

# Effect of grafting method and height on the growth of grafted plants and production of feathers in spur type apple cultivars at nursery stage

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## Abstract

Among the four methods of propagation viz., tongue grafting, chip budding, shield budding and annular budding, tongue grafting showed maximum linear and radial growth of the scion as well as rootstock. The effect of propagation methods in respect of production of feathers, tongue grafting resulted maximum number and length of feathers and height of feather emergence in both the cultivars, viz., Redspur and Wellspur. Among the three propagation heights i.e., 15, 20 and 25 cm above the collar, the maximum linear growth was recorded with 15 cm height but no definite pattern was observed in relation to radial growth and production of feathers.

**Key words:** Grafting method, grafting heights, growth, feathers, spur types, apple

## Introduction

Different methods of propagation were standardized in traditional apple cultivars but so far no information is available on spur type of cultivars. Earlier there were opinion that single stemmed plant perform better in the orchard but now it has been established that feathers in early stage of plant, provide better framework to the plants in the orchard. The propagation methods and height have significant role in growth as well as production of feather at nursery stage which ultimately influence the architecture of the tree and yield. The present study was made to study the effect of propagation methods in respect of growth of grafts, production of feathers and height of feather in Redspur and Wellspur apple cultivars.

## Materials and methods

Four propagation methods i.e., tongue grafting, chip, shield and annular budding were tried. The tongue grafting and chip budding were performed in March, while shield and annular budding were performed in summer (May). Two spur type apple cultivars, Wellspur and Redspur were used as scion and crab apple as rootstock. Scion wood was collected from previous year's growth from a healthy tree during mid February and was stored till further use in March. For summer budding (May), scion wood was collected from current season's growth from healthy and bearing trees at the time of budding. These budsticks were defoliated immediately after collection. The propagation was performed at three heights from the collar region i.e., 15, 20 and 25 cm.

## Results and discussion

**Growth of grafted plants:** The linear growth of scion was significantly influenced by method as well as height of propagation in Redspur and only by method of propagation in Wellspur. However, the radial growth of scion and stock were influenced significantly by both the methods and height of propagation in both the cultivars. Among four methods of

propagation, tongue grafting gave maximum linear and radial growth of scion as well as stock in both the cultivars (Table 1, 2). These findings are in conformity with those of Sewal (1975) who obtained the highest linear and radial growth in almond with tongue grafting. Bans (1991) also obtained maximum linear and radial growth with tongue grafting in walnut. The higher growth of plants with tongue grafting and chip budding as compared to shield and annular budding may be attributed to quick union formation, early initiation of growth and longer duration of growing season. Besides, it has also been shown (Susses and Clutter, 1959; Larson, 1962 and Ramsay and Martin, 1970) that the activity of growth promoters and callus proliferation, which are essential for successful union and vegetative growth are the highest at budbreak stage and this may be the cause for higher growth of the plants raised by tongue grafting and chip budding.

**Table 1. Effect of propagation method and height on scion linear growth (cm) in spur type apple cultivars**

Method / height of propagation	Cultivar	
	Redspur	Wellspur
<i>Method</i>		
Tongue grafting	130.60	87.38
Chip budding	118.30	41.16
Shield budding	56.80	48.65
Annular budding	62.00	60.99
CD ( $p=0.05$ )	15.00	19.76
<i>Height of propagation</i>		
15 cm	99.88	66.59
20 cm	76.38	60.68
25 cm	99.57	31.37
CD ( $p=0.05$ )	14.28	NS

Linear growth of scion was affected significantly by the height of propagation in Redspur, while radial growth of scion and rootstock was influenced by the height of propagation in both the cultivars. In Redspur, the linear growth of the scion was observed to be higher with 15 cm grafting height closely followed

by 25 cm grafting height and radial growth of scion was maximum with 25 cm height of grafting. In Wellspur, the linear and radial growth of scion as well as stock are observed to be maximum with 15 cm of grafting height, which decrease with increase in the grafting height from the collar .

**Table 2. Effect of propagation method and height on radial growth (cm) of scion and stock in spur type apple cultivars**

Methods / height of propagation	Redspur		Wellspur	
	Scion	Stock	Scion	Stock
<i>Method</i>				
Tongue grafting	2.77	3.12	2.68	2.88
Chip budding	2.44	2.86	1.59	2.25
Shield budding	1.85	2.52	1.50	2.42
Annular budding	1.91	2.49	1.72	2.57
CD ( $p=0.05$ )	0.39	0.42	0.39	0.40
<i>Height of propagation</i>				
15 cm	2.33	2.88	2.06	2.70
20 cm	1.96	2.53	2.87	2.57
25 cm	2.46	2.83	1.69	2.32
CD ( $p=0.05$ )	0.27	0.30	0.33	0.26

The observations in respect of the performance of 15 cm grafting height are in agreement with those of Srivastava *et al.* (1973), who reported that grafting at 15 cm above collar region was significantly superior in terms of plant height as compared with grafting at collar. Similarly, Pathak and Srivastava (1973) achieved the best results in terms of girth when plants were tongue grafted at 7.6 or 15 cm height above the collar.

**Production of feathery:** The method of propagation exerted significant influence on the number of feathery in both the cultivars whereas height of emergence of feathery and the length of feathery were significantly affected by method of propagation only in Redspur. Among the four propagation methods, tongue grafting was observed to produce maximum number and length of feathery and height of feather emergence from the union in both the cultivars (Table 3, 4). The results regarding production of feathery are in conformity with those of Sharma and Singh (1979), who recorded a significantly greater number of lateral branches per plant in case of tongue grafting in peach.

**Table 3. Effect of propagation method and height on the number of feathery in spur type apple cultivars**

Methods / height of propagation	Cultivar	
	Redspur	Wellspur
<i>Method</i>		
Tongue grafting	1.33	1.77
Chip budding	1.00	0.08
Shield budding	0.25	0.25
Annular budding	0.08	0.25
CD ( $p=0.05$ )	0.94	0.84
<i>Height of propagation</i>		
15 cm	0.75	0.06
20 cm	0.69	0.69
25 cm	0.56	0.31
CD ( $p=0.05$ )	NS	NS

**Table 4. Effect of propagation method and height on height (cm) of emergence of feather from graft union and its length (cm) in spur type apple cultivars**

Method / height of propagation	Redspur		Wellspur	
	Height	Length	Height	Length
<i>Method</i>				
Tongue grafting	30.36	28.54	14.92	17.67
Chip budding	24.15	20.47	4.83	1.66
Shield budding	7.33	11.25	3.33	3.17
Annular budding	2.83	3.58	2.75	3.50
CD ( $p=0.05$ )	13.31	12.45	NS	NS
<i>Height of propagation</i>				
15 cm	16.87	12.47	4.56	2.69
20 cm	20.11	21.41	10.57	9.94
25 cm	11.52	14.00	4.25	6.87
CD ( $p=0.05$ )	NS	NS	NS	NS

The present study revealed that tongue grafting showed maximum linear and radial scion growth. Grafting at the height of 15 cm produced better results.

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