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Original Research

Vegetative Propagation of Fig 'Sawari' and 'Tarnab Inzar' Through Stem Cuttings

Ibrar Hussain*, Abdul Samad, Nisar Naeem, Ziaullah, Hafeez ur Rehman, Kamran Shah, Shah Zeb and Ayub Jan
Horticulture Research Program, Agricultural Research Institute, Tarnab, Peshawar, Pakistan

ABSTRACT

Fig is a perennial fruit tree with high economic importance among horticultural crops in some countries. The fruit has a good market value, both at national and international level. The objective of this work was to evaluate the potential of vegetative propagation of fig cvs. 'Sawari' and 'Tarnab Inzar' through stem cuttings with different lengths, aiming to improve the production of nursery plants. The experiment was carried out from January to April 2017 and it was laid out in randomized complete block design with different sizes of cuttings (10, 15 and 20 cm) examined for two cultivars 'Sawari' and 'Tarnab Inzar', with three replications keeping 20 cuttings per treatment. The variables studied were number of leaves, number of roots, root length, shoot length, sprouting percentage and survival percentage. Cuttings size of fig cultivars had a significant temporal variation in the percentage of successful rooting and survival of cuttings. Based on data regarding number of leaves, number of roots, root length, sprouting percentage, it was concluded that 20 cm long cuttings collected for both cultivars are the best option for commercial production of fig nursery plants.

Keywords: *Asexual propagation, cutting size, cutting rooting, commercial plant production, Ficus carica.*

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INTRODUCTION

Fig (*Ficus carica*) is a subtropical fruit that belongs to the *Ficus* genus of the Moraceae family. It is grown in some parts of the world such as Mediterranean region, South-West Asia, South America, South Africa and in a lesser extent in Australia. Fig fruits, having quite large nutritional values, are consumed fresh or dried. Fig is accepted as a blessed fruit in celestial religions. Due to these specifications, it has been cultivated and consumed since ancient times (Botti et al., 1997; Pareira and Nachtigol, 1997).

'Tarnab Inzar' is a fig cultivar developed at Agriculture Research Institute (ARI), Tarnab, Peshawar in 2010, having plamate type of leaves, vigorous, early bearing and early maturing. 'Sawari' is another selection of Fig. It was the result of breeding programme run by Horticulture Research Department, ARI, Tarnab, Peshawar. It was approved for cultivation in North-eastern region of Pakistan. It has comparatively big dark reddish fruits at maturity and is comparatively late ripening than 'Tarnab Inzar'. Its leaves are bigger in size and smooth on border (Hussain et al., 2012).

The propagation of woody fruit trees like fig by means of stem cuttings is the most widely used multiplication process in the world (Hussain et al., 2014). Outstanding parts of the mother plant like stem cuttings, roots placed under suitable conditions form adventitious roots, giving rise to new plants identical to the one from whom they originated (Hoffmann et al., 1994; Hussain et al., 2016). The use of woody cuttings is justified by allowing the use of discarded material during winter pruning, preferably branches of one year of age, and rooting without any environmental control and growth hormonal treatment (Ojima and Rigitano, 1969), allowing the formation of plants directly in the nursery (Pinheiro and Oliveira, 1973).

Propagation of woody plants through stem cutting is a common technique; it depends on callus formation, initiation of roots, development of root system, and lateral growth of the cuttings (Fachinello et al., 1995). However, without proper guidance, significant losses of propagative material occur. Thus, it is important to study the possibility of rooting the discarded pruned material in winter season, which is advantageous, providing the next winter, twelve months later, rooted plants ready for commercialization (Hoffmann et al., 1994). Considering the aspects above, the objective of this study was to evaluate potential of different sizes of cuttings of two new fig cultivars for large scale production of fig nursery plants.

MATERIALS AND METHODS

The experiment was carried out at Horticultural Research Farm, Agricultural Research Institute (ARI), Tarnab, Peshawar, Pakistan from January to April, 2017. In this experiment, two fig cultivars (Sawari and Tarnab Inzar) were tested for their propagation using different sizes of cuttings (10, 15 and 20 cm).

Corresponding author
E-mail: ibrar_horti @yahoo.com (I. Hussain)

The experiment was laid out in randomized complete block design with two factors and three replications keeping 20 cuttings per treatment. This experiment was conducted in lath house providing 30% shade. Fig cuttings were collected from mother orchard at ARI, Tarnab, Peshawar, in the morning, they were tested in the laboratory for prevalence of any disease. The cuttings with uniform color, shape, and size with at least three buds were collected from each cultivar. The cuttings were planted in polythene bags containg a growing medium consisting of sand, silt and clay at a ratio of 1:1:1 by volume.

After 90 days of planting, the data were collected on the following parameter; number of leaves by counting leaves on each cutting, number of roots by counting major roots on each cutting, root length and shoot length was measured by a ruler and means were calculated, sprouting percentage was estimated by observing each cutting from start of experiment till end, survival percentage was recorded by observing alive cuttings. The data were subjected to analysis of variance and means were compared by Tukey test at 5% probability (Banzatto and Kronka, 2006).

RESULTS

Number of Leaves

Number of leaves produced per cutting was significantly influenced by cutting size. The higher number of leaves was attained by cuttings with 20 cm length (11.50), followed by 15 cm, whereas lower number of leaves was recorded when the cutting size was 10 cm. Fig cultivars and their interaction with cutting size remained non-significant (Table 1).

Number of Roots

Roots are important factor for plants development and growth. The cutting size had significant influence on number of roots, irrespective of the cultivar. The higher number of roots was attained by cuttings with 20 cm length (11.00), whereas the cutting with 15 cm and 10 cm length attained significantly lower number of roots. Fig cultivars and their interaction with cutting size remained non-significant for number of roots (Table 1).

Root Length

Cutting size significantly influencedthe length of roots produced. Cuttings with 20 cm length had significantly greater root length (14.06 cm), compared to cutting with 15 cm and 10cm (9.56 cm and 7.33 cm, respectively). Root length was also significantly different for fig cultivars. Greater root length (11.97 cm) was attained by 'Sawari' compared to 'Tarnab Inzar' (8.67 cm). The interaction of fig cultivars with cutting size was found statistically non-significant for root length (Table 1).

Sprouting Percentage

Cutting size had significant influence on the sprouting of cuttings. Fig cuttings with 20 cm length had maximum sprouting (92.50%), whereas the cutting with 15 cm (85.0%) and 10 cm (82.33%) attained lower sprouting percentage. Sprouting percentage was non-significant for different fig cultivars; however, both 'Sawari' and 'Tarnab Inzar' attained a high sprouting percentage (88.77% and 84.44%, respectively). Whereas, the interaction of fig cultivars with cutting size was non-significant for the parameter (Table 1).

Shoot Length

Shoot length was significantly influenced by fig cultivars, cutting size and the interaction of these two factors. 'Sawari' attained greater shoot length (17.27 cm) than 'Tarnab Inzar' (8.77 cm). Cutting size had significant influence on shoot length. Fig cuttings with 20 cm length had maximum shoot length (16.25 cm), whereas the cutting with 15 cm (12.16 cm) and 10 cm (10.66 cm) attained significantly shorter shoot length than 20 cm cuttings. In case of interaction, the fig cultivar 'Sawari' had greater shoot length when 20 cm cuttings were used, whereas 'Tarnab Inzar' resulted in the minimum shoot length for 10 cm cuttings (Table 2).

Survival Percentage

Survival percentage was significantly influenced by both the factors studied; also, the interaction of cultivars and cutting size was found statistically significant. Fig cultivars 'Sawari' and 'Tarnab Inzar' significantly differed for survival percentage. 'Sawari' attained higher survival percentage than 'Tarnab Inzar' (Table 2). Cutting size had significant influence on survival of

Table 1: Number of leaves, sprouting percentage, root length and number of roots of fig cultivars with different cutting size.

	Variables			
Cultivars (V)	Number of Leaves	Sprouting percentage	Root length	Number of roots
Sawari	8.66	88.77	11.97A	8.55
Tarnab Inzar	8.44	84.44	8.67B	8.22
F	0.43ns	2.58ns	9.45*	0.51ns
Cutting size (C)				
10 cm	5.33C	82.33B	7.33B	6.50B
15 cm	8.83B	85.00AB	9.56B	7.66B
20 cm	11.50A	92.50A	14.06A	11.00A
F	109.89*	5.10*	13.70*	33.09*
F (V x C)	0.11ns	0.29ns	3.05ns	2.19ns
CV	8.45	6.60	21.99	11.85

Means followed by the same letter(s) are not significantly different at 5% level of significance by Tukey test (p<0.05).
ns = non-significant and * = significant at 5% level of significance.

Table 2: Shoot length and survival percentage of fig cultivars with different cutting size.

Variables	Shoot length			Survival percentage		
	Cultivars			Cultivars		
Cutting Size	Sawari	Tarnab Inzar	Mean	Sawari	Tarnab Inzar	Mean
10 cm	14.00bc	7.33d	10.66B	71.33bc	70.00c	70.66B
15 cm	16.00b	8.33d	12.16B	78.33bc	71.67bc	75.00B
20 cm	21.83a	10.66cd	16.25A	93.33a	80.00b	86.66A
Mean	17.27A	8.77B		81.00A	73.88B	
F (V)	199.40*			22.26*		
F (C)	30.72*			40.20*		
F (VxC)	5.14*			5.30*		
CV	9.80			4.13		

Means followed by the same letter(s) are not significantly different at 5% level of significance by Tukey test (p<0.05).
ns = non-significant and * = significant at 5% level of significance.

the cuttings. The cuttings of 20 cm length resulted in the maximum survival percentage (86.66%), compared to cutting with 15 cm (75.0%) and 10 cm (70.66%) length. In case of interaction, the fig cultivar 'Sawari' had higher survival percentage (93.33%) when 20 cm cuttings were used, whereas 'Tarnab Inzar' recorded the minimum survival percentage for 10 cm cuttings (70.0%).

DISCUSSION

Cutting size showed significant variation for most of variables studied; number of leaves, number of roots, root length, sprouting percentage, shoot length and survival percentage of fig cultivars. The cuttings of 10 cm size had lower number of shoot as well as roots variables, evidencing that their carbohydrate resource was lesser, in comparison to that of the larger cuttings of 20 cm, as higher content of carbohydrates helps in the formation of the root system and development of shoots.

According to Pizzatto et al. (2011), during the rooting period, cytokinin's are gradually metabolized in favour of bud sprouting and root growth or simply inactivated by the tissue of the plant, if there are not enough reserves for their metabolism. Similar results were obtained by Biasi and Costa (2003), on the woody cuttings of *Lippia alba* (Mill.) and Mayer et al. (2002) in which the best results in the analyzed variables (percentage of rooting and sprouting, and buds and length of shoots) were obtained with maximum cutting size.

The difference in rooting between cultivars is a known feature for production of new plants. According to Aljane and Sabrine (2014), different fig cultivars were found having non-significant differences for shoot as well as rooting variables. Dutra et al. (1999) while studying six cultivars of plum, observed the variation for rooting variables among cultivars. Mayer et al. (2001) evaluated propagation of apricot cultivars and narrated that different genotypesshowed high variation in rooting of cuttings. Hussain et al. (2016) reported that in different cultivars of blackberries, rooting success of cuttings depends on type of cutting used. Rufato et al. (2001) while working with the rooting of 'Portugal', 'Pineapple', 'Mendoza Inta-37' and 'Meliforme' quince cuttings, with a length of 12 cm, obtained only 5% rooting for the cultivar Portugal. The formation of adventitious roots on cuttings is directly or indirectly controlled by genes (Haissig and Reimenschneider, 1988). The potential of a stem to form roots is variable with the species and cultivar, and these can be classified as easy, medium or difficult to root, although the ease of rooting is due to the interaction of several factors and not only genetic potential (Fachinello et al., 1995). Dutra et al. (1998) while studying six cultivars of plum reported that cuttings of 15 cm in length, gave highest percentage of roots compared to other cutting sizes for a single variety and not for all. Further, it was noticed that the use of mini-cuttings exhibited a poor result.

CONCLUSION

It is concluded that 20 cm long cuttings collected for cultivars 'Sawari' and 'Tarnab Inzar' are the best option for commercial production of fig nursery plants.

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