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## Effect of IBA and rooting media for success and survival hardwood cutting of pomegranate under protected condition

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### Abstract

The presented experiment entitled “Effect of IBA and rooting media for success and survival hardwood cutting of pomegranate under protected condition” were carried out during 2018-2019 at Instructional Cum Research Farm, Department of Horticulture, Collage of Agriculture, Badnapur. The present experiment laid out in Factorial Randomized Block Design with 12 treatment combination of two factors like, rooting media i.e. Red soil + FYM (2:1), Black soil + FYM (2:1), Sand + FYM (2:1) and Coco peat + FYM (2:1) and IBA i.e. 1500 ppm, 3000 ppm and 4500 ppm and replicated three times. The study revealed that significant difference among all rooting media for different rooting parameters. Among all the four rooting media studied, mixture of coco peat + FYM performed superior in almost all parameters. viz. number of days taken for first sprouting observation taken after planting of cutting. The success percentages of rooted cutting at 30 DAP. The percentage of rooted cutting, number of root per cutting, length of longest root per cutting, fresh weight of root at 90 DAP. The survival percentage of rooted cutting, number of leaves per cutting at 30, 60 and 90 DAP. The present investigation can be concluded that the cutting treated with IBA 4500 ppm and grown in mixture of coco peat + FYM gave maximum effect on root formation.

**Keywords:** IBA, rooting media, cutting, coco peat

### Introduction

Pomegranate (*Punica granatum* L.) is an important fruit crop of the Tropical and Subtropical regions belonging to the family Punicaceae and genus Punica. It is semi-arid fruit crop. The pomegranate is widely considered to have been originated in Iran and has been cultivated since ancient times. Today is widely cultivated throughout Iran, India the drier parts of South-East Asia, Malaya, the East Indies and dry hot areas of the United State and Latin America. Its cultivation is possible even marginal degraded land earlier found as unsuitable for growing crop. Its ability with stand soil salinity and water to some extent made this crop as hardy fruit crop. Pomegranate fruit bears to deciduous shrub or small tree. In India mainly cultivated varieties like Ganesh, Mridula, Bhagwa, Dholka, Jyoti, Muscat, Jodhpur Red, Ruby Red, etc. growing different agro-climatic conditions.

Pomegranate is commercially grown for its delicious, refreshing with sweet- acidic taste. Pomegranate is also processed to make product like fruit juice, concentrate and beverage, wine, syrup and jelly. The 'Anardana' is also prepared from pomegranate.

Indole Butyric Acid (IBA) is the synthetic plant hormone. It is active in inhibiting axillary bud break on developing shoots, and it stimulates the root initiation. It promotes cell elongation which helped to increase in root length. It is a leading plant hormone used to generate new roots in the cloning of plants through cuttings. Some factors that affect the rooting of pomegranate cuttings are physiological condition of the parent plant, cutting type, season of cutting, rooting medium and use of rooting hormones (Polat and Caliskan, 2009)<sup>[1]</sup>. Suitable medium for cutting establishment should have enough moisture and good aeration. Use of optimum rooting media and optimum concentration of IBA would help in rapid multiplication of pomegranate cuttings.

### Materials and Methods

The present investigation entitled “Effect of IBA and rooting media for success and survival hardwood cutting of pomegranate under protected condition” was carried out during

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2018-2019 at Instructional Cum Research Farm, Department of Horticulture, College of Agriculture, Badnapur. Tal. Badnapur, Dist. Jalna under Vasant Rao Naik Marathwada Krishi Vidyapeeth Parbhani. The details about material used and methods adopted during the course of investigation are given below.

**Factor 1: Rooting media (A): 4 Levels.** A1: Red soil + FYM (2:1). A2: Black soil + FYM (2:1). A3: Sand + FYM (2:1). A4: Coco peat + FYM (2:1),

**Factor 2: Rooting Hormone (B): 3 Levels.** B1: IBA - 1500 ppm. B2: IBA - 3000 ppm. B3: IBA - 4500 ppm. 3.2.3

#### Treatment Combination

A1B1: Red soil + FYM (2:1) + IBA @ 1500 ppm, A1B2: Red soil + FYM (2:1) + IBA @ 3000 ppm, A1B3: Red soil + FYM (2:1) + IBA @ 4500 ppm, A2B1: Black soil + FYM (2:1) + IBA @ 1500 ppm, A2B2: Black soil + FYM (2:1) + IBA @ 3000 ppm, A2B3: Black soil + FYM (2:1) + IBA @ 4500 ppm, A3B1: Sand + FYM + (2:1) + IBA @ 1500 ppm, A3B2: Sand + FYM + (2:1) + IBA @ 3000 ppm, A3B3: Sand + FYM + (2:1) + IBA @ 4500 ppm, A4B1: Coco peat + FYM (2:1) + IBA @ 1500 ppm, A4B2: Coco peat + FYM (2:1) + IBA @ 3000 ppm, A4B3: Coco peat + FYM (2:1) + IBA @ 4500 ppm. The experiment was conducted in Factorial Randomized Block design with twelve treatments which were replicated thrice. Five cuttings were selected randomly from each treatment of each replication. These five cuttings were labeled for recording observation through the study.

#### Result and Discussion

Observations were recorded on root parameters for five cuttings in each treatment and in each replication. The data

recorded was subjected to statistical analysis to get information on mean performance.

#### Effect of IBA and rooting media on percentage of rooted cuttings

##### Effect of rooting media

The data in respect of percentage of rooted cuttings (Table 1) were found to be significantly maximum percentage of rooted cutting in treatment A4 (81.71%) cuttings grown in a mixture of coco peat + FYM and significantly followed by cuttings grown in a mixture of black soil + FYM recorded in treatment A2 (75.12%) and significantly minimum percentage of rooting recorded in treatment A1 (70.86%) was found in cuttings grown in red soil + FYM. The maximum percentage of rooted cuttings which might be perhaps due to the release of phenolic compounds from the coco peat (Lokesh et al., 1988) [5]. These results are in accordance with Ansari (2013) [2] in pomegranate cuttings.

##### Effect of IBA

Data indicated for effect of IBA were found significant differences were observed between IBA treatments for percentage of rooted cuttings as presented in table 1. The cuttings treated with IBA 4500 ppm recorded significantly higher percentage recorded in treatment B3 (77.59%) and significantly followed by cuttings treated with IBA 3000 ppm recorded in treatment B2 (75.49%) and lowest percentage of rooted cutting with IBA 1500 ppm recorded in treatment B1 (73.31%). The enhanced hydrolytic activity in presence of applied IBA coupled with appropriate planting time might be responsible for the increase percentage of rooting (Singh, 2013) [3]. These results are in accordance with K. K. Singh (2017) [4] in pomegranate cuttings.

**Table 1:** Effect of IBA and rooting media on percentage of rooted cuttings

Rooting Media (A)	90 DAP			Mean
	IBA Concentrations			
	1500 (B1)	3000 (B2)	4500 (B3)	
A1. (Red Soil + FYM)	69.38 (34.69)	70.13 (35.06)	73.09 (36.54)	70.86 (35.43)
A2. (Black Soil + FYM)	72.64 (36.32)	75.32 (37.66)	77.39 (38.69)	75.12 (37.55)
A3. (Sand + FYM)	71.51 (35.75)	74.57 (37.28)	76.38 (38.19)	74.15 (37.07)
A4. (Coco peat + FYM)	79.69 (36.65)	81.93 (40.96)	83.51 (41.75)	81.71 (40.85)
Mean	73.31 (36.65)	75.49 (37.74)	77.59 (38.79)	
Factors	A	B	A X B	
S.Em±	0.19	0.16	0.33	
CD at 5%	0.56	0.48	NS	

#### Effect of IBA and rooting media on percentage of rooted cuttings

**Effect of rooting media:** The data in respect of percentage of rooted cuttings were found to be significantly maximum percentage of rooted cutting in treatment A4 (81.71%) cuttings grown in a mixture of coco peat + FYM and significantly followed by cuttings grown in a mixture of black soil + FYM recorded in treatment A2 (75.12%) and significantly minimum percentage of rooting recorded in treatment A1 (70.86%) was found in cuttings grown in red soil + FYM. The maximum percentage of rooted cuttings which might be perhaps due to the release of phenolic compounds from the coco peat (Lokesh et al., 1988) [5].

#### Effect of IBA

Data indicated in table 2 for effect of IBA were found significant differences were observed between IBA treatments for percentage of rooted cuttings. The cuttings treated with IBA 4500 ppm recorded significantly higher percentage recorded in treatment B3 (77.59%) and significantly followed by cuttings treated with IBA 3000 ppm recorded in treatment B2 (75.49%) and lowest percentage of rooted cutting with IBA 1500 ppm recorded in treatment B1 (73.31%). The enhanced hydrolytic activity in presence of applied IBA coupled with appropriate planting time might be responsible for the increase percentage of rooting (Singh, 2013) [3].

**Table 2:** Effect of IBA and rooting media on survival percentage of rooted cuttings

Rooting Media (A)	30 DAP				Mean	60 DAP				Mean	90 DAP				Mean
	IBA Concentration (ppm) (B)					IBA Concentration (ppm) (B)					IBA Concentration (ppm) (B)				
	1500 (B1)	3000 (B2)	4500 (B3)			1500 (B1)	3000 (B2)	4500 (B3)			1500 (B1)	3000 (B2)	4500 (B3)		
A1. (Red Soil + FYM)	66.31 (33.15)	68.52 (34.26)	72.62 (36.31)	69.15 (34.57)	60.55 (30.28)	64.11 (32.06)	68.37 (34.18)	64.34 (32.17)	56.11 (28.05)	60.81 (30.40)	64.60 (32.30)	60.51 (30.25)			
A2. (Black Soil + FYM)	70.17 (35.08)	74.68 (37.34)	76.34 (38.17)	73.73 (36.86)	66.25 (33.13)	70.67 (35.34)	72.85 (36.42)	69.92 (34.96)	60.79 (30.39)	64.63 (32.31)	68.11 (34.05)	64.51 (32.25)			
A3. (Sand + FYM)	68.08 (34.04)	70.53 (35.26)	72.47 (36.23)	70.36 (35.18)	64.23 (32.12)	66.27 (33.13)	68.09 (34.05)	66.20 (33.10)	60.74 (30.37)	62.49 (31.24)	66.25 (33.12)	63.16 (31.58)			
A4. (Coco peat + FYM)	76.14 (38.07)	80.53 (40.26)	82.75 (41.37)	79.81 (39.90)	72.86 (36.43)	76.27 (38.13)	80.75 (40.37)	76.62 (38.31)	68.08 (34.04)	72.30 (36.15)	76.18 (38.09)	72.19 (36.09)			
Mean	70.18 (35.09)	73.57 (36.78)	76.05 (38.02)		65.98 (32.99)	69.33 (34.66)	72.51 (36.25)		61.43 (30.71)	65.06 (32.53)	68.79 (34.39)				
Factors	A	B	A X B		A	B	A X B		A	B	A X B				
S.Em±	0.42	0.36	0.73		0.45	0.39	0.79		0.43	0.38	0.75				
CD at 5%	1.24	1.08	NA		1.34	1.16	NA		1.29	1.12	NA				

### Effect of IBA and rooting media on number of roots per cuttings

#### Effect of rooting media

The data shown in table 3 with respect to number of roots per cuttings were found to be significantly maximum number of roots per cuttings in treatment A4 (30.46) cuttings grown in a mixture of coco peat + FYM and significantly followed by cuttings grown in a mixture of black soil + FYM recorded in treatment A2 (28.49) and significantly minimum number of roots per cuttings recorded in treatment A1 (22.16) was found in cuttings grown in red soil + FYM. The cuttings grown in a mixture of coco peat and FYM gave the maximum number of roots, might be due to presence of cytokinin in coco peat which encourages the induction of adventitious roots (Ellyard and Ollerenshaw, 1984)<sup>[6]</sup>.

#### Effect of IBA

The data indicated in table 3 there were significant differences among the IBA concentrations for number of roots per cuttings. Effects of IBA were found significant differences were observed between IBA treatments for number of roots per cuttings. The cuttings treated with IBA 4500 ppm recorded significantly higher number of roots per cuttings in treatment A4 (30.18) and significantly followed by cuttings treated with IBA 3000 ppm recorded in treatment A2 (26.85) and lowest number of roots per cutting with IBA 1500 ppm recorded in treatment A1 (23.52). The highest number of roots per cutting with 4500 ppm IBA might to the fact that positive response of IBA induced an accelerated rate for initiation and consequent production of more number of roots. The observations are findings to close in Ghose *et al.* (1988)<sup>[7]</sup> in pomegranate cuttings,

**Table 3:** Effect of IBA and rooting media on number of roots per cutting

Rooting Media (A)	90 DAP			Mean
	IBA Concentrations			
	1500 (B1)	3000 (B2)	4500 (B3)	
A1. (Red Soil + FYM)	18.07	22.60	25.80	22.16
A2. (Black Soil + FYM)	26.30	28.47	30.70	28.49
A3. (Sand + FYM)	22.10	26.33	30.43	26.29
A4. (Coco peat + FYM)	27.60	30.00	33.77	30.46
Mean	23.52	26.85	30.18	
Factors	A	B	A X B	
S.Em±	0.68	0.59	1.17	
CD at 5%	2.01	1.74	NS	

### Effect of IBA and rooting media on length of longest root per cutting

#### Effect of rooting media

The data shown in table 4 with respect to length of longest root per cuttings were found to be significantly maximum number of root per cuttings in treatment A4 (22.59 cm) cuttings grown in a mixture of coco peat + FYM and significantly followed by cuttings grown in a mixture of black soil + FYM recorded in treatment A2 (21.06 cm) and significantly minimum length of longest root per cuttings recorded in treatment A1 (18.33 cm) was found in cuttings grown in red soil + FYM. The better texture and porosity of coco peat also being a well drained media it promoted better root character which facilitated easy penetration of roots (Siddangaiah *et al.* 1996)<sup>[8]</sup>.

#### Effect of IBA

The data indicated in table 4 there were significant differences among the IBA concentrations for length of longest root per cutting.

Effects of IBA were found significant differences were observed between IBA treatments for maximum length of longest root per cutting.

The cuttings treated with IBA 4500 ppm recorded significantly maximum length of longest root per cutting in treatment B3 (23.10 cm.) and significantly followed by cuttings treated with IBA 3000 ppm recorded in treatment B2 (20.23 cm.) and lowest length of longest root with IBA 1500 ppm recorded in treatment B1 (18.28 cm.). This might be due to the fact that auxins are known to induce stimulus for regeneration of root by promotion of hydrolysis, mobilization in the region of root formation (Nanda *et al.*, 1975)<sup>[9]</sup>.

**Table 4:** Effect of IBA and rooting media on length of longest roots per cutting

Rooting Media (A)	90 DAP			Mean
	IBA Concentrations			
	1500 (B1)	3000 (B2)	4500 (B3)	
A1. (Red Soil + FYM)	16.17	18.60	20.23	18.33
A2. (Black Soil + FYM)	18.10	19.73	22.67	20.17
A3. (Sand + FYM)	17.53	20.40	25.23	21.06
A4. (Coco peat + FYM)	21.33	22.17	24.27	22.59
Mean	18.28	20.23	23.10	
Factors	A	B	A X B	
S.Em±	0.54	0.46	0.93	
CD at 5%	1.59	1.38	NS	

### Effect of IBA and rooting media on Fresh weight of roots

#### Effect of rooting media

The data presented in table 5 regarding were significant differences among the rooting media was significantly maximum fresh weight of roots recorded in treatment A4 (2.47g.) was found in cuttings grown in a mixture of coco peat + FYM and significantly followed by cuttings grown in a mixture of black soil + FYM recorded in treatment A2 (2.07g) and significantly minimum fresh weight of roots recorded in treatment A1 (1.45g.) was found in cuttings grown in red soil + FYM. The increase in root weight is due to more number of root and highest root girth and length of the roots. (Khayyat *et al.*, (2007) <sup>[10]</sup> recorded that improved fresh weight in pothos by using coco peat substrate.

**Table 5:** Effect of IBA and rooting media on fresh weight of roots

Rooting Media (A)	IBA Concentrations			Mean
	1500 (B1)	3000 (B2)	4500 (B3)	
A1. (Red Soil + FYM)	1.29	1.44	1.63	1.45
A2. (Black Soil + FYM)	1.90	2.06	2.26	2.07
A3. (Sand + FYM)	1.52	1.74	1.96	1.74
A4. (Coco peat + FYM)	2.12	2.54	2.75	2.47
Mean	1.71	1.95	2.15	
Factors	A	B	A X B	
S.Em±	0.10	0.09	0.18	
CD at 5%	0.30	0.26	NS	

### Effect of IBA and rooting media on success percentage of rooted cuttings

**Effect of rooting media:** The data in respect to success percentage of rooted cuttings in table 6 were found to be significantly maximum success percentage of rooted cuttings in treatment A4 (83.56%) cuttings grown in a mixture of coco peat + FYM and significantly followed by cuttings grown in a mixture of black soil + FYM recorded in treatment A2 (76.10%) and significantly minimum success percentage of rooted cuttings recorded in treatment A1 (73.25%) was found in cuttings grown in red soil + FYM. The above result conformity by Ugusirin and Engine (2010) <sup>[11]</sup> in Fig cutting.

### Effect of IBA

The data indicated in table 5 there were significant differences among the IBA concentrations for fresh weight of roots. The cuttings treated with IBA 4500 ppm recorded significantly maximum fresh weight of roots in treatment B3 (2.15g) and significantly followed by cuttings treated with IBA 3000 ppm in treatment B2 (1.95g.) and lowest fresh weight of roots per cuttings with IBA 1500 ppm in treatment B1 (1.71g.). This might be due to the fact that positive response of plant growth regulator induces an accelerated rate for initiation and consequent production of more number of roots and length of roots. Similar results are conformed by K. K. Singh (2017) <sup>[4]</sup> in pomegranate cutting.

### Effect of IBA

The data indicated in table 6 there were significant differences among the IBA concentrations for success percentage of rooted cuttings. The cuttings treated with IBA 4500 ppm recorded significantly maximum success percentage of rooted cutting in treatment B3 (78.92%) and significantly followed by cuttings treated with IBA 3000 ppm in treatment B2 (77.05%) and minimum success percentage of rooted cuttings with IBA 1500 ppm in treatment B1 (74.82%). The above result conformity by Ghosh *et al.*, (1988) <sup>[7]</sup> in pomegranate cutting.

**Table 6:** Effect of IBA and rooting media on success percentage of rooted cuttings

Rooting Media (A)	30 DAP			Mean
	IBA Concentrations			
	1500 (B1)	3000 (B2)	4500 (B3)	
A1. (Red Soil + FYM)	71.22 (35.61)	73.27 (36.63)	75.25 (37.63)	73.25 (36.62)
A2. (Black Soil + FYM)	74.11 (37.05)	76.05 (38.02)	78.16 (38.08)	76.10 (38.05)
A3. (Sand + FYM)	72.17 (36.02)	75.05 (37.52)	77.15 (38.58)	74.79 (37.39)
A4. (Coco peat + FYM)	81.76 (40.88)	83.82 (41.91)	85.11 (42.55)	83.56 (41.78)
Mean	74.82 (37.41)	77.05 (38.52)	78.92 (39.46)	
Factors	A	B	A X B	
S.Em±	0.19	0.16	0.33	
CD at 5%	0.56	0.48	NS	

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