Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2021; 10(2): 1198-1200
Received: 12-01-2021
Accepted: 17-02-2021

C Rajamanickam
Department of Horticulture, Agricultural College and Research Institute, Madurai, Tamil Nadu, India

A Beaulah
Department of Horticulture, Agricultural College and Research Institute, Madurai, Tamil Nadu, India

C Ravindran
Department of Horticulture, Agricultural College and Research Institute, Killikulam, Tuticorin, Tamil Nadu, India

Corresponding Author:
C Ravindran
Department of Horticulture, Agricultural College and Research Institute, Killikulam, Tuticorin, Tamil Nadu, India

Effect of IBA on shoot and root production of guava (*Psidium guajava* L.) through softwood cuttings cv. Lucknow – 49

C Rajamanickam, A Beaulah and C Ravindran

DOI: https://doi.org/10.22271/phyto.2021.v10.i2p.13973

Abstract
The study on the Influence of IBA on rooting of guava (*Psidium guajava* L.) through softwood cuttings cv. Lucknow 49 was carried out at College orchard, Department of Horticulture, Agricultural College and Research Institute, Madurai during 2019 – 20 with the aim to identify the best IBA concentration suitable for guava softwood cuttings. Nine levels of IBA *viz*., 250, 500, 1000, 1500, 2000, 3000, 4000, 5000 and 6000 ppm concentrations were prepared and treated with softwood cutting as quick dip method. These cuttings were planted in polybags and kept under mist chamber for sprouting. The study was laid out in a Completely Randomized Block Design (CRD) with nine treatments and three replications. Observations such as sprouting percentage (%), days taken for sprouting (days), number of leaves, shoot length (cm), root length (cm), root weight (g), number of roots per cutting and survival percentage (%) were recorded and analyzed statistically. The results revealed that cuttings treated with IBA solution of 3000 ppm (T6) recorded the highest values of all the traits *viz*., sprouting percentage (75.50 %), least number of days for sprouting (9.79 days), number of leaves (43.52), shoot length (31.6 cm), root length (3.24 cm), root weight (2.1 g), number of roots (7.2) survival percentage (1.85 g) and root dry weight (110.12 mg) followed by T7 (4000 ppm of IBA) whereas the lowest value was recorded in cuttings treated with 250 ppm of IBA (T1) (54.26 %; 25.90 days; 2.8; 4.50 cm; 18.56; 0.68 g; 3.5; 40.58 %; 99.14 mg). From the conclusion of the present study it was concluded that IBA @ 3000 ppm (T6) treated softwood cuttings recorded the highest values in all the traits and this is one of the alternate method of guava propagation for seedling multiplication.

Keywords: Guava, soft wood cuttings, Propagation, IBA concentrations, quick tip method

Introduction
Guava (*Psidium guajava* L.) belongs to the family Myrtaceae, which comprises 3,000 species under 80 genera. It is well distributed in the tropical and subtropical regions of the world, especially in South America, Asia and Australia. In India, it thrives well up to an altitude of 1515 m but the best quality guava is produced in Indo Gangetic plains where low night temperature (10 ºC) prevails during winter season. Besides its high nutritive value, it bears heavy crop every year and gives handsome economic returns. In recent years, guava is getting more popularity in the international trade due to its nutritional value and development of various processed products like jelly, jam, sharbat, ice-cream, cheese, canned fruit, RTS, nectar, squash and powders are prepared from guava fruits. In India, guava is cultivated in an area of 2.6 lakh hectares with a production of 38.26 lakh tonnes and productivity of 14.71 tonnes per hectare during (NHB, 2016-17) [9].

It is propagated commercially by means of both vegetative and direct seedling methods, but the fruits of commercial grade are not obtained. The main reason for this is that guava seedlings do not retain the characteristics of the parents and they bear fruits of variable sizes and quantity though they have long life span, so that to use those plants which have promising features like high performance, tolerance to pests and diseases hence it is necessary using vegetative propagation techniques (Albany *et al.*, 2004) [1]. In direct seedling method, progeny are not uniform due to segregation and recombination of different characters. Moreover, the plants propagated through seeds comes to bearing much later than the plants propagated through vegetative means. Clonal propagation of guava is the possible approach to ascertain uniformity among the progeny and to maintain good quality fruits (Giri *et al.*, 2004) [3]. Initially, true-to-type planting material is a basic need in guava orchards to ensure both quality and quantity of guava fruits. Propagation of guava through air layering and ground layering is a time consuming and hence necessitated a search for alternate but effective means of vegetative propagation. The methods of vegetative propagation have been studied for the purpose of the production chain. In addition to the propagation structure, the costs of new technologies must also be taken into account.

Of late, several woody perennials are successfully and rapidly propagated through use of terminal cuttings. In this context, rapid methods of propagation become very important when planting material is limited due to scarcity of a clone or varieties or due to sudden expansion in acreage. Thus it leads to an idea about the utilization of terminal cuttings towards rapid propagation techniques in guava. With this background, the present experiment on Influence of IBA on rooting of guava (*Psidium guajava* L.) through terminal cuttings cv. Lucknow 49 were investigated at College Orchard, Department of Horticulture, Agricultural College and Research Institute, Madurai during 2019 – 2020.

Material and Methods

The present experiment was conducted during the year 2019 – 20 with an objective to study the influence of different concentrations of IBA for rooting of softwood cuttings in guava. Guava variety Lucknow – 49 used for this study. The experiment comprised of nine levels of IBA concentrations such as 250, 500, 1000, 1500, 2000, 3000, 4000, 5000, 6000 ppm prepared and treated with softwood cutting as quick dip method. The cuttings were made of uniform size of 18 - 20 cm long, having four buds and two cut leaves used for the experiment. 25 softwood cuttings of guava var. Lucknow – 49 were used per replication and totally 75 cuttings per each treatment. The proximal ends of the prepared cuttings were dipped for 10 seconds to each IBA concentrations and in water for control as treatment before they were placed in the experiment plot. The cuttings were placed 8 cm deep in the polybags and kept under mist chamber for sprouting. The experiment was laid out in a Completely Randomized Block Design (CRD) with nine treatments and three replications as per the method suggested by Panse and Sukhatme (1967) [10]. Biometric observations such as sprouting per cent (%), days taken for bud sprouting, number of leaves per cutting, shoot length (cm), root length (cm), root weight (g), number of roots per cutting, survival per cent (%) and dry root weight (mg) were recorded and analysed statistically.

Results and Discussions

The influence of IBA for rooting and shooting of guava cv. Lucknow 49 are presented in Table 1. The present experiment results revealed that the highest sprouting percentage (77.58 %) was recorded during cutting treated with 3000 ppm of IBA (T6), whereas the minimum success percentage (54.26 %) was observed in T1 (250 ppm IBA). The reason might be that application of IBA has been found to stimulate cambial activity thereby resulting the mobilization of reserve food material to the site of root initiation as stated by Gurumurthy *et al.* (1984) [4]. Exogenous application of auxin breaks starch in to simple sugars, which is needed to a greater extent for the production of new cells and for increased respiratory activity in the regeneration tissue at the time of initiation of new root primordia (Nanda, 1975) [8]. The enhanced hydrolytic activity in presence of applied IBA might be responsible for the increased per cent of rooted cuttings. The least days taken for sprouting (17.90 days) was obtained in T6 (3000 ppm of IBA) followed by T7 (19.50 days). The longest days taken for sprouting (25.90 days) were noticed in cuttings treated with 250 ppm of IBA (T1). This might be due to better utilization of stored carbohydrates; nitrogen in the semi hardwood with the IBA application enhanced the IBA concentration in the cell and increased the cell division which results on quick callus formation in the cutting as stated by Chauhan and Reddy (1971) [2] in plum. Similar results were reported by Sivaprakash *et al*., (2018) [15].

Regarding number of leaves per cutting, cutting treated with 3000 ppm of IBA (T6) recorded the highest leaves (5.2) followed by T3 (2000 ppm IBA) whereas the lowest number of leaves (2.80) was observed in T1 (250 ppm). Favorable climatic conditions play an important role to increase the number of leaves. The application of IBA might have played some role in augmenting to increase the number of leaves per cutting (Singh and Singh, 2002) [12]. These findings are in agreement with the findings of Singh *et al*. (2015) [13]. Shoot length recorded the highest in T6 (8.15 cm) followed by T7 (7.70 cm), whereas the lowest shoot length was noticed in cuttings treated with IBA 250 ppm (T1) (4.50 cm). This might be due to the action of IBA, increased concentration and activity of IBA which caused hydrolysis and translocation of carbohydrates and nitrogenous substances in the cellular level at the base of cuttings and resulted in accelerated cell elongation and cell division under favorable environmental condition.

The softwood cuttings treated with IBA 3000 ppm (T6) recorded the highest root length (28.05 cm), whereas the lowest length was recorded the cuttings raised under 250 ppm of IBA (18.56 cm) (T1). This might be attributed that the action of IBA activity which would have caused hydrolysis and translocation of carbohydrates and nitrogenous substances in the cellular level at the base of cuttings and resulted in accelerated cell elongation and cell division under favorable environmental condition. This is in accordance with the findings of Singh *et al.* (2003) [11]; Kareem *et al.* (2016) [6] stated that IBA (4000 ppm) showed the maximum results in terms of shooting per cent, roots number per cutting, normal root length respectively in guava. In the case of root weight, the highest weight was recorded in T6 (1.59 g) followed by T7 (1.51 g), whereas the lowest weight was found in cuttings treated with IBA 250 ppm (T1) (0.68 cm). The same trend was noticed in dry root weight also. The cuttings treated with IBA 3000 ppm (T6) exhibited the highest dry root weight of 110.12 mg followed by T7 (108.15 mg). The lowest weight was found in T1 of 99.14 mg. The increase in root weight might have directly influenced the fresh weight of the roots as reported by Milind (2008) [7] in stevia and Singh and Tomar (2015) [13] in phalsa. Regarding number of roots per cutting, the highest numbers was observed in T6 (7.2 g) followed by T7 (6.70), whereas the lowest number of roots was occurred in cuttings treated IBA 250 ppm (3.50). This might be due to higher root length and shoot length which accumulates more stored carbohydrates and more number of roots increased their volume per cutting of the roots as stated by Hartman (2002) [5]. Similar results were also reported by Singh and Tomar (2015) [13] and Singh *et al*. (2015) [14] in phalsa.

The highest survival per cent was noticed in T6 of 66.54 per cent followed by T7 (62.47 %). The lowest per cent of survival was noticed in IBA 250 ppm treated cuttings (40.58 %). This might be due to production of more number of leaves per cutting, shoots and roots was due to the reason that the plant diverted the maximum assimilate quantities to the leaf buds, since the leaves are one of the production sites of natural auxins besides being very important for vital processes like photosynthesis and respiration (Wahab *et al.*, 2001) [17]. The results are similar with the findings of Soni *et al.* (2016) [16] in hardwood cuttings of guava.

Table 1: Influence of IBA for rooting and shooting of guava cv. Lucknow 49

IBA concentrations	Sprouting per cent (%)	Days taken for bud sprouting (days)	Number of leaves per cutting	Shoot length (cm)	Root length (cm)	Root weight (g)	No. of roots per cutting	Survival per cent (%)	Root dry weight (mg)
T1 – IBA @ 250 ppm	54.26	25.90	2.8	4.50	18.56	0.68	3.5	40.58	99.14
T2 - IBA @ 500 ppm	58.74	24.50	3.1	4.72	19.01	0.75	4.0	42.28	101.25
T3 -IBA @ 1000 ppm	60.25	24.20	3.4	4.98	19.87	0.92	4.6	46.35	102.87
T4 -IBA @ 1500 ppm	68.47	22.80	3.5	5.87	20.58	1.10	5.8	47.25	105.91
T5- IBA @ 2000 ppm	70.89	22.50	4.6	7.54	26.87	1.48	6.4	58.74	106.65
T6 -IBA @ 3000 ppm	77.58	17.90	5.2	8.15	28.05	1.59	7.2	66.54	110.12
T7 -IBA @ 4000 ppm	75.14	19.50	4.8	7.70	27.15	1.51	6.7	62.47	108.15
T8 -IBA @ 5000 ppm	60.85	23.50	2.8	7.04	19.47	1.37	6.1	48.56	105.47
T9 -IBA @ 6000 ppm	62.54	23.00	2.3	6.89	19.56	1.39	5.4	47.58	105.68
SEd	0.41	0.27	0.11	0.581	1.047	0.06	0.10	0.391	21.45
CD (P=0.05%)	0.72	0.51	0.24	1.014	3.015	0.19	0.214	0.584	40.65

Conclusion

On the basis of results revealed from the study, it is concluded that different concentration of IBA significantly influenced the growth parameters of guava terminal cutting. In the present study, IBA 3000 ppm showed highest sprouting percentage, shoot length, root length, sprouting per cent, early sprouts, number of leaves, root weight, dry root weight and survival per cent. Softwood cutting treated with IBA.3000 ppm exhibited better rooting and sprouting performance as compared with other IBA concentrations. Thus, softwood cutting is recommended along with IBA 3000 ppm quick dip for successful propagation of guava cuttings.

References

1. Albany V, Vilchez NRP, Viloria ZJJA, Castro CZJ, Gadea J. Effect of vegetative propagation of guava using air layering technique. Agronomia Tropical (Maracay), 54(1):63-73. Interacademicia, 2004;5:278-281
2. Chauhan KS, Reddy RS. Effect of growth regulators and mist on rooting in stem cutting of plum (*Prunus domestica* L.). Indian J. Hort 1971;25:229-231.
3. Giri C, Shyamkumar B, Anjaneyulu C. Progress in tissue culture, genetic transformation and applications of biotechnology to trees: an overview. Trees, 2004;18(2):115-135.
4. Gurumurthy K, Gupta BB, Kumar A. Hormonal regulation of root formation. In: Hormonal Regulation of Plant Growth and Development (S.S. Purohit Ed.), Agrobotanical Publishers, India 1984, 387-400.
5. Hartmann HT, Kester DE, Davies Júnior FT, Geneve RL. Plant propagation:principles and practices. 7th ed. New Jersey: Prentice Hall 2002, 880.
6. Kareem A, Abdulmanan, Saeed S, Rehman SU, Shahzad U, Nafees M. Effect of different concentrations of IBA on rooting of Guava (*Psidium guajava* L.) in low tunnel under shady situation. Journal of Agriculture and Environment for International Development – JAEID 2016;110(2):197-203.
7. Milind RI. Effect of growth regulators and environments on rooting of stevia cuttings (*Stevia rebaudiana Bertoni*). M.Sc. (Agri.) Thesis, University of Agriculture Sciences, Dharwad 2008.
8. Nanda K. Physiology of adventitious root formation. Indian Journal of Plant Physiology 1975.
9. NHB. Indian Horticulture Database, 2015-16. National Horticulture Board, New Delhi. www.nhb.gov.in. 2016.
10. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi 1967, 381.
11. Singh AK, Singh R, Ashutosh MK, Singh YP, Jahuri S. Effect of plant growth regulators on survival, rooting and growth characters in long pepper (*Piper longum* L.). Propagation Hort 2003;35:208-211.
12. Singh AK, Singh VS. Influence of wood maturity and auxins on the regeneration of Bougainvillea cuttings. Progressive Horticulture 2002;34(2):196-199.
13. Singh KK, Tomar YK. Effect of planting time and indole butyric acid levels on rooting of woody cuttings of Phalsa (*Grewia asiatica* L.). Hort. Flora Respect 2015;4(1):39-43.
14. Singh KK, Chauhan JS, Rawat JMS, Rana DK. Effect of different growing conditions and various concentrations of IBA on the rooting and shooting of hardwood cutting of Phalsa (*Grewia asiatica* l.) under valley condition of Garhwal Himalayas. Plant Arch 2015;15(1):131-136.
15. Sivaprakash M, Rajangam J, Swaminathan V, Venkatesan K. Effect of plant growth regulators on rooting and sprouting of different stem cuttings of guava (*Psidium guajava L.*) cv. Lucknow-49 under mist chamber condition. Madras Agric. J 2018;105(7-9):336-340.
16. Soni N, Pandey SK, Singh SS, Singh SRK, Mishra A, Baghel SS, Kaurav PK. Propagation of guava through cuttage under net house condition at Jabalpur, Madhya Pradesh, India. Flora and Fauna 2016;22(1):36-40.
17. Wahab F, Nabi G, Nawab A, Muslim S. Rooting response of semi-hardwood cuttings of guava (*Psidium guajava* L.) to various concentrations of different auxins. J Bio. Sci 2001;14:1984-1987.