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## EFFECT OF SCION DEFOLIATION AND STOCK LEAF RETENTION ON THE GRAFT HEIGHT OF LIME

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### ABSTRACT

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The present experiment was conducted at the Germplasm Centre (GPC) of the Fruit Tree Improvement Program (FTIP), Bangladesh Agricultural University, Mymensingh, during the period from June to October, 2013 to investigate the effects of scion defoliation and stock leaf retention on the graft height of Lime (cv. BAU lime-1). The experiment consisted of two factors such as Factor A: four scion defoliation periods *viz.*, defoliation before 9 days of grafting, defoliation before 6 days of grafting, defoliation before 3 days of grafting and defoliation on the day of grafting and Factor B: retention of leaf on rootstock below graft union *viz.*, rootstock with leaf and rootstock without leaf. The study was laid out following Randomized Complete Block Design (RCBD) with three replications. The grafts were kept under observation in poly tunnel condition. Results revealed that highest graft height (45.47 cm) was observed when scions were defoliated 6 days before grafting and lowest graft height (38.72 cm) was observed when scions were defoliated on the day of grafting. In respect of retention of leaves on rootstock, the highest graft height (43.83 cm) was found when grafting was done on rootstock with leaves and lowest graft height (39.78 cm) was found when grafting was done on rootstock without leaves. Therefore, the maximum graft height in lime can be achieved if scion defoliated 6 days prior to grafting operation and leaves are kept on root stock below graft union.

**Key words:** scion defoliation, stock leaf retention, graft height, lime

### INTRODUCTION

Climatic condition of Bangladesh is suitable for growing many tropical and sub-tropical fruits. Only some major fruits like mango, pineapple, banana, litchi, lemon, guava, papaya, coconut are grown in large scale in the country. Lime (*Citrus aurantifolia*) is remarkable among the fruits, which is one of the important, popular and nutritious fruits in the world. Only 55000 metric tons lime and lemon were produced in 4000 acres land during the year 2010-2011 (BBS 2011). Lime under the family Rutaceae probably originated in India and then spread to the Middle East and other tropical and subtropical countries. The health benefits of citrus fruit have mainly been attributed to the presence of bioactive compounds, such as phenolics (e.g. flavanone glycosides, hydroxycinnamic acids) vitamin C and carotenoids. The juice of fruit contains K, Ca, Fe, Mg, Na, S and P. The peel contains volatile oil which is used in the production of perfumes and different kinds of sweets. Also lime has medical uses like citric acid which is used in drug. Lime is mainly propagated by seed and air layering in the country. In case of seed propagation; there are some disadvantages. In some cases, seedlings are not true-to-type with mother tree; due to juvenility factors, seedling trees do not usually bear fruit until they are nearly a decade old; and they are vulnerable to unfavorable soil conditions, diseases, and so forth. But the vegetative method is desirable because it enables to retain the characteristics of the mother plant, to get flower and fruit earlier, to remain initially relatively smaller with the benefit of more plants accommodation per unit area and to give the growers earlier fruit and more economic benefit. Growth of grafted plant depend on several factors including time of operation, grafting method, defoliation period of scion, age of the rootstock and leaf and node retention of rootstock. Plant height is an important parameter of plant growth, the present study was undertaken to investigate the effects of scion leaf defoliation and stock leaf retention of cleft grafting on the graft height of lime.

### MATERIALS AND METHODS

The present experiment was conducted at the 'BAU Germplasm Centre (GPC) of Fruit Tree Improvement Program (FTIP), Bangladesh Agricultural University, Mymensingh during the period from June to October, 2013. High yielding cultivar namely FTIP BAU Kagozi Lebu-1 (Semi-seedless) was used in this study. The rootstocks used in the experiment were raised in polybag from the lemon seeds of unknown variety. The scion shoots used, were collected from mother plants of lime (cv. BAU Lebu-1). The two-factor experiment consisting of 8 treatment combinations was laid out in Randomized Complete Block Design (RCBD) with three replications. For each treatment combination grafting operations were performed on twenty rootstocks of each plot of a block. Thus in total  $4 \times 2 \times 3 \times 20 = 240$  grafts were made. The experiment consisted of two factors, Factor A: scion defoliation period *viz.*, Defoliation before 9 days of grafting, Defoliation before 6 days of grafting, Defoliation before 3 days of grafting, Defoliation on the day of grafting and Factor B: Stock leaf retention *viz.*, Rootstock with leaves below graft union Rootstock without leaves below graft union. Data on graft height at 30, 60, 90 days after grafting were collected and were statistically analyzed to find out the significance of differences between the treatments and treatment combinations. The means of all the treatments were

calculated and the analyses of variances (ANOVA) for all the characters were performed by 'F' variance test. The significance of differences between treatments means were compared by Least Significant Difference (LSD) test (Gomez and Gomez, 1984).

## RESULTS AND DISCUSSION

### Main effect of scion leaf defoliation period

The graft height was significantly ( $P < 0.01$ ) influenced by different scion leaf defoliation period of lime. The variations in graft height due to the effect of scion leaf defoliation period have been presented in Table 1. At 90 DAG, the highest graft height (45.47 cm) was found when the grafting was done with the scion defoliated 6 days before grafting and the lowest graft height (38.72 cm) was recorded from scion defoliated on the day of grafting. Aftab (2004) conducted an experiment on the effect of defoliation period of scion and retention of stock leaf on the success and stionic growth in cleft grafting of mango cv. Amrapali. He reported that scion should be defoliated either 10 or 5 days before grafting operation and the rootstock should retain leaves below the graft union for the highest success, survivability and stionic growth in mango cv. Amrapali. Jha and Bramachari (2002), recorded the highest values for length of scion when scions were procured before grafting.

Table 1. Main effect of scion defoliation period on graft height at different days after grafting

Scion defoliation period before grafting(days)	Total graft height (cm)		
	30 DAG	60 DAG	90 DAG
9	40.19	41.57	42.33
6	40.85	42.35	45.47
3	37.72	39.50	40.70
0	36.07	37.47	38.72
LSD at 1%	0.261	0.388	1.39
Level of significance	**	**	**

\*\* = Significant at 1% level of probability, DAG= Days after grafting

### Main effect of stock leaf retention

Data on the increased graft height showed significant ( $P < 0.01$ ) variations due to the effect of different stock leaf retention which have been presented in Table 2. Grafting operation performed using root stock with leaf gave the highest graft height (43.83 cm) at 90 DAG, whereas the lowest graft height (39.78 cm) was found when grafting was done using root stock without leaf. Biswas (2007) also observed the maximum rootstock (20.55 cm) and scion in Indian olive when grafting was done retaining leaf on rootstock. Masuda (2004) observed maximum stionic height (49.32 cm) and canopy volume ( $0.015 \text{ m}^3$ ) in BAU tall Indian olive when grafted on one year old rootstock with leaves.

### Combined effect of scion leaf defoliation period and stock leaf retention on the graft height at different days after grafting

The interaction effect of scion leaf defoliation period and stock leaf retention on the graft height was significant at 30, 60 and 90 DAG (Table 3). The variations in the graft height due to the combined effect of scion leaf defoliation period and stock leaf retention have been presented in Table 3. At 90 DAG, the highest graft height (46.73 cm) was recorded when scions defoliated 6 days prior to grafting operation were grafted with rootstocks having leaves below grafting union while the lowest graft height (36.73 cm) was observed when scions defoliated on the day of grafting were grafted with rootstocks without leaves below grafting union.

Table 2. Main effect of stock leaf retention on graft height at different days after grafting

Stock leaf retention	Total graft height (cm)		
	30 DAG	60 DAG	90 DAG
L <sub>1</sub>	41.36	42.61	43.83
L <sub>2</sub>	36.05	37.83	39.78
LSD at 5%	0.133	0.198	0.708
LSD at 1%	0.185	0.275	0.986
Level of significance	**	**	**

Table 3. Combined effect of scion defoliation period and stock leaf retention on graft height at different days after grafting

Stock leaf retention	Scion defoliation period before grafting (days)	Graft Height (cm)		
		30 DAG	60 DAG	90 DAG
Stock with leaves	9	42.25	43.70	44.80
	6	38.13	39.39	39.87
	3	43.33	44.70	46.73
	0	38.37	40.00	44.20
Stock with leaves	9	41.13	42.13	43.10
	6	34.30	36.87	38.30
	3	38.73	39.90	40.70
	0	33.40	35.03	36.73
LSD at 5%		0.266	0.396	1.42
LSD at 1%		0.369	0.549	1.97
Level of significance		**	**	**

The significant variations in graft height found because of different scion defoliation periods might be due to the variations in the level of graft union, time required for bud breaking and amount of nutrient supply to the growing shoot. Higher vigor could be attributed to growth activity of buds of scion which get activated after defoliation which enhanced the length of rootstock and scion. The highest graft length was found when grafting done retaining leaf on rootstock this may be due to early establishment of graft union for adequate supply of photosynthates by stock leaf. Retention of leaves on rootstock facilitates carbohydrate production as a result proper supply of food is ensured that increased the cellular activities through rapid establishment of vascular connection between scion and rootstock, thus increase the growth of the grafted plant.

## CONCLUSION

Different scion leaf defoliation period and stock leaf retention significantly influenced the graft height of the grafted plants. From the results, it reveals that lime can be propagated by grafting using pre-cured scion and keeping leaves below grafting union for better establishment of graft union and also for rapid growth of the grafted plants. But for the highest graft height grafting should be done using scions defoliated 6 days before grafting keeping leaves on root stock below graft union.

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