

## INFLUENCE OF INDOL-3-BUTYRIC ACID (IBA) AND VARIOUS TIME ON ROOTING OF GUAVA (*PSIDIUM GUAJAVA L.*) AIR LAYERING

**\*Krishan Kumar Singh and \*\*Subhasis Mahato**

*\*Department of Horticulture and \*\*Department of Forestry and NR, Chauras Campus, HNB Garhwal Central University, Srinagar (Garhwal) 246174, Uttarakhand*

*Email: [forekrishna@gmail.com](mailto:forekrishna@gmail.com)*

*Received-02.04.2016, Revised-18.04.2016*

**Abstract:** An experiment was carried out during 2014-15 at Horticulture research center, Department of Horticulture, Chauras Campus, HNB Garhwal Central University, Srinagar (Garhwal), Uttarakhand India. Four different concentrations of IBA viz., 2000ppm, 3000ppm, 4000ppm, 5000ppm were used in four time of layering (May, June, July and August). Amongst various concentrations of IBA, 5000ppm concentrations of IBA treatment proved best treatment in respect of percent rooted, number of primary roots, root quality. In case of time of layering August month the maximum rooting success.

**Keywords:** Guava, IBA, Time, Rooting percentage, Survival percentage

### INTRODUCTION

**G**uava (*Psidium guajava L.*) is one of the most important fruit crop in India. It is belong to Myrtaceae family and place of origin of guava is tropical America. It is a rich source of Vitamin-C (260mg/100gm) which is the second after aonla (600mg/100gm). Guava can be used in preparation of Juice, Jam and Marmalade (Hossen *et al.*, 2009). India is the major producer of Guava in the world. It is cultivated in almost all parts of the country. The total fruits area and production has been estimated at 7216 thousand ha, 88977 thousand MT annually (NHB, 2013-14).

Bose *et al.* (1986) showed that the time of layering and detachment of layers from the mother plants is the most important factor for rooting success because of presence of sufficient soil moisture, humidity and optimum temperature which are prerequisites of highest survival of the detached air- layers. So, propagation is also recommended in proper time for maximum survival of the detached air- layers in case of guava. Chinees layering are also known as air layering, pot layering, and gooty. Air layering is also practiced in jackfruit (Mukharjee and Chatterjee, 1978), guava (Sarker and Ghose, 2006) and citrus (Kumar and Gill, 1996). Bari (2002) observed that the maximum rooting percentage, survival percentage was showed under mid June layers prepared time. The use of plant growth regulators to increase the efficacy of propagation in cutting and layering are now common and moreover, use of growth regulators has opened a new vista for nurserymen for propagation of fruit trees. The success of air- layers depends on the use of optimum concentration of IBA and time of application

(Sharma *et al.* 1975). Root inducing auxins enhanced the success of air layering by producing roots easily (Patel *et al.* 1996). Sharma *et al.* (1991) recorded that the maximum rooting and survival percentage was observed under 10000ppm concentration of IBA with July month.

### MATERIAL AND METHOD

The present investigation was conducted in month of August 2014 in the mist house located at the Horticultural Research Centre, HNB Garhwal University, Srinagar Garhwal, Uttarakhand, India. The research centre is situated in the Alaknanda valley at  $30^{\circ} 13' 25.26''$  N and  $78^{\circ} 48' 04.93''$  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.

Five year old matured, healthy and vigorous plants were selected for the experimental work. On the selected plants the shoots of uniform age (one year old) and of pencil thickness were randomly selected for air layering. Material used during experimentation moss grass for rooting media, IBA five treatment (2000ppm, 3000ppm, 4000ppm, 5000ppm and 0ppm) and four time of operation (May, June, July and August) with black polythene sheets (200  $\mu$  gauge) for wrapping. The experiment was laid out in Randomized Block Design (RBD) with five concentrations of IBA, four time of operation (May, June, July and August) and three replications. The data pertaining to root and shoot character were tabulated and statistically analysed as per the methods outlined by Cochran and Cox (1992).

\*Corresponding Author

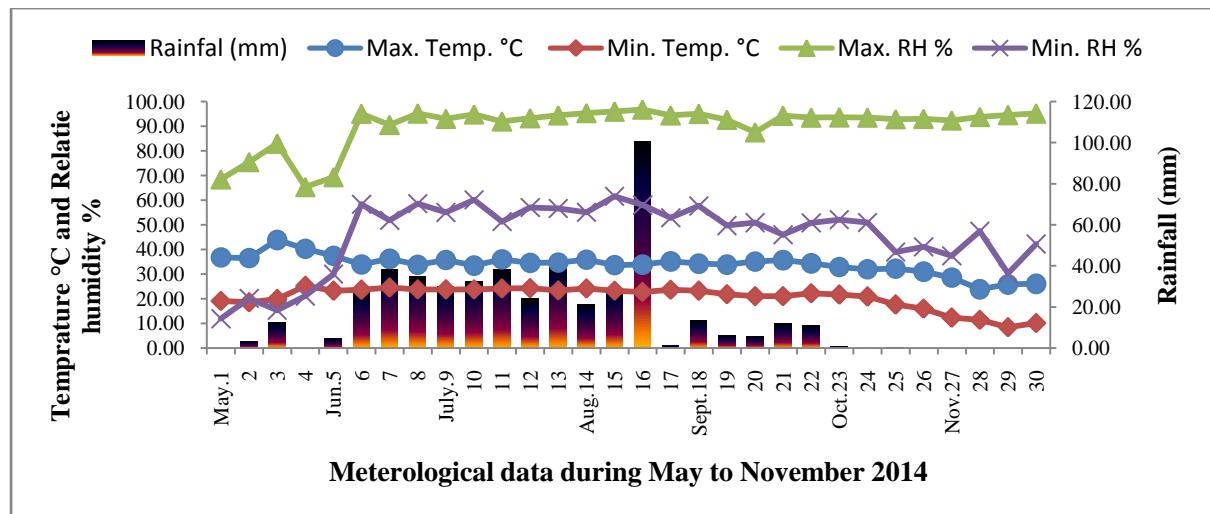


Fig. 1. Metrological observation during the experimental period at weekly interval 2014

## RESULT AND DISCUSSION

The perusal of data (Table 1) revealed that all plant growth regulators significantly influenced rooting and survival percentage in layered plant. The highest rooting percentage (84.667%) was recorded under 5000ppm concentration of IBA followed by 3000ppm IBA while the minimum rooting percentage (38.333%) was observed in under control treatment. This might be due to the fact that optimum concentration of IBA may have caused mobilization and utilization of carbohydrates and nitrogen fraction with the presence of co-factors at wound site which may have helped in better root initiation. Hence, IBA at highest concentration resulted in good rooting of the guava air layers. Further the superiority of IBA in producing higher percentage of rooting compared to NAA might be due to their respective differences in initializing hydrolysis of nutritional reserves. Plant layer treated with IBA 5000ppm produced maximum survival percentage (81.667%) while the lowest survival percentage was observed under control. Significantly maximum number of primary root (8.607) was recorded with IBA 5000ppm and the minimum number of primary root observed under (4.147) control treatment. The similar results have been reported by Sharfuddin and Hussain (1973) in litchi and Chawla *et al.* (2012) in litchi. Growth substances accelerate the rooting, produce a large root system and increase the percentage of survival. Growth regulators like IAA, NAA and IBA have been used to stimulate plant growth and specially root formation in layering. IBA has been found to be most effective in producing maximum number of roots with better vigour.

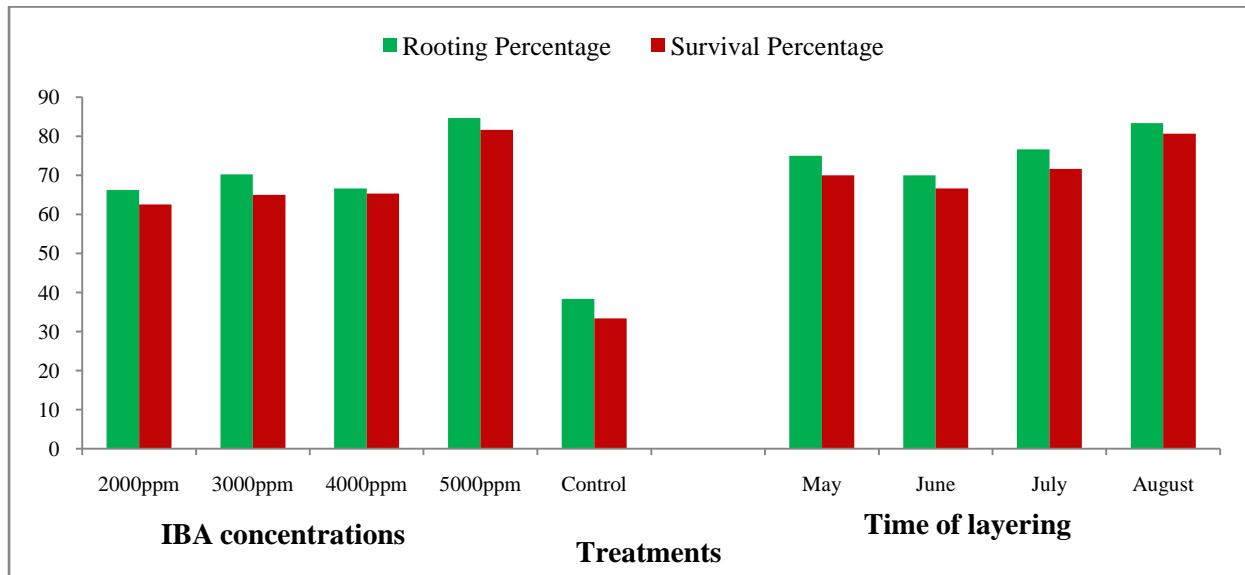
The maximum number of shoot and leaf/layer (8.110 and 8.110) was recorded under 5000ppm concentration of IBA while minimum were observed in control. The application of root promoting substances during layering to get best rooting within a minimum time period and IBA has been found

most effective (Nanda and Kochhar, 1985). The maximum length of longest root/layer (7.663cm) was showed under 4000ppm IBA and the minimum length of longest root/layer was reported under control treatment. This result is in conformity with the findings of Rymbai and Reddy (2010) in guava. Several workers have reported successful results by the use of plant growth regulators in stimulating of root primordia in air layering of guava crop (Bhagat *et al.*, 1999; Singh and Bhuj, 2000; Tyagi and Patel, 2004 and Singh *et al.*, 2007). Auxin particularly IBA, NAA and IAA have reported to induce rooting in many of the species with varied success. However, the response to treatment with different growth substances varies with species to species and with changing physiological and environmental factors. In case of time of layering significantly the maximum percentage of rooted and survival layer (83.333% and 80.667%) was observed under August time while the minimum was recorded under June layering time. Season was the important factor for successful layering in woody plant because of rooting on layers enhance by light and presence of sufficient moisture and optimum temperature. The similar results were reported by Dhillon and Mahajan (2000) in litchi.

The maximum number of primary root/layer (7.617) was observed under July time while the minimum number of primary root/layer (5.543) was recorded under May time of operation. July and August is best for root development of air layers in guava at Garhwal Himalayan region. These results are in conformity with Sarker and Ghose (2006) in guava. Significantly the maximum length of longest root (6.853 cm) was showed under August time of operation and the minimum length of longest root (3.640cm) was observed under July month. Present findings are in conformity with the results of Shukla and Bajpai (1974) in litchi. Highest number of shoot and root/layer (7.293 and 8.330) were observed under August time of operation and minimum was

recorded under July month (Table 2 and Fig 2). Akhter (2002) observed that the vegetative propagation of guava by layering is done during summer of the year i.e. from February to August with varying success and survival. It is found that certain percentage of layers die in the nursery due to untimed layering, detachment shock of layers and

other factors particularly low atmospheric humidity, soil moisture, low night temperature and scorching sun light of the day etc. These results further get support from the findings of Sharma and Grewal (1989) in litchi and Kanwar and Khalon (1986) in litchi.



**Fig. 2.** Effect of IBA concentrations and times on rooting and survival percentage of air layering

**Table 1.** Effect of IBA concentrations on root and shoot character of air layers of Guava

IBA concentration	Rooted Percentage	Survival Percentage	Number of primary root	Length of longest root (cm)	Number of shoots/layer	Number of leaf/layer
2000ppm	66.220	62.517	5.000	6.110	5.183	7.667
3000ppm	70.220	65.000	5.553	6.553	5.887	6.220
4000ppm	66.663	65.333	7.777	7.663	7.113	6.887
5000ppm	84.667	81.667	8.607	7.327	8.110	7.777
Control	38.333	33.333	4.147	3.073	3.667	4.220
S.Em	0.931	3.165	0.294	0.244	0.269	0.339
CD at 5%	3.036	10.318	0.960	0.796	0.877	1.106
CV	2.474	8.906	8.207	6.890	7.784	8.971

**Table 2.** Effect of Time on root and shoot character of air layers of Guava

Planting Time	Rooted Percentage	Survival Percentage	Number of primary root	Length of longest root (cm)	Number of shoots/layer	Number of leaf/layer
May	75.000	70.000	5.543	5.073	5.663	7.443
June	70.000	66.667	6.110	6.297	6.473	8.073
July	76.667	71.667	7.617	3.640	5.330	7.333
August	83.333	80.667	5.997	6.853	7.293	8.330
S.Em	1.984	2.000	0.177	0.174	0.108	0.547
CD at 5%	6.855	6.912	0.612	0.600	0.374	1.892
CV	4.506	4.795	4.857	5.499	3.026	12.163

## CONCLUSION

Among IBA, 5000ppm concentration of IBA found the most effective for rooting percentage, growth attributes and survival percentage in air-layering of guava. The month of August showed significant effect on better rooting and survival performance on guava.

## REFERENCES

**Akhter, A.A.** (2002). Effect of time and methods on the success of layering in Guava, M.Sc. Thesis. Dept. Hort., Bangladesh Agricultural University, Mymensingh.

**Bari** (2002). Annual Report of 2001-02. Fruit Research Station, BARI, Rajshahi. pp. 23.

**Bhagat, B.K., Singh, C. and Chaudhary, B.M.** (1999). Effect of growth substances on rooting and survival of air-layers of guava (*Psidium guajava* L.) cv. Sardar. *Orissa J. Hort.*, 27(2):72-75.

**Bose, T.K., Mitre, S.K. and Sadhu, M.K.** (1986). Guava. In: Propagation of Tropical and Sub tropical Horticultural Crops. Naya Prokash, Calcutta. pp. 291-301.

**Chawla, W., Mehta K. and Chauhan, N.** (2011). Influence of plant growth regulators on rooting of litchi (*Litchi chinensis* Sonn.) air layers. *The Asian Journal of Horticulture*. 7(1):160-164.

**Cochran, W. G. and Cox, G. M.** (1992). Experimental Designs. John Wiley and Sons, Inc., New York.

**Dhillon, B.S. and Mahajan, B.V.C.** (2000). Effect of different dates on the air layering performance of litchi cultivars in Punjab. *Agril. Sci. Digest*, 20(3): 207-208.

**Hossen, S., Kabir, M.S., Uddin, M. B., Rahman, A.K.M.L., and Mamun, M.R.A.** (2009). Effect of different extractions of juice on quality and acceptability of guava jelly. *j. innov.dev.strategy*. 3(4): 27-35.

**Kanwar, J.S. and Kahlon, G.S.** (1986). Propagation studies in litchi. *J. Res. Punjab Aril. Univ.*, 23(1): 33-39.

**Kumar, R. and Gill, D.S.** (1996). Effect of IBA and P. Hydroxy - benzoic acid on rooting behaviour of air layering of baramasi lemon. *Haryana J. Hort. Sci.*, 25 (4): 172-176.

**Mukharjee S.K., Chatterjee, B.K.** (1978). Effect of Etiolation and Bioregulators on air layering of Jackfruit (*Artocarpus heterophyllus* Lam.). *Indian J. Hort.*, 35 (1): 1-4.

**Nanda, K.K. and Kochhar, V.K.** (1985). Vegetative propagation of plants. Kalyani Publishers, New Delhi (India).

**National Horticulture Board Data base - 2012 - 13**, [www.nhb.gov.in](http://www.nhb.gov.in).

**Patel, R.K., Bose, U.S. and Tripathi, S.K.** (1996). Effect of growth regulators and wrappers on success and survival of air layering in guava cv. Allahabad safeda. *Crop Research (Hissar)*. 12 (1) : 56-60.

**Rymbai, H. and Sathyanarayana Reddy, G.** (2010). Effect of IBA, time of layering and rooting media on air layers and plantlets survival under different growing nursery conditions in guava. *Indian J. Hort.*, 67(spl. issue):99-104.

**Sarkar, A. and Ghosh, B.** (2006). Air layering in guava cv L-49 as affected by plant growth regulators, wrappers and time of operation. *Environment and Ecology*, 24S(Special 3A):820-823.

**Sharfuddin, A.F.M. and Hussain, A.** (1973). Effect of growth regulator, rooting and wrapping materials on the success of air-layering in litchi. *Bangladesh Hort.*, 1(2): 44-51.

**Sharma, K.K., Sandhu, A.S., Bajwa, M.S. and Dhillon, B.S.** (1975). Effect of IBA and NAA on the rooting of the air layers of guava. *J. Res. P.A.U.*, Ludhiana, 1 : 23-25.

**Sharma, R.C. and Grewal, G.P.S.** (1989). A note on propagation studies in litchi. *Haryana J. Hort. Sci.*, 18: 74-76.

**Sharma, R.S., Sharma, T.R. and Sharma, R.C.** (1991). Influence of growth regulators and time of operation on rooting of air layering in guava (*Psidium guajava* L.) cv. Allahabad Safeda. *Orissa J. Hort.*, 19 : 41-45.

**Shukla, R.K. and Bajpai, P.N.** (1974). Blossom bud differentiation and autogamy in litchi. *Indian J. Hort.*, 31: 226-228.

**Singh, D.K. and Bhuj, B.D.** (2000). Response of air-layering of guava to paclobutrazol and coloured polywrappers. *Agricultural Science Digest*, 20(3):171-173.

**Singh, P., Chandrakar, J., Singh, A. K., Jain, V. and Agrawal, S.** (2007). Effect on rooting in guava cv. Lucknow-49 through PGR and organic media under Chhattisgarh condition. *Acta Horticulturae*, (735):197-200.

**Tyagi, S. K. and Patel, R. M.** (2004). Effect of growth regulators on rooting of air layering of guava (*Psidium guajava* L.) cv. Sardar guava. *Orissa J. Hort.*, 32(1): 58-62.