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Research Note :

EFFECT OF IBA CONCENTRATIONS ON GROWTH AND ROOTING OF *Citrus limon* CV. PANT LEMON CUTTINGS

K.K. Singh*, T. Choudhary and Prabhat Kumar

Department of Horticulture, Chauras Campus, HNB Garhwal Central University, Srinagar (Garhwal) 246174, Uttarakhand, India

**E-mail: forekrishna@gmail.com*

ABSTRACT: An investigation was undertaken to study the effect of different concentrations of IBA on growth and rooting of *Citrus limon* cuttings under Garhwal region.The hardwood cuttings of *Citrus limon* cv. Pant Lemon were collected from healthy vigorous shoots of 3-5 year old plants. The cuttings were planted in one kg capacity polythene bags containing soil, sand and FYM mixture in 1:1:1 (v/v) ratio. The stem cuttings of *Citrus limon* were treated with IBA solutions of different concentrations i.e. 1000, 1500, 2000 ppm and control (tap water only) by quick dip method. The experiment was replicated thrice with 10 cuttings in each treatment. Among all the treatments, the number of sprouted cuttings (6.29), length and diameter of sprout (23.77cm and 1.52 cm, respectively), number of sprouts, number of leaves and number of roots/cutting (17.77 and 23.00 and 52.42, respectively), and average maximum length and diameter of roots (26.33 cm and 1.33 cm, respectively) were noticed maximum in treatment with 2000 ppm concentration of IBA.

Keywords: *Citrus limon, stem cutting, IBA, rooting, growth.*

Lemon (*Citrus limon* L.) is an important plant of *Citrus species* used for culinary and nonculinary purposes throughout the world. Its juice containing 5 per cent citric acid is used primarily in cooking, baking and drinks. Many lemon-flavoured drinks and candies are available in the market (Burhan, 1). Citrus is not usually propagated by seeds for commercial planting because these seeds do not produce true fruits. Therefore, it is advisable to avoid seedlings for commercial plantation (Sadhu, 7).

Vegetative propagation is vital to produce citrus plants having desirable characters as mother plant and they are propagated *true-to-type* from cuttings, budding, grafting, layering, etc. Stem cutting is a fast and efficient method for propagating some citrus species such as Tahiti lime. Studies on rooting of citrus stem cuttings deals especially with the induction of rooting by growth regulators and the differences in stem cutting rooting capacity of different species and varieties.

This investigation was conducted at the Horticultural Research Centre of HNB Garhwal University, Srinagar (Garhwal), Uttarakhand, India. The research centre is situated in the Alaknanda valley at 30° 13' 25.26'' N and 78° 48' 04.93'' E and 563 m above mean sea level and exhibits a subtropical climate with dry summer and rigorous winters with occasional dense fog in the morning hours from mid December to mid February. The experimental materials consisted of 15 cm long hardwood stem cuttings of *Citrus limon* were collected from 5 year old plants. While preparing the cuttings, a slanting cut in each cutting was given on distal end and smooth cut was made at proximal end just below the lower node. The experiment was replicated thrice with 10 cuttings in each treatment. A total 120 cuttings were tested. The cuttings were treated with IBA solutions at 1000, 1500, 2000 and control (tap water only) by quick dip method. The cuttings were planted in 1 kg capacity perforated white polythene bags containing soil, sand and FYM mixture in 1:1:1 (v/v) ratio and kept in open condition for rooting. The basal 1.5-2.0 cm portion of the cuttings was dipped in growth regulator formulation for 10 second and immediately planted in medium to a depth of 6-8 cm. The number of sprouted cuttings, number of sprouts, length of

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Table1: Effect of IBA concentrations on survival performance and vegetative growth of *Citrus limon.*

Treatments	Number of sprouted cuttings	Number of sprouts/cutting	Length of sprout (cm)	Diameter of sprout (cm)	Number of leaves/cutting
1000 ppm	5.00	13.60	10.61	0.87	12.22
1500 ppm	3.34	13.22	15.18	0.42	8.66
2000 ppm	6.29	17.77	23.77	1.52	23.00
Control	2.75	8.11	8.28	0.32	10.33
C.D. (P=0.05)	1.98	1.84	2.01	0.62	2.01

Table2: Effect of IBA concentrations on rooting performance of *Citrus limon.*

Treatments	Average number of roots	Average length of root (cm)	Average diameter of root (cm)	Fresh weight of root (g)	Dry weight of root (g)
1000 ppm	34.89	17.13	0.57	4.08	1.557
1500 ppm	33.52	15.73	0.77	3.83	1.860
2000 ppm	52.42	26.33	1.33	6.66	2.743
Control	27.18	13.15	0.37	3.19	1.157
C.D.(P=0.05)	5.34	2.42	0.45	0.98	0.25

sprout, number of primary roots per cutting, average length of root,and fresh and dry weight of roots were recorded after three months. The data recorded were subjected to statistical analysis for least significant difference (RBD) as described by Snedecor and Cochran (11).

A perusal of Table 1 and 2 shows that the treatment with different concentrations of IBA significantly affected the various growth characters of hardwood cuttings in *Citrus limon.*

The maximum number of sprouted cuttings (6.29) was recorded under 2000 ppm concentration followed by 1000 ppm concentration of IBA and minimum (2.75) in control. The enhanced hydrolytic activity in presence of applied IBA coupled with appropriate planting time might be responsible for the increased percentage of rooted cuttings. High carbohydrate and low nitrogen have been reported to favour root formation (Carlson, 2).

The maximum average length of sprout per cutting (23.77cm) and maximum average diameter of sprout per cutting (1.52 cm) were recorded under 2000 ppm concentration of IBA, while the minimum length (8.28 cm) and minimum average diameter of sprout per cutting (0.32 cm) were recorded under control. The present findings are similar to the findings of Srivastava *et al.* (12) and Umrao (13) with respect to average length and diameter of sprout.

The maximum average number of sprouts (17.77) and leaves (23.00) per cutting were recorded under 2000 ppm concentration of IBA followed by 1000 ppm concentration of IBA while the minimum average number of sprouts (8.11) and leaves (8.66) per cutting were recorded under control. It might be due to wood maturity of cutting which probably reserves high starch and sugar. The appropriate planting time, application of IBA as well as genetic makeup of genotype used may have played some role in augmenting the number of leaves per cutting (Singh and Singh, 8; Singh *et al.,* 9).

The maximum number of roots per cutting (52.42) was produced under 2000 ppm concentration of IBA followed by 1000 ppm concentration of IBA, while the minimum number of roots per cutting (27.18) was recorded under control. The maximum average length (26.33 cm) and diameter (1.33 cm) of roots per cutting were also recorded under 2000 ppm concentration of

IBA treatment followed by 1000 ppm concentration of IBA. While the minimum average length of roots (13.15 cm) and diameter (0.37 cm) per cutting was recorded in control. Auxin application has been found to enhance the histological features like formation of callus and tissue and differentiation of vascular tissue (Mitra and Bose, 4). The above finding also agree with the finding of Panwar et al. (6) in respect to average number of roots and maximum length of root.

The maximum average diameter of root per cutting was observed under 2000 ppm concentration of IBA followed by 1000 ppm concentration of IBA. The minimum average diameter of root per cutting (0.37 cm) was recorded under control. The maximum average fresh weight and dry weight of roots per cutting (6.66 g and 2.743 g, respectively) were recorded under 2000 ppm concentration of IBA followed by 1000 ppm concentration of IBA. The minimum average fresh and dry weight of roots per cutting (3.19 g and 1.157 g, respectively) were noted under control. Application of IBA at right time proved beneficial to the cutting of Bougainvillea peruviana (Singh and Singh, 8). These finding are agreed with the finding of Singh *et al.* (10) in pomegranate cv. Ganesh.

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