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Influence of different planting dates and media on growth of kiwi (cv. Hayward) cuttings

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ABSTRACT: An experiment was carried out to determine the influence of different planting dates and media on the growth of kiwi (cv. Hayward) cuttings at Agriculture Research Institute (ARI) Mingora Swat, during 2011. The experiment was laid out in Randomized Complete Block Design (RCBD) with split plot arrangement in three replications. Planting Dates (20th Jan, 30th Jan, 10th Feb, 20th Feb and 2nd March) were allocated to main plots, whereas soil media (Silt+ Garden soil+ FYM) at the rate of 1:1:1, 2:1:1, 1:2:1 and 1:1:2 were assigned to sub plots. Days to 50% sprouting, survival percentage, number of roots plant^{-1} and plant height were significantly affected by planting dates and soil media. Maximum survival percentage (29.16%), number of root plant^{-1} (13.31) and plant height (40.42 cm) was recorded for the cuttings planted on 20th Feb. On the other hand minimum days to 50% sprouting (28.49) were recorded for cuttings planted on 2nd March. Significant effect of planting media was observed for most of vegetative stages including rooting attributes of Kiwi (cv. Hayward) cuttings. Maximum survival percentage (22.46%), number of roots plant^{-1} (12.65), plant height (40.15 cm) and minimum days to sprouting (44.17) were recorded for the media Silt: Garden soil: FYM at the ratio of 2:1:1 respectively. Kiwi cuttings planted in the month of February showed good results in most of parameters, rather than month of January and March. In case of planting media most of the root and growth parameters were best in (silt: Garden soil: FYM at the ratio of 2:1:1). Based on the result from the experimental work, it is recommended that Kiwi cuttings should be planted in February in soil media with combination of (silt: Clay: FYM at the ratio of 2:1:1) for better growth and development under the agro climatic condition of Swat.
Key words: Soil media, Kiwi cuttings, planting dates, Pakistan.

Introduction

Kiwi (*Actinidia chinensis* L.) belongs to the family Actinidiaceae, a cross pollinated fruit crop and is dioecious in nature. The plant is a vigorous, woody, twining vine or climbing shrub and supported on trellis system. A vigorous vine may well cover up an area of 10- 15 feet broad, 18- 24 feet lengthy and 9 -12 feet height (Morton, 1987). Kiwifruit plants were introduced into New Zealand in the early 1900's which subsequently become the world's largest exporter of kiwifruit. From New Zealand the fruit had spread to other countries of world. Except New Zealand and California, kiwifruit is also grown commercially in France, Belgium, Egypt, Italy, England, Chile and Spain (Ferguson, 1984). Kiwi fruit is rich in vitamin C, vitamin E, folic acid and potassium (Maillar 1998). The fruit extract was found to inhibit melanoma, a type of skin cancer (Collins *et al* 2001). Kiwifruit contain carteriolsletein which is good for eye health (Cho *et al* 2004). They contain amino acid like arginine and glutamate which dilates the arterioles and improve the blood flow. They have good sodium/potassium ratio which is critical for a healthy heart. Inositol is found in Kiwi fruit which is beneficial in the treatment of depression and helps to regulate body hormones. Kiwi fruit contain folic acid which is vital for the health of mother and child during pregnancy (Morton, 1987).

The fruit has a soft texture and a unique flavor. Nowadays, kiwifruit is a commercial crop in several countries, mainly in Italy and New Zealand. Italy is the leading country in kiwi production with 415,877 (tons production), followed by New Zealand with 378,500 (tons) in year 2011(FAO STAT, 2012). Other countries like, France, Chile, Japan, Canada, Iran and United States are the top Kiwi production countries around the world. Kiwi fruit is relatively recent introduction in Pakistan.

Kiwifruit plants can be propagated both sexually and asexually. Sexual propagation is mostly done to produce root stock for budding and grafting. Grafting, budding, rooting of cuttings and micro propagation are four major propagation methods for kiwifruit propagation. However common method of Kiwifruit propagation is grafting and cuttings (Tanimoto, 1994 and Harada, 1995). Rooting from the cutting was strongly influenced by fruit specie, variety, planting time and growth hormones (Kumar and Sharma, 2002). According to Ono *et al,* 2003 growing media and time of cutting plantation are very important for rooting.

Previous research work revealed that kiwi fruit cutting shown variable rooting ability. In Pakistan there is great demand of true to type plants of kiwi fruit, however unfortunately the kiwi plants are not available in private nurseries as will as in Government Research Institutions due to there standard propagation method. Therefore the experiment was designed to standardize the time of kiwi fruit propagation and to find suitable rooting media for kiwi fruit cutting.

Material And Method

A Research study "Influence of different planting dates and media on the growth of Kiwifruit (cv. Hayward) cuttings" was carried out at Agricultural Research Institute Mingora Swat. Hayward variety was selected for the experiment. Pencil size of dormant cuttings (20 cm long) of kiwi fruit were prepared were inserted in black polythene bags filled with the required media. The experiment was carried in Randomized Complete Block Design (RCBD) with split plot arrangement arranged replications having 20 treatments. There were two factors (planting dates and soil media).

(Planting Dates)	(Soil Media) Silt: Garden soil: F.Y.M
January20th	1: 1: 1
January 30th	2: 1: 1
February10th	1: 2: 1
February20th	1: 1: 2
March 2nd	

Planting dates were subjected to main plots whereas soil media to sub plots. Sixteen cuttings per treatment were inserted in black polythene bags filled with the media and in this way a total of 960 cuttings were planted in four different media. The cuttings were kept in lath house to maintain high humidity and prevent water loss from the cuttings through transpiration. The experiment lasted until December 25, 2011. The data were subjected to analysis of variance (ANOVA) and least significant difference (LSD) test was done using computer software MSTATC. During the experiment, data on days to 50% sprouting, Survival percentage, Number of Roots plant^{-1} and Plant height (cm) was collected.

Results And Discussion

Days to 50% sprouting

The data recorded for days to 50 % sprouting are presented in Table -1 and the analysis of variance is placed in Table-1a.The analysis of variance showed that planting dates and soil media had significant effect on days to sprouting, while interaction had non-significant effect.

Comparison of means for different planting dates showed that minimum days to 50% sprouting (28.49) was recorded in cuttings planted on 2nd march, followed by 20th February (39.32), while maximum days to 50% sprouting (61.14) was recorded in cuttings planted on 20th January. The cuttings collected in March were ready for sprouting in the field thus took minimum days to sprouting. The research findings are similar with the results of Ercisli *et al.* (2002) who observed early sprouting in kiwifruit cuttings collected in February as compared to January.

The soil media effects was also significant and minimum days to 50% sprouting (44.71) was observed in media (silt: Garden soil: FYM at the ratio of 2:1:1) followed by (silt: Garden soil: FYM at the ratio of 1:2:1) (46.17), while maximum days to 50 % sprouting (47.57) was recorded in cuttings planted in (silt: Garden soil: FYM at the ratio of 1:1:1). The media containing more silt took minimum days to sprouting because of the

larger pore size and good aeration capacity of the media these results are in conformation with the findings of Ono *et al* 2003, Pandey, 1997 and Rana *et al* 1999.

Survival percentage (%)

The data regarding survival percentage is presented in Table-2 and the analysis of variance is given in Table-2a.Statistical analysis revealed that planting time, planting media and their interaction significantly affected the survival percentage.

The mean table for survival percentage showed that maximum survival percentage (29.16 %) was recorded for cuttings planted on 20th February followed by (21.31 %) survival in cuttings planted on 10th February, while minimum survival percentage (12.33 %) was found in cuttings planted on 2nd March. The cuttings planted in March sprouted earlier thus the reserve food in the cuttings were utilized by the sprouted shoot and there were no supply of food materials from the media because of no roots formation therefore the minimum survival were recorded. According to Biasi *et al.* (1990) planting time of kiwi fruit cutting is very imported for the survival of plant, he reported maximum survival in the month of February rather then January and March.

The mean value of planting media also indicate significant variation, where maximum survival percentage (22.46 %) was obtained in cuttings planted in planting media (silt: Garden soil: FYM at the ratio of 2:1:1) which was statistically different from the rest of treatments followed by (19.06%) cuttings planted in planting media (silt: Garden soil: FYM at the ratio of 1:1:2), while minimum percent survival (17.86%) was observed in cuttings planted in (silt: Garden soil: FYM at the ratio of 1:2:1). This might be due to more pore spaces in the silt because of that callus was formed easily, roots were initiated and the cuttings survived. The findings are in close relation with that of Bashir *et al.* (2003) who noted high survival percentage in the media containing more silt.

Similarly mean values for interaction showed that maximum survival percentage (37.5%) was obtained in cuttings planted on 20th February in soil media (silt: Garden soil: FYM at the ratio of 1:1:2), while minimum survival percentage (10.25%) was observed in cuttings planted on 2nd March in soil media (silt: Garden soil: FYM at the ratio of 1:1:1). Cuttings planted in February produce more roots and transport maximum nutrients from the media containing more FYM which was rich in the available nutrients because of that maximum plants were survived.

Number of roots plant^{-1}

The data related to number of roots plant^{-1} is presented in Table-3 and the analysis of variance is given in Table-3a.From the analysis of variance table, it is concluded that planting dates and media significantly influenced the number of roots plant^{-1}, while the interaction was non-significant.

According to the mean values, more number of roots plant^{-1} (13.31) were obtained in cuttings planted on 20th February, followed by (11.25) when cuttings were planted on 2nd March, while minimum number of roots plant^{-1} (9.05) were found in cuttings, planted on 20th January. This might be due to the climatic condition of the month of February. In the month of January the temperature was very low which was not favorable for formation of roots. While in February the temperature was raised and the rainfall and humidity was also more thus the cutting form maximum roots. Ercis *et al.* (2002) reported that kiwi cutting planted in February produce more roots.

The planting media effect was also highly significant, and cuttings planted in planting media (silt: Garden soil: FYM at the ratio of 2:1:1) had (12.65) roots followed by (11.40) roots in soil media (silt: Garden soil: FYM at the ratio of 1:1:2), while minimum number of roots plant^{-1} (9.18) were observed in cuttings planted in media (silt: Garden soil: FYM at the ratio of 1:2:1). The more number of roots are due to the more nutrient, heat, porosity, aeration and water holding capacity of the media containing more farm yard manure. The results are matching with the observation of Kishore *et al.* (2001) reported a significant variation regarding root formation on different planting media.

Plant height (cm)

The data recorded for plant height (cm) is presented in Table-4 and the analysis of variance is given in Table-4a.The statistical analysis of the data revealed that planting time, planting media and their interaction had highly significant effects on plant height (cm).

Comparing the means of planting dates, it is cleared from the table that maximum plant height (40.42 cm) was observed in cuttings planted on 20th February, followed by (36.94 cm) cuttings planted on 10th February, while minimum plant height (31.81 cm) was found in cuttings planted on 30th January. This might be due to the more number of roots through which they absorbed maximum nutrients and attain more height. The results are in close relation with the findings of Hughes et al. (1992), who reported that cutting formed more and lengthy roots gain maximum size during one growing season.

The mean values for soil media revealed that maximum plant height (40.15 cm) was recorded in (silt: Garden soil: FYM at the ratio of 2:1:1), followed by (35.99 cm) cuttings planted in (silt: Garden soil: FYM at 2:1:1), while minimum plant height (30.87 cm) was observed when cuttings were planted in (silt: Garden soil: FYM at the ratio of 1:1:1). These results are in line with findings of Bashir *et al.* (2003) who reported significant effect on plant height in rooted cuttings of Jajoba planted on different growing media.

The interaction of planting time and planting media showed significant result for plant height, and maximum plant height (48.66 cm) was observed in cuttings planted on 20th February in (silt: Garden soil: FYM at the ratio of 2:1:1), while minimum plant height (24.94 cm) was found in cuttings planted on 20th January in (silt: Garden soil: FYM at the ratio of 1:1:1). According to Grange and Loach, (1983) that maximum no of roots, survival percentage, number of leaves plant^{-1} and plant height are due to the temperature, humidity, rainfall, large pore spaces of the media containing more silt. The results are also in conformation with the findings of and Kishore *et al.* (2001).

Conclusion and Recommendation

Based on the results of the present study it is concluded that kiwi fruit cutting planted in the month of February showed good results for most of the parameters. In case of planting media most of the root and growth parameter are best in the media containing silt, Garden soil and farm yard manure at the ratio of 2:1:1 respectively in the agro climatic condition of Swat, Pakistan. The trail was for short period of time, to know the best planting time a throughout the year experimental trials are needed.

Table 1. Days to 50% sprouting of kiwi cuttings as affected by planting dates and media

		Soil Media			
Planting Dates	Silt: Garden soil: FYM 1:1:1	Silt: Garden soil: FYM2:1:1	Silt: Garden soil: FYM1:2:1	Silt: Garden soil: FYM1:1:2	Mean
20th Jan	62.31	58.91	61.95	61.41	61.14a
30th Jan	59.33	50.62	52.41	55.37	54.43ab
10th Feb	48.79	47.12	48.41	48.94	48.09c
20th Feb	39.20	39.12	39.41	39.54	39.32d
2nd Mar	28.20	27.79	28.69	29.29	28.49e
Mean	47.57 a	44.71 b	46.17 ab	46.73 a	

Means of the same category followed by different letters are different statistically at 5% level of Probability.
LSD Value for planting dates at 5% level of probability = 1.099
LSD Value for planting media at 5% level of probability =1.567

Table 2.Survival percentage (%) of kiwi cuttings as affected by planting dates and media

		Soil Media			
Planting Dates	Silt: Garden soil: FYM 1:1:1	Silt: Gardens oil: FYM2:1:1	Silt: Garden soil: FYM1:2:1	Silt: Garden soil: FYM1:1:2	Mean
20th Jan	12.50	25.00	12.41	18.75	17.16 bc
30th Jan	20.83	20.83	14.58	14.41	17.66 bc
10th Feb	25.00	25.00	20.83	14.41	21.31 b
20th Feb	25.00	27.08	27.08	37.50	29.16 a
2nd Mar	10.25	14.41	14.41	10.25	12.33 c
Mean	18.71b	22.46a	17.86b	19.06 b	

Means of the same category followed by different letters are different statistically at 5% level of Probability.
LSD Value for planting dates at5%level of probability =5.589
LSD Value for planting mediaat5%level of probability = 2.709
LSD value for interaction mediaat5%level of probability = 6.075

Table 3. Number of roots plant^{-1} of kiwi cuttings as affected by planting dates and media.

		Soil Media			
Planting Dates	Silt: Garden soil: FYM 1:1:1	Silt: Garden soil: FYM 2:1:1	Silt: Garden soil: FYM 1:2:1	Silt: Garden soil: FYM 1:1:2	Mean
20th Jan	7.573	10.27	8.24	10.17	9.05 c
30th Jan	8.273	12.33	7.35	11.21	9.79 bc
10th Feb	9.320	13.20	8.66	9.14	10.08 bc
20th Feb	12.337	15.25	11.34	14.31	13.31 a
2nd Mar	10.223	12.22	10.33	12.22	11.25 b
Mean	9.54 c	12.65 a	9.18 c	11.40 b	

Means of the same category followed by different letters are different statistically at 5% level of probability
LSD Value for planting dates at 5% level of probability =1.689
LSD Value for planting media at 5% level of probability =0.868

Table 4. Plant height (cm) of kiwi cuttings as affected by planting dates and media.

		Soil Media			
Planting Dates	Silt: Garden soil: FYM 1:1:1	Silt: Garden soil: FYM 2:1:1	Silt: Garden soil: FYM 1:2:1	Silt: Garden soil: FYM 1:1:2	Mean
20th Jan	24.94	38.66	29.88	33.77	31.81 b
30th Jan	31.77	34.66	31.50	34.61	33.13 cd
10th Feb	35.19	40.14	35.88	36.55	36.94 b
20th Feb	33.81	48.66	40.65	38.55	40.42 a
2nd Mar	28.66	38.66	35.65	36.47	34.86 bc
Mean	30.87 c	40.15 a	34.71 b	35.99 b	

Means of the same category followed by different letters are different statistically at 5% level of Probability.
LSD Value for planting dates at 5%level of probability= 2.577
LSD Value for planting media at 5%level of probability = 1.985
LSD value for interaction at 5%level of probability = 4.439

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