

## VARIETAL PERFORMANCES OF DIFFERENT CITRUS SPECIES UNDER SOME TESTED METHODS OF VEGETATIVE PROPAGATION

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### ABSTRACT

The experiment was carried out at the Horticulture Farm, Bangladesh Agricultural University, Mymensingh to study the response of different species of citrus namely lime, lemon scented, lemon semi-seedless, lemon seedless, pummelo, multa and mandarin to different methods of vegetative propagation. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. The results revealed that the highest (89.52%) success was observed in air layering and the lowest (75.00%) in stem cutting followed by cleft grafting (75.00%). Considering the species, the highest (100%) success was found in lemon scented. The second highest (99.00%) success was recorded in lime. The lowest (46.68%) success was noted in multa.

**Key words:** Vegetative propagation, citrus, lemon, sapling success.

### Introduction

Citrus fruits are very much popular throughout the world and occupy a prominent position in the fruit industry of the world. The leading citrus producing countries of the world are USA, Brazil, Spain, Italy, India, Mexico, Morocco, Israel, China, Japan etc. Bangladesh stands in a very low position in respect of the production of citrus fruits. But it is the matter of happy that citrus cultivation is getting popularity day by day in Bangladesh though the area and production of citrus fruits are not increasing satisfactorily. The area of citrus fruits was 2834 ha and the production was 10,000 metric ton in 2001-2002 (BBS, 2002). It is therefore, necessary to give attention for increasing the production of citrus fruits and to improve their qualities to meet the increasing demand of the people of Bangladesh. In case of citrus, sometimes sexual method of propagation is practiced which is attributed to low fruit qualities due to high genetic variations. In vegetative propagation, however, no genetic change takes place since no genetic union with recombination of genes occurs. Hence, the propagules generally become true to the type. Among the different vegetative methods of propagation cleft grafting, air layering and stem cutting were found to be the most convenient and commercial propagation methods for citrus fruits, which give an increased yield. The information regarding the suitability of these techniques is not sufficiently available. Therefore, a study was undertaken to investigate the performance of cleft grafting, air layering and cutting in different citrus species.

### Materials and Methods

The experiment was conducted at the Horticulture Farm, Bangladesh University, Mymensingh to study the effects of different methods of propagation in different citrus species, namely lime, lemon scented, lemon semi-seedless, lemon seedless, pummelo (Misti), multa (Mosambi) and mandarin (Darjiling). In this experiment three methods of propagation, namely cleft grafting, stem cutting and air layering were used to observe the growth behavior of citrus. The study was continued from 15 to 90 days after emergence of shoot. On completion of vegetative propagation, observation was made and related data were collected to assess different parameters. Percentage of success of each propagation method was calculated as follows:

$$\% \text{ of success of propagation} = \frac{\text{No. of successful grafts/rooted cuttings/layers in a treatment}}{\text{Total no. of grafts/rooted cuttings/layers done in a treatment}} \times 100$$

**Results and Discussion**

**Effect of Methods of Propagation:** The number of leaves at 15 days interval varied significantly due to the methods employed in the experiment. Among the methods of propagation, the highest (25.75) number of leaves was observed in stem cutting (SC) while the lowest (13.26) in cleft grafting (CG) at 90 days after emergence (DAE). The highest (25.75) number of leaves observed in SC, as because the number of initial shoots and leaves was high in comparison with CG and air layering (AL). As the numbers of shoots (emergence) were high and for this, the shoots produced more leaves. This verifies with the results of Bhagat *et al.* (1999) who got higher number of leaves per graft in enriching than veneer and cleft grafting.

Table 1. Effect of method of propagation on vegetative performances of citrus at different days after emergence (DAE)

Method of propagation	Number of leaves at different DAE						Scion length (cm)	Plant canopy spread at 90 DAE (cm <sup>2</sup> )	Number of branches at 90 DAE
	15	30	45	60	75	90			
Cleft grafting	5.11	7.78	9.25	10.27	11.69	13.26	14.30	118.80	2.68
Stem cutting	4.31	5.66	7.82	14.27	20.38	25.76	13.26	241.94	4.02
Air layering	5.22	7.39	9.52	11.25	13.24	14.93	22.94	49.25	2.27
LSD (0.05)	0.446	0.558	0.468	0.576	0.850	0.963	1.019	7.150	0.307
LSD (0.01)	0.597	0.747	0.747	0.770	1.138	1.289	1.364	9.568	0.411
Level of Sig.	**	**	**	**	**	**	**	**	**

\*\* : Significant at 1% level

The highest (22.94 cm) scion length was recorded in AL while it was the lowest (13.26 cm) observed in SC. The scion length was the highest in the air layering because the diameter of top portion of the stem is very thin and reserved of food is less. For this, less scion length may hamper the percentage of success for the scarcity of food material remain in the stem. The canopy per sapling in various methods and variety measured at 90 day after emergence (DAE). Methods of propagation showed significant variation in respect of plant canopy spread (Table 1). The highest (241.94 cm<sup>2</sup>) plant canopy spread was observed in SC whereas the lowest (49.25 cm<sup>2</sup>) in AL. The plant canopy spread medium (118.88 cm<sup>2</sup>) observed in CG. Plant canopy spread was the highest (241.94 cm<sup>2</sup>) in cutting, because the cuttings provide large number of shoots which borne higher number of leaves in the produced branches and it made the highest plant canopy spread. Methods of propagation showed significant variation in respect of number of branches (Table 1).

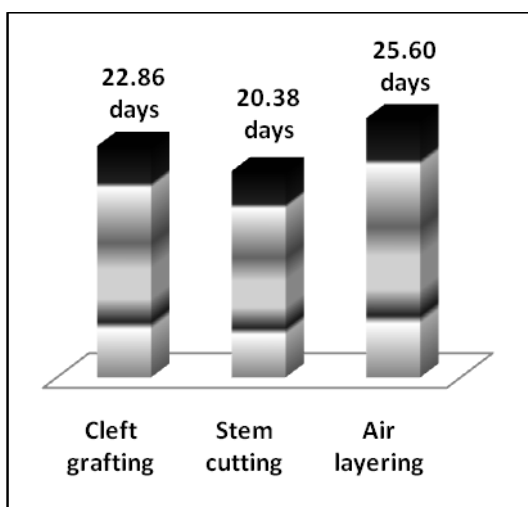


Fig. 1. Effect of propagation method on days to first emergence

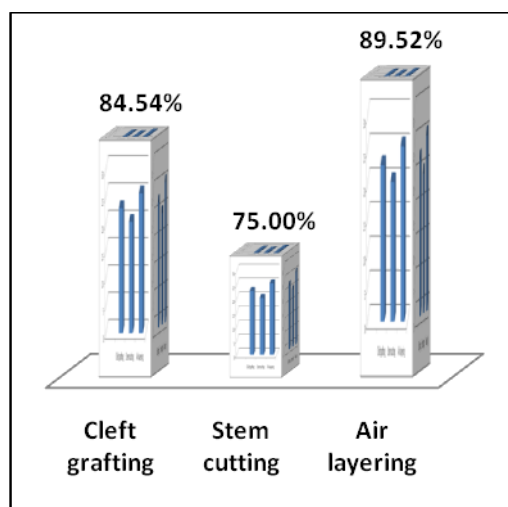


Fig. 2. Effect of propagation method on percent success of citrus saplings

The highest (4.02) number of branches was observed in SC while the lowest (2.27) in AL. The highest (4.02) number of branches in SC, because of the cutting produced higher number of shoots than CG and AL. The highest days (25.60 days) required first emergence of shoot observed in AL. The lowest (20.38 days) required first emergence of shoot observed in SC followed by CG (Fig. 1). So, the earlier emergence as well as the graft union in the cleft grafting method might be due to keeping the rootstock as functional plant which might help in the auxin synthesis and translocation to the union portion that helps in the callus formation and differentiation of parenchymatous cells as well as the cambium and vascular bundle. Success in different methods and variety was evaluated 100 days after operation, when the saplings were taken care specially by providing shade and other cultural operation. But under field conditions some sapling died possibly due to improper graft union (in cleft grafting), less number of roots as well as problematic root formation (in cutting), dryness of rooting media (in layering). Propagation methods showed significant variation in respect of percent success (Fig 2). The highest (89.52%) percent of success was observed in AL while it was the lowest (75.00%) observed in SC followed by CG. Dhar (1998) in Jackfruit and Bhandary and Mukharjee (1970) in guava obtained higher plant growth from veneer grafts than that of cleft method.

**Effect of variety:** Different variety showed significant variation in respect of number of leaves (Table 2). Lemon scented gave the highest (28.05) number of leaves per plant at 90 DAE which was significantly higher than that of any other species. Lime produced the second highest (24.82) number of leaves per plant. On the other hand, Multa produced the lowest (4.68) number of leaves. The highest (18.20 cm) length of scion was observed in Mandarin, followed by Pummelo where as the lowest (12.00 cm) in Multa. Different variety showed significant variation in respect of plant canopy spread (Table 2). The highest (218.59 cm<sup>2</sup>) plant canopy spread was observed in Lemon Scented while it was the lowest in Multa (23.61 cm<sup>2</sup>). The highest (3.89) number of branches was observed in Lime whereas the second highest (3.86) observed in Lemon Scented. The lowest (1.29) number of branches was observed in Multa. There was a significant variation among the variety in respect of required days to first emergence of shoot (Fig. 3) The highest (24.80 days) required to first emergence of shoot was observed in Mandarin closely followed by Lime (24.06 days) while it was the lowest (16.58 days) observed in Multa. Different variety showed significant variation in respect of percent of success (Fig. 4). Among the different variety of citrus, the highest (100%) percent of success was observed in Lemon Scented, while it was the lowest (46.68%) observed in Multa.

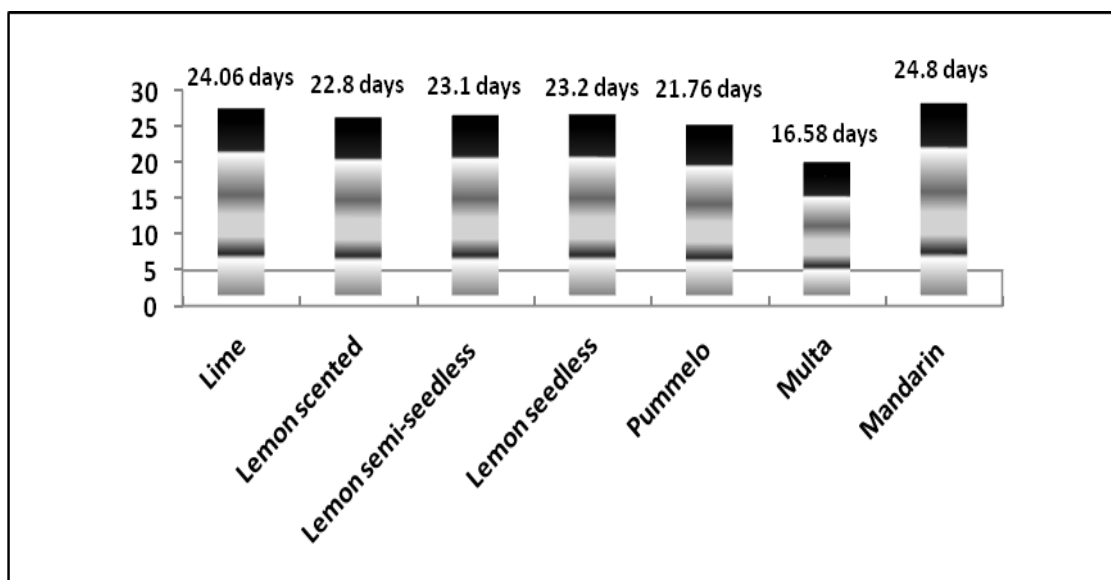


Fig. 3. Effect of varieties on days to first emergence

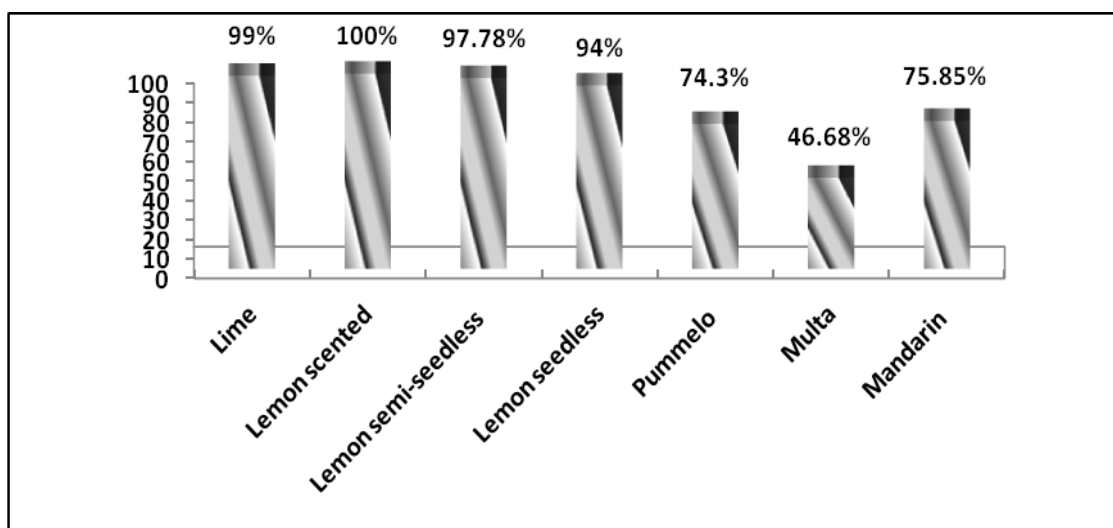


Fig. 4. Effect of varieties on percentage success of citrus saplings

Table 2. Effect of varieties on vegetative performances of citrus at different days after emergence (DAE)

Varieties of citrus	Number of leaves at different DAE						Scion length (cm)	Plant canopy spread at 90 DAE (cm <sup>2</sup> )	Number of branches at 90 DAE
	15	30	45	60	75	90			
Lime	6.98	10.26	12.09	16.42	19.91	24.82	17.01	187.40	3.89
Lemon Scented	8.98	11.63	14.30	18.89	24.07	28.05	17.22	218.59	3.86
Lemon semi-seedless	5.32	6.46	9.36	12.24	15.76	19.74	17.33	159.28	3.56
Lemon seedless	4.63	6.56	8.56	12.23	16.9	19.46	17.89	143.81	2.94
Pummelo	3.46	5.28	6.62	9.09	11.58	13.59	18.17	102.02	2.67
Multa	1.38	2.05	2.89	3.68	4.11	4.67	12.00	23.61	1.29
Mandarin	3.40	6.34	8.22	10.97	13.99	15.56	18.20	122.11	2.71
LSD (0.05)	0.681	0.852	0.714	0.879	1.299	1.472	1.557	10.92	0.469
LSD (0.01)	0.912	1.141	0.956	1.177	1.738	1.969	2.083	14.62	0.628
Level of Significance	**	**	**	**	**	**	**	**	**

\*\* : Significant at 1% level

### Conclusion

The study concluded that the species lemon scented performed the best followed by lime. These species can be propagated successfully by cleft grafting, stem cutting and air layering. On the other hand, multa cannot be propagated by stem cutting.

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