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RESEARCH PAPER

Effect of growth regulators (IBA and NAA) on rooting and survival of guava air layers

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Abstract : The present investigation was conducted at Fruit Nursery, Department of Horticulture, College of Agriculture, Gwalior during the year 2015-16 on guava cv. Gwalior-27. The treatment combinations comprised with four concentration of IBA *viz.,* 0ppm (I_0), 7500ppm (I_1), 10000ppm (I_2) and 15000ppm (I_3) and four concentration of NAA *viz.,* 0ppm (B_0), 50ppm (N_1), 100ppm (N_2) and 150ppm (N_3). Results revealed that higher concentration of IBA (15000 ppm) and NAA (150 ppm) gave significantly highest results on callusing, number of primary and secondary roots, root weight per air layer, rooting and survival percentage over other lower concentrations while, combined application of higher concentration of both the growth regulators (I_3N_3) also gave higher results for all the parameters however, it was statistically at par with application of IBA @ 15000 ppm + NAA @ 100 ppm (I_3N_2) for all the parameters except survival percentage.

Key Words : Guava, IBA, NAA, Callusing, Roots, Rooting, Survival percentage

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INTRODUCTION

Guava is generally propagated by vegetative methods *viz.,* inarching, stooling air-layering, cutting, budding and grafting etc.Among these methods, air-layering is an easy method for the propagation of this crop. The response of different growth substances to per cent success varied from species to species with changing physiological and environmental conditions. Auxins particularly IBA and NAA have been reported to induce rooting in many of the plant species with varied success.Most of the workers have reported IBA and NAA as better growth regulators than others for inducing rooting in cuttings and air-layering's due to their stable nature. Air layering was reported to have yielded good results (Hartmann and Kester, 1972). Air layering with the help of growth substances is more efficacious and is the best method of vegetative propagation of guava reported by Tingwa and Abbadi (1968) and Majumdar and Mukherjee (1968).The latest advance in the knowledge of growth regulators in plant propagation has further improved the scope of their use in vegetative

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propagation of guava fruit crop.

MATERIAL AND METHODS

The present investigation was conducted at Fruit Nursery, Department of Horticulture, College of Agriculture, Gwalior during the year 2015-16with 75 plants of guava cv. Gwalior-27 having uniform vigour and size.About 1-2 years old healthy branches having pencil like thicknesswere selected for air-layering and 30 air-layers under each treatment were operated.The same rooting media were used which were prepared with (1:1) soil + FYMfor all treatments.The treatment combinations comprised with four concentration of IBA*viz.,* 0ppm (I_0), 7500ppm (I_1), 10000ppm (I_2) and 15000ppm (I_3) and four concentration of NAA*viz.,*0ppm (B_0), 50ppm (N_1), 100ppm (N_2) and 150ppm (N_3). The experiment laid out in Randomized Block Design with three time replications. The air layering operation was done in first week of September and detached after 65 days of operation. Rooted air-layers were just dipped in 0.1% solution of Carbendazim and then planted in polythene bags containing mixture of soil + FYM + leaf mould in 2:1:1 ratio. The observations were taken on callus formation, number of primary and secondary roots, fresh and dry weight of roots, rooting and survival percentage.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Effect of IBA:

Perusal of the datapresented in Table 1 clearly shows that different levels of IBAhad significant and positive effects on all the parameters with increasing its concentration. The significantly highest callusing (6.19 mm), number of primary roots (11.41), number of secondary roots (16.68), dry weight of roots (1.14 g), rooting percentage (90.84%) and survival percentage (71.53%) was recorded with application of IBA @ 15000ppm (I_3) followed by I_2 (10000ppm IBA) and I_1(7500ppm IBA) while lowest values for above parameters were observed under control or without application of IBA (0ppm). During the process of rooting, callusing occurs first and root primordial forms afterwards. For prompt callusing, proper concentration of carbohydrates in the branches used for air layering is essential. Layering is usually done during rainy season because synthesized food material including carbohydrates gets accumulated in the plants and it encourages quick healing and better callusing. Further, during the process of rooting application of exogenous auxin also helps to a greater extent.Application of IBA at higher concentration had helped in triggering the activity of hydrolyzing enzymes like amylase, invertase (Prasad et al., 1990), which catalysis the degradation of starch into sugars required during initial substances and their downward movement increase number of roots and per cent rooting (Tyagi and Patel, 2004). These results were conformity with the findings of Kumar and Syamal (2005), Singh (2001) in guava and Gowda et al., (2006) in rose apple.The highest roots weight may be attributed to the fact that external application of auxin generally stimulates the movement of natural auxin and others materials in downward direction from the leaves and shoot tips, which accumulate at the incision made on the shoot resulting in the formation of roots with higher fresh and dry weight of rootsas reported by Tyagi and Patel (2004).

Effect of NAA:

It is revealed from data presented in Table 1 that application of NAA was significantly affected to all parameters. An increasing trend in all the parameters were observed with increase in concentrations of NAA. The significantly highest callusing (5.96 mm), maximum number of primary roots (11.12) and secondary roots (16.29),dry weight of roots per layers (1.01 g), rooting percentage (81.08%) and maximum survival after planting (56.57%) was observed withapplication of NAA @ 150 ppm (N_3) over other treatments except number of secondary roots which was statistically at par with application of NAA @ 100ppm (N_2) while minimum results for all the parameters were noted under the treatment without NAA application.The maximum callusing, number of primary and secondary roots may be due to hormonal effect and accumulation of other internal substances and their basipetal movement as well as accumulation of other internal substances and their downward movements. The difference in root system due to different hormones might have been due to their varying molecular structure and configuration. The higher concentration of NAA stimulated faster growth of roots resulting in maximum length as reported by Tyagi

and Patel (2004). The increase in root weight may be attributed to the fact that external application of auxin generally stimulates the movement of natural auxin and other material on downward direction from the leaves and shoot tips which accumulate at the incision made on the shoot resulted in the formation of roots with higher fresh and dry weight (Lal *et al.*, 2007). Rooting and survival percentage was completely governed by the volume of root of the plants. Thus when the growth of the air layers after detachment and planting in the nursery was also better. These findings are in accordance with the results reported by Singh and Singh (1970), Singh (2001), Singh (2002) and Raut *et at.* (2015).

Interaction effect:

The interaction of IBA and NAA was also found significant effects on all the parameters. The maximum callusing (7.26 mm), number of primary (12.65) and

Table 1 : Effect of different concentrations of IBA, NAA and their combinations on callusformation, number of roots, dry weight, rooting and survival of guava air layers

Treatment	Callus formation (mm)	No. of primary roots layer^{-1}	No. of secondary roots layer^{-1}	Dry weight of roots (g)	Rooting (%)	Survival (%)
Levels of IBA						
I_0	2.85	6.84	11.98	0.50	46.90	22.42
I_1	4.43	9.20	14.34	0.93	74.33	44.24
I_2	5.55	10.70	15.85	1.07	83.09	60.10
I_3	6.19	11.41	16.68	1.14	90.84	71.53
SEm±	0.08	0.14	0.27	0.01	0.59	0.75
$CD_{5\%}$	0.23	0.41	0.78	0.03	1.73	2.16
Levels of NAA						
N_0	2.78	6.79	11.92	0.81	50.03	41.67
N_1	4.98	9.79	14.99	0.86	71.62	47.37
N_2	5.23	10.40	15.59	0.95	76.42	52.68
N_3	5.96	11.12	16.29	1.01	81.08	56.57
SEm±	0.08	0.14	0.27	0.01	0.59	0.75
$CD_{5\%}$	0.23	0.41	0.78	0.03	1.73	2.16
Interaction (I×N)						
I_0N_0	2.17	5.03	10.16	0.34	31.04	13.67
I_0N_1	2.51	6.27	11.43	0.36	41.24	19.67
I_0N_2	2.89	7.57	12.68	0.62	54.97	26.67
I_0N_3	3.82	8.49	13.63	0.66	60.34	29.67
I_1N_0	2.51	6.27	11.43	0.85	70.49	34.67
I_1N_1	4.40	9.27	14.42	0.86	70.83	42.02
I_1N_2	4.60	9.79	14.94	0.90	72.76	46.47
I_1N_3	6.19	11.47	16.57	1.08	83.25	53.80
I_2N_0	2.89	7.57	12.68	0.92	74.88	52.67
I_2N_1	6.32	11.60	16.79	1.10	84.69	59.67
I_2N_2	6.42	11.78	16.94	1.12	85.88	62.92
I_2N_3	6.56	11.86	17.00	1.12	86.90	65.14
I_3N_0	3.82	8.49	13.63	1.12	87.71	65.67
I_3N_1	6.69	12.04	17.34	1.14	89.73	68.14
I_3N_2	6.99	12.48	17.79	1.15	92.07	74.67
I_3N_3	7.26	12.65	17.96	1.16	93.84	77.67
SEm±	0.16	0.29	0.54	0.02	1.19	1.50
$CD_{5\%}$	0.46	0.83	NS	0.06	3.46	4.33

secondary (17.96), roots dry weight per plant (1.16 g), rooting percentage (93.84%)and survival percentage (77.67%) were observed with application of IBA @ 15000 ppm + NAA @ 150 ppm (I_3N_3) which was closely followed by application of IBA @ 15000 ppm + NAA @ 100 ppm (I_3N_2) and both were statistically at par with each other for all the parameters except rooting percentage while, minimum values for all the parameters were recorded with control (I_0N_0).This can be attributed due to increased level of growth promoting substance, better rooting surrounding and other nutrients with the application of rooting media. All the treatments resulted in higher growth and survival of the air layers compared to the control. Among the plant growth regulators, IBA was the most effective for the rooting, establishment, survival and vegetative growth of the air layers.These results were conformity with the findings of Kumar and Syamal (2005), Gowda *et al*. (2006) andTyagi and Patel (2004).

Conclusion:

Thus from the above findings, it may be concluded that guava can be successfully propagated by air-layering with the application of plant growth regulators. The results of present investigation suggest that for maximum callusing, rooting as well as success and subsequent establishment of air-layers of guava in nursery, alone application of IBA @ 15000 ppm or in combination with NAA @ 100 ppm concentration are quite useful and best.

REFERENCES

Gowda, V. N., Shyamalamma, S. and Ragavendra Prasad, G. C.(2006). Influence of Auxins and 1, 2, 4 Acid on Rooting of Litchi (*Litchi chinensis* Sonn.) air Layers. *Acta Horticulture,* **727**: 73- 78.

Hartmann, H. T. and Kester, D. E. (1972). *Plant Propagation: Principles and Practices.* Chapman and Hall, London. 283 p.

Hartmann, H. T., Kester, D. E., Davies, F. T., Geneve, R. L. (2002). 7th ed., Prentice Hall, NJ.

Kumar, K. and Syamal, M. M.(2005). Effect of etiolation and plant growth substances on rooting and survival of air-layers of guava. *Indian J.]Horticulture,* **62**(3): 290-292.

Lal, S., Tiwari, J.P., Awasthi, P. and Singh, G. (2007). Effect of IBA and NAA on rooting Potencial of stooled shoots of guava. *Acta Horticulture,* **735**:193-196.

Macdonald, B. (1986). Vol: **I**, *fourth printing*, Timber Press, Portland, Oregon, pp. 669.

Majumdar, P. K. and Mukherjee, S. K. (1968). Guava a new vegetative propagation method. *Indian Horticulture*, **12**: 11-35.

Prasad, P. V., Suryanaryana, V. and Naramnaidu (1990). Studies on certain aspects of veneer grafting in mango. *South Indian Horticulture*, **38**(1): 1-7.

Raut, U.A., Jadhav, G.G., Bhogave, A.F. and Deshmukh, M.S. (2015). Effect of different IBA levels on air layering of karonda (*Carissa carandas* L.). *Research on Crops,* **16**(3): 537-541.

Singh, D. and Pathak, S. (2012). Effect of IBA and NAA on propagation of Barbados cherry through layering. *Crop Research,* **43**(1, 2 & 3): 120-122.

Singh, M. (2001). Efficacy plant growth regulators, their concentration and wrappers on rooting success and survival air layered guava twigs. *Crop Research,* **21**(2): 153-16.

Singh, M. (2002). Response of plant growth regulators and wrappers on air-layering of guava (*Psidium guajava* L.). *Advances in Plant Sciences,* **15**: 153-157.

Tingwa, P.O. and Addadi, S. (1968). The vegetative propagation of tropical guava (*Psidium guajava* L.) in the Sudan. *Sudan Agriculture J.,* **3**: 12-20.

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