values for the studied attributed were compared and presented in bar graphs. Grape varieties were presented at X-axis while different media were kept at y-axis.

No. of leaves per cutting

Data related to number of leaves per cutting of different grape varieties is shown in Figure 1.1, and the corresponding analysis of variance (ANOVA) is presented in table 1. The obtained data revealed that number of leaves per cutting of different grape cultivars is significantly affected by potting media under greenhouse conditions in summer season. Maximum number of leaves were produced by the cuttings of grape variety NARC Black (V_1) planted in 1:1 mixture of sand + Garden soil (M_3) followed by the cutting of variety Early Round (V_2) planted in the same media. While minimum number of leaves was generated by the cuttings of grape variety Perlette (V_3) planted in pure sand (M_1).

Table 1. Analysis of variance (ANOVA) for the number of leaves per cutting of different grape cultivars in different media.

SOV	DF	SS	MS	F-ratio	P-value
Treatment	2	14.0000	7.00000	9.21	0.0148
Error	6	4.5600	0.76000		
Total	8	18.5600			

Coefficient of variance (CV) =13.63

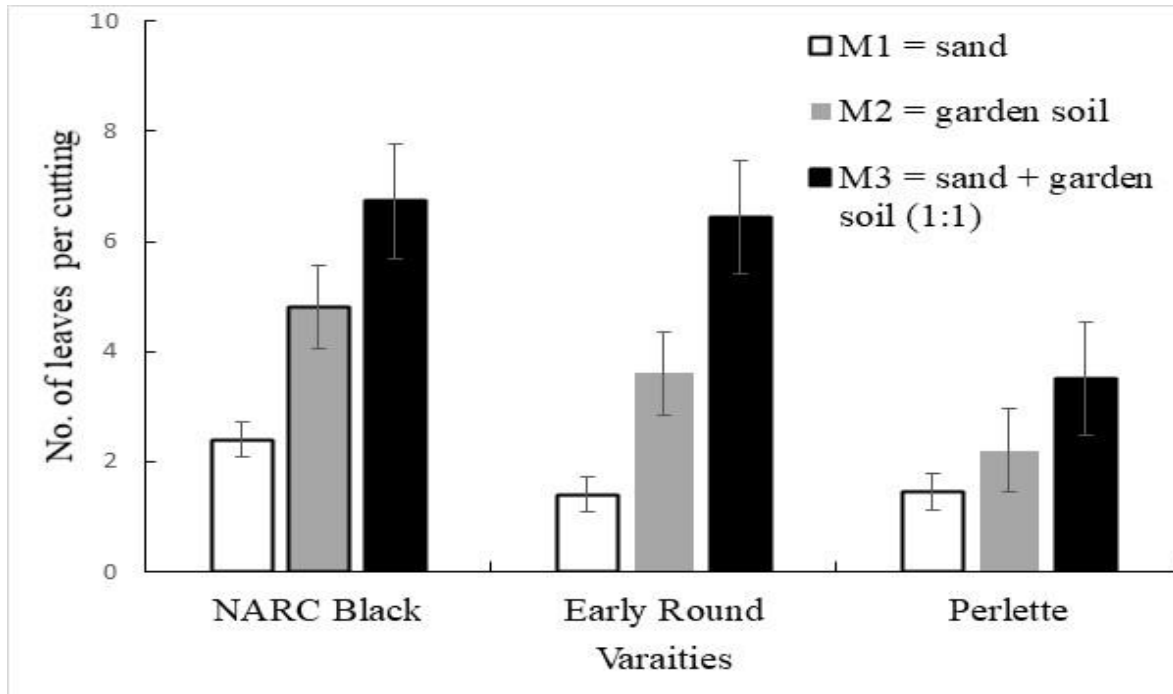


Figure 1.1. Different media effect on number of leaves per cuttings of different grape cultivars.

The above studies showed that potting media significantly affect the number of leaves production in grapes cuttings. The application of 1:1 mixture of sand + garden soil significantly increases leaves production in grape cuttings of all the varieties but the most affective was variety NARC black which produce average (6.73) leaves. While the minimum average (1.45) leaves was produced by cuttings of grape variety Perlette in sand medium.

Similar kind of results also recorded by Muhammad Farooq *et al.*, (2018), they planted woody grape cuttings in different growing media, they observed the highest number of leaves (17.0) per stem cutting grown in the potted medium having canal silt (25%) and bagasse (75%) mixture. Sidique *et al.*, (2002) also revealed that potting media significantly affect leaves production in fig cuttings they recorded high leaves production in garden soil and pure sand mixture.

No. of roots per cutting

Data related to number of roots per cutting is shown in the figure 1.2 and the corresponding analysis of variance (ANOVA) is presented in table 2. Maximum number of roots were produced by cuttings of variety NARC Black planted in 1:1 mixture of sand + garden soil (M₃) followed by variety Early Round planted in the same media, while less number of roots were produced by Perlette (V₃) planted in sand (M₁).

Table 2. Analysis of variance (ANOVA) for number of roots per cutting of the different grape cultivars in different media.

SOV	DF	SS	MS	F-ratio	P-value
Treatment	2	0.74667	0.37333	0.47	0.0466
Error	6	4.77333	0.59556		
Total	8	5.52000			

Coefficient of variance (CV) =17.35

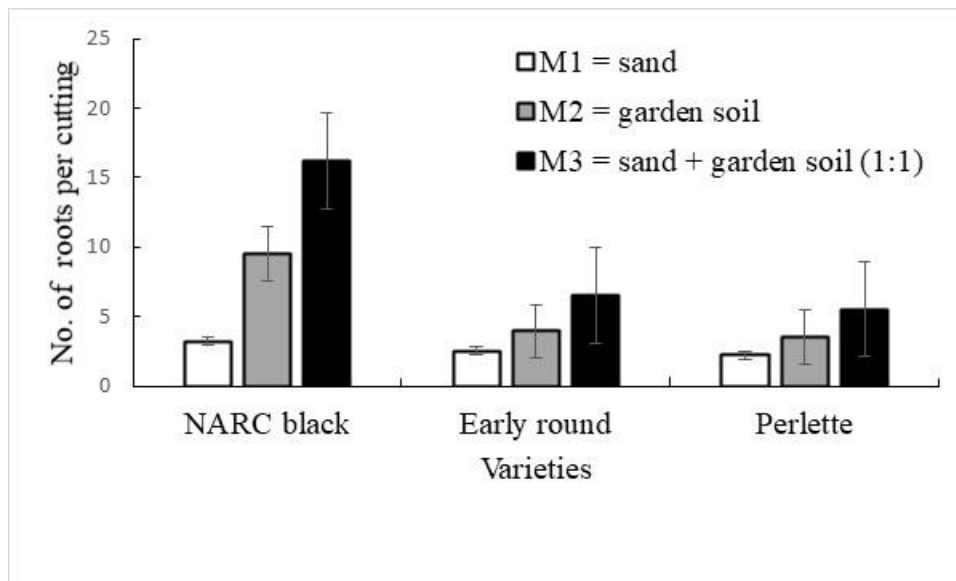


Figure 1.2. Different media effect on number of roots per cutting of different grape cultivars.

Potting media types has significant influence on number of roots per cutting of every cultivar as maximum average (16.2) observed in NARC black planted in 1:1 mixture of sand + garden soil. While minimum average (2.2) number of roots was produced by Perlette (V_3) planted in sand medium (M_1). Similarly, the effect was reported by Kaplan and Gokbayrak, (2012) and Satisha *et al.*, (2008). They observed that significant effect of potting media on number of roots in grape rootstock cuttings. The result also confirmed with the finding of Somkuwar *et al.*, (2011) they found that higher number of roots primordial in Freedom rootstock due to the increased amounts of reducing sugar and carbohydrates.

Shoot length (cm)

Experimental data for shoot length (cm) of different grape cultivars is shown in the figure 1.3, and its analysis of variance (ANOVA) is presented in table 3. Maximum shoot length was produced by grape variety early round (V_2) planted in 1:1 mixture of sand + Garden soil (M_3) followed by grape variety NARC Black (V_1) planted in the same medium. While minimum shoot length was produced by grape variety Perlette (V_3) planted in sand (M_1).

Table 3. Analysis of variance (ANOVA) for shoot length (cm) of different grape cultivars in different media.

SOV	DF	SS	MS	F-ratio	P-value
Treatment	2	9.8854	4.94271	2.10	0.0039
Error	6	14.1448	2.35747		
Total	8	24.0302			

Coefficient of variance (CV) =14.77

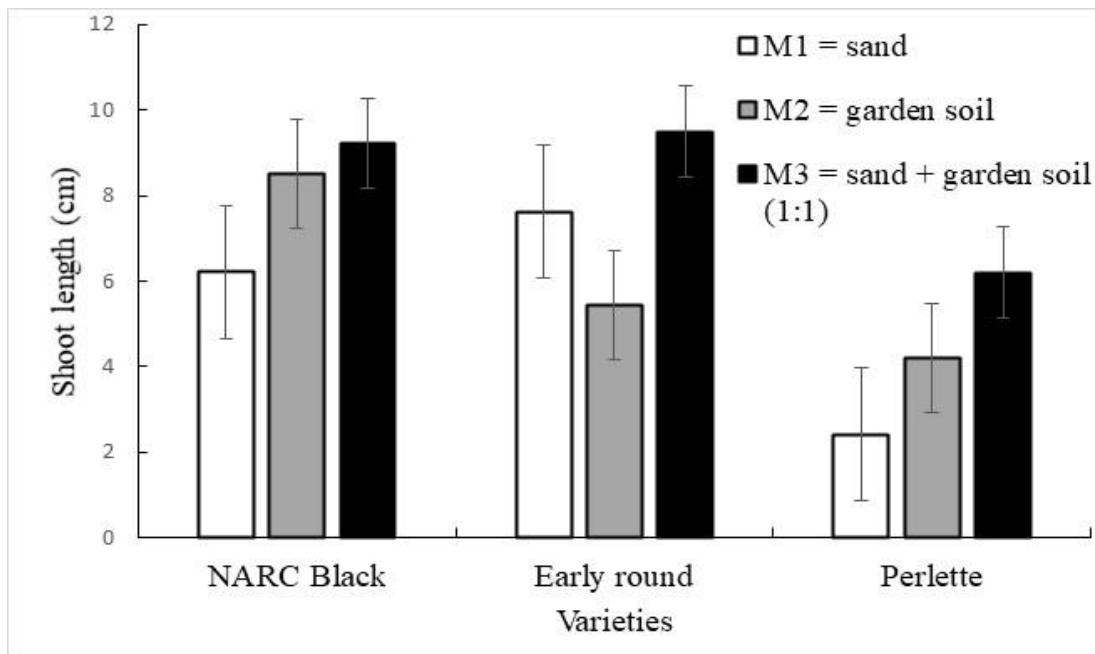


Figure 1.3. Effect of different media on shoot length (cm) in grape cuttings of different cultivars.

It is clear from the above studies that potting media significantly affect shoot length in grape cuttings of different varieties. Maximum average shoot length (9.5 cm) was produced by grape variety early round planted in 1:1 mixture of sand + garden soil while grape variety Perlette produce shoots with minimum average (2.42 cm) shoot length. Previous studies by John *et al.*, (2003) shown similar significant effect of potting media on shoot length of grape cuttings. They revealed pure soil as best potting media for the vegetative growth of grape cuttings.

Rooting percentage

Data regarding rooting percentage in different grape cultivars affected by different potting media is given in figure 1.4 and the corresponding analysis of variance (ANOVA) is presented in table 4. Maximum rooting percentage was recorded for variety NARC Black (V_1) planted in 1:1 mixture of sand + Garden soil (M_3) followed by Early Round (V_2) planted in the same media. Minimum rooting percentage was recorded for Perlette (V_3) planted in sand (M_1).

Table 4. Analysis of variance (ANOVA) for rooting percentage of different grape cultivars in different media.

SOV	DF	SS	MS	F-ratio	P-value
Treatment	2	1.1022	0.55111	0.25	0.0051
Error	6	13.1200	2.18667		
Total	8	14.2222			

Coefficient of variance (CV) =8.86

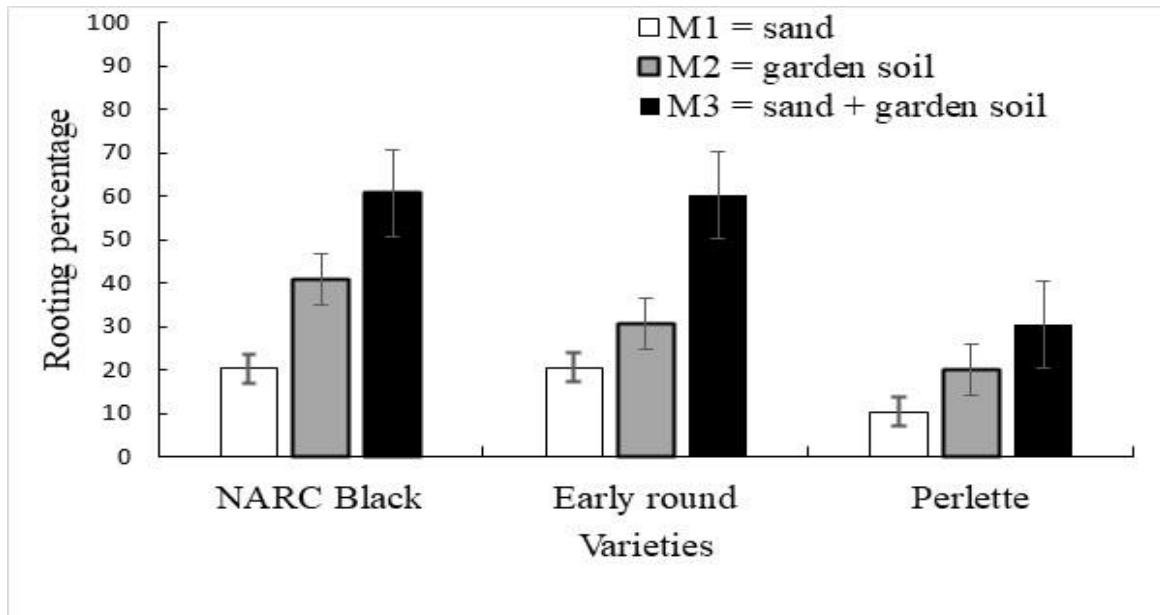


Figure 1.4. Effect of different media on rooting percentage in grape cuttings of different cultivars. Rooting percentage significantly affected by potting media as in the above table maximum average roots (60.73) was produced by NARC black (V_1) planted in 1:1 mixture of sand + garden soil (M_3) while minimum roots was also produced by grape variety NARC black (V_1) in sand (M_1). Similarly, this effect was also recorded by patail *et al.*, (1998) they observed that capability of rooting percentage was more affected by the interaction between potting media and cultivar.

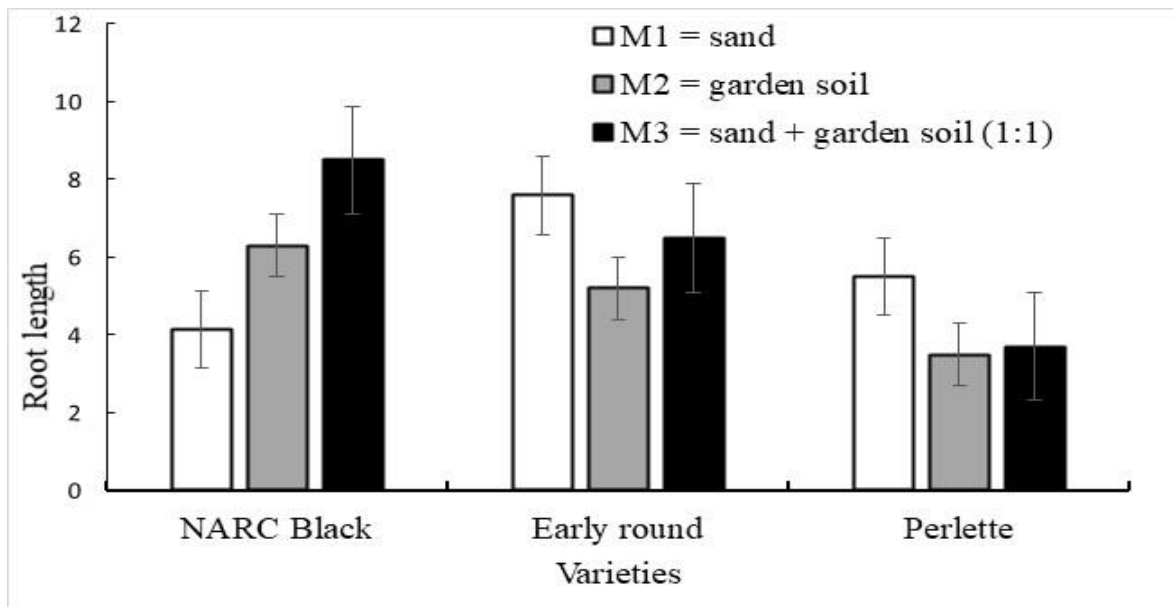
Root length (cm)

Data regarding grapes root length per cutting of different grape cultivars affected by different media under greenhouse conditions are given in figure 1.5 and the corresponding analysis of variance is shown in table 5. It is shown that lengthy roots were recorded in NARC Black (V_1) planted in 1:1 mixture of sand + Garden soil (M_3) followed by early round (V_2) planted in sand (M_1). Short roots were noted for Perlette (V_3) planted in Garden soil (M_2).

Table 5. Analysis of variance (ANOVA) for root length (cm) of different grape cultivars in different media.

SOV	DF	SS	MS	F-ratio	P-value
Treatment	2	0.89787	0.44893	0.44	0.0032
Error	6	6.12133	1.02022		
Total	8				

Coefficient of variance (CV) =20.91

**Figure 1.5.** Effect of different rooting media on root length (cm) in grape cuttings of different cultivars.

As from above findings significant effect of different potting media on root length of different grape cultivars is shown. Lengthy average leaves (8.5 cm) produced by NARC black (V_1) in 1:1 mixture of sand + garden soil (M_3) while minimum average (2.5 cm) root length was observed in Perlette (V_3) planted in garden soil (M_2). Similar results were recorded by Grande *et al.*, (2002) in which they stated that the cuttings that were planted in the mixture of sand and garden soil produce maximum root length.

Shoot diameter (mm)

The experimental data related to shoot diameter of different grape cultivars affected by different potting media under greenhouse conditions are presented in figure 1.6 and the corresponding analysis of variance (ANOVA) is given in table 6. It is clearly that thicker shoots were produce by NARC Black (V_1) planted in M_3 (1:1 mixture of sand + garden soil) followed by Early Round (V_2) while thinner shoots were produced by Perlette (V_3) planted in M_3 (1:1 mixture of sand + Garden soil).

Table 6. Analysis of variance (ANOVA) for shoot diameter (mm) of different grape cultivars in different media.

SOV	DF	SS	MS	F-ratio	P-value
Treatment	2	2.64062	1.32031	4.62	0.0611
Error	6	1.71573	0.28596		
Total	8	4.35636			

Coefficient of variance (CV) =35.23

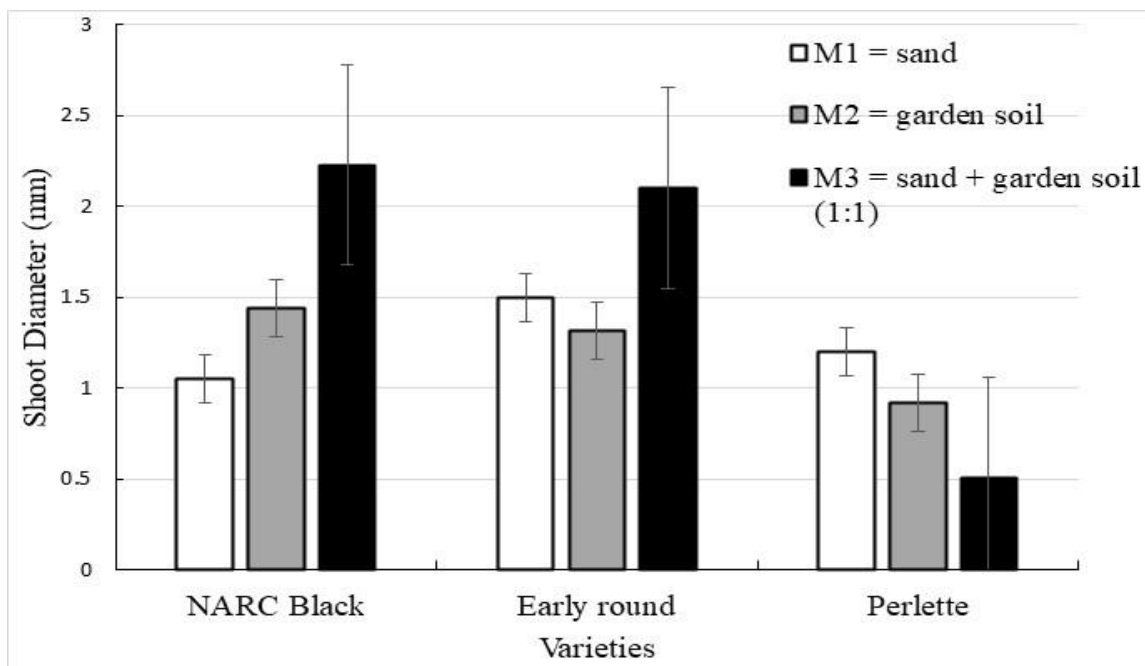


Figure 1.6. Effect of different media on shoot diameter (mm) in grape cuttings of different cultivars

Shoot diameter is significantly affected by potting media as shown. Maximum shoot diameter was observed in NARC black planted in 1:1 mixture of sand + garden soil while minimum average (0.51) shoot diameter was produced by Perlette planted in 1:1 mixture of sand + garden soil. Similarly, M.Jamy *et al.*, (1995) revealed that potting media significantly affect shoot diameter of planted cuttings. They recorded maximum shoot diameter in grape cuttings planted in normal soil plus farmyard manure.

IV. Conclusions

It is concluded from the obtained findings of the present study that cuttings of grape variety NARC Black produced maximum and lengthy root when planted in mixture of sand + garden soil (1:1). While cuttings of grape variety Early Round and Perlette produced lengthy roots when planted in pure sand.

Based upon the findings it is recommended that sand + garden soil (1:1) may be utilized for cutting propagation of grape variety NARC Black and Pure sand for Early Round and Perlette during summer season.

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CONFLICT OF INTEREST

All the authors declare that they have no conflict of interest.

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AUTHORS

First Author – Muhammad Amir, M.Sc (Hons), Department of Horticulture, Abdul Wali Khan University Mardan, Khyber Pakhtunkhwa, Pakistan

Second Author – Sayed Hussain, Department of Horticulture, Abdul Wali Khan University Mardan, Khyber Pakhtunkhwa, Pakistan

Third Author – Solevo Martin, center of research, production and conservation of ornamental plants and vegetables, SIBI planning and environmental company, Benin.

Fourth Author – Muhammad Asad Latif, Department of plant pathology, University of Agriculture Faisalabad, Pakistan

Fifth Author – Abdul basit, Department of Horticulture, The University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan

Sixth Author- Naseer Ahmad, Department of Horticulture, The University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan

Seventh Author – Firdos Khan, Department of Horticulture, The University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan

Eighth Author – Waqar ullah, Department of Horticulture, The University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan

Ninth Author – Raza ullah, Jilin Agriculture University, China

Tenth Author – Muhammad Abbas, Abbas, Department of Horticulture, Abdul Wali Khan University Mardan, Khyber Pakhtunkhwa, Pakistan

Correspondence Author – Sayed Hussain