



ISSN (E): 2277- 7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; 11(3): 1979-1981  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 06-12-2021

Accepted: 19-02-2022

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## Effects of different plant growth regulators on rooting of hardwood cuttings of pomegranate (*Punica granatum* L.) under shade net condition

**Dhannajay Kumar, UB Deshmukh, MS Paikra, MK Chandrakar, Dikeshwar Nishad and Anil**

### Abstract

Present investigation entitled “Effects of different plant growth regulators on rooting of hardwood cuttings of pomegranate (*Punica granatum* L.) under shade net condition” was carried out under shade net condition in Instructional and Research Farm Bharregaon under work in Pt. K.L. Shukla College of Horticulture and Research Station, Rajnandgaon, (C.G.)2020-21 The experiment comprises of eleven treatments consisting of five treatments of IBA and five treatments NAA one control that is T<sub>0</sub>(Control), T<sub>1</sub>(IBA500ppm), T<sub>2</sub> (IBA1000ppm), T<sub>3</sub>(IBA1500ppm), T<sub>4</sub>(IBA2000ppm), T<sub>5</sub>(IBA2500ppm) and T<sub>6</sub> (NAA500ppm), T<sub>7</sub>(NAA1000ppm), T<sub>8</sub>-(NAA1500ppm), T<sub>9</sub>-(NAA2000ppm), T<sub>10</sub>-(NAA2500ppm), in case of the with a replicated three in a complete randomized design (CRD). The overall best performance was observed in different concentration of PGR T<sub>5</sub> for rooting and survival percentage. Number of roots per cutting (46.86), Length of roots (29.92 cm), Diameter of roots (1.44mm), Fresh weight of root (1.35 gm), Dry weight of root (0.91 gm), Survival percentage (80.00%).

**Keywords:** Pomegranate, IBA, NAA survival and rooting parameters

### Introduction

Pomegranate (*Punica granatum* L.) belonging to family Punicaceae is an ancient fruit originated in Persia, Afghanistan and Baluchistan (De Candolle, 1967) [3] and is also thought to be indigenous to the region of Iran but later spread to Mediterranean countries. Pomegranate is the most popular fruit and cultivated in Tropical and Sub-Tropical parts of the world.

The fruit is widely grown in countries such as Spain, Morocco, Egypt, Iran, Afghanistan, Baluchistan and also to some extent in Burma, China, Japan, the U.S.A. and India. It is grown to a limited extent as a cultivated crop in selected areas in almost all the states of India. Maharashtra has more than two-thirds of the area, while other states like U.P., A.P., Gujarat, Rajasthan, Karnataka, and Tamil Nadu share the rest. In India pomegranate production is 2329 thousand MT from an area of 264 thousand hectares and. (Anonymus, 2019-20)

Chhattisgarh pomegranate distribution on Raipur, Balaudabajar, Mahasamund, Durag, Balod, Bametara, Rajnandgaon, Kabirdham, Jagdalpur, Kanker, Dantewada, Mungeli, Janjgir-champa, Korba, Raigard, Jaspur, Surajpur in Chhattisgarh pomegranate production 6.055 thousand MT. from an area 0.896 thousand hectares Rajnandgoan, pomegranate is cultivation for area of 0.062 thousand ha. With production of 0.155 thousand MT. (Directorate horticulture and farm forestry Chhattisgarh 2020-21).

Chemical composition of pomegranate fruits recorded that the edible parts represented 52% of the total fruit weight, comprising 78% juice and 22% seeds (EI- Nembr *et al*, 1990). Hundred gram of edible portion of pomegranate contain moisture (78.0 g), protein (1.60 g), fat (0.10 g), minerals (5.10 g), phosphorus (0.07 g), iron (0.30 mg), riboflavin (100 mg) and vitamin C (16 mg) (Sheikh, 2006) [6].

Pomegranate is propagated by both sexual and asexual means. Rhizogenesis is the most habitually used organogenetic phenomenon in vegetative multiplication of pomrgranate. Pomegranates can be propagated using both softwood or hardwood cuttings, but hardwood cuttings are commercially adopted methods. IBA is the most important plant growth regulators (PGR) generally employed for induction and development of rooting in cuttings.

### Materials and Methods

The research was conducted at the Horticultural Research cum Instructional farm Bharregaon,

Pt. K.L.S. College of Horticulture and Research Station, Pendri, Rajnandgaon, I.G.K.V. Raipur, (CG.), during the year 2020-2021. It consisted of carried out in a completely randomized design (CRD) with three replications. And each replication 11 treatments, Total number of cutting per treatment 10, Total number of cutting 330.

**Table 1:** Treatment details

S.no	Notation	Concentration (ppm)
1	T <sub>0</sub>	Control (Dipped in distilled water)
2	T <sub>1</sub>	IBA500ppm
3	T <sub>2</sub>	IBA1000ppm
4	T <sub>3</sub>	IBA1500ppm
5	T <sub>4</sub>	IBA2000ppm
6	T <sub>5</sub>	IBA2500ppm
7	T <sub>6</sub>	NAA500ppm
8	T <sub>7</sub>	NAA1000ppm
9	T <sub>8</sub>	NAA1500ppm
10	T <sub>9</sub>	NAA2000ppm
11	T <sub>10</sub>	NAA2500ppm

## Result and Discussion

The survival percentage and roots parameters of pomegranate can be defined as the percentage of survival of alive cutting pomegranate and number of roots per cutting, length of roots (cm), diameter of roots (mm), Fresh weight of roots (gm), and dry weight of roots (gm). It was recorded after 90 days of planting the cutting. "The data presented in table 2. shows that the survival percentage of cuttings ranged from 53.33 to

80.00% the maximum survival percentage of cutting was observed under T<sub>5</sub> IBA2500 ppm (80.00%) which were followed by T<sub>10</sub> NAA2500 ppm (76.66%) and T<sub>4</sub> IBA 2000 ppm (73.33%) Whereas, minimum percentage of success of cuttings was recorded under control (53.33%) T<sub>0</sub>. Cuttings treated with IBA 2500 ppm had the best survival rate, owing to the establishment of an efficient root system absorption (Reddy *et al.*, 2008)<sup>[5]</sup>.

The data presented in table 2 shows that the number of roots per cutting ranged from 21.93 to 46.86 the maximum value of these parameter was noticed under treatment T<sub>5</sub> IBA 2500 ppm (46.86) which was followed by T<sub>4</sub> IBA 2000 ppm (43.40). Significantly lowest number of roots per cuttings was recorded with treatment T<sub>0</sub> control (21.93). The impact of this therapy on cell wall plasticity which speeds up cell division and boosts callus production and root growth, might explain the results (Weaver, 1972)<sup>[8]</sup>.

The data presented in table 2 shows that the length of roots ranged from 18.44 to 29.92. The maximum length of roots per cuttings was observed under T<sub>5</sub> IBA2500 ppm (29.92) which were followed by T<sub>4</sub> IBA2000 ppm (28.34) and T<sub>10</sub> NAA2500 ppm (28.16) whereas minimum length of roots per cuttings was recorded under control T<sub>0</sub> (18.44). The difference in auxins could be attributable to other variables, such as IBA higher stability and slower rate of conjugation, which means that the free IBA necessary to promote roots will be present for a longer time than and NAA (Krisantini *et al.* 2006)<sup>[4]</sup>.

**Table 2:** Effects of different plant growth regulators on survival percentage of cuttings, number of roots percuttings, length of roots cuttings

Notation	Treatments details	Survival %	No of roots cuttings	Length of roots cuttings(cm)
T <sub>0</sub>	Control (Dipped in distilled water)	53.33	21.93	18.44
T <sub>1</sub>	IBA500ppm	60.00	28.93	21.94
T <sub>2</sub>	IBA1000ppm	66.66	36.60	23.77
T <sub>3</sub>	IBA1500ppm	70.00	37.26	25.92
T <sub>4</sub>	IBA2000ppm	73.33	43.40	28.34
T <sub>5</sub>	IBA2500ppm	80.00	46.86	29.92
T <sub>6</sub>	NAA500ppm	56.66	25.13	20.80
T <sub>7</sub>	NAA1000ppm	63.33	31.93	22.50
T <sub>8</sub>	NAA1500ppm	66.66	36.73	24.47
T <sub>9</sub>	NAA2000ppm	70.00	39.06	27.16
T <sub>10</sub>	NAA2500ppm	76.66	39.93	28.16
S.Em±		3.17	1.34	0.81
CD(5%) =		9.38	3.95	2.40
CV (%) =		8.22	6.58	5.71

The data presented in table 3 shows that the diameter of roots ranged from to 0.87 to 1.44 The the higher diameter of roots per cuttings of pomegranate was recorded in the treatment T<sub>5</sub> IBA 2500 ppm (1.44) which were followed by T<sub>4</sub> IBA 2000 ppm (1.34) and T<sub>10</sub> NAA 2500 ppm (1.26), The lower diameter of roots per cuttings of pomegranate was noted significantly under treatment T<sub>0</sub> control (0.87). Which helps the plants to grow a healthy root system with an increased diameter of the roots. The results obtained are in accordance with the previous results of Patil *et al.* (2001) in pomegranate. The data presented in table 3 shows that the fresh weight of roots ranged from to 0.81 to 1.35 the maximum fresh weight of roots per cutting was observed under T<sub>5</sub> IBA2500 ppm (1.35) which were followed by T<sub>4</sub> IBA 2000 ppm (1.31) and T<sub>10</sub> NAA 2500 ppm (1.28) Whereas, minimum percentage of success of cuttings was recorded under control T<sub>0</sub> (0.81). Increase in fresh weight of roots was probably due to

increased root number, length of roots which is evident from tables and the varietal and climatic differences during the study in relation to chemical regimes were reflected in producing heavier roots which inturn increased fresh weight of roots. The increase in number of roots and length of roots have directly influenced the fresh weight of roots. Saed (2010)<sup>[7]</sup> in pomegranate.

The data presented in table 3 shows that the dry weight of roots ranged from to 0.45 to 0.91 the maximum dry weight of roots per cutting was observed under T<sub>5</sub> IBA 2500 ppm (0.91) which were followed by T<sub>4</sub> IBA 2000 ppm (0.85) and T<sub>10</sub> NAA 2500 ppm(0.82) Whereas, minimum dry weight of roots per cuttings was recorded under control(0.45) T<sub>0</sub>. The results indicate that cuttings of different growth regulators higher amounts of stored carbohydrates when coupled with IBA and NAA increased the number of roots resulting in higher dry weight of roots accumulation. Saed (2010)<sup>[7]</sup> in pomegranate.

**Table 3:** Effects of different plant growth regulators on diameter of roots, Fresh weight of roots, Dry weight of roots

Notation	Treatments details	Diameter of roots cuttings (mm)	Fresh weight of roots cuttings (g)	Dry weight of roots cuttings (g)
T <sub>0</sub>	Control (Dipped in distilled water)	0.87	0.81	0.45
T <sub>1</sub>	IBA500ppm	1.10	1.17	0.66
T <sub>2</sub>	IBA1000ppm	1.15	1.21	0.73
T <sub>3</sub>	IBA1500ppm	1.22	1.26	0.78
T <sub>4</sub>	IBA2000ppm	1.34	1.31	0.85
T <sub>5</sub>	IBA2500ppm	1.44	1.35	0.91
T <sub>6</sub>	NAA500ppm	1.05	1.15	0.63
T <sub>7</sub>	NAA1000ppm	1.11	1.19	0.67
T <sub>8</sub>	NAA1500ppm	1.16	1.23	0.73
T <sub>9</sub>	NAA2000ppm	1.24	1.26	0.78
T <sub>10</sub>	NAA2500ppm	1.26	1.28	0.82
S.Em±		0.02	0.01	0.01
CD(5%) =		0.08	0.03	0.02
CV(%) =		4.03	1.52	2.29

### Conclusion

On the basis of experimentation on “Effects of different plant growth regulators on rooting of hardwood cuttings of pomegranate (*Punica granatum* L.) under shade net condition” higher survival percentage of pomegranate hardwood stem cuttings was recorded. Significantly higher root growth (number of roots per cuttings, length of roots per cuttings, diameter of roots per cuttings, fresh weight of roots per cuttings and dry weight of roots per cuttings) were recorded under IBA 2500ppm is best.

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