Indian J. Hort. 67(Special Issue), November 2010: 443-446

Short communication

Effect of IBA concentrations on guava stooling and plantlets survival under open and polyhouse conditions

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Guava belong to Myrtaceae family, one of the most common and popular fruit in area and production after mango, banana and citrus in India. This fruits is native of tropical America and is extensively cultivated in South Asian countries, Hawiian Islands, Cuba and India. It has been cultivated in India since early 17th century and gradually became a crop of commercial significance. Guava is quite prolific bearer and highly remunerative with out much care. The commercial method of guava propagation is stooling. Several efforts in order to improve rooting and survival of stool layers have been attempted by Dutta and Mitra (3), Saroj and Pathak (6) and Singh (7). Several workers have also reported successful result by the used of IBA in stimulating of root primordial in stool layers of fruit crops but with varying success (Mishra *et al*., 5). However, the response to treatment with different IBA concentrations varies with species to species and with changing physiological, location and environmental factors. The establishment and survival of rooted layers in open conditions is very poor as reported by Singh (7) and Lal *et al.* (4). To facilitate better percentage of establishment and survival of rooted layers, polyhouse nursery conditions are the alternative to an open nursery conditions for solving the various problems connected with raising plants for increasing area under guava plantation was conducted with objectives to discover the effect of IBA on rooting and survival of stool layers under open and polyhouse conditions.

The experiments was carried out at the Fruit Research Station, Sangareddy, Medak district, Andhra Pradesh, from first week of May to first week October, 2008-09 on guava cv. L-49. Guava cv. L-49 planted at a spacing of 1 X 2m in a nursery block was selected and subsequently in the first week of May, 2008, the plant was sawed off just at a height of 8-10 cm above the ground level to encourage new vigorous shoots from the stumps. Normal cultural practices were followed during the period of experiment. With the commencement of high temperature and sufficient field moisture, a large number of new shoots were induced.

When the shoots attained a height of 45-60 cm and about uniform pencil thickness, a circular ring of bark about 2.5 cm wide was removed leaving one node from the base of selected shoots in the first week of July. The exposed portion of the ring was gently rubbed in order to remove the cambium but with out causing any injury to the underlying wood. However, very thin and thick shoots were thinned out from the stool plant to achieve uniformity.

The lanolin paste containing different concentrations (3000, 5000, 7000 and 9000 ppm) of IBA were smeared thoroughly on and around just above the ringed portion. A set of stools with out IBA treatment was taken as control. In all the cases the ringed shoots were well mounded by moist soil up to a height of 10-15cm above the ringed shoots so as to cover the basal portion of each shoot and then followed by light irrigation and mulched with dried straw to conserve soil moisture during hot summer months and to avoid washing of soil due to heavy rain. The soil was kept sufficiently moist through out the stooling periods by irrigating frequently.

In the first week of September, i.e. 60 days after mounding, the soil was carefully removed so as to expose the ringed portion. Each rooted shoot was detached from the mother plant. While removing, the rooted shoots as much as possible soil was allowed to adhere to the roots. The shoots were headed back before separating from the mother stool in order to maintain the root shoot ratio.

Observations on rooting and root characters were recorded before transplanting. In each treatment, forty of the rooted stooled shoots were transplanted in the polybag containing soil: sand and FYM (1:1:1). These were kept maintained under both polyhouse and open conditions for studying their initial establishment and growth parameters. The experiment was carried out in Randomized Block Design with five treatments. Each treatment was replicated four times and 20 layers were used in each replication. The experiment for survival and growth characters under nurseries were analysed in factorial RBD.

Data presented in the table clearly that all IBA concentrations significantly increased the rooting

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Table 1. Effect of IBA concentrations on rooting and root parameters of stool layers.

Treatment (ppm)	Rooting (%)	Primary roots/ layer	Secondary roots/ layer	Length of longest roots (cm)	Root weight (g) / layer Fresh	Dry
Control	61.50	5.05	9.85	4.83	2.37	0.396
IBA 3000	73.75	11.05	16.85	8.65	4.12	0.665
IBA 5000	87.50	16.70	31.15	10.85	7.78	1.270
IBA 7000	98.75	24.95	48.40	12.31	11.70	1.841
IBA 9000	90.00	18.10	37.65	11.30	8.94	1.488
Mean	82.30	15.17	28.76	9.88	6.99	1.320
S.E(m) ±	1.93	0.20	0.48	0.10	7.68	0.002
CD (0.05)	5.94	0.62	1.47	0.32	0.24	0.005

percentage of stool layers in guava over control. However, the maximum rooting (98.75%) was obtained by IBA at 7000 ppm followed by IBA at 9000 ppm (90.00%). This may be due to the fact that amount of natural auxin and co-factors already present in the shoots, responded well to the external application of IBA. The concentration (7000 ppm) might have increased the level of auxin to optimal level leading to profuse rooting. The lower IBA concentrations and the natural rooting factors (under control) may however be inadequate rooting as reported by Bhagat *et al.* (2).

It was observed from that the application of IBA enhanced number of primary and secondary roots, length of roots and fresh and dry weight of roots produced per layer. The highest number of primary roots per stool layer was recorded by IBA at 7000 ppm (24.95) followed by IBA at 9000 ppm (18.10). Similarly, the maximum number of secondary roots per layer was recorded by IBA at 7000 ppm (48.40) followed by IBA at 9000 ppm (37.65). IBA at 7000 ppm concentration has also recorded maximum root length (12.31 cm) which was significantly higher than all other treatments. Maximum fresh weight of roots (11.70 g) was obtained by IBA at 7000 ppm and the minimum fresh weight (2.37 g) was observed under control. Dry weight of roots per layer was recorded maximum in IBA at 7000 ppm treatment (1.841 g) which was significantly higher than all other treatments. However, the lowest root dry weight (0.396 g) per stool layer was recorded in control.

Treatment with IBA significantly improved the number of primary and secondary roots in guava stool layers over control indicating the influence of IBA in increasing the number of primary and secondary. Our results are in strong agreement with the finding of Dutta and Mitra (3), and Bhagat *et al.* (2).

The survival and growth parameters of rooted layers were significantly influenced by different IBA concentrations as well as environmental conditions of the nursery and their interactions. Among the IBA concentrations, IBA at 7000 ppm recorded the maximum survival (87.05%) which was significantly superior over the rest of the treatments. However, the lowest survival percentage of rooted stool layers was recorded under open conditions in control (54.17%). Polyhouse gave higher survival (79.59%) plantlets over open conditions (73.43%). In the IBA and nurseries interactions, IBA at 7000 ppm and polyhouse recorded maximum survival (96.43%). However, the lowest was recorded by control under open conditions (54.17%).

IBA concentrations and nurseries was also significantly effect on days to sprouting as clearly indicated in Table 2. A minimum day (7.77) was required for bud sprouting was observed in the IBA at 7000 ppm which differed significantly from the other concentrations followed by IBA at 9000 ppm (8.25). The slowest sprouting was found under control (10.27). In case of nurseries, minimum days of sprouting (8.64) was required in the Polyhouse nursery and significantly faster over Open field nursery which gave the slowest sprouting (9.24). The interaction effect of methods of layering and nurseries conditions on days to sprouting was statistically insignificant.

Leaves number at 45 DAT and 60 DAT was significantly effect by IBA concentrations and nurseries. Leaves number at 45 DAT, was observed maximum (11.00) in IBA at 7000 ppm, followed by IBA at 9000 ppp (9.97). However, the lowest was recorded under control (7.53). Regarding nurseries, polyhouse (9.72) produced more number of leaves than open conditions (9.05). Similarly, leaves number at 60 DAT, the maximum (15.17) was obtained in IBA at 7000 ppm which was on a par with IBA at 9000 ppm (14.38). However, the minimum was recorded under control (11.13). In respect of nurseries, polyhouse recorded higher number of leaves (14.11) than open conditions (13.12). The interaction effect of IBA concentrations and nurseries conditions has no significant effect on number of leaves. The possible explanation for better survival, minimum days taken for

Table 2. Effect of IBA and nurseries on survival and growth characters of rooted stool layers

Factors (ppm)	Survival (%)			Days taken for sprouting			Number of leaves 45 DAT			Number of leaves 60 DAT		
	Open	Poly	Mean	Open	Poly	Mean	Open	Poly	Mean	Open	Poly	Mean
Control	54.17	62.50	58.33	10.56	9.98	10.27	7.39	7.67	7.53	11.00	11.25	11.13
IBA 3000	61.67	70.00	65.83	9.65	9.35	9.50	8.69	9.10	8.89	13.03	13.50	13.26
IBA 5000	80.95	83.93	82.44	9.24	8.60	8.92	9.17	9.95	9.56	13.75	14.48	14.11
IBA 7000	87.05	96.43	91.74	8.33	7.21	7.77	10.34	11.67	11.00	14.00	16.33	15.17
IBA 9000	83.33	85.11	84.22	8.42	8.07	8.25	9.68	10.25	9.97	13.75	15.02	14.38
Mean		73.43	79.59	9.24	8.64	9.05	9.72	13.12	14.11			
CD (0.05)												
Nursery (N)			1.12			0.27			0.24			0.51
IBA Conc. (I)			1.78			0.43			0.38			0.80
N x I			2.52			NS			N S			NS

DAT = Day after transplant, Open = Open field nursery, Poly = Polyhouse nursery

sprouting and maximum number of leaves with IBA at 7000 ppm under both open nursery and polyhouse nursery conditions might be due to less brittleness, longer root length, more fibrous and more number of primary and secondary roots and higher fresh and dry weight which is sufficient enough to support the plantlets (Tyagi and Patel, 9).

The maximum survival, minimum days taken for sprouting and maximum number of leaves under polyhouse irrespective of IBA concentrations might be due to the facts that it provides congenial environmental conditions to the plantlets when compared to uncontrolled environmental conditions of open nursery. This finding is in strong agreement with the results obtained by Ahmad *et al.* (1) in patch budding of walnut, Singh *et al.* (8) on Wedge method of grafting in guava (*Psidium guajava*) cultivars Allahabad Safeda and Sardar under greenhouse obtained higher successes than in an opened conditions .

Application of IBA was found to be significantly effective in inducing rooting, promoting root characters, facilitates earlier sprouting and maximum number of leaves of plantlets stool layers in guava. IBA at 7000 ppm proved to be the most effective for rooting, root characters, establishment and growth characters of planlets of stooling. The survival and plantlets growth under polyhouse was always better than that of open nursery conditions irrespective of IBA concentrations.

REFERENCES

1. Ahmad, M.F., Iqbal, U. and Khan, A.A. 2007. Response of different environments and dates of patch budding on success in walnut. *Indian J. Hort.* **64**: 286-89.

2. Bhagat, B.K., Jain, B.P., Singh, C. and Chowdhary, B.M. 1999. Studies on the propagation of guava (*Psidium guajava* L.) cv. Sardar by ground layering in polybags. *Orissa J. Hort.* **27**: 19-21.

3. Dutta, P. and Mitra, S.K. 1991. Effect of etiolation on stooling of guava (*Psidium guajava* L.). *Indian Agriculturist,* **35**: 101-5.

4. Lal, S., Tiwari, J.P., Awasthi, P. and Singh, G. 2007. Effect of IBA and NAA on rooting potential of stooled shoots of guava (*Psidium guajava* L.) cv. Sardar. *Acta Hort*. **735**: 193-96.

5. Mishra, D., Lal, B. and Pandey, D. 2007. Clonal multiplication of Psidium species with mound layering. *Acta Hort.* **735**: 339-42.

6. Saroj, P.L. and Pathak, R.K. 1994. Propagation of wild guava through stooling. *Advances in Agric. Res. in India,* **2**: 74-80.

7. Singh, D.K. 1998. Regeneration of guava (*Psidium guajava* L.) cultivars by stooling with the aid of Paclobutrazol. *Ann. Agric. Res*. **19**: 317-20.

8. Singh, G., Gupta, S., Mishra, R. and Singh, A. 2007. Technique for rapid multiplication of guava (*Psidium guajava* L.). *Acta Hort.* **735**: 177-83.

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

Received: February, 2010; Revised: April, 2010
Accepted: August, 2010