Annals of Plant and Soil Research 16 (3): 264-267 (2014)

EFFECT OF DIFFERENT ROOTING MEDIA ON SURVIVAL AND SUCCESS OF AIR LAYERS IN KAGZILIME

SOMPRABHA MISHRA

Department of Horticulture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, College of Agriculture, Rewa-486001 (M.P.), India

Received: March, 2014; Revised accepted: August, 2014

ABSTRACT

The experiment was conducted during 2009-10 at the Fruit Research Station, Kuthulia Farm, College of Agriculture, Rewa (M.P.) to study on the effect of different rooting media on survival and success of air layers in kagzilime. Amongst the rooting media tried, soil or peat soil + FYM + sand (1:1:1 ratio) caused higher rooting percentage of kagzilime. The number of primary roots, maximum and minimum root length, fresh and dry weight of roots per air layer after planting increased up to maximum extent due to the above mixtures of rooting media. The maximum plant height, number of branches and leaves per air layer were noted with soil or peat soil + FYM + sand. However, this was followed by soil or peat soil + FYM (1:1) without sand. Lower values of these parameter were recorded under soil alone treatment. Pest soil proved superior to soil alone in respect of these parameters.

Key words: Air layers, kagzilime, rooting media, success, survival

INTRODUCTION

The kagzilime (*Citrus aurantifolia* Swingle) is an important citrus crop which is grown on commercial scale in India as well as Madhya Pradesh. Citrus is a member of the family Rutaceae, subfamily Aurantioideae. It has very wide distribution in all the parts of India and is the most important acid fruit for multipurpose uses. The kagzilime can be propagated by seed, layering marcottage and budding. It is usually grown by seeds all over the country. But layering is a method of vegetative propagation (producing roots on the stem) which can be easily used for multiplication of fruit plants especially those which do not readily propagated from cutting. In layering, the roots are induced on the shoots while they are still attached to mother plant. After proper rooting, the stem is detached and becomes a new plant for growing on its own roots. According to Loach (1988), the rooting media should be considered an integral part of the propagation system; percentage rooting and the quality of the roots produced are directly influenced by the medium. Hartmann *et al.* (2002) and Fabbri *et al.* (2004) stated that the appropriateness of the medium depends on the species, the cutting type, the season, the propagation system used, and the cost and availability of the medium components. Good water management is also crucial for success. Soil is the most common rooting media. However, other rooting materials like FYM, sand, peat soil and sawdust may be used in different combinations. The information on these aspects was lacking hence, the comparative efficiency of rooting media for better root development over soil alone was evaluated.

MATERIALS AND METHODS

The experiment was conducted during 2009-10 at the Fruit Research Station, Kuthulia Farm, College of Agriculture, Rewa (M.P.). The soil was mixed red, black with clay-loam having depth of 4 meters. The soil pH was 5.7, electrical conductivity 0.12 dS m^{-1}, organic carbon 4.9 g kg^{-1}, available N 222 kg ha^{-1}, available P_2O_5 13.2 kg ha^{-1} and available K_2O 332 kg ha^{-1}. The rainfall during experimental period (July 2009 to January, 2010) was 760 mm distributed in 48 rainy days. The treatments comprised eight types of rooting materials viz. FYM, sand, peat soil and saw dust in different combinations (Table 1). The rooting materials were applied for air layering on one-year old branches of about pencil thickness. Twenty air layerings were performed in each treatment. The experiment was conducted in randomized block design with three replications. Thus, the experiment contained 24 plots with a total of 480 air layerings. The uniform twigs having pencil thickness of kagzilime were selected shoots (twigs) below the bud. The respective rooting media was applied evenly around the ringed out portion with the help of hand and then wrapped with polythene film and then tied with the help jute rope. The branches of control treatment were treated with soil alone. The layering was done on 13-15 July 2009 and separated by the end of August after 45 days of layering. Planting of air-layers in nursery bed was done on 30 August, 2009. Pre-planting observations (rooting success, primary roots/layer maximum and minimum

root length/layer, fresh and dry weight of roots/layer) and post-planting observations (survival %, plant height, branches and leaves/layere) were recorded.

RESULTS AND DISCUSSION

Effect of media on rooting of air layers: The success in rooting of air layers was found 87.8 to 93.3% by the rooting media having a mixture of peat soil + FYM with or without sand in1:1:1 ratio. This was followed by the mixture of soil + FYM + sand or peat soil with or without FYM giving 67.6 to 87.8% success in air layers. In contrast to this, soil alone as rooting media resulted in the 57% success in rooting (Table 1). The success up to 87.8 to 93.3.% in rooting of air layer of kagzilime by peat soil + FYM with or without sand rooting media might be owing to most ideal (favourable) conditions i.e. sufficient nutrients, moisture and aeration available to the air layers. Whereas, in case of soil alone these favourable conditions were not available as per requirement of the air layers. The rooting media having sand in mixture proved the best because of the proper porosity (aeration) available to the rooting of air layers. However, the work of Isfendiyaroglu *et al.* (2009) on rooting of Ayualik olive cutting in different media indicated that the rooting was dramatically decreased when pure sand, pure peat or their mixtures were used. The poor rooting in olive cutting in sand medium might be linked to the rapid loss of water from this medium. Therefore, in the present research the mixture of rooting media comprising of soil + FYM + sand in 1:1:1 ratio played the unique role for making rooting in air layers up to 87.0 to 93.3 % success.

Table 1: Pre-planting observations of air layering of kagzilime as influenced by different rooting media

Treatments	Success in rooting (%)	Primary roots/layer		Maximum root length/layer (cm)		Minimum root length/layer (cm)		Fresh weight of roots/layer (g)		Dry weight of roots/layer (g)	
	45 DAL	45 DAL	105 DAL	45 DAL	105 DAL	45 DAL	105 DAL	45 DAL	105 DAL	45 DAL	105 DAL
Soil alone	57.00	13.83	17.77	5.00	6.33	0.24	0.32	0.33	0.77	0.07	0.08
Soil + FYM(1:1)	73.00	17.77	21.77	5.50	7.27	0.39	0.52	0.34	0.34	0.09	0.11
Soil + FYM + Sand (1:1:1)	83.00	26.60	34.43	7.57	10.67	0.87	0.96	0.50	0.86	0.11	0.16
Peat soil	78.67	14.10	30.63	6.70	7.97	0.33	0.42	0.43	0.78	0.08	0.09
Peat Soil + FYM (1:1)	87.83	22.37	23.80	5.33	9.30	0.32	0.62	0.40	0.77	0.09	0.11
Peat Soil+FYM+Sand (1:1:1)	93.33	27.00	31.13	7.83	9.77	0.49	0.73	0.51	0.93	0.10	0.15
Soil + saw dust (1:1)	80.20	20.20	19.13	7.60	8.83	0.37	0.42	0.34	0.68	0.06	0.10
Soil + saw dust+ FYM (1:1:1)	79.00	14.00	16.87	6.67	7.17	0.42	0.41	0.49	0.83	0.10	0.12
S.E.±	0.82	1.72	1.09	0.27	0.39	0.02	0.06	0.034	0.087	0.014	0.014
C.D. at 5%	2.05	4.28	2.70	0.68	0.98	0.05	0.145	0.084	NS	0.036	0.034

DAL=days after layering, NS=non-significant

Effect of media on number, length and weight of roots

The number of primary roots per layers was increased up to significantly maximum (26.6 to 27.0) by the same rooting media (soil or peat soil + FYM + sand 1:1:1) over the remaining media at 45 and 105 days after layering. The length and weight of the roots were also recorded the highest with the same treatments (Table 1). The superiority of these rooting media might be owing to their unique ability to enhanced rooting and root development as compared to other mixed or separate rooting media. The mixed rooting media proved better than their separate applications. This may be due to higher concentration of growth promoting nutrients, proper aeration and more moisture supplying capacity. Rapid elongation and division of the cells modifying the physiological process supports the faster root growth in terms of number, length and weight (Singh and Pandey, 2009). These results are in conformity with the findings of Narayan *et al.* (2008), Bihari *et al.* (2009) and Anjanawe *et al.* (2013). The higher number of roots per layer with soil or peat soil combination with FYM and sand was probably due to their combined and accumulation of required internal substances and their downward movement. The increase in length and weight of the roots with soil or peat soil + FYM + sand combination might be due to greater accumulation of food material at the ringed portion which resulted in 0ideal conditions for root development. The increased fresh and dry weight of roots may be due to formation of more roots, higher accumulation of food material as well as longer root length and changes in amino acid metabolism during the regeneration of roots (Singh and Pandey, 20009). These results collaborate with those of Awan *et al.* (2000), Singh *et al.* (2005) and Infendiyaroglu *et al.* (2009) who worked on the mixture of different rooting media in lichi, guava and olive "Ayvalik" cuttings.

Table 2: Post-planting observations of air layering of kagzilime as influenced by different rooting media

Treatments	Survival percentage		Plant height (cm)		Branches/layer		Leaves/layer	
	30 DAP	60 DAP	30 DAP	60 DAP	30 DAP	60 DAP	30 DAP	60 DAP
Soil alone	48.00	54.33	19.57	23.70	2.17	4.27	12.17	27.87
Soil + FYM(1:1)	60.83	69.50	32.00	39.40	3.40	7.17	19.40	40.23
Soil + FYM + S and (1:1:1)	77.60	82.00	35.43	42.30	4.47	8.27	21.87	46.83
Peat soil	70.90	72.11	28.60	36.33	2.97	6.40	12.97	24.87
Peat Soil + FYM(1:1)	71.73	76.67	35.73	41.73	3.77	7.37	22.87	41.93
Peat Soil + FYM + Sand (1:1:1)	75.37	77.00	39.63	43.80	4.10	7.93	22.33	45.47
Soil + saw dust (1:1)	67.73	70.63	33.73	38.75	9.87	6.23	18.33	38.23
Soil + saw dust+ FYM (1:1:1)	57.33	66.33	37.80	41.93	3.27	6.53	12.40	30.23
S.E.±	0.76	0.72	1.06	1.79	0.16	0.16	1.41	0.82
C.D. at 5%	1.89	1.81	2.65	4.47	1.41	0.40	3.51	2.05

DAP=days after planting

Effect of media on survival and growth of air layers

The data (Table 2) indicate that all the rooting media increased the survival percentage of kagzilime air layers quite higher as compared to soil alone. The highest survival percentage was recorded with the mixture rooting media having soil or peat soil + FYM + sand, followed by peat soil with or without FYM. The higher survival percentage obtained in air layers treated with these mixed rooting media might be due to the formation of higher number of primary roots. The number of roots per layer was increased, the absorption of food materials and water from the soil to the plant was also increased which resulted in the higher survivability. FYM play a vital role in maintenance of physical and biological conditions of soil and supplied macro and micronutrients to crop besides maintenance of humic substances in soil. Similar findings have been reported by Singh and Pandey (2009) and Bisen *et al.* (2010). The maximum plant height was also noted from the same rooting media having soil or peat soil + FYM + sand. The next rooting media were peal soil + FYM and soil + saw dust + FYM which gave significantly higher plant height over soil alone. Thus higher plant height obtained with rooting media (soil or peat soil + FYM + sand) might be due to higher number of primary roots produced in these rooting media. The formation of more number of roots per air layer favoured the better establishment and facilitating ideal observation of food material and water from the soil to the plant resulting in longer shoot. The mixture of soil or peat soil with FYM and sand gave significantly higher number of branches and leaves per air layer of kagzilime over rest of the rooting media. These growth parameters are associated with higher number of primary roots per air layer. Infendiyaroglu *et al.* (2009) very rightly said that the clonal variation the type of cutting material, the concentration of hormone (indole butyric acid) applied, and the physical properties of the rooting medium can all influence rooting, especially in more difficult-to-root cultivars. It may be concluded from the results that the best rooting media was soil or peat soil + FYM + sand (1:1:1 ratio) for the air layer of kagzilime under Rewa conditions.

REFERENCES

Anjanawe, S.R., Kanpure, R.N., Kachouli, B.K. and Mandloi, D.S. (2013) Effect of plant growth regulators and growth media on seed germination and growth vigour of papaya. *Annals of Plant and Soil Research,* **15**(1): 31-34.

Awan, A.A., Hussain, Azaz, Rehman, Noor, Jan, Ayub and Ali, Nawab (2000) Effect of different media and timing factors on rooting of lichi plant through air layering. *Pakistan Journal of Biological Sciences,* **3**(11): 1809-1810.

Barde, Pravin, Tiwari, Rajesh, Kanpure, R.N., Baghe, B.S. and Kumawat, B.R. (2010) Effect of biofertilizers and growth regulators on rooting and growth of pomegranate cuttings. *Annals of Plant and Soil Research,* **12**(1): 46-47.

Bihari, M., Surya Narayan and Rakesh Kumar (2009) Effect of growing media on seed germination, rate of seed germination, transplanting success and seedling mortality in anola (*Emblica officinalis* Garten.). *Journal of Interacademicia,* **13**(4): 408-411.

Bisen, A., Pandey, S.K. and Mishra, S.P. (2010) Efficacy of bio-regulators and rooting media on rooting and survival of air layers of guava. *Annals of Plant and Soil Research,* **12**(2): 115-118.

Fabbri, A., Bartolini, G., Lambardi, M., Kailis, S. (2004) *Olive Propagation Manual*, Landlinks Press, Collingwood, pp.141.

Hartmann, H.T., Kester, D.E., Davies, F.T., Geneve, R.L. Jr. (2002) *Plant Propagation, Principles and Practices.* 7th ed. Prentice Hall, NJ, pp. 880.

Isfendiyaroglu, M., Ozeker, E. and Baser, S. (2009) Rooting of "Ayvalik" olive cutting in different media. *Spanish Journal of Agricultural Research*, **7**(1): 168-172.

Loach (1988) Controlling environment conditions to improve adventitious rooting. In : Adventitious root formation in cuttings (Davis, T.D., Haissig, B.E. and Sankhla, N., eds.). *Dioscorides Press, Portland, Oregon*, pp. 248-279.

Narayan, Surya, Singh, A.K. and Prasad, V.M. (2008) Effect of growing media on seed germination, rate of seed germination, transplanting success and seedling mortality in anola (*Emblica officinalis* Garten.). *The Allahabad Farmer*, LXIV, 1 : 77-80.

Singh, B.V. and Pandey, S.K. (2009) Influence of growth regulators and rooting medium on promotion of root characters and survival of air-layered guava shoots. *Annals of Plant and Soil Research*, **11**(2): 120-121.

Singh, Prabhakar, Chandrakar, J., Singh, A.K., Jain, Vijay and Agrawal, S. (2005). Effect on rooting in guava cv. Lucknow-49 through PGR and Organic Media under Chhattisgarh condition. *Acta Horticulture*, **735:** 218-221.