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**Sachin Kumar**

Department of Horticulture,  
Sardar Vallabhbhai Patel  
University of Agriculture and  
Technology, Meerut, Uttar  
Pradesh, India

**Satya Prakash**

Department of Horticulture,  
Sardar Vallabhbhai Patel  
University of Agriculture and  
Technology, Meerut, Uttar  
Pradesh, India

**Yogesh Prasad**

Department of Horticulture,  
Sardar Vallabhbhai Patel  
University of Agriculture and  
Technology, Meerut, Uttar  
Pradesh, India

**Arvind Kumar**

Department of Horticulture,  
Sardar Vallabhbhai Patel  
University of Agriculture and  
Technology, Meerut, Uttar  
Pradesh, India

**Pooran Chand**

Department of Genetics and  
Plant Breeding, Sardar  
Vallabhbhai Patel University of  
Agriculture and Technology,  
Meerut, Uttar Pradesh, India

**BP Dhyani**

Department of Soil Science,  
Sardar Vallabhbhai Patel  
University of Agriculture and  
Technology, Meerut, Uttar  
Pradesh, India

**Corresponding Author:****Sachin Kumar**

Department of Horticulture,  
Sardar Vallabhbhai Patel  
University of Agriculture and  
Technology, Meerut, Uttar  
Pradesh, India

## Effect of IBA and boric acid treatments on rooting and growth of stem cutting in pomegranate (*Punica granatum* L.)

**Sachin Kumar, Satya Prakash, Yogesh Prasad, Arvind Kumar, Pooran Chand and BP Dhyani**

**Abstract**

The present study was conducted at Horticultural Research Centre (HRC) of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, Uttar Pradesh, during 2016 and 2017. The experiment was laid out using Factorial RBD with IBA treatments (i.e. control, IBA 1000 ppm, IBA 2000 ppm, IBA 1000 ppm + Boric Acid 1%, IBA 2000 ppm + Boric Acid 1%). The stem cuttings when treated with IBA 2000 ppm + Boric acid 1% had recorded significantly highest shoot and root growth of stem cutting in pomegranate. However, among the IBA and Boric acid treatments applied to stem cuttings, poor shoot and root growth of stem cutting.

**Keywords:** Pomegranate, cutting, IBA, boric acid, shoot and root growth

**Introduction**

Pomegranate (*Punica granatum* L.) is grown in tropical and subtropical regions of the world. However, it can easily grow in temperate regions also. The total area under cultivation of pomegranate in India is 1.07 lakhs ha and production around 0.743M tons (NHB, 2018). Maharashtra is the leading producer of pomegranate followed by Karnataka, Andhra Pradesh, Gujarat and Tamil Nadu. Ganesh, Bhagwa, Ruby, Arakta and Mridula are the different varieties of pomegranates produced in Maharashtra. In India, pomegranate is commercially cultivated in Solapur, Sangli, Nasik, Ahmednagar, Pune, Dhule, Aurangabad, Satara, Osmanabad and Latur districts of Maharashtra; Bijapur, Belgaum and Bhagalkot districts of Karnataka and to a smaller extent in Gujarat, Andhra Pradesh and Tamil Nadu.

The pomegranate is propagated seed, cutting, layering, offshoot at the base of tree and by grafting. Cutting is the most used form of multiplication in pomegranate. Propagation by cuttings is simple and works well. Pomegranates can be propagated from softwood or hardwood cuttings. Hardwood cuttings are the preferred means of propagation, but softwood cuttings collected in early fall can be used with varying degrees of success. A tree from a hardwood cutting will bear fruit in year two after planting, while it will take at least three years from seed. Trees will reach maturity in five to seven years, and can live up to 200 years. This study helps in standardizing IBA and boric acid conc. for rooting and growth of stem cuttings in pomegranate.

**Materials and methods**

The present investigation was conducted at Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, 250110 (UP), during 2016 and 2017. Geographically, University is located at 29.01° North latitudes, 77.75° East longitudes at an altitude of 237 meter above from mean sea level (MSL). The field experiment was conducted in a Factorial Randomized Block Design (RBD), replicated thrice during 2016 and 2017. The experimental materials included five treatment combinations (i.e. control, IBA 1000 ppm, IBA 2000 ppm, IBA 1000 ppm + Boric Acid 1%, IBA 2000 ppm + Boric Acid 1%).

**Results and discussion**

The vegetative traits of stem cutting were favorably influenced by IBA and boric acid. The effect of IBA and boric acid treatments on bud sprouting in stem cutting of pomegranate was observed that the stem cuttings of pomegranate when treated with 2000 ppm IBA + 1% Boric acid had significantly earliest sprouting (12.25 and 12.19 days) under shade condition. However, control cuttings had sprouted very late (17.39 and 17.56 days) in open condition. Among the treatments applied,

Significantly maximum vegetative growth of cuttings in terms of shoot number (5.13 and 5.27) and mean shoot length (52.94 cm and 54.26) was recorded with '2000 ppm IBA + 1% Boric acid'. The positive influence of pre-planting treatments (IBA and boric acid) on growth of stem cutting was also reported by Lata (2015) [13], who observed that stem cuttings of pomegranate when treated with IBA 2000 ppm + 1% Borax had maximum number of shoots (6.74/cutting), shoot length (45.00 cm) and number of leaves (203.57) after 90 days of transplanting, while control cutting had poorest shoot growth among the treatments. Upadhyay and Badyal (2007) [23] and Damar *et al.*, (2014) [4] also reported that stem cutting of pomegranate when treated with 2000 ppm IBA had maximum shoot growth in respect of number of shoots, plant height and total number of leaves. The significant response of IBA on growth of stem cutting as observed in the present study has also been reported by Raut *et al.*, (2015) [18] who have reported that IBA application at 2500 ppm in stem cutting of pomegranate gave maximum shoot growth. However, Kumari *et al.*, (2013) [13]; Kaur and Kaur, 2016 [9] and Kamboj *et al.*, (2017) [7] observed significantly better shoot growth of stem cutting with lower concentration of IBA (500-1000 ppm) and 1% boric acid in terms of shoot number, shoot length, shoot diameter, number of leaves and total leaf area.

Other researchers have also reported the significant effect of rooting hormone (IBA) on vegetative growth of stem cutting in pomegranate (Poudel, 2018 [16]; Kumar *et al.*, 2017 [10]; Kumari, 2012 [11]; Barde, 2010 [3]; Ram *et al.*, 2005 [17]; Bankar and Prasad, 1992 [2]; Baloni *et al.*, 2017 [1]; Umrao, 1999 [22] and Panwar *et al.*, 2001 [14]). However, in the other crop (Fig), Kaur and Kaur, (2017) [8] had recorded maximum shoot growth of stem cutting with higher concentration (3000 ppm) of IBA.

Advancement in bud sprouting in cuttings treated with 2000 ppm IBA + 1% Boric acid in the present study may be due to the fact that among the synthetic auxins, IBA is more effective in inducing adventitious root formation in stem

cutting (Hartmann and Kester, 1986) [5]. It has been confirmed that auxin is a requirement for initiation of adventitious roots on stem cuttings (Hartmann and Kester, 1986) [5] which has resulted in early sprouting in cuttings treated with IBA.

The root growth of stem cutting was significantly affected the application of IBA and boric acid treatments to the cuttings.

Of the IBA and boric acid treatments applied in the present study, significantly maximum root growth of cuttings in terms of root number (40.89 and 41.00), mean root length (27.68 cm and 27.90 cm), mean root diameter (1.58 mm and 1.61 mm) and percent root dry weight (71.40% and 71.99) was recorded with '2000 ppm IBA + 1% Boric acid'.

The significant effect of IBA and boric acid on root growth of stem cutting as observed in the present study has also been reported by Lata (2015) [13] and Upadhyay and Badyal (2007) [23], who have observed that 2000 ppm IBA application with and without 1% boric acid had significantly increased the maximum number of roots (38.87/cutting) and root length (33.92 cm) in cuttings after three months of planting respectively, while control cuttings had poorest root growth among the treatments. The findings of the study also confirmed the findings of Damar *et al.*, (2014) [4], Kaur and Kaur (2016) [9] and Kamboj *et al.*, (2017) [7] who have recorded significantly maximum root growth of stem cuttings (i.e. number of roots, length of roots, diameter of roots, fresh weight of roots and dry weight of root) with 1000-2000 ppm IBA.

Other researchers also supported the favourable effect of IBA on root growth of cuttings (Poudel, 2018 [16]; Baloni *et al.*, 2017 [1]; Kabir *et al.*, 2017 [6]; Seiar, 2016 [19]; Raut *et al.*, 2015 [18]; Tomar, 2011 [21]; Singh, 2013; Kumar *et al.*, 2017 [10]; Parmar, 1990 [15] and Kumari *et al.*, 2013 [11]). However, Sharma *et al.*, (2009) observed the significant effect of IBA on root growth of pomegranate cuttings at higher concentration (5000 ppm). In other crop (Fig) also, higher concentration (3000 ppm) of IBA was found effective in increasing the root growth of cutting (Kaur and Kaur, 2017) [8].

**Table 1:** Effect of IBA and Boric acid on Days for bud sprouting, sprouting, number of shoots and mean shoot length

Treatments	Days taken for bud sprouting		Sprouting %		Number of shoots		Mean shoot length (cm)	
	2016	2017	2016	2017	2016	2017	2016	2017
Control	17.39	17.56	93.3	88.3	2.79	2.87	22.32	23.37
IBA1000	13.82	14.01	95.6	95.5	4.21	4.37	46.75	47.20
IBA2000	12.68	12.97	97.8	100.0	4.68	4.78	50.25	50.64
IBA1000+1% Boric Acid	13.18	13.34	96.7	95.5	4.58	4.74	49.43	49.42
IBA2000+1% Boric Acid	12.25	12.19	97.8	100.0	5.13	5.27	52.94	54.26

**Table 2:** Effect of IBA and Boric acid on Number of primary roots, mean root length, mean root diameter, percent dry weight of root.

Treatments	Number of primary roots		Mean root length (cm)		Mean root diameter (mm)		Percent dry weight of root	
	2016	2017	2016	2017	2016	2017	2016	2017
Control	14.36	14.07	11.83	11.97	0.58	0.61	56.00	56.56
IBA1000	35.45	35.36	23.59	23.52	1.12	1.14	65.98	66.41
IBA2000	38.09	38.03	25.20	25.28	1.35	1.36	67.65	68.21
IBA1000+1% Boric Acid	39.55	39.71	26.30	26.56	1.44	1.46	68.73	69.11
IBA2000+1% Boric Acid	40.89	41.00	27.68	27.90	1.58	1.61	71.40	71.99

## Conclusion

Based on the results of two years study, it can be inferred that the stem cuttings of pomegranate when treated with 2000 ppm IBA + 1% Boric acid had recorded significantly earliest sprouting and maximum sprouting percent, shoot and root growth of stem cuttings in pomegranate. However, among the IBA Boric acid treatments applied to stem cuttings, poorest

shoot and root growth of stem cutting were observed grown in control.

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