www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(5): 971-975

www.thepharmajournal.com
Received: 01-02-2023
Accepted: 04-03-2023

Bharanidharan A
Student, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Ranchana P
Assistant Professor, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Gopi V
Assistant Professor, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Patricia Kalaiarasi J
Assistant Professor, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Dinesh Kumar P
Assistant Professor, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Irine Chacko
Student, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Giriprasath RS
Student, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Vishal S
Student, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Krishna Prasanth Y
Student, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Pavethra A
Student, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Corresponding Author:
Ranchana P
Assistant Professor, School of Agriculture and Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu, India

Effect of IBA concentrations and time of air layering of West Indian cherry (*Malpighia glabra* L.) in Coimbatore region

Bharanidharan A, Ranchana P, Gopi V, Patricia Kalaiarasi J, Dinesh Kumar P, Irine Chacko, Giriprasath RS, Vishal S, Krishna Prasanth Y and Pavethra A

Abstract
An investigation was carried out on "Effect of IBA concentrations and time of air layering of West Indian Cherry (*Malpighia glabra* L.) in Coimbatore region during the period 2022 - 2023, at the School of Agricultural Sciences, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu. The result revealed that the minimum number of days taken for root initiation, maximum rooting percentage, maximum number of primary roots, maximum number of secondary roots and maximum length of primary root were observed in the month of August, treated with IBA @ 3000 ppm. Hence, it can be recommended for the successful propagation of West Indian cherry.

Keywords: West Indian cherry, vegetative propagation, air layering, IBA

Introduction
West Indian cherry (*Malpighia glabra* L.), is a tropical fruit species. It is also known as Barbados cherry and Acerola. It belongs to the family Malpighiaceae, the species presumably originated from South Mexico, Central and South America but currently grown in many tropical and sub-tropical regions of Asia. It is a large bushy type plant and it grows up to 3 - 6 m in height (Dey *et al*., 2018) [4]. Kirker *et al*., 2021 has reported that 100 g edible portion of West Indian cherry fruit contains 2000 - 4000 mg of vitamin C. The highest ascorbic acid content of the fruit leads to high antioxidant property (Cruz *et al*., 2019) [1]. Carotenoids, flavonoids and anthocyanins are also found in increased level in this fruit (Prakash and Baskaran 2018) [12]. It can also be propagated through seeds but the germination rate was very poor due to non-viable embryos. Hence, the vegetative propagation is identified as a promising tool for plant multiplication. Cleft or modified crown grafting, air layering, budding, and cuttings were therefore used as vegetative techniques of propagation. The preferred way of vegetative propagation among these various approaches is stem cutting because it is less expensive, quicker, simpler, and doesn't call for specialized skills like other approaches (Caula *et al*., 2008) [2]. In natural habitats, air layering has evolved as a frequent method of vegetative propagation for many species. When a branch hits the ground, it creates adventitious roots, which causes natural layering. The connection with the parent plant is cut at a later time it will grow as a new plant. Layering is more difficult than cutting, but it has the advantage of allowing the propagated portion to continue receiving water and nutrients from the parent plant while growing roots (Hazarika *et al.*, 2021) [5]. Layering involves an interruption of downward translocation of organic substances. The rooting ability of air layered shoots is decided by several factors that vary with the crops, cultivars and biochemical constituents of the clone (*viz*., carbohydrates, nitrogen, sugars, starch, phenols, auxin levels etc.) and the climatic conditions prevailing in the season (*viz*., temperature, relative humidity, rain fall etc.) of layering. All these factors should be at optimum level to attain better rooting of West Indian cherry layers. The success in layering of fruit crops depends upon mother plants, time of layering, rainfall, humidity, temperature, rooting media, growth media, plant growth regulators and care at the time of bark removal by ringing of shoots (Maurya *et al.*, 2012) [8]. These considerations were taken into account and an experiment was carried out to determine the best time to air layering and the right amount of IBA to increase success rates.

Materials and Methods

The experiment was carried out on "Effect of IBA concentrations and time of air layering of West Indian Cherry (*Malpighia glabra* L.) in Coimbatore region during the period 2022 - 2023, at the School of Agricultural Science, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu. It was laid out in Factorial Randomized Block Design (FRBD) with three treatments consisting of IBA with two different concentrations (3000 and 4000 ppm) in four different months (First fortnight of June, July, August and September) respectively.

Selection of plants and shoots for air layering

The air layering was done in nine-year-old West Indian cherry tree. On the selected trees, low-lying branches of pencil thickness (One year old) were chosen for the study purposes. The average length of the selected shoots was 60 cm and showing bark with smooth texture.

Preparation of Indole-3-Butyric Acid (IBA) lanolin paste

1g of IBA powder was weighed on a chemical weighing balance and then put into a beaker to make 1000 ppm of IBA lanolin paste. After that, 5ml of 95% ethyl alcohol was added to the powder and thoroughly shaken to ensure appropriate dissolution. After that, 200g of lanolin paste was heated in a beaker. Transferring the dissolved growth regulator into the melted lanolin paste, the mixture was vigorously swirled or stirred using a magnetic stirrer until the ethanol evaporated. This procedure involved creating a uniform mixture of IBA and lanolin paste.

Method of application

The method of Kumar (2012) [6] was followed for air layering. A bark along with cambium and phloem was removed just below the node leaving the xylem intact. This was accomplished by making two parallel cuts one inch apart with a sharp knife around the stem through the bark and cambium layers. The parallel sections were joined by an incision and the ring of bark was removed exposing the inner wood tissue. The cambial tissue present over the xylem was scrapped to prevent the formation of a callus bridge. The removed portion was covered with ball of sphagnum moss.

Detachment and planting of rooted air layers from mother trees

After the root formation, the rooted layers were given cut at three times to reduce the shock from sudden detachment at a weekly interval and separated from the mother plant after 90 days and required observations were taken after that the air layered saplings were planted in the polybag filled with media [soil, coir pith and FYM (1: 1: 1)] and kept in shade net house.

Result and Discussion

Effect of IBA concentration on rooting parameters

Data presented in (Table 1) revealed that early root initiation was obtained under the treatment C_2 (33.34 days) which was significantly superior over other treatments as well as control (70.30 days). The conversion of starch into simple sugars, which is necessary for the synthesis of new cells and for enhanced respiratory activity in regenerating tissues at the time of root initiation and it was resulted by the addition of auxins in air layering (Nanda 1975) [9]. Significantly the highest percentage of rooted layer (90.00%) was noticed in C_2 (IBA @ 3000 ppm) followed by C_3 (IBA @ 4000 ppm) respectively. Different concentrations of plant growth regulators created variations in rooting. The perusal of data (Table 1) revealed that all plant growth regulators significantly influenced the number of primary and secondary roots in layered plant. Plant layer treated with IBA @ 3000 ppm (C_2) produced maximum number of primary roots per layer (13.66), followed by C_3 (IBA @ 4000 ppm) respectively (7.08). Simultaneously, number of secondary roots was observed highest (57.58) with treatment C_2 (IBA @ 3000 ppm). The increased number of roots may be the result of rooting co-factors accumulating above the ringed portion under the impact of IBA. The same outcomes were noticed by Patil *et al.* (2011) [13] in Guava. Primary root of the air layers was found to be significantly longer with treatment C_2 (8.62 cm), followed by C_3 (7.06 cm). Higher IBA concentrations may cause the roots to grow longer due to hormonal effects and internal material accumulation (Singh 2001) [15] in Guava.

Effect of month of air layering on rooting parameters

The higher percentage of rooted air layer was observed in the month of August (71.11%) and it was followed by the month of September (68.88%). This result was in accordance with the findings of Chandrappa and Gowda (1998) [3] in guava. August month took minimum number of days for root initiation (45.57 days). Maximum number of primary and secondary roots (10.44 and 38.55) per air layer was observed when west Indian cherry air layering was performed in the month of August followed by September and June i.e., 9.44 and 7.88, 37.88 and 36.77, respectively. Considerably maximum length of primary roots per air layer was observed in the August month (7.32 cm) which was significantly superior over all other treatments. According to Nautiyal (2002) [10], the availability of necessary moisture may be the cause of the better success during the monsoon season. The fact that August had the highest rooting percentage indicates that environmental factors such as the steady rise in relative humidity from June to August and the temperature approaching down from high summer temperatures to moderate summer and autumn temperatures had an impact on rooting parameters. Similar result was also observed by Rymbai and Reddy (2014) [14] in guava.

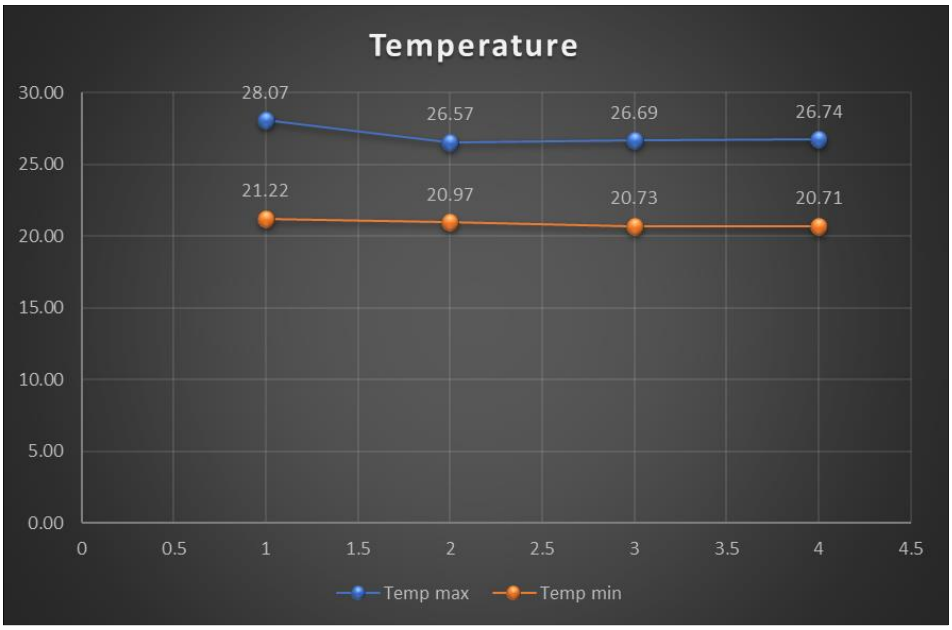

Fig 1: Temperature recorded during study period

Table 1: Effect of IBA concentrations and time of air layering on rooting and root parameters of west Indian cherry layers

Treatment	Days taken for root appearance	Percent rooted layers (%)	No. of primary roots	No. of secondary roots	Length of the primary roots (cm)
T_1 - June	48.30	57.77	7.88	36.77	6.91
T_2 - July	46.20	55.55	7.11	35.00	6.65
T_3 - August	45.57	71.11	10.44	38.55	7.32
T_4 - September	48.55	68.88	9.44	37.88	7.25
SE. d	0.85	5.12	0.59	0.90	0.18
CD	1.78	10.69	1.23	1.88	0.39
C_1 - Control	70.30	30.00	5.41	10.50	5.41
C_2 - IBA @ 3000 ppm	33.34	90.00	13.66	57.58	8.62
C_3 - IBA @ 4000 ppm	37.82	70.00	7.08	43.08	7.06
SE. d	0.74	4.97	0.512	0.78	0.16
CD	1.54	10.38	1.06	1.63	0.34

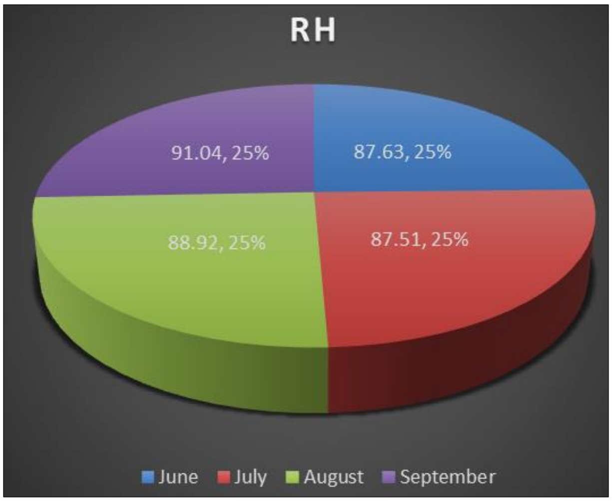

Fig 2: Relative humidity recorded study period

Effect of interaction of IBA and time of air layering on rooting parameters

Fig. 3 revealed that layers prepared in the month of September treated with IBA @ 3000 ppm has taken minimum number of days (31.33) taken for root initiation and followed by layers prepared in the month of August and July (32.35 and 33.36 days). This might be expressed due to the fluctuating weather conditions. Early rooting may have been aided by the presence of high relative humidity along with the occurrence of rain and the ideal temperature. Patel *et al*. (2012) [11] recorded minimum numbers of days taken for root initiation with IBA @ 5000 ppm in Pomegranate air layers. Significantly higher rooting percentage of 100% was observed in the layers treated with IBA @ 3000 ppm prepared in August month and followed by layers prepared in the month of June, July and September (86.67%) as shown in the Fig.4. The depicted data from the Table.2 reveals that the greater number of primary and secondary roots was observed in the layers prepared during August month and treated with IBA @ 3000 ppm (17 and 60.66) and followed by layers prepared in the month of September treated with IBA @ 3000 ppm (15 and 59.66). According to Reddy *et al.* (2014) [14], treatment of IBA @ 3000 ppm by employing sphagnum moss as rooting media in air layers of Fig cv. Poona resulted with maximum number of primary and secondary root production. The length of the primary root was calculated and it was observed that the highest length of the primary root was observed in the layer prepared in the month of August treated with IBA @ 3000 ppm (9.3 cm). The best root quality (Profuse and fibrous) was observed in the layers prepared in the month of July, August and September with IBA @ 3000 ppm.

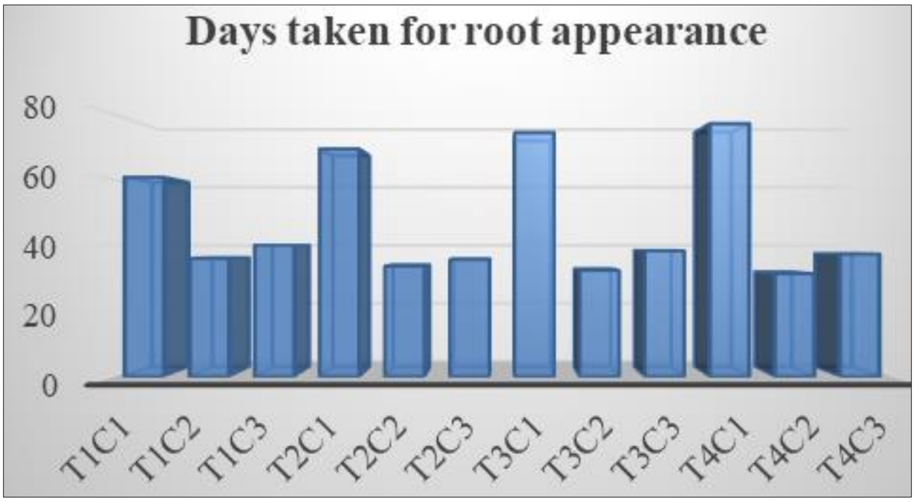

Fig 3: Effect of IBA concentrations and time of air layering on days taken for root appearance in West Indian cherry

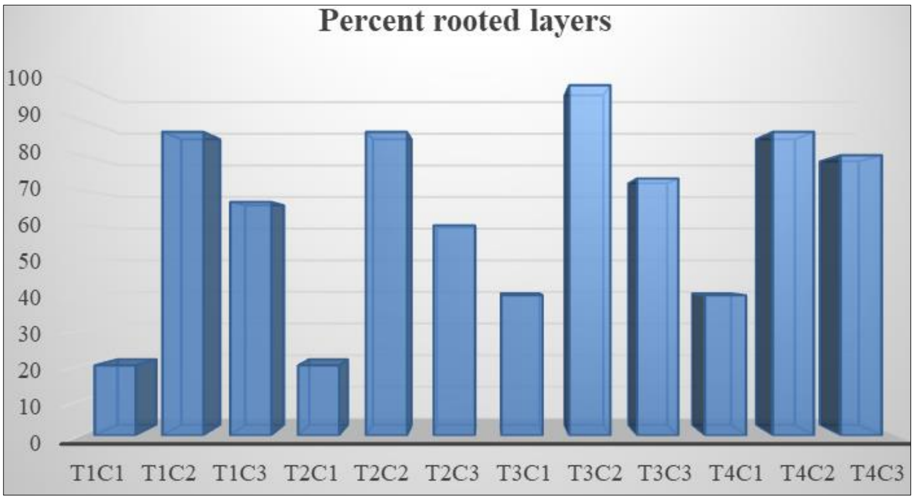

Fig 4: Effect of IBA concentrations and time of air layering on percent rooted air layers in West Indian cherry

Table 2: Interaction effect of IBA concentrations and time of layering on rooting parameters in west Indian cherry air layering

Treatment	No. of primary roots	No. of secondary roots	Length of the primary roots (cm)	Root quality
T_1C_1	5.33	9.67	5.03	Thick and brittle
T_1C_2	12.00	56.33	8.30	Moderate and fibrous
T_1C_3	6.33	44.33	7.40	Moderate and fibrous
T_2C_1	4.67	9.00	4.90	Thick and brittle
T_2C_2	10.67	53.67	8.17	Profuse and fibrous
T_2C_3	6.00	42.33	6.90	Moderate and fibrous
T_3C_1	6.33	11.00	5.80	Thick and brittle
T_3C_2	17.00	60.67	9.30	Profuse and fibrous
T_3C_3	8.00	44.00	6.87	Moderate and fibrous
T_4C_1	5.33	12.33	5.93	Thick and brittle
T_4C_2	15.00	59.67	8.73	Profuse and fibrous
T_4C_3	8.00	41.67	7.10	Moderate and fibrous
SE. d (±)	1.02	1.56	0.32	
CD (0.05)	2.13	3.26	0.68	

Conclusion
The study revealed that August and September months were found to be favourable time for early root initiation and its subsequent development and resulted with an increased rooting percentage. The better rooting parameters and root quality were obtained in the air layers prepared during first fortnight of August and September months treated with IBA @ 3000 ppm.

Acknowledgement
The authors are thankful to the School of Agriculture and science, Karunya Institute of Technology and Sciences (Deemed University), for their support and providing required facilities to carrying this work.

References
1. Cruz RG, Beney PS, Lira TM, Vieira S. Comparison of the antioxidant property of acerola extracts with synthetic antioxidants using an *in vivo* method with yeasts. Food Chemistry. 2019;277:698-705.
2. Caula AB, Robert NT. Plant propagation concepts and laboratory exercises. CRC Press; c2008. p. 394
3. Chandrappa, Gowda NV. Influence of auxins and 1, 2, 3, acid on rooting of guava air layers. Mysore Journal of Agricultural Sciences. 1998;32:59-66.
4. Dey Koyel, Ghosh A, Bauri FK, Bhowmick N, Dey AN, Mishra DK, et al. Barbados cherry: Agriculture, breeding utilization and role in nutritional and economical security- A review. Agricultural Reviews, 2018, 39(2).
5. Hazarika J, Hazarika DN, Langthasa S. Standardization of propagation method of Custard Apple by Air Layering. Journal of Agri search. 2021;8(3):222-228.
6. Kumar R. Off season air layering in litchi: A prudent and efficient approach. Technical Bulletin-6, NRC for Litchi Mushahari, Muzaffarpur, Bihar; c2012. p. 13.
7. Kirker Constance L. and Mary Newman. Cherry. Reaktion Books; c2021
8. Maurya RK, Ray NR, Chavda JC, Chauhan VB and Patil AK. Evaluation of different organic media and water holding materials with IBA on rooting and survival of air layering in guava (*Psidium guajava* L.) cv. Allahabad Safeda. The Asian Journal of Horticulture. 2012;7(1):44-47.
9. Nanda K. Physiology of adventitious root formation. Indian Journal of Plant Physiology. 1975;18:80-90.
10. Nautiyal DP. Vegetative propagation in three important fodder tree species of family Moraceae from Garhwal Himalaya, Ph.D. Thesis submitted to H.N.B. Garhwal University, Srinagar, Uttarakhand, India; c2002
11. Patel DM, Nehete DS, Jadav RG, Satodiya BN. Effect of PGR's and rooting media on air layering of different pomegranate (*Punica granatum* L.) cultivars. The Asian Journal of Horticulture. 2012;7(1):89-93.
12. Prakash A, Baskaran R. Acerola, an untapped functional superfruit: A review on latest frontiers. International Journal of Food Science & Technology. 2018;55:3373-3384.
13. Patil KD, Patel BN, Aklade SA, Patil SJ. Influence of time on ringing, wrappers and IBA on air layering in guava (*Psidium guajava* L.) cv. Sardar. Haryana Journal of Horticultural Sciences. 2011;40(1-2):22-26.
14. Reddy PPN, Ray NR, Patel AD, Patel JS. Effect of rooting media and IBA levels on rooting and survival of air layering of fig (*Ficus carica* L.) cv. Poona under middle Gujarat agro-climatic conditions. The Asian Journal of Horticulture. 2014;9(1):1-5.
15. Singh M. Efficacy of plant growth regulators, their concentrations and wrappers on rooting success and survival of air layered guava twig. Crop Research. 2001;21(2):153-156.
16. Tyagi SK and Patel RM. Effect of growth regulators on rooting of air layering of guava (*Psidium guajava* L.) cv. Sardar guava. Orissa Journal of Horticulture. 2004;32(1):58-62.