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Effect of Organic Media, Plant Growth Regulators and Different Colour of Wrappers on Roots Studies of Air Layering of Guava (*Psidium guajava* L.)

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A B S T R A C T

The present investigation entitled "Effect of organic media, plant growth regulators and different colour of wrappers on success and survival of air layering of Guava (*Psidium guajava* L.)" Was carried out in Month of August during 2019 and 2020 at the Fruit Research Station Entkhedi, Bhopal, (M.P.) under the R.A.K. College of Agriculture, Sehore. The experiment was laid down in Randomized Block Design with three replication and twenty-five treatments. In these treatments five colour of Poly wrappers was used *i.e.*, White, Black, Blue, Red and Green, five concentrations of Growth regulators *i.e.*, IBA 0 ppm, IBA 2500 ppm, IBA 5000 ppm, IBA 7500 ppm and IBA 10000 ppm and four types of media i.e., Vermicompost, Soil, Leaf manure and Sphagnum moss. Observations was recorded on rooting studies like callus formation day taken from layering date, rooting percentage success, average number of primary roots per air-layer, average number of secondary roots per air-layer, average length of primary roots, average length of secondary roots, average diameter of primary roots, average fresh weight of roots and average dry weight of roots. Result obtained that the treatment T_{21} (IBA 10000 PPM + Vermicompost + W_5) found superior in all the parameters of rooting studies during 2019-20 and 2020-21, and also in pooled data.

Introduction

Growing of fruit crops is very popular in India from ancient time because suitable climatic condition but Guava (*Psidium guajava* L.)is one of the most popular fruits grown crop in tropical, sub-tropical and some parts of arid regions of India. Guava belongs to the family Myrtaceae. Guava originated from an area thought to extend from Mexico, Central America or northern South America throughout the Caribbean Region Chromosome number of guava 2n= 22 Besides, it is also a cheap and very rich source of vitamin-C (228.3) mg carbohydrate(14.32) g, iron(0.26) mg, fat(0.95) g, sugar (8.92) g, Protein (2.55) g, vitamin B_1(0.067) mg, vitamin B_2 (0.04)mg, vitamin B_3 (0.084) mg,

and contains a fair amount of calcium(18) mg and phosphorus(40) mg as well as found in 100 gm. Guava fruits are also used for preparation of salad, chutney, jam, jelly, nector etc. These qualities make guava an important and one of the most popular fruits of India.

Plant growth regulator IBA play an important role of rooting of air layering of guava but suitable concentration be must for rooting 5000 ppm concentration is best results found for air layering rooting media coco peat absolved more water this actual volume 10 time more water socked and humidity make long time. Sphagnum mass is most important role play in rooting of guava they water socked and give moisture long time.

Auxins particularly IBA and IAA have been reported to induce rooting in many of the plant species with varied success. The response of different growth substances to percent success varied from species to species with changing physiological and environmental conditions. Most of the workers have reported IBA and NAA as better growth regulators than others for inducing rooting in guava air- layering due to their stable nature. Hartmann and Kester (1972) was reported to have yielded good results.

According to Loach (1988), the rooting media should be considered an integral part of the propagation system; percentage rooting and the quality of the roots produced are directly influenced by the medium. Hartmann *et al.*, (2002) stated that the appropriateness of the medium depends on the species the cutting type, the season, the propagation system used and the cost and availability of the medium component. There is a need to establish appropriate and low-cost rooting media.

Uses of different type of wrapping material also very important and the success of air layering also depends on the colour and type of wrapping material. Etiolation in plants occurs when they are grown in either partial or a complete absence of light. Etiolation may reduce the production of lignin, thus instead of forming lignin phenolic metabolic may be channeled to enhance root initiation. Polythene wrappers have properties which in some respects makes it similar to the outer skin of plants. It is water proof, transmits light and allows gaseous exchange of oxygen and carbon-dioxide and low transmission of water vapour. The different colours of polythene wrappers *i.e.* black white blue, red and green are used at the time of operation.

Materials and Methods

The experiment was carried out in Month of August during 2019 and 2020 at the Fruit Research Station Entkhedi, Bhopal, (M.P.) under the R.A.K. College of Agriculture, Sehore. The experiment was laid down in Randomized Block Design with three replication and twenty five treatments *viz.*, T_1(IBA 0 ppm + Vermicompost + W_1), T_2 (IBA 0 ppm +Soil + W_1), T_3 (IBA 0 ppm + Leaf Manure + W_1), T_4 (IBA 0 ppm + SphagnumMoss + W_1), T_5 (IBA 0 ppm +Compost + W_1), T_6 (IBA 2500 ppm + Vermi compost + W_2), T_7 (IBA 2500 ppm + Soil + W2), T_8 (IBA 2500 ppm + Leaf Manure + W_2), T_9 (IBA 2500 ppm + Sphagnum Moss + W2), T_{10} (IBA 2500 ppm +Compost + W_2), T_{11} (IBA 5000 ppm + Vermi compost + W_3), T_{12} (IBA 5000 ppm + Soil + W_3), T_{13} (IBA 5000 ppm + Leaf Manure + W_3), T_{14} (IBA 5000 ppm + Sphagnum Moss + W_3), T_{15} (IBA 5000 ppm + Compost + W_3), T_{16} (IBA 7500 ppm + Vermicompost + W_4), T_{17} (IBA 7500 ppm + Soil + W_4), T_{18} (IBA 7500 ppm + Leaf Manure + W_4), T_{19} (IBA 7500 ppm + Sphagnum Moss + W_4), T_{20} (IBA 7500 ppm + Compost + W_4), T_{21} (IBA 10000 ppm + Vermicompost + W_5), T_{22} (IBA 10000 ppm + Soil + W_5), T_{23} (IBA 10000 ppm + Leaf Manure + W_5), T_{24} (IBA 10000 ppm + Sphagnum Moss + W_5) and T_{25} (IBA 10000 ppm + Compost + W_5). Result observed that the treatment T_{21} (IBA 10000 PPM + Vermicompost + W_5) found superior in all the parameters of shoots and economics also during 2019-20 and 2020-21 also in pooled data. The different Observations was recorded on rooting studies like callus formation day taken from layering date, rooting percentage success, average number of primary roots per air-layer, average number of

secondary roots per air-layer, average length of primary roots, average length of secondary roots, average diameter of primary roots, average fresh weight of roots and average dry weight of roots.

Results and Discussion

During the investigation the treatment T_{21} (IBA 10000 ppm + Vermicompost + W_5) performed superior in both of the year it might be due to the IBA, vermicompost and green polythene wrappers give positive response on cell division and cell enlargement. The result is undifferentiated mass of cell is formed the closely scientist is Singh (2001) studied on the callus formation and find out that the 10000 ppm IBA gives positive response on callus formation. Parmar *et al.,* (2018) also studied on callus formation and find out the success percent of air-layers (83.3 %) callus formation in Kagzi lime.

The treatment T_{21} (IBA 10000 ppm + Vermicompost + W_5) performed superior in both of the year it might be due to the IBA, vermicompost and green polythene wrappers give positive response on successful root formation it might be due to the above treatment combination give impact on advantageous root formation the closely finding are Singh (2001) and Parmar *et al.,* (2018) studied on the rooting success percent and find out that the 10000 ppm IBA gives positive response on root formation with different rooting media.

The maximum average number of primary and secondary roots per air-layer formation were recorded under the treatment T_{21} (12.95 and 16.67), while the minimum average number of primary and secondary roots per air-layer formation was significantly find out under the treatment T_2(6.73 and 9.23). The average number of primary and secondary roots per air layer was found superior in the treatment T_{21}in both of the year and also in pooled data. It might be due to the well treatment variation and combination the closely findings are Singh (2001); Reddy *et al.,* (2014) and Parmar *et al.,* (2018) studied on the rooting success percent and number of primary and secondary roots.

The maximum average length of primary and secondary roots formation was recorded under the treatment T_{21}(6.58cm and 2.25cm) followed by the treatment other treatments, while the minimum average length of primary and secondary roots formation was significantly found out under the treatmentT_2(3.11cm and 0.68 cm).

The length of primary and secondary roots increase by the treatment combination of T_{21}might be due to the IBA, rooting media vermin and green polythene wrappers give positive response and the closely finding are Patel *et al.,* (1996) find out the 3000 ppm of IBA give higher lent of primary and secondary roots.

The maximum average diameter of primary roots formation was recorded under the treatment T_{21} (2.17cm) followed by the treatment other treatments. While the minimum average diameter of primary roots formation was significantly found out under the treatment T_2(0.53cm). The average diameter was found in T_{21} in both of the year and also in pooled data. It might be due to the positive response of IBA. The closely finding are Rathore (1982) and Sharma *et al.,* (1991).

The maximum average fresh and dry weight of roots formation was recorded under the treatmentT_{21} (2.44g and 1.21g) followed by the treatment other treatments, while the minimum average fresh and dry weight of roots formation was significantly found out under the treatment T_2(0.98g and 0.36g).

The average fresh and dry weight was found in T_{21} in both of the year and also in pooled data. It might be due to the positive response of IBA. The closely finding are Das and Prasad (2014); Reddy *et al.,* (2014) and Baghel*et al.,* (2016).

The treatment T_{21} (IBA 10000 PPM + Vermicompost + W_5) found superior in rooting studies of air layer. The application of 10000 ppm Indole -3- Butyric Acid on air layer and it is wrapped with green polythene with vermicompost rooting media give superior performance.

Table.1 Effect of organic media, plant growth regulators and different colour of wrappers on roots studies of air layering of Guava.

Tret.	Callus formation days taken in 2019-20	Callus formation days taken in 2020-21	Pooled data on Callus formation days taken	Rooting % success during 2019-20	Rooting % success during 2020-21	Pooled data rooting % success	Average number of primary roots per air-layer during 2019-20	Average number of primary roots per air-layer during 2020-21	Pooled data average number of primary root per air-layer
T_1	2.27	2.32	2.29	48.67	42.33	45.5	7.77	9.90	8.83
T_2	6.67	6.68	6.68	30.84	33.67	32.26	6.20	7.27	6.73
T_3	2.22	2.24	2.23	41.74	41.00	41.37	8.47	8.47	8.47
T_4	2.00	2.01	2.01	34.87	34.67	34.77	7.00	9.00	8.00
T_5	2.13	2.15	2.14	41.71	41.67	41.69	7.47	7.47	7.47
T_6	2.45	2.46	2.46	62.54	62.00	62.27	8.83	8.83	8.83
T_7	3.52	3.53	3.53	44.89	47.33	46.11	8.34	8.97	8.66
T_8	3.44	3.45	3.45	60.73	60.33	60.53	9.59	9.59	9.59
T_9	3.22	3.23	3.23	54.93	54.33	54.63	8.26	9.42	8.84
T_{10}	3.34	3.36	3.35	58.98	58.33	58.66	8.43	8.43	8.43
T_{11}	2.52	2.53	2.53	72.87	72.00	72.43	9.93	9.47	9.70
T_{12}	4.46	4.47	4.47	53.83	56.67	55.25	7.63	8.63	8.13
T_{13}	3.84	3.85	3.85	69.84	69.67	69.76	9.09	9.70	9.40
T_{14}	4.02	4.03	4.03	70.88	70.00	70.44	9.36	10.22	9.79
T_{15}	4.22	4.24	4.23	71.87	71.00	71.44	9.37	9.26	9.32
T_{16}	3.66	3.66	3.66	84.88	84.33	84.61	11.20	11.30	11.25
T_{17}	5.94	5.95	5.95	62.91	62.33	62.62	9.39	9.39	9.39
T_{18}	5.71	5.72	5.72	78.93	78.00	78.47	11.10	11.12	11.11
T_{19}	5.89	5.90	5.90	80.33	83.00	81.67	12.10	12.11	12.10
T_{20}	5.92	5.94	5.93	86.67	84.33	85.50	12.57	12.67	12.67
T_{21}	1.71	1.87	1.79	94.00	91.00	92.50	12.58	13.32	12.95
T_{22}	3.92	3.93	3.93	70.71	70.00	70.36	9.16	9.19	9.17
T_{23}	6.04	6.05	6.05	85.90	85.67	85.78	11.88	11.56	11.72
T_{24}	6.18	6.19	6.19	87.00	85.68	86.33	11.96	12.36	12.16
T_{25}	6.31	6.32	6.32	89.85	87.67	88.76	12.13	11.53	11.83
SE(m) ±	0.21	0.18	0.16	2.91	2.40	1.94	0.47	0.63	0.49
SE(d)	0.30	0.25	0.23	4.11	3.40	2.74	0.67	0.89	0.70
C.D.	0.59	0.51	0.45	8.19	6.77	5.46	1.34	1.76	1.39

Table.2 Effect of organic media, plant growth regulators and different colour of wrappers on roots studies of air layering of Guava.

Treat.	Average length of primary roots during 2019-20 (cm)	Average length of primary roots during 2020-21(cm)	Pooled data average length of primary roots(cm)	Average length of secondary roots during 2019-20 (cm)	Average length of secondary roots during 2020-21(cm)	Pooled data average length of secondary roots(cm)	Average diameter of primary roots during 2019-20 (cm)	Average diameter of primary roots during 2020-21 (cm)	Pooled data average diameter of primary roots
T_1	2.41	5.00	3.70	1.02	1.23	1.13	0.69	0.70	0.70
T_2	2.40	3.83	3.11	0.70	0.66	0.68	0.51	0.54	0.53
T_3	2.55	6.13	4.34	0.93	1.99	1.46	0.65	0.68	0.66
T_4	3.43	4.13	3.78	0.94	0.95	0.94	0.60	0.60	0.60
T_5	2.76	4.37	3.56	1.03	1.05	1.04	0.74	0.67	0.70
T_6	3.64	4.07	3.86	1.16	1.52	1.34	0.87	0.86	0.86
T_7	2.45	4.48	3.47	1.21	1.00	1.11	0.70	0.65	0.64
T_8	3.40	5.13	4.27	1.34	1.77	1.56	0.82	0.86	0.84
T_9	2.83	4.17	3.50	1.19	1.67	1.43	0.84	0.80	0.82
T_{10}	3.38	4.93	4.15	1.31	1.13	1.22	0.72	0.86	0.73
T_{11}	4.22	5.10	4.66	1.70	1.46	1.58	0.92	0.85	0.85
T_{12}	2.83	4.67	3.75	1.42	1.03	1.22	0.77	0.71	0.74
T_{13}	3.97	4.43	4.20	1.46	1.27	1.37	0.89	0.86	0.80
T_{14}	4.12	5.19	4.65	1.69	1.38	1.54	0.88	0.84	0.86
T_{15}	4.51	5.50	5.01	1.79	1.50	1.73	0.88	1.11	0.99
T_{16}	5.77	5.03	5.40	2.00	1.73	1.86	1.23	1.23	2.04
T_{17}	3.67	4.17	3.92	1.82	1.24	1.53	0.86	0.76	0.81
T_{18}	4.25	5.17	4.71	1.76	1.43	1.60	1.11	1.15	1.13
T_{19}	5.83	4.70	5.27	2.23	1.55	1.89	0.93	1.42	2.00
T_{20}	4.63	5.53	5.08	2.04	1.57	1.80	1.12	1.27	1.14
T_{21}	6.53	6.63	6.58	2.42	2.08	2.25	2.12	2.23	2.17
T_{22}	3.96	4.60	4.28	1.77	1.37	1.57	0.74	0.74	0.74
T_{23}	4.93	5.23	5.08	2.16	1.79	1.98	1.45	1.63	1.54
T_{24}	6.30	5.30	5.80	2.08	1.93	2.01	1.87	1.50	1.77
T_{25}	5.73	5.80	5.77	2.18	1.90	2.04	1.80	1.81	1.63
SE(m) ±	0.43	0.51	0.43	0.09	0.26	0.13	0.14	0.07	0.13
SE(d)	0.60	0.72	0.61	0.13	0.36	0.19	0.19	0.11	0.18
C.D.	1.20	1.43	1.23	0.25	0.72	0.38	0.38	0.21	0.36

Table.3 Effect of organic media, plant growth regulators and different colour of wrappers on roots studies of air layering of Guava.

Treat.	Average fresh weight of roots during 2019-20 (g)	Average fresh weight of roots during 2020-21 (g)	Pooled data average fresh weight of roots (g)	Average dry weight of roots during 2019-20(g)	Average dry weight of roots during 2020-21(g)	Pooled data average dry weight of roots(g)
T_1	1.35	1.11	1.23	0.41	0.37	0.39
T_2	0.97	0.99	0.98	0.38	0.34	0.36
T_3	1.42	1.23	1.33	0.45	0.40	0.42
T_4	1.25	1.32	1.28	0.40	0.42	0.41
T_5	1.20	1.34	1.27	0.39	0.47	0.43
T_6	1.25	1.22	1.24	0.74	0.70	0.72
T_7	1.24	1.17	1.21	0.48	0.44	0.46
T_8	1.37	1.41	1.39	0.67	0.64	0.66
T_9	1.48	1.54	1.51	0.66	0.69	0.68
T_{10}	1.40	1.58	1.49	0.57	0.69	0.63
T_{11}	1.65	1.74	1.69	0.87	0.88	0.87
T_{12}	1.30	1.60	1.45	0.61	0.64	0.63
T_{13}	1.64	1.66	1.65	0.87	0.85	0.86
T_{14}	1.79	1.83	1.81	0.82	0.87	0.84
T_{15}	1.72	1.69	1.70	0.96	0.92	0.94
T_{16}	2.19	2.20	2.20	1.10	1.14	1.12
T_{17}	1.89	1.40	1.65	0.78	0.83	0.81
T_{18}	2.18	2.20	2.19	1.09	1.05	1.07
T_{19}	2.36	2.10	2.23	1.16	1.12	1.14
T_{20}	1.75	2.23	1.99	1.18	1.14	1.16
T_{21}	2.41	2.47	2.44	1.22	1.20	1.21
T_{22}	2.16	2.17	2.17	0.90	0.92	0.91
T_{23}	1.84	2.02	1.93	1.16	1.11	1.13
T_{24}	1.84	1.82	1.83	1.15	1.13	1.14
T_{25}	2.18	2.17	2.18	1.16	1.12	1.14
SE(m) ±	0.14	0.11	0.10	0.03	0.04	0.03
SE(d)	0.20	0.16	0.14	0.05	0.06	0.04
C.D.	0.39	0.31	0.27	0.10	0.12	0.08

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