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Effects of Different Rooting Media on the Growth of Pomegranate Cuttings in Kandahar, Afghanistan

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Abstract

One of the most widely consumed fruits is the pomegranate (*Punica granatum* L.), which belongs to the *Punicaceae* family. The pomegranate is one of the most important fruits in terms of its nutritional worth. Hardwood cutting is the most successful pomegranate propagation technique. However, pomegranates have been propagated using a variety of growing conditions, some of which have led to an increase in cutting growth red soil and vermicompost, for example, enhanced the number of shoots, shoot length, cutting height, number of cutting leaves, and dry matter of cutting leaves. Pomegranate cultivars in Kandahar have a limited genetic variety, and the area lacks high-quality media for optimal pomegranate propagation. Furthermore, there hasn't been much prior research on the problem in the area. Therefore, the experiment was carried out in the research farm of Afghanistan National Agricultural Science and Technology University (ANASTU). A complete randomized design (CRD) was used to replicate twelve treatment combinations and four cultivars. The purpose of the study is to investigate how various growing media affect pomegranate cutting growth.

Keywords: Cutting, Growth, Pomegranate, Rooting Media

Introduction

One of the earliest crops ever grown worldwide is the pomegranate tree (Punica granatum L.) (Ibrahim & Kenan, 2018) [10]. The pomegranate belongs to the Punicaceae family, which has two species-P. granatum and P. proto Punica-and just one genus, Punica (Bhupathi Reddy *et al*., 2022) [8]. It's delicious edible fruits, as well as its therapeutic and decorative uses, make it an economically and nutritionally important plant in tropical and subtropical regions of the world (Bhupathi Reddy *et al*., 2022) [8]. Iran is believed to be the native home of the pomegranate (Bhupathi Reddy *et al*., 2022) [8].

Air layering, hardwood cuttings, and softwood cuttings are the methods used to propagate pomegranates (Bhupathi Reddy *et al*., 2022) [8]. But the primary method of pomegranate propagation is vegetative (clonal) (Chandra & Dhinesh Babu, 2010) [9]. The most practical and efficient technique is hardwood cutting propagation (Bhupathi Reddy *et al*., 2022) [8]. Compared to other propagation techniques, cuttings require less time (Bhupathi Reddy *et al*., 2022) [8]. One of the most popular and effective ways to propagate pomegranates is through cuttings (Ibrahim & Kenan, 2018) [10].

Various growing media, including coco-peat, vermiculite, perlite, sphagnum moss, FYM, vermicompost, and soil, are employed to propagate pomegranates (Bhupathi Reddy *et al*., 2022) [8]. PGRs and appropriate growing media, such as vermiculite and coco peat, vermiculite with perlite, or a combination of vermiculite and coco peat in equal amounts, are the best ways to grow cuttings at the commercial level (Bhupathi Reddy *et al*., 2022) [8].

The maximum shoot length, number of leaves, height of cutting, total number of cutting leaves, and dry matter percentage of leaves were measured after applying pomegranate cuttings planted in Red Soil + Vermicompost (1:1) rooting media (Rathwa *et al*., 2017) [12]. The findings showed that peat medium and pomegranate moss medium considerably increased the quantity of

leaves, roots and shoots, root wet weight, and root length (Sharif *et al*., 2023) [13].

According to Sharif *et al*. (2023) [13], cuttings cultivated on a mixed media exhibited a notable increase in foliar leaf growth, including leaf area, leaf dry weight, and chlorophyll content. Additionally, foliar treatment of humic acid at a dose of 100 mg L-1 is helpful for enhancing root growth and some vegetative properties of pomegranates, and peat moss medium is superior than sand and mix (sand + peat moss) for pomegranate cutting growth (Sharif *et al*., 2023) [13]. With the exception of fresh leaf weight and chlorophyll metrics, peatmoss media is noticeably better than mix and sand media overall (Jamal *et al*., 2023) [11]. With the exception of shoot counts, the foliar spray with Alga 600 concentrations did not significantly alter the most examined metrics (Jamal *et al*., 2023) [11].

The treatment combination comprising Coco peat: Perlite: Vermiculite with 2000 ppm IBA recorded highest values in terms of length of cutting after survival (81.08 cm), percentage of rooted cuttings (97.78%), survival of rooted cuttings (93.78%), number of roots per cutting (41.50), length of longest roots per cutting (32.03 cm), fresh weight of root (2.25 g), sprouts per cutting (2.59), shoots per cutting (9.87), length of shoots per cutting (32.33 cm), leaves per rooted cuttings (145.40), leaves per longest shoot (29.99), fresh weight of shoot (16.67 g), root to shoot ratio (0.15) and survival percentage after shifting in poly bags (82.22) (Tanwar *et al*., 2020) [14].

Despite the diverse gene pool available in the region, the genetic diversity available in Kandahar province has not been fully exploited and is dependent only on two major cultivars i.e., Kandahar and Bedana, thus restricting the choice of other cultivars which may have the potential for tolerance to various biotic and abiotic stresses. The pomegranate industry of Afghanistan and Kandahar in particular for want of choice of specific cultivars may suffer a serious setback in the event of an outbreak of certain insect pest and diseases such as, wilt, bacterial blight fruit borer, cracking etc., which have now become a major threat in most of the pomegranate growing countries of the world.

The second major problem hindering the successful cultivation of pomegranate in Kandahar province is the lack of availability of quality planting material. In dearth of quality planting material, seedling plants are grown which show wide variation in growth and yield attributes. Some of the major issues related to non-availability of planting material are the lack of technical knowhow regarding the exact time and method of propagation including responsive rooting media for higher graft take.

The fruit industry of Afghanistan for the past one decade had been witnessing a gradual shift in the cultivation of fruit crops from grape, almond and apricot towards pomegranate, thus putting colossal pressure on the demand of planting material. To avoid the inherent problems of wilt and bacterial blight, it is essential that genuine planting materials are provided to the growers. In this back drop there is an urgent need for refinement of technology over the traditional propagation practices which are in vague for the last several decades. Keeping in view the above problems and the future prospects of pomegranate industry for diverse agro-ecological regions in Afghanistan, basic research on the standardization of rooting media for the promising genotypes grown in Kandahar is being proposed with the following objective.

1. To evaluate the effect of pomegranate cultivars on success and vegetative growth in different rooting media at specific intervals.

Materials & Method

The hard wood c.v cutting process in completed at the kohkaran research & Extension farm, the first we are selected that four different C.V of pomegranate in the size of cutting cultivars are 30cm, then, we collect and stored for (15) days in moisture place before the cultivation. Hard wood stem cutting of cultivars Kandhari, Tashkughani, Tagabi Bedana and Tagabi Danadar collected at an interval of 15 days during February-March will be evaluated for its survival and plant establishment in different rooting media in Kandahar Province of Afghanistan.

Four cultivar of pomegranate such as C_1 Kandhari, C_2 Tashkughani, C_3 Tagabi Bedana, C_4 Tagabi Danad and 12 rooting media examined in Complete Randomized Design (CRD) replicate trice. The experiment was conducted at Afghanistan National Agricultural Sciences and Technology University (ANASTU) research farm. At the maximum growth stage all the relevant growth parameters were collected accordingly following the standard methods and procedures, and reasonable analysis conducted in order to compare the differences. The data will be analysed in completely randomized block design using statistical analysis system software (SAS version 2).

Table 1: Rooting media (Eight)

T_1 Soil	T_2 Sand	T_3 FYM/Poultry manure
T_4 Leaf litter (Apricot)	T_5 Perlitte	$T_{6\ Soil}$ Sand
T_7 Soil+FYM/Poultry manure	T_8 Soil +Leaf Litter	T_9 Soil +Perlite
T_{10} Soil+Sand+FYM/Poultry manure	T_{11} Soil+Sand+Leaf Litter	T_{12} Soil+Sand+Perlite

Results

Number of leave/shoots

The data pertaining to Number of leaves/shoots is presented in Table 4. The analysis showed that potting media had significant effect on number of leaf/shoots. The overall mean showed that the number of leaf/shoots was significantly higher in T_{12} (Soil+Sand+Perlite) (39.38) followed by T_9 (Soil Perlite) (36.50). No leaf emergence was recorded in the treatments T_3 (Poultry manure) (0.00) and T_7 (Soil+Polutry manure) (0.00), while it was minimum in the treatment T_4 (Leaf mould) (3.00g) with similar statistical values in the treatment T_8 (3.75g). Cultivar response to different potting media showed the maximum number of leaves/shoots in cvs. Tashkurgani (21.33) and Kandhari (20.78) and the minimum number of leaves ware registered in cv. Tagabi Danadar (16.75). The interaction effect among the treatments and cultivar showed that the number of leaves/shoots ware significantly highest in the treatment combination $T_{12}C_3C_2$. Irrespective of the varying treatment combination and cultivar, no leaf emergence was recorded in the cultivars T_3 and T_7 potting media, except T_4 and T_8 in which minimum number of leaves/shoots were recorded in cvs. Tagbi Danadar (12.00) and Tashkugani (15.00) leaves/shoot (Table 2).

Table 2: Effects of rooting media on number of leaves/shoots

Treatment	C_1	C_2	C_3	C_4	Mean
T_1	29.67gjkih	25.00 ljkm	24.00 lnkm	16.00 pnoq	23.67e
T_2	26.00ljkm	22.00lnom	20.00pnom	14.00 pq	20.50f
T_3	0.00 r	0.00 r	0.00 r	0.00 r	0.00h
T_4	0.00 r	0.00 r	0.00 r	12.00q	3.00g
T_5	34.00egdfch	37.00ebdfe	35.00egdfc	28.00ljkih	33.50c
T_6	31.00gjfih	27.00ljkie	25.00ljkm	22.00lnom	26.25
T_7	0.00 r	0.00r	0.00 r	0.00 r	0.00h
T_8	0.00 r	15.00pq	0.00 r	0.00 r	3.75g
T_9	35.00egdfc	38.00ebdac	40.00bac	33.00edfih	36.50b
T_{10}	24.00lnkm	20.00pom	17.67pnoq	16.00pnoq	19.42f
T_{11}	31.33egjfih	30.00gjkih	22.00 lnom	25.00 ljkm	27.08d
T_{12}	38.33bdac	42.00ba	44.00a	35.00egdfc	39.83a
Mean	20.78a	21.33a	18.97b	16.75c	19.46
P=0.005	T	1.65			
	V	0.95			
	T×V	6.84			

Fresh weight of leaf (g)

The data depicted in table 5 showed that among all the potting media, T_{12} (Soil+Sand+Perlite) attained the maximum fresh wt. of leaf (0.37g) followed by the treatment T_9 (Soil+Perlite). Excluding the treatments T_3 (Pollutry Manure) and T_7 (Soil + poultry manure) which failed to sprout, the minimum leaf fresh was recorded in the treatments T_8 (Soil + Leaf mould) (0.04g) and T_4 (Leaf mould) (0.02g). The cultivar response to the different potting media was maximum in Tashkurgani (0.19g) followed by Tagabi Danadar (0.17g). Interaction effect between the treatment and cultivar was found to be significantly higher in the treatments $T_{12}C_2C_3$ (Table 3).

Table 3: Effects of rooting media on fresh weight of leaf

Treatment	C_1	C_2	C_3	C_4	Mean
T_1	0.18 ^{ikj}	0.22 ^{h}	0.14 ^{lnm}	0.20 ^{ihj}	0.19 ^{e}
T_2	0.16 ^{lk}	0.18 ^{ikj}	0.12 ^{onm}	0.15 ^{lkm}	0.15 ^{f}
T_3	0.00 ^{p}	0.00 ^{p}	0.00 ^{p}	0.00 ^{p}	0.00 ^{j}
T_4	0.00 ^{p}	0.00 ^{p}	0.00 ^{p}	0.09 ^{o}	0.02 ^{i}
T_5	0.28 ^{ef}	0.31 ^{ed}	0.32 ^{dc}	0.33 ^{bdc}	0.31 ^{c}
T_6	0.20 ^{ihj}	0.21 ^{ih}	0.11 ^{on}	0.26 ^{gf}	0.20 ^{e}
T_7	0.00 ^{p}	0.00 ^{p}	0.00 ^{p}	0.00 ^{p}	0.00 ^{j}
T_8	0.00 ^{p}	0.17 ^{lkj}	0.00 ^{p}	0.00 ^{p}	0.04 ^{h}
T_9	0.31 ^{ed}	0.35 ^{bac}	0.32 ^{dc}	0.35 ^{bac}	0.33 ^{b}
T_{10}	0.14 ^{lnm}	0.18 ^{ikj}	0.09 ^{o}	0.10 ^{o}	0.13 ^{g}
T_{11}	0.22 ^{h}	0.29 ^{ef}	0.20 ^{ihj}	0.23 ^{gh}	0.23 ^{d}
T_{12}	0.36 ^{ba}	0.38 ^{a}	0.38 ^{a}	0.35 ^{bac}	0.37 ^{a}
Mean	0.15 ^{c}	0.19 ^{a}	0.14 ^{d}	0.17 ^{b}	0.16
P=0.005	T	0.017			
	V	0.009			
	T×V	0.034			

Leaf dry weight

The data presented in Table 6 showed that leaf dry wt. followed a pattern similar to the leaf fresh wt. Among the different combinations of potting media, leaf dry wt. (g) was recorded maximum in T_{12} (Soil+Sand+Perlite) (0.26g) followed by T_9 (Soil+Perlite) (0.23g) with statistical similarity in T_5 (Perlite). The minimum leaf dry wt.(g) was registered in the treatment T_3 (Pollutry Manure) and T_7 (Soil+Pollutry manure) and was statistically similar with the values recorded in the treatments T_8 (Soil+ Leaf Mould) and T_4 (leaf mould). Clultivar response to different potting media in terms of leaf dry wt. (g) was observed maximum in Tashkurgani followed by Kandhari and Tagabi Danadar (0.11g) and the difference was not significant. The interaction effect of different treatment and cultivar combinations, was highest in T_{12} without any significant variation. Minimum interaction effect between treatment and variety was observed in T_3, T_4 & T_7 (Table 4).

Table 4: Effects of rooting media on leaf dry weight

Treatment	C_1	C_2	C_3	C_4	Mean
T_1	0.13 ^{gifh}	0.15 ^{egdfh}	0.10 ^{jgikh}	0.12 ^{jgifh}	0.13 ^{d}
T_2	0.11 ^{jgikh}	0.14 ^{egfh}	0.08 ^{jgikh}	0.08 ^{jgikh}	0.10 ^{e}
T_3	0.00 ^{l}	0.00 ^{l}	0.00 ^{l}	0.00 ^{l}	0.00 ^{g}
T_4	0.00 ^{l}	0.00 ^{l}	0.00 ^{l}	0.05 ^{lk}	0.01 ^{gf}
T_5	0.20 ^{ebdac}	0.24 ^{ba}	0.21 ^{bdac}	0.21 ^{bdac}	0.22 ^{b}
T_6	0.14 ^{egfh}	0.18 ^{ebdfc}	0.06 ^{jlk}	0.16 ^{egdfc}	0.14 ^{d}
T_7	0.00 ^{l}	0.00 ^{l}	0.00 ^{l}	0.00 ^{l}	0.00 ^{g}
T_8	0.00 ^{l}	0.11 ^{jgikh}	0.00 ^{l}	0.00 ^{l}	0.03 ^{f}
T_9	0.22 ^{bac}	0.24 ^{ba}	0.21 ^{bdac}	0.23 ^{ba}	0.23 ^{b}
T_{10}	0.10 ^{jgikh}	0.12 ^{jgifh}	0.07 ^{jlik}	0.07 ^{jlik}	0.09 ^{e}
T_{11}	0.15 ^{egdfc}	0.20 ^{ebdac}	0.12 ^{jgifh}	0.16 ^{egdfc}	0.16 ^{c}
T_{12}	0.26 ^{a}	0.27 ^{a}	0.27 ^{a}	0.25 ^{ba}	0.26 ^{a}
Mean	0.11 ^{b}	0.14 ^{a}	0.09 ^{c}	0.11 ^{b}	0.11
P=0.005	T	0.016			
	V	0.009			
	T×V	0.067			

Shoot length (cm)

The results showed significant influence of potting media on shoot length. The shoot length was recorded maximum in the treatment T_{12} (Soil+Sand+Perlite) (42.12 cm) followed by T_9 (Soil+Perlite), while minimum shoot length was recorded in the treatments T_3 and T_7 which did not show any sprouting there by resulting in ultimate failure to develop into shoot and form leaves. Cultivars responded differently to the potting media and over all mean revealed the maximum growth of shoot in cultivars Tashkurgani (23.43 cm) closely followed by Kandhari (22.76 cm) without any significant difference. Minimum shoot length with statistical parity was recorded in cultivars Tagabi Bidana and Tagabi Danadar. Ineraction effect between the treatment and cultivar registered maximum shoot length in $T_{12}C_1C_2$ and $T_{11}C_3C_2$ while it was minimum in T_3 and $T_4C_1C_2C_3C_4$ (Table 5).

Table 5: Effects of rooting media on shoot length

Treatment	C_1	C_2	C_3	C_4	Mean
T_1	30.00 ^{hji}	26.78 ^{jk}	25.00 ^{jlk}	23.37 ^{mlk}	30.00 ^{d}
T_2	26.22 ^{jk}	24.12 ^{lk}	25.00 ^{jlk}	22.11 ^{mlk}	26.22 ^{e}
T_3	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	0.00 ^{h}
T_4	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	16.11 ^{n}	0.00 ^{g}
T_5	38.89 ^{bdc}	39.75 ^{bdac}	35.00 ^{hfdeg}	37.00 ^{fdec}	38.89 ^{b}
T_6	34.71 ^{hfdeg}	32.55 ^{hfig}	30.67 ^{hjig}	25.67 ^{jlk}	34.71 ^{c}
T_7	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	0.00 ^{h}
T_8	0.00 ^{o}	20.33 ^{mln}	0.00 ^{o}	0.00 ^{o}	0.00 ^{g}
T_9	40.08 ^{bdac}	42.56 ^{bac}	38.33 ^{dec}	35.00 ^{hfdeg}	40.08 ^{b}
T_{10}	25.12 ^{jlk}	20.08 ^{mln}	18.00 ^{mn}	18.00 ^{mn}	25.12 ^{f}
T_{11}	35.95 ^{fdeg}	30.53 ^{hjig}	33.00 ^{hfeg}	27.00 ^{jik}	35.95 ^{c}
T_{12}	42.12 ^{bac}	44.47 ^{ba}	45.00 ^{a}	40.00 ^{bdac}	42.12 ^{a}
Mean	22.76 ^{a}	23.43 ^{a}	20.83 ^{b}	20.36 ^{b}	22.76
P=0.005	T	1.36			
	V	0.79			
	T×V	5.66			

Fresh weight of Shoot

Significant variation in fresh weight of shoot was observed among all the treatment combinations of potting media (Table 8). The results exhibited the maximum mean value in treatment T_{12} (Soil+Sand+Perlite) (11.43g) followed by T_9

(Soil+Perlite) (10.70g). Its minimum mean value was observed in T_3 (Poultry manure) and T_7 (Soil+Leaf mould) closely followed by the treatments T_4 (Leaf mould) and T_8 (Soil+Leaf mould). Also, significant differences were detected amongst the cultivars and overall mean exhibited maximum fresh wt. of shoot in cultivar Tashkugani (5.67g) followed by culitvar Tagabi Bidana (5.25g) which was at par with cultivar Kandhari (5.16g). The maximum value for shoot fresh wt. in the interaction effect was noted in $T_{12}C_2$ (12.72g) and was statistically similar with $T_{12}C_1$ (12.00) Table. The interaction effect among the treatment and cultivar was observed minimum in T_3 and T_4 $C_1C_2C_3C_4$ with corresponding zero values.

Table 6: Effects of rooting media on **s**hoot fresh weight

Treatment	C_1	C_2	C_3	C_4	Mean
T_1	6.16^{mln}	5.11^{qop}	5.16^{qop}	4.95 ^{qop}	5.34 ^{e}
T_2	5.42^{mopn}	4.97^{qop}	4.53^{qop}	3.93 ^{sr}	4.71 ^{f}
T_3	0.00^{t}	0.00^{t}	0.00^{t}	0.00 ^{t}	0.00 ^{h}
T_4	0.00^{t}	0.00^{t}	0.00^{t}	3.00 ^{s}	0.75 ^{g}
T_5	9.07^{ghi}	8.39^{jkl}	9.84^{gef}	7.96 ^{jk}	8.82 ^{c}
T_6	6.49^{l}	5.73^{moln}	6.25^{ml}	5.39 ^{mopn}	5.97 ^{d}
T_7	0.00^{t}	0.00^{t}	0.00^{t}	0.00 ^{t}	0.00 ^{h}
T_8	0.00^{t}	3.29^{s}	0.00^{t}	0.00 ^{t}	0.82 ^{g}
T_9	10.07^{def}	12.59^{a}	11.00^{dc}	8.85 ^{jhi}	10.70 ^{b}
T_{10}	4.49^{qpr}	4.45^{qr}	5.28^{qopn}	3.04 ^{s}	4.32 ^{f}
T_{11}	8.25^{jkl}	10.54^{de}	9.40^{ghf}	7.48 ^{k}	8.92 ^{c}
T_{12}	12.00^{ba}	12.72^{a}	11.59^{bc}	9.42 ^{ghf}	11.43 ^{a}
Mean	5.16^{b}	5.67^{a}	5.25^{b}	4.50 ^{c}	5.15
P=0.005	T	0.46			
	V	0.26			
	T×V	0.93			

Dry weight of Shoot (g)

Perusal of the data presented in Table 9 indicated significant variation in the dry weight of shoot (g.) Maximum dry weight of shoot was recorded in T_{12} (Soil+Sand+Perlite) (6.17g) followed by T_9 (Soil+Perlite) (5.72g). Minimum dry weight of shoot was observed T_3 (Poultry manure) and T_7 (Soil+Leaf mould) closely followed by the treatments T4 (Leaf mould) and T8 (Soil + Leaf mould). The dry Wt. of shoot in other potting media varied between the mean minimum and maximum values. The dry wt. of shoot in the cultivars was significantly influenced by the potting media and was maximum in the cutivar Tagabi Bidana (3.05g) followed by Tashkurgani (2.74g) while it was recorded minimum in the cvs. Kandhary (2.30g) and Tagabi Danadar (2.27g) with similar statistical values. Potting media and cultivar interaction effect was significant and was observed maximum in $T_{12}C_3$, $T_{12}C_3$ (7.04g), $T_{12}C_2$ (6.60g), T_9C_3 (6.59g) and T_9 C_2 (6.57g) without any significant differences (Table 7).

Table 7: Effects of rooting media on dry weight of shoot

Treatment	C_1	C_2	C_3	C_4	Mean
T_1	2.40 ^{lmkjn}	2.97 ^{hji}	2.79 ^{hkji}	2.47 ^{lmkjin}	2.66 ^{e}
T_2	2.20 ^{lmkjn}	1.76 ^{lmkn}	2.46 ^{lmkjn}	1.90 ^{lmkjn}	2.08 ^{f}
T_3	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	0.00 ^{h}
T_4	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	1.64 ^{lmn}	0.41 ^{g}
T_5	4.12 ^{egf}	4.11 ^{egf}	5.59 ^{bde}	4.72 ^{edf}	4.64 ^{c}
T_6	2.60 ^{lmkji}	2.08 ^{lmkjn}	3.54 ^{hgi}	2.70 ^{lhkji}	2.73 ^{e}
T_7	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	0.00 ^{o}	0.00 ^{h}
T_8	0.00 ^{o}	1.45 n	0.00 ^{o}	0.00 ^{o}	0.36 ^{g}
T_9	4.82 ^{ed}	6.57 ^{ba}	6.59 ^{ba}	4.89 ^{ed}	5.72 ^{b}
T_{10}	1.70 ^{lmn}	1.83 ^{lmkn}	2.91 ^{hji}	1.5 6 ^{mn}	2.00 ^{f}
T_{11}	3.70 ^{hgf}	5.48 ^{dc}	5.72 ^{bde}	2.35 ^{lmkjn}	4.31 ^{d}
T_{12}	6.02 ^{bac}	6.60 ^{ba}	7.04 ^{a}	5.00 ^{edc}	6.17 ^{a}
Mean	2.30 ^{c}	2.74 ^{b}	3.05 ^{a}	2.27 ^{c}	2.59
P=0.005	T	0.25			
	V	0.15			
	T×V	1.07			

Total Chlorophyll (mg/g)

It is evident from the data presented in Table 14 that the maximum chlorophyll content was recorded in T_{12} (Soil+Sand+Perlite) (4.45.mg/g) followed by the treatments T_9 (Soil+Perlite) (3.39mg/g) and T5 (Perlite) (3.49mg/g). The difference between them was however, not significant. Minimum chlorophyll content was noted in the treatments T_3 (Poultry manure) and T_7 (Soil+Leaf mould) followed by a correspondingly higher value in the treatment T_4 (Leaf mould) (0.39 mg/g) and T_8 (Soil+Leaf mould) (0.51mg/g). Cultivar response with respect to chlorophyll content (mg/g) in different potting media was documented maximum in Tashkurgani, Tagabi Bidana and Tagabi Danadar having statistical parity. The interaction effect between treatment and cultivar revealed significantly higher chlorophyll content in $T_{12}C_3$ (5.16mg/g) followed by $T_{12}C_2$ (4.36mg/g), while it was minimum in the treatments T_3 and T_4 $C_1C_2C_3C_4$ respectively Table 8).

Table 8: Effects of rooting media on total chlorophyll

Treatment	C_1	C_2	C_3	C_4	Mean
T_1	2.29 ^{knjlm}	2.82 ^{khjgi}	3.01 ^{fhjgi}	2.81 ^{khjgi}	2.73 ^{dc}
T_2	2.41 ^{kjlim}	2.31 ^{knjlm}	2.08 ^{knlm}	1.98 ^{nlm}	2.19 ^{e}
T_3	0.00 ^{n}	0.00 ^{n}	0.00 ^{n}	0.00 ^{n}	0.00 ^{g}
T_4	0.00 ^{n}	0.00 ^{n}	0.00 ^{n}	1.55 ^{n}	0.39 ^{f}
T_5	3.42 ^{fegd}	3.47 ^{fegd}	3.72 ^{fcebd}	3.33 ^{fegd}	3.49 ^{b}
T_6	2.30 ^{knjlm}	2.45 ^{kjlim}	2.50 ^{khjlim}	3.24 ^{fhegd}	2.62^{d}
T_7	0.00 ^{n}	0.00 ^{n}	0.00 ^{n}	0.00 ^{n}	0.00 ^{g}
T_8	0.00 ^{n}	2.03 ^{nlm}	0.00 ^{n}	0.00 ^{n}	0.51 ^{f}
T_9	3.86 ^{cebd}	2.47 ^{kjlim}	3.70 ^{fegd}	3.53 ^{fcegd}	3.39 ^{b}
T_{10}	2.32 ^{kjlm}	2.24 ^{knlm}	2.43 ^{kjlim}	1.78 ^{nm}	2.19 ^{e}
T_{11}	2.82 ^{khjgi}	3.13 ^{fhegi}	3.00 ^{fhjgi}	2.56 ^{khjli}	2.88 ^{c}
T_{12}	3.98 ^{cbd}	4.36 ^{b}	5.16 ^{a}	4.29 ^{cb}	4.45 ^{a}
Mean	1.95 ^{b}	2.11 ^{a}	2.1 ^{a}	2.09 ^{a}	2.07
P=0.005	T	0.18			
	V	0.10			
	T×V	0.76			

Discussion

The overall mean showed that number of leaf/shoots was significantly higher in T12 (Soil + Sand + Perlite) (39.38) followed by T9 (Soil + Perlite) (36.50). Similarly, Saffari *et al.* (2012) [1] found that the effect of both medium and different concentration of hormones on number of roots, percentage survival of stem cutting, root fresh and dry weight were significant and the best result was obtained in perlite, with 4000 ppm IBA. Whereas, no leaf emergence was recorded in the treatments T_3 (Pollutry manure) (0.00) and T_7 (Soil + Pollutry manure) (0.00), while it was minimum in the treatment T_4 (Leaf mold) (3.00g) with similar statistical values in the treatments T_8 (3.75g).

On the question of influence of potting media on shoot length, this study found that it did have significant influence. The shoot length was recorded maximum in the treatment T_{12} (Soil + Sand + Perlite) (42.12 cm) followed by T_9 (Soil + Perlite), while minimum shoot length was recorded in the treatments T_3 and T_7 which did not show any sprouting there by resulting in ultimate failure to develop into shoot and

form leaves. This finding supports the idea of Yasin *et al.* (2012) who had indicated that shoot length (20 cm), root length (16 cm), short dry weight and root dry weight had been highest in FYM medium. Whereas, cultivars responded differently to the potting media and overall mean revealed the maximum growth of shoot in cultivars Tashkurgani (23.43 cm) closely followed by Kandhary (22.76 cm) without any significant difference. While minimum shoot length with statistical parity was recorded in cultivars Tagabi Bidana and Tagabi Danadar. These findings support the idea of El-Naggar and El-Nasharty (2009) [5] who reported that potting media as well as nutritional requirements are the most important factors affecting the rooting and growth of plants and the researcher had pointed out the Perlite is recognized to have a unique capillary action that's what it makes a superior growing medium.

On a question of variation in fresh weight of shoot, this study observed among all the treatment combinations of potting media. The results exhibited the maximum mean value in treatment T_{12} (Soil + Sand + Perlite) (11.43 g) followed by T_9 (Soil + Perlite) (10.70 g). Whereas, its minimum mean value was observed in T_3 (Poultry manure) and T_7 (Soil + Leaf mold) closely followed by the treatments T_4 (Leaf Mold) and T_8 (Soil + Leaf mold). This finding supports the idea of Gurjar *et al.*, (2011) who found that the survival percentage of rooted cutting was significantly higher when hard wood cuttings of pomegranate were planted in a combination of soil, sand and leaf mold. Similarly, a rooting medium comprising of soil, sand and FYM in a 2: 1: 2 ratios had been advocated by Bahadur *et al.* (2009) [7]. Moreover, this study detected the significant differences amongst the cultivars and overall mean exhibited maximum fresh wt. of shoot in cultivar Tashkurgani (5.67 g) followed by cultivar Tagabi Bidana (5.25 g) which was at par with cultivar Kandhary (5.16g). Whereas, the maximum value for shoot fresh wt. in the interaction effect was noted in $T_{12}C_2$ (12.72g) and was statistically similar with $T_{12}C_1$ (12.00). While, the interaction effect among the treatment and cultivar was observed minimum in T_3 and $T_4C_1C_2C_3C_4$ with corresponding zero values. And no data was found in the support of the above finding the previous literature.

However, on the variation in the dry weight of shoot, this study found that maximum dry weight of shoot was recorded in T_{12} (Soil + Sand + Perlite) (6.17 g) followed by T_9 (Soil + Perlite) (5.72 g). Whereas, minimum dry weight of shoot was observed in T_3 (Poultry manure) and T_7 (Soil + Leaf mold) closely followed by the treatments T_4 (Leaf mold) and T_8 (Soil + Leaf mold). Furthermore, the dry Wt. of shoot in other potting media varied between the mean minimum and maximum values. The dry wt. of shoot in the cultivars was significantly influenced by the potting media and was maximum in the cultivar Tagabi Bidana (3.05g) followed by Tashkurgani (2.27g) while it was recorded minimum in the cvs. Kandhari (2.30g) and Tagabi Danada (2.27g) with similar statistical values. This finding supported the idea of Millar and Jones (1995) [4] who found that different media, other than routinely used garden soils such as perlite, vermiculite and coco peat considerably improves the rooting in cuttings because soil medium may be linked to the rapid loss of water from this medium. Similarly, El-Naggar and El-Nasharty (2009) [5] reported that potting media as well as nutritional requirements are the most important factors affecting the rooting and growth of plants.

Finally, this study recorded maximum chlorophyll content in T12 (Soil + Sand + Perlite) (4.45 mg/g) followed by the treatments T9 (Soil + Perlite) (3.39 mg/g) and T5 (Perlite) (3.49 mg/g). They didn't show any significant difference between themselves. Minimum chlorophyll content was noted in the treatments T3 (Poultry manure) and T7 (Soil + Leaf mold) followed by a correspondingly higher value in the treatment T4 (Leaf mold) (0.39 mg/g) and T8 (Soil + Leaf mold) (0.51 mg/g). Cultivar response with respect to chlorophyll content (mg/g) in different potting media was documented maximum in Tashkurgani, Tagabi Bidana and Tagabi Danadar having statistical parity. However, this finding supports the idea of Charter (2017) who conducted a study on rooting and vegetative growth of hardwood cutting of twelve pomegranate reported differences in morphological and physiological character with larger leaf area in cultivar wonderful and better rooting in cultivar Ambrosia and higher chlorophyll content in cultivars 'Haku Botan' and 'Loffani'.

Conclusion

The potting media had significant effect on number of leaves/shoots as the highest number of leaf/shoot (39.38) was recorded in T_{12} (Soil+Sand+Perlite). And amongst different genotype Tashkurgani cultivar produced the maximum number of leaf/shoot (21.33). while amongst the different interactions the number of leaves/shoots was significantly highest in the treatment combination $T_{12}C_3C_2$.

Amongst different potting media T12 (Soil+Sand+Perlite) attained the maximum fresh wt. of leaf (0.37g) and the cultivar response to the different potting media was maximum in Tashkurgani (0.19g). while interaction effect between the treatment and cultivar was found to be significantly higher in the treatments T12C2C3.

Among the different combinations of potting media, leaf dry wt. (g) was recorded maximum in T_{12} (Soil+Sand+Perlite) (0.26g) and Clultivar response to different potting media in terms of leaf dry wt. (g) was observed maximum in Tashkurgani.

The shoot length was recorded maximum in the treatment T_{12} (Soil+Sand+Perlite) (42.12 cm) and the maximum growth of shoot was recorded in cultivars Tashkurgani (23.43 cm) and similarly the interaction effect between the treatment and cultivar registered maximum shoot length in $T_{12}C_1C_2$ and $T_{11}C_3C_2$.

The maximum mean value of shoot fresh weight was recorded in treatment T_{12} (Soil+Sand+Perlite) (11.43g) and amongst the different cultivars maximum fresh wt. of shoot in cultivar Tashkugani.

Maximum dry weight of shoot was recorded in T_{12} (Soil+Sand+Perlite) (6.17g) and also amongst different pomegranate genotypes the maximum dry weight of shoot (3.05g) was recorded in the cutivar Tagabi Bidana. Similarly, Potting media and cultivar interaction effect was significant and was observed maximum in $T_{12}C_3$, $T_{12}C_3$ (7.04g).

The maximum chlorophyll content (4.45.mg/g) was recorded in T_{12} (Soil+Sand+Perlite) and Cultivar response with respect to chlorophyll content (mg/g) in different potting media was documented maximum in Tashkurgani, Tagabi Bidana and Tagabi Danadar having statistical parity. The interaction effect between treatment and cultivar revealed significantly higher chlorophyll content in $T_{12}C_3$

(5.16mg/g).

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