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Research Article

Effect of IBA Concentration and Time of Air layering in Guava

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Abstract

Present investigation was conducted in the rainy season during the year 2016-17, 2017-18, 2018-19 with an objective to find out the suitable concentration of IBA and time for higher success in guava air layers in vidarbha region of Maharashtra. The pooled data results indicated that application of IBA 7,500 ppm concentration during the month of August (I4M2) showed minimum days required for root initiation and maximum rooted air layer percent, no. of roots per layer, length of roots, leaf area, and height of the layer. Higher success of guava air layers was found in the treatment I4M3 followed by (I4M2).

Keywords: *IBA Concentration, air layering, time of air layering*

Introduction

The Guava (*Psidium guajava* L.) is one of the hardy fruit crops being cultivated throughout the India. It is native of tropical America and is widely distributed throughout the tropical and sub tropical regions of the world. Guava is fourth most important fruit in area and production after mango, banana and citrus in India. Guava shares 3.3 percent of area and 3.3 per cent of production of total fruit crop grown all over India. Guava is 5th in productivity among different fruit crops grown in India.

Guava is considered as "common man's apple" and 'the apple of tropics' because of its availability for a longer time during the year at very moderate price. The major components of guava fruits are vitamin C (250 mg/100 g fresh fruits), carbohydrates (13%) and minerals (calcium 29 mg, phosphorus 10 mg and iron 0.5 mg/100 mg fresh fruits). It is a very rich and cheap source of vitamin C as it contains 4-6 times more vitamin C than citrus fruit. Guava fruits are rich in pectin content, hence are extensively used in preparation of jelly .The fruit is also used in preparing jelly, cheese, butter, paste, juice, juice concentrate, powder, canned slice/shell, nectar, puree and ice cream.

The guava plants can be propagated by several ways such as seed, cuttings, stooling, air layering, grafting etc. The seed propagation was wide spread earlier is now restricted to raising of rootstock material. The vegetative propagations by mound layering are becoming more and more popular on account of their cheaper cost and easy method. They also have better success obtained.

However, greater deal of variation in percent success is observed in mound layering. One of the causes for variation has been observed to be the age of shoots/trees used in mound layering. During mound layering operation in guava the mother trees are required to keep near ground level, so that mounding is possible and therefore restriction for increase height of the mother trees and keep its canopy with short near ground level.

(Anonymous, 2014) has pointed out that June was found to be the best month for air layering in guava and the growth substances used were an equal mixture of NAA and IBA in talc, at 10,000 ppm which was found to be the best concentration tested.

Keeping these points in the view, an

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experiment entitled "Effect of IBA concentrations and time of air layering in Guava" is framed along with following objectives.

Materials and Methods

An experiment was conducted in the year 2015-16, 2016-17, 2017-18 during the rainy season. Propagation of guava conducted at different month and different IBA concentrations on 8-10 years old guava orchard planted at spacing of 4x3m in high density planting at Main Garden, Department of Fruit Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The experiment was laid out in factorial randomized block design with two factors ,IBA concentrations with four levels (I1)1000ppm, (I2)2500ppm, (I3)5000ppm, (I4)7500ppm and time of air layering with the month of (M1) July , (M2) August ,(M3) September which were replicated four times. The period of observation was 75 days after layering and for survival percent was observed 60 days after transplanting. The selected shoot was one year old and pencil size thickness with the average length 690 cm. The selected shoot was girdled by removel of ring of the bark about 2-2.5 cm. The lanoline paste containing IBA in different concentrations was applied evenly above the upper portion of the cut rings with the help of glass rod. Girdled portion was covered with the sphagnum moss. A sheet of the polythene (150 guage) was then covered. These air layers were separated from the parent plant 75 days after layering by given three installation cut an interval of one week, so as reduce to shock of sudden detachment. After detachment of air layers shoot,ten of the successful rooted shoots were transplanted in the polybag (10x15cm)containing soil ,sand and FYM in the ratio 2:1:1statastical analysis was done as per the method described by Panse and Sukhatme (1967). Percent values are transformed in to the arc sign values. All data was subjected to analysis of varience (ANOVA) to determine significant differences and comparison of mean at a significant level of 5%.

Result and Discussion

Effect of IBA Concentrations

The data presented in table revealed that early root initiation was observed under treatment I4 (25.15 days) which was significantly superior to I3, I2 and I1 ie.(27.35,28.77,33.61 days).The effect of IBA with increasing concentration might be due to the activity of auxin at cambium layers which may adequate for initiation of root primordial (Bhagat. *et al.*, 1999). Significantly maximum percentage of rooted air layers with IBA 7500 ppm (68.69 %) ,followed by IBA 5000 ppm (63.90 %) ,while minimum percentage of rooted air layer observed in IBA1000 ppm ie.(51.79%),maximum utilization of carbohydrates and nitrogen fraction with the presence of co-factor at wound (girdled) site which may have helped in better root initiation. IBA at higher concentration resulted better rooting.

The same trend was observed for Length of Root per layers (cm), Numbers of Leaves per Layers, Leaf Area (cm^2), Survival (%). Maximum no. of roots per layer was significantly maximum with IBA 7500 PPM (8.2) whereas minimum value (3.5). The increase in no. of roots per layer may be due to the accumulation of rooting co -factors above the ringed portion as influenced by IBA similar results was observed by (Patil. *et al*., 2011).

The length of root of air layer was maximum in treatment IBA 7500 ppm ie. (7.3 Cm) significantly superior over the all other treatments. Whereas, minimum length of roots per layer was found in treatment I1(3.1 Cm) Increase in length of root at higher concentrations of both IBA might be due to hormonal effect and accumulation of internal substances and their basipetal (downward) movement(Murlimanohar baghel, 2016) (Singh, 2001).

Highest number of leaves per air layer was recorded under treatment I4 (12.92) followed by I3 (11.39);whereas minimum value was observed under treatment I1 (6.94).This might be due to the early root

initiation of roots,more no. of roots and higher root length which absorb more nutrients and water resulted in higher no. of roots after transplanting. The increase in no. of leaves under different concentrations of IBA was earlier reported by (Tyagi and Patel, 2004).

The greatest average leaf area of air layer was recorded under I4 45.83and minimum leaf area was observed under I1 (22.93).This is might be due to the higher concentrations of auxin leads to the best aerial growth.These results accordance with the findings of Raut (1992).

Notably the height of the rooted air layer was recorded under the treatment I4 (48.45) and minimum under the treatment I1 (24.83). Significantly higher survival percent was observed under treatment I4 (73.71) followed by I3 (67.32), whereas minimum survival percent was noticed under the I1 (24.83). These results are in close conformity with the findings of (Patil. *et al*., 2011)

Effect of Time on Air Layering

Data presented in the table indicated the minimum days required for root initiation was observed in the month of August (36.29 days) followed by July (38.46 days) and September (40.13days).

Higher percentage of rooted air layer was observed in the month of August (85.71%) followed by treatment in July (80.56%) and minimum no. of roots per layer was recorded in the month of September (75.69%).

Guava layering performed in the month of August showed maximum numbers of roots per air layer, ie. (9.0) followed by June (8.2) and September (7.4) respectively. These results are concurrence with the findings Rymbai and Reddy (2010).

Considerably maximum length of roots per air layer was recorded in month of August (7.8 cm) which was singnificantly superior over root length in the month of July (7.4cm) and September (6.9cm) month.

This may be due to the favourable environmental condition during the month of August. Minimum no. of leaves per air layer was observed in the month of July (13.59) followed by September (13.44) and August (13.19).

Maximum leaf area was found in the month of September (43.60 cm^2) followed by August (43.04 cm^2) and July (41.71 cm^2).

Height of the rooted air layer was maximum recorded in the month of August (46.25) followed by September (45.72) and July (45.59). Maximum survival percent was found in the month of August (85.83 %) followed by September (78.75%) and July (75.65%).the results has close conformity with the Baghel (2015).

Interaction Effect of IBA Concentrations Time of Air Layering in Guava

Data revealed in the table indicated that minimum days required for the root initiation was observed in the treatment combination I4M2 ie.IBA7500 ppm in the month of August (27.01) followed by treatment I4M1 (27.94), I4M3 (28.90).

The percentage of rooted air layer was significantly superior over the all other treatment combination (80.17 %) when air layer of guava treated with treatment combination IBA 7500ppm in the month of August. This might be due to combined effect of IBA and time of air layering. Higher concentration of IBA fascillited better root initiation and favorable season provided conductive environment like optimum temperature, relative humidity and rainfall. These results are accordance with (Chandrappa and Gowda, 2006) in guava air layer.

The interaction effect of treatment I4M2 recorded maximum no. of roots per layer (9.7) followed by treatment I4M1 (9.25).this may be cumulative effect of higher IBA and more congenial environmental factor during the month of August.

Table: Effect of IBA concentrations and time of air layering on different growth parameters of guava pooled data

Treatment	Days Required for root Initiation	Rooted air layers (%)	Number of Roots per layers	Length of Root per layers (cm)	Numbers of Leaves per Layers	Leaf Area (cm2)	Height of the rooted air layers (cm)	Survival (%)
IBA concentrations (ppm)								
I1	33.61	51.79 (44.38)	3.5	3.1	6.94	22.93	24.83	42.17 (37.09)
I2	28.77	57.63 (47.80)	5.8	5.2	9.51	25.84	28.19	57.01 (47.48)
I3	27.35	63.90 (51.70)	7.0	6.4	11.39	33.13	36.08	67.32 (54.07)
I4	25.15	68.69 (54.85)	8.2	7.3	12.92	45.83	48.45	73.71 (58.16)
''F'' Test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE (m)±	0.282	0.051	0.267	0.035	0.042	2.15	2.07	0.056
CD at 5 %	0.828	0.150	0.785	0.105	0.123	6.31	6.08	0.166
Time of air-layering (Month)								
M1	38.46	80.56 (66.18)	8.2	7.4	13.59	41.71	45.59	75.65 (63.32)
M2	36.29	85.71 (69.45)	9.0	7.8	13.19	43.04	46.25	85.83 (67.93)
M3	40.13	75.69 (63.21)	7.4	6.9	13.44	43.60	45.72	78.75 (65.55)
''F'' Test	Sig.	Sig	Sig.	Sig	Sig.	Sig	Sig	Sig
SE (m)±	0.326	0.054	0.309	0.041	0.048	2.48	2.39	0.065
CD at 5 %	0.956	0.173	0.90	0.121	0.142	7.28	7.02	0.191
Interaction effect (I x M)								
I1M1	38.03	51.54 (44.34)	4.03	3.42	7.70	24.90	27.38	43.59 (41.21)
I1M2	34.93	62.55 (52.27)	4.35	3.70	7.80	25.61	28.10	55.49 (42.37)
I1M3	39.08	52.36 (46.35)	3.5	3.23	7.63	25.93	27.30	41.49 (40.06)
I2M1	32.01	63.55 (52.87)	6.50	5.72	10.45	28.28	30.68	62.30 (57.96)
I2M2	30.52	68.22 (55.68)	7.2	6.48	10.81	28.93	31.74	68.40 (55.87)
I2M3	33.36	60.31 (50.95)	5.8	5.45	10.65	28.94	31.56	54.35 (50.45)
I3M1	30.21	70.68 (57.22)	7.7	7.22	12.73	35.21	40.12	64.77 (53.55)
I3M2	28.52	74.74 (59.83)	8.8	7.46	12.89	37.65	40.17	80.11 (63.52)
I3M3	32.43	67.57 (55.28)	7.01	6.70	12.34	39.59	39.98	79.54 (63.14)

I4M1	27.94	76.76 (61.18)	9.25	8.36	14.41	50.64	53.78	81.49 (64.36)
I4M2	27.01	80.17 (63.56)	9.7	8.62	14.48	51.26	54.17	82.10 (64.69)
I4M3	28.90	72.04 (62.04)	8.5	7.65	14.18	50.86	53.56	82.12 (64.81)
''F'' Test	Sig.	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE (m)±	0.564	0.102	0.53	0.071	0.084	4.30	4.41	0.113
CD at 5 %	1.656	0.300	1.57	0.210	0.246	12.62	12.16	0.332

This might be due to the hormonal effect leading to accumulation of internal substances and their basipetal (downward) movement with increased cell division as such line references was also reported by (Singh, 2001).

The same strand was observed significantly maximum values for Length of Root per layers (8.62 cm), Numbers of Leaves per Layers (14.48), Leaf Area (51.26 cm^2), Height of the rooted air layers (54.17 cm) indicates the with treatment combination IBA 7500 ppm in the month of August followed by treatment combination IBA 7500 ppm in the month of July (8.36, 14.41, 50.64, 53.78, 8.36) respectively.

The interaction effect of highest IBA concentrations 7500 ppm and most congenial time of air layering in the month of August in guava air layering were significant on rooting character. The balance between auxin and other constituents in the plant tissues control organ formation and is the basis for rooting and root character. This balance may be achieved by the various, combination of Genetical, Chemical and Environmental factors. (Westwood, 1973).Better rooting helps to vegetative growth of the air layers.

The vegetative growth characters might be due to the early root initiation, more no. of roots and higher root length which absorb more nutrients and water resulted in higher no. of roots after transplanting. The increase in no. of leaves under different concentrations of IBA was earlier reported by (Tyagi and Patel, 2004).

The maximum Survival percent of guava air layer was found in the treatment combination IBA concentrations 7500 ppm in the month September (82.12 %)at par with the treatment combination 7500 ppm IBA concentrations in the month of August (82.10%).

It is might be due to the rooting co- factors and their balance with nutritive substances and auxin .these results are in close conformity with the findings of (Rymbai and Reddy, 2010).

It is concluded that air layering in guava performed in the month of August with IBA 7500 ppm under treatment significantly influenced the root growth, vegetative growth and survival percentage of the air layer.

Result

Among the different concentrations of IBA, the guava air layer treated with IBA 7500 ppm (I4) and 5000 ppm (I3) observed higher values for various root parameters viz., early root initiation (32.26 days), followed by 7500ppm IBA concentration 34.04 the maximum percentage of rooted air layer (64.15%), highest number roots which is followed IBA 7500 ppm (61.40), The same strand was observed for number of roots per layers length of root per layers. The number of leaves per layers was observed maximum in the treatment IBA 1000 ppm followed by 7500 ppm i. e. 10.73 and 9.73. While leaf area also observed maximum in the same treatment 17.09 and 16.42. The height of the rooted air layers was maximum i. e. 18.52 treated with 7500 ppm IBA at par with 5000 ppm IBA i. e. 17.66. The survival percentage i. e. 63.33 and 57.24 observed in 7500 ppm IBA and 5000 ppm IBA respectively.

However in respect to different time of air layering, August (M2) and September (M3) month recorded highest percentage of rooted

air layer (61.68% and 61.18%) and same strand was observed for all other parameters.

The interaction effect of IBA 7500 ppm + August month (I4M2) was found significantly superior over other treatment combinations for percentage of rooted air layer (80.06 %), followed by (76.63%) (I3M3) combination and observed same trend in all other parameters but final survival percentage observed at par in treatment (I4M2) (81.50%) with (I4M3) (81.40%) and (I4M1) (81.33%) & (I3M2) i. e. 7500 ppm IBA in August month and 7500 ppm IBA with September month showing the 80.00 and 79.60% survival.

Conclusions

From the result of an experiment conducted to study the, effect of IBA concentrations and time of air layering in guava, following conclusions could be drawn:

In respect to IBA concentrations, guava air layer was significantly influenced by the different concentrations. The better performance was observed under treatment I4 (IBA 7500 ppm) and (IBA 5000 ppm) for all root and growth parameters before detachment and after detachment of guava air layer.

Regarding the time of air layering, the performance of guava air layer was influenced by the different months of air layering. August month (M2) was found significantly superior for percentage of rooted air layer for all parameters and survival percentage.

The combined effect of IBA concentrations and time of air layering indicated that, guava air layer treated with treatment combination 7500 ppm IBA + August month (I4M2) and 5000 ppm IBA + August month significantly influence for root induction and final survival percentage. Successful propagation of Guava fruit crop through air layering recommended propagation operation in the month August and air layers treated with 5000 & 7500 ppm IBA paste found better survival and success percentage under Vidarbha condition.

References

1. Ananymous. “Indian horticulture database.” *NHB* (2014). http://nhb.gov.in.
2. Bhagat, B. K., Jain, B. P., C. Singh. and Chowdhary, B. M. "Studies on the propagation of guava (Psidium guajavaL.) cv. Sardar by ground layering in polybags." *Orissa J. Hort* 27.1 (1999): 19-21.
3. Baghel, M. M. "Effect of IBA concentrations and time of air layering in guava.” M.Sc. Horticulture Thesis, Submitted to *Dr. Panjabrao Deshmukh Krishi Vidyapeeth Akola,Maharashtra*.
4. Chandrappa. and Gowda, N. V. “Influence of Auxin and 1, 2, 3 acid on guava air layers.” *Mysore Journal of Agriculture Sciences* 32 (1998): 59-66
5. Gowda,V. N., S. Shyamalamama. And Prakash, G. N. “Influence of Auxun and 1, 2, 4 acids on rooting of rose apple.” *Acta Hort* 727 (2006): 89-94
6. Baghel, M., Raut, U. A. and Vikas, R. "Effect of IBA concentrations and time of air-layering in guava cv. L-49." *Research Journal of Agricultural Sciences* 7.1 (2016): 117-120.
7. Panse, V. G. and Sukhatme, P. V. “Statistical method of agricultural workers.” *ICAR Publication, New Delhi* (1967).
8. Patil, K. D., Patel, B. N., Aklade, S. A. and Patil, S. J. "Influence of time of ringing, wrappers and IBA on air layering in guava (Psidium guajava L.) cv. Sardar." *Haryana Journal of Horticultural Sciences* 40.1/2 (2011): 22-26.
9. Raut, Y. D. “Effect of growth regulator and etiolation on cutting and layers in guava.” M.Sc. Horticulture Thesis, Submitted to *Dr. Panjabrao Deshmukh Krishi Vidyapeeth Akola, Maharashtra*.
10. Rymbai, H. and Reddy, G. S. “Effect of IBA, time of layering ,rooting media, on air layers and plantlets survival under different growing nursery conditions in guava.” *Indian Journal of Horticulture* 67 (2010): 99-104
11. Singh, M. "Efficacy of plant growth regulators, their concentrations and wrappers on rooting success and survival

of air-layered guava twigs." *Crop Research* 21.2 (2001):153- 156.
12. Tyagi, S. K. and Patel, R. M. "Effect of growth regulators on rooting of air layering of guava (Psidium guajava L.) Cv. Sardar." *Orissa Journal of Horticulture* 32.1 (2004):58-62.

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