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Bhuriya Verma
Department of Horticulture, Fruit Science, College of Agriculture Gwalior, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Raj Kuamr Dhakad
Department of Vegetable Science, School of Agriculture and Rural Development, BRAUSS Mhow, Madhya Pradesh, India

Poonam Bhadauriya
Department of Horticulture, Fruit Science, College of Agriculture Gwalior, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Usha Parmar
Department of Horticulture, Fruit Science, College of Agriculture Gwalior, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

KS Tomar
Department of Horticulture, Fruit Science, College of Agriculture Gwalior, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

Corresponding Author:
Bhuriya Verma
Department of Horticulture, Fruit Science, College of Agriculture Gwalior, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh, India

A study of different concentration of IBA and NAA on rooting per cent of guawa (*Psidium guajava* L.), air layering

Bhuriya Verma, Raj Kuamr Dhakad, Poonam Bhadauriya, Usha Parmar and KS Tomar

Abstract
The present investigation entitled "A study of different concentration of IBA and NAA on rooting per cent of guawa (*Psidium guajava* L.), air layering.*"* was conducted at the Horticulture farm Nursery, Department of Horticulture, College of Agriculture, Rajmata Vijya Raje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.) during the session 2016 - 2017. The experiment was laid out in Randomized Block Design with 16 treatment combinations consisting of three level of IBA, I_0 = 0 ppm (Control), I_1 = 5,000 ppm IBA, I_2 = 10,000 ppm IBA, I_3= 15,000 ppm IBA and NAA, N_0= o ppm (Control), N_1= 5,000 ppm NAA, N_2 = 10,000 ppm NAA, N_3 = 15,000 ppm NAA. Maximum rooting percent was found significantly under I_3 (15,000 ppm IBA) treatment followed by I_2 and I_1 including control and for NAA treatments N_3 = 15,000ppm NAA was observed significantly higher followed by N_2 = 10,000 ppm.

Keywords: NAA, IBA, rooting percentage and air layering

Introduction
Guava (*Psidium guajava* L.), a native of Tropical America (from Mexico to Peru), is popular fruit crop in India due to its wide climatic adaptability and availability of fruits for long period during the year. In India, the total area under guava cultivation was approximately 255 Thousand Hectares with an estimated annual production of 4048 Lakh Tonnes (Anonymous, 2016). Its fruit is rich in vitamin-C (80 mg of vitamin C in 100g of fruit), Crude fiber (0.9-1.0 g) protein (0.1-0.5 g), carbohydrates (9.1-17 mg), minerals (Ca, P, Fe etc.) and pectin (Kamath *et al.,* 2008). The guava plant comes up well even under the harsh conditions owing to its hardy nature. However, the main constraint in the popularization of guava is the preponderance of seedling progeny as seedling plants do not perpetuate the exact characters of particular superior selection in comparison to the vegetatively propagated fruit trees. Guava can be successfully propagated asexually by cutting (Kuperberg 1953) [6], layering (Manna *et al*., 2004), grafting (Singh *et al*., 2005) and budding (Kaundal *et al*., 1987) [5]. Air layering is only reliable method for guava mass multiplication has an advantage over budding and grafting because, being on its own root the suckering problem is minimized and for stem cutting it require specialized environment conditions such as mist propagation beds (Nelson 1954) [8]. The success in air layering of guava is mainly depends upon mother plant, time of layering, rainfall, humidity, temperature, rooting media, growth media, plant growth regulators and care during removal of bark from shoots. Air-layering is practiced during the month of June-July with good success rates due to the relatively low temperature (23 ˚C to 31 ˚C), high relative humidity (80 to 90%) and rainfall which provides the conducive environment for the root initiation (Ahmed, 1964) [1]. Layers prepared during these months get an additional advantage of longer duration of a favorable season for establishing the layer in the soil after preparation. The percentage of establishment and survival of rooted layers is reported to be poor, mainly due to hormonal imbalance and non-availability of standardized rooting media (Singh, 2002) [12]. Air layering with the help of plant growth regulators and rooting media is reported to stimulate root primordial in the air layers (Tyagi and Patel, 2004) [14]. Plenty of literature is available on these aspects for different fruit crops like pomegranate (Patel *et al*. 2012), litchi (Chawla *et al*. 2012; Das and Prasad, 2014) [3, 4] etc. However, there is a lack of standardization of PGR's doses and their interaction with different rooting media in the important fruit crops like guava.

Material and methods

The experiment entitled 'A study of different concentration of IBA and NAA on rooting per cent of guawa (*Psidium guajava* L.), air layering'. was carried out, during *Rabi* season of 2017-18 at the horticulture nursery, College of Agriculture, Gwalior during the year 2016-17. Gwalior is located at 26˚ 13' N latitude and 78˚ 14' E longitude and 208 meters above mean sea level. The climate of Gwalior is subtropical with hot and dry summers where maximum temperature exceeds 45 ˚C in May and June. The winters are cool and minimum temperature reaches as low as 2 ˚C in December and January; occurrence of frost is expected from the last week of December to the first week of February. Usually the monsoon arrives in the second fortnight of June and lasts till September. Occasionally light rains are expected during winter. The annual rainfall ranges between 650 to 751 mm, most of which received from end of June to end of September. Drought is the common feature due to the scanty and uneven distribution of rainfall. The total of 467 mm rainfall was received during the experimental period. In the present investigation ten healthy branches were selected under each treatment and replicated four times to form the Asymmetrical Factorial Randomized Block Design with16 treatments and 64 plants of guava of uniform vigour and size were selected and about 1 (1-2) years old healthy branches of pencil thickness were selected for air-layering. The length of branches was 45-60 cm and diameter 1 cm approximately, 30 air-layers under each treatment and 1920 under the whole experiment were operated. The growth regulators were prepared in talcum powder base. First of all IBA and NAA with 5,000 ppm strength was prepared. 0.5 gm of growth regulators was weighed on electrical balance and then dissolved in about 10.00 cc absolute alcohol. This solution was then thoroughly mixed with 99.5 gm of talcum powder, IBA and NAA with 10,000 ppm strength was prepared. 1 gm of growth regulators was weighed on electrical balance and then dissolved in about 10.00 cc absolute alcohol. This solution was thoroughly mixed with 99 gm of talcum powder and IBA and NAA with 15,000 PPM strength was prepared. 1.5 gm of growth regulators was weight on electrical balance and then dissolved in about 10.00cc absolute alcohol. The solution was then thoroughly mixed with 98.5 gm of talcum powder. For all treatment same rooting media were used which were prepared with (1:1) Soil+Fym and white colour polythene wrapper was used at the time of operation. After 65 days from the date of air layering prepared, air-layers were detached by making a cut just below the lowest end of the ringed surface with sharp secateurs. The air-layers were brought under shade after detachment and their polythene covers were removed gently. Care was taken to ensure that the roots were not injured at the time of removing polythene wrapper. After this, rooted air-layers were planted in polythene bags containing mixture of soil + FYM + leaf mould (2:1:1).

Table 1: Treatments Combination and concentration

Treatments Combination				Concentration of IBA	Concentration of NAA:
I_0N_0	I_0N_1	I_0N_2	I_0N_3	I_0 = control.	N_0 = control.
I_1N_0	I_1N_1	I_1N_2	I_1N_3	I_1 = IBA@ 5,000ppm.	N_1 = NAA@ 5,000ppm.
I_2N_0	I_2N_1	I_2N_2	I_2N_3	I_2 = IBA@ 10,000ppm.	N_2 = NAA@ 10,000ppm.
I_3N_0	I_3N_1	I_3N_2	I_3N_3	I_3 = IBA@ 15,000ppm.	N_3 = NAA@ 15,000ppm.

Result and discussion

Effect of IBA and NAA on Success in rooting percentage

Commercial adoption of any propagation practice depends upon the rooting percentage success with the technique used. In the present experiment, the success was recorded in percentage on the basis of air-layers rooted under each treatment up of rooting per cent was calculated at the time of detachment i.e. 65 days after operation. The rooting percentage were recorded and statistically analyzed. The results are presented in Table 2 and graphically depicted in Fig.01. Clearly shows that different concentrations of IBA and NAA had significant effect on the rooting percentage. However, their combinations had non- significant effect on the rooting percentage.

The data is observed on rooting percentage was affected by different concentrations of IBA, which significantly increased the rooting percentage over the control. IBA, I_3 (IBA 15,000 ppm) shows maximum rooting percentage (52.08%) followed by (43.56%) inI_2 (10,000 ppm IBA) and (40.20%) in I_1 (5,000 ppm IBA) and was significantly better than all the other treatments as well as control (I_0) with minimum success in rooting percentage 38.33%. In case of effect of NAA, it was observed that the maximum rooting percentage (47.73%) was observed in N_3 (15,000 ppm NAA) followed by (45.21%) inN_2 (10,000 ppm NAA) and (41.87%) in N_1 (5,000 ppm NAA) and was significantly better than all the other treatments as well as control (N_0) with minimum success in rooting percentage 39.37%. The interaction of IBA and NAA indicate that, the maximum success rooting percentage (57.50%) were observed in I_3N_3 (15,000 ppm IBA + 15,000 ppm NAA) were observed (53.33%) in I_3N_2 (15,000 ppm IBA + 10,000 ppm NAA) While, the minimum rooting percentage (31.66%) were observed under I_0N_0 (Control).

Table 2: Effect of different concentration of IBA, NAA on success in rooting percentage

	Success in rooting percentage (%)				
Treatment	**I_0**	**I_1**	**I_2**	**I_3**	**Mean**
N_0	31.66	37.50	41.66	46.66	39.37
N_1	35.83	39.16	41.66	50.83	41.87
N_2	40.83	41.66	45.00	53.33	45.21
N_3	45.00	42.50	45.91	57.50	47.73
Mean	38.33	40.20	43.56	52.08	

	I	N	I*N
SE(m)±	0.816	0.816	1.632
CD(5%)	2.326	2.326	NS

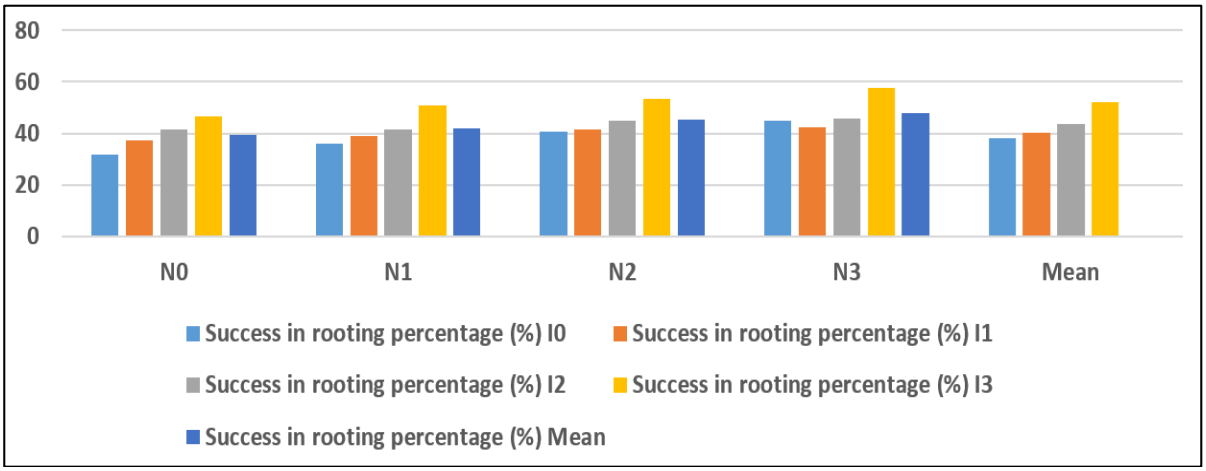

Fig 1: Effect of different concentration of IBA, NAA on success in rooting percentage

It might have been due to good drainage and high porosity that helped in the development of excellent root system. Such media enhances apical meristematic activities and also triggers cambial cell division. It also reflects that these combinations might have provided favorable physical conditions for sufficient nutrients access which are needed for activating enzymatic and biochemical processes. The present investigations are in conformity with the results of Shrivastava *et al.* (1998), Rajput and Senjaliya (2015) [9] and Sinish *et al.* (2005) in citrus, and Singh *et al.* (2007) [13], Maurya *et al.* (2012) [7] and Rymbai *et al.* (2012) [10] in guava.

Conclusion

In general, it was concluded that the media I_3, IBA (15,000 ppm IBA) followed by I_2 comprising of (10,000 ppm IBA) was superior over rest of the IBA under study, which significantly influenced the rooting, growth and survival of air layers of guava.

As regards NAA treatment N_3 = 15,000ppm NAA was observed superior followed by N_2= 10,000 ppm NAA showed significant effect on rooting, growth and survival of air layers of guava.

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