Indian J. Hort. 71(2), June 2014: 273-276

Short communication

Studies on the effect of some pre-conditioning treatments, IBA and collection time on the success of semi-hardwood cuttings in kiwifruit

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ABSTRACT

A field trial was undertaken to study the effect of pre-conditioning treatments, IBA and collection time on the rooting of kiwifruit semi-hardwood cuttings. The experiment comprised of various treatments, *viz.*, Blanching, girdling, IBA @ 5000 ppm, blanching + girdling, blanching + IBA @ 5000 ppm, girdling + IBA @ 5000 ppm, blanching + girdling + IBA @ 5000 ppm. In order to standardize the time of cuttings, these were treated at three times at monthly interval starting from mid May and was subjected to above treatments. The treatment of blanching plus girdling plus IBA @ 5000 ppm improved significantly the percent rooted cuttings (69.4%) of semi-hardwood cuttings of kiwifruit. Furthermore, root characteristics and survival percentage (70.2%) were also recorded maximum with this treatment. The best collection time of semi-hardwood cuttings in kiwifruit was found to be mid July followed by mid August.

Key words: Kiwifruit, semi-hardwood cuttings, girdling, blanching, IBA.

The Chinese gooseberry or kiwifruit (*Actinidia deliciosa* Chev.) is a deciduous, dioecious fruiting vine native to south and central part of China. The full economic potential of this fruit was exploited in New Zealand. In India, kiwifruit was first introduced in Bengaluru in early sixties and later in Shimla hills of Himachal Pradesh. Himachal Pradesh is the first state to demonstrate its commercial cultivation in the country. Now, it has become a promising commercial fruit in mid and low hills of other states namely Arunachal Pradesh, Sikkim, Uttrakhand and Meghalaya. It occupies an area of 117 hectares in Himachal Pradesh with an annual production of 555 metric tonnes (Anon., 1).

In order to meet the increasing demand of kiwifruit plants for commercialization, the planting material is required on large scale which has necessitated the need for development of an easier, quicker and economic method of propagation. The raising of kiwifruit plants by cutting method has been found to best as it is quick, less expensive and requires less space and skill. Among two types of cuttings, semi-hardwood cuttings are known to give higher rooting success than the hardwood cuttings. The higher rooting potential of semi-hardwood cuttings has been attributed to endogenous auxin in tender vegetative growth of semi-hardwood cuttings (Hartmann and Kester, 6). The physiological status of the plant exerts a strong influence on the root initiation. The involvement of metabolites and rooting promoters/inhibitors has been reported to play a significant role. A number of exogenous compounds have been applied to the cuttings to encourage rooting and the most widely applied is IBA (indole 3-butyric acid). Furthermore, pre-conditioning treatments such as blanching and girdling have also been reported to improve rooting capacity of the cuttings (Hartmann *et al.*, 7). Keeping in view the above factors into consideration, the present investigations were carried out to elucidate the effect of some pre-conditioning treatments, IBA and collection time on the rooting of semi-hardwood cuttings of kiwifruit. The investigations were carried out in the mist chamber at field of the Department of Fruit Science, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.) during the year 2009-2010. The cuttings were collected from 24-year-old own rooted bearing vines of kiwifruit cv. Allison at three times, *i.e.* in second week of June, second week of July and second week of August from actively growing shoots having well developed axillary buds without lateral branches. Blanching was done four weeks before taking the cuttings. Blanching was done by covering with 2 cm black adhesive tape just above a node. Girdling was done one week before taking the cuttings with the thin metallic wire just below a node. The IBA application was given at the time of planting of cuttings with quick dip method. The observations were made after 120 days of planting the cuttings on different root, shoot and leaf characters of semi-

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hardwood cuttings. The data on the field survival of the rooted cuttings were recorded at 60 days, after transferring of the rooted cuttings from mist chamber to the open field conditions. The data were analyzed by applying Randomized Block Design (RBD). The data on percentage were statistically analyzed after Arc sin transformation as suggested by Gomez and Gomez (5). Correlation coefficients (r-values) between different root characters and survival percentage was calculated as per the method suggested by Panse and Sukhatme (12).

The application of pre-conditioning treatments, *viz.*, Blanching and girdling in combination with IBA treatment influenced the different rooting characteristics. Data revealed that the highest per cent rooted cuttings, total number of roots, number of main roots, number of lateral roots, length of longest root, total root length were recorded with the treatment of blanching + girdling + IBA @ 5000 ppm (Table 1). The lowest values were recorded with control which were statistically at par with girdling, blanching, blanching + girdling, IBA @ 5000 ppm alone and girdling + IBA @ 5000 ppm.

Pre-conditioning treatments like localized etiolation or blanching has been known to play a significant role in enhancing rooting potential of many plants. Davies and Hartmann (3) observed decreased biosynthesis of lignin in etiolated cuttings, which may alter the (blanching) availability of phenolic metabolites, thus enhancing the root initiation. Etiolation with black tape provides the opportunity for localized application of auxin to the stem during shoot growth, which in some cases has proved more effective in stimulating rooting (Howard and Harrison-Murray, 8).

Hartmann and Kester (6) have reported that girdling treatment at the base of cuttings caused an accumulation of carbohydrates and other root promoting substances above girdling which can result in increased root initiation. Kossuth *et al.* (10) observed that girdling of cuttings, 2 weeks before collection, enhanced the rooting of apple cuttings. Rathore (14) reported 70-80 per cent rooting in softwood cuttings of Allison kiwifruit after treatment with 5000 ppm IBA under intermittent mist, whereas, rooting in untreated cuttings was 40 per cent. They further reported that rooting in IBA (2500 to 7500 ppm) treated semi-hardwood and hardwood cuttings ranged from 28 to 42% and 30 to 52%, respectively. The combined effect of etiolation and auxin treatment has been investigated in apple. Unetiolated cuttings of the scion variety rooted comparatively at low level with a range of concentrations of synthetic hormones. Indole butyric acid applied to etiolated cuttings promoted a significant increase in root formation (Delargy and Wright, 4). Maynard and Bassuk (11) reported that blanching in combination with 8000 ppm IBA treatment increased the rooting percentage in softwood cuttings of woody plants like *Carpinus betulus* and *Corylus americana*. Khoe (9) studied the effect of some pre-conditioning treatments on the rooting of cuttings in peach cv. July Elberta. She recorded maximum rooting percentage in semi-hardwood cuttings treated with blanching + girdling + IBA @ 2000 ppm IBA. The collection time of the semi-hard wood cuttings exerted a significant influence on the different root characteristics (Fig. 1). Seasonal timing or the period of year during which cuttings are taken may impact rooting. Although, it is possible to make cuttings of easy-to-root species throughout the year, softwood cuttings of many deciduous woody species taken during summer are reported to enhance the rooting percentage. Biasi *et al.* (2)

Table 1. Effect of pre-conditioning treatments, IBA and collection time on the root characteristics in semi-hardwood cuttings of kiwifruit.

Treatment	No. of main roots	No. of lateral roots	Length of longest root (cm)	Total root length (cm)
Blanching	3.3	32.6 (5.7)*	10.9	120 (11.0)
Girdling	2.9	25.5 (5.1)	9.9	106.8 (10.3)
IBA @ 5000 ppm	5.3	118.6 (10.9)	11.6	144.5 (12.0)
Blanching+ Girdling	4.6	118 (10.8)	11.5	126.8 (11.3)
Blanching + IBA @ 5000 ppm	10.9	134 (11.6)	27.7	256.9 (16.0)
Girdling + IBA @ 5000 ppm	8.2	133 (11.5)	26.5	147.1 (12.1)
Blanching + girdling + IBA @ 5000 ppm	14.9	148.4 (12.2)	30.4	408.3 (20.4)
Control	2.3	23.1 (4.8)	8.5	99.1 (10.0)
CD at 5%	0.8	0.8	0.3	2.5

*Figures in parentheses are square root transformed values obtained highest rooting from the cuttings collected in July-August after treatment with 2000, 4000 and 6000 ppm IBA in Hayward cultivar of kiwifruit. Rana *et al.* (13) reported that cuttings prepared during the active growth stage (July-August) gave better results than those prepared during the dormancy stage. Ucler *et al*. (15) also studied the effects of IBA and date of collection on the rooting ability of semi-hardwood cuttings of kiwifruit. They reported that cuttings taken in July had better rooting ability in terms of main root numbers, mean length of the longest five roots and rooting area.

Maximum field survival percentage of the semi-hardwood rooted cuttings under field conditions was also recorded with the treatment of Blanching (etiolation) + girdling + IBA @ 5000 ppm (Fig. 1). The possible explanation to these findings lies in better development of root systems with more number of roots, greater root length, fresh and dry weight of roots under this treatment. Thus, these events might have enabled the rooted cuttings to make better growth under field conditions after plantation and thereby accounted the highest field survival percentage. The correlation studies exhibited significant positive correlation between different root characteristics and the survival percentage as affected by various pre-conditioning treatments, IBA and collection time (Fig. 1). Number of roots have highest positive correlation with plant survival (Table 2).

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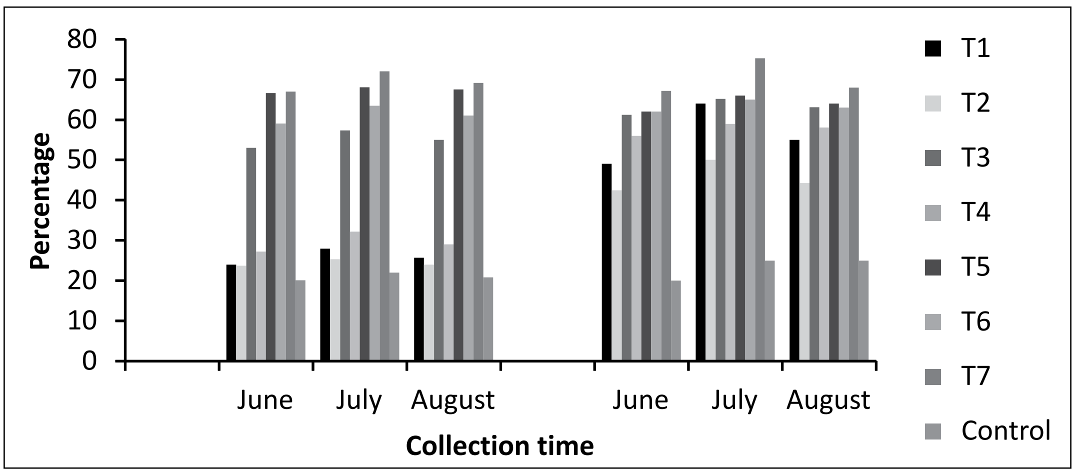

Fig. 1. Effect of pre-conditioning treatments, IBA and collection time on the success of semi-hardwood cuttings of kiwifruit.

Table 2. Correlation between different root characteristics and survival percentage of rooted cuttings.

Root Characters	Percent rooted cuttings	No. of roots	No. of main roots	No. of secondary roots	Length of longest root	Total root length	Fresh weight of roots	Dry weight of roots	Survival percentage
Percent rooted cuttings	1	0.89	0.86	0.88	0.89	0.76	0.99	0.95	0.77
No. of roots		1	0.82	0.99	0.78	0.69	0.88	0.86	0.81
No. of main roots			1	0.79	0.91	0.93	0.88	0.92	0.72
No. of secondary roots				1	0.76	0.66	0.86	0.84	0.80
Length of longest root					1	0.81	0.87	0.87	0.67
Total root Length						1	0.79	0.86	0.63
Fresh weight of roots							1	0.96	0.78
Dry weight of roots								1	0.79
Survival percentage									1

*Tested at 5% level of significance.

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Received: July, 2012; Revised: January, 2014;
Accepted: April, 2014