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INFLUENCE OF DIFFERENT CONCENTRATIONS OF IBA ON THE SHOOTING AND ROOTING OF HARDWOOD CUTTINGS OF POMEGRANATE (*PUNICA GRANATUM* L.) CV. GANESH UNDER VALLEY CONDITION OF GARHWAL HIMALAYA

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Abstract

The present investigation entiteld "Influence of Different Concentrations of IBA on the Shooting and Rooting of Hardwood Cuttings of Pomegranate (*Punica granatum* L.) cv. Ganesh under Valley Condition of Garhwal Himalaya" was carried out at the Horticultural Research Centre, Department of Horticulture, Chauras Campus, H.N.B. Garhwal University, Srinagar (Garhwal), Uttarakhand, India during the winter season of 2015. The stem cuttings of *Punica granatum* L. cv. Ganesh treated with IBA solution of different concentration *i.e.* 500ppm, 1000 ppm, 1500 ppm and control by quick dip method Among all the treatments, maximum percentage of sprouted cuttings (71.0%), minimum percentage of unsprouted cuttings (15.5%), minimum percentage of dead cuttings (13.3%), number of sprouts per cutting (9.10), average length of sprout (19.22 cm), average diameter of sprout (0.36cm), number of leaves on new shoots (66.81), percentage of rooted cuttings (69.14%), number of primary roots per cutting (40.03), length of longest root per cutting (27.88 cm), diameter of thickest root per cutting (0.22 cm), fresh weight of root per cutting (1.77 gm) and dry weight of root per cutting (1.02 gm) was noticed in500 ppm concentration IBA.

Key words : Hardwood stem cuttings, IBA, open field.

Introduction

Pomegranate (*Punica granatum* L.) is an old tree and mentioned in ancient holly books such as Bible, belongings to the family Punicaceae, is one of the favorite table fruits of tropical and subtropical region. The pomegranate tree is native to Iran to the Himalayas in northern India and has been cultivated since ancient times throughout the Mediterranean region of Asia, Africa and Europe. The most important growing regions of pomegranate are Egypt, China, Afghanistan, Pakistan, Bangladesh, Iran, Iraq, India, Burma and Saudi Arabia. This fruits tree grows best in semi-arid climate where cool winter and hot summer prevail. All parts of the tree have been utilized as sources of tannin for curing leather. The juice of wild pomegranate yields citric acid and sodium citrate for pharmaceutical purposes. Because of their tannin content, extracts of the bark, leaves, immature fruit, and fruit rind have been given as astringents to halt diarrhea, dysentery and hemorrhages. Dried, pulverized flower buds are employed as a remedy for bronchitis. Because of its sweet juice and high medicinal properties, pomegranate has great demand in the market. Besides this, it is very hardy and there for considered a good fruit for arid zones of India. But at present its cultivation is limited on small scale. To meet the demand of people for pomegranate, its production has to enhance several folds. Therefore, to increase its cultivation, there is a need to produce large number of true to type plants of high yielding varieties through the vegetative propagation. Although, seed propagation is possible in pomegranate but seedling plants bear fruits quit late and also show variation in yield, fruit shape and size and quality (Purohit, 1981). Therefore, there is a need to multiply the pomegranate through vegetative propagation, so that true to type plants may be produced in nursery and supplied for mass production to obtained early fruiting of good quality. Pomegranate is generally propagated by hard wood cuttings. It is well known facts that use of auxins in cuttings increase success of cuttings through early and quality root formation.

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Materials and Methods

The experiment was conducted under the open condition at Horticultural Research Centre, Chauras Campus, H.N.B. Garhwal University (A Central University), Srinagar Garhwal, Uttarakahnd, India. Physically, the Srinagar valley is spread between latitude 30^0 12' 0" to 30^0 13' 4" North and longitude 78^0 0' 45" to 78^0 0' 50" East. This valley is about 6 km long and 2 km wide located on both side of famous Alaknanda river, about 132 km from Haridwar on the way to Badrinath Dham, at 540 meter above MSL in Himalayan region. This region has a sub-tropical climate, with both extremes in the temperature, *i.e*., winter and summer seasons. In fairly cold winters, the temperature sometimes goes as low as 6.83 to 20.77^0C in the month of January and up to 15.46-29.83^0cm in the month of April. The average minimum and maximum temperature, relative humidity and rainfall vary from 6.83^0 C to 29.83^0C, 70.51% and 33.3 mm, respectively.

The plants selected for preparing cuttings were moderately vigorous and healthy. Cuttings were made from healthy and partially mature shoots having 2-3 nodes. The length of the cuttings was kept between15-20cm (6-8 inches). Cuttings were taken early in the morning. The basal cut was made just below the node without any injury to the bud and the upper slanting cut was made about 1.4 cm above the node. For preparing the rooting media, the sandy soil and farm yard manure (FYM) in ratio 1:1 were mixed thoroughly. The mixture was filled in polythene bags (2 kg capacity) tightly leaving one inch space at the top. For the preparation of IBA solution of 500 ppm, 1000 ppm and 1500 ppm the required amount of IBA (125 mg, 250 mg and 375 mg, respectively) was weighted. These amounts of I.B.A. then dissolved in small amount of alcohol containing few drops of ammonium hydroxide and finally diluted with distilled water. The final volume of each solution was maintained 250 ml. Quick dip method was adopted for treatment of the cuttings with IBA solutions. The basal portions of cuttings up to 2.5-3.0 cm were soaked with solution for 10 seconds. The treated cuttings with different IBA concentration were planted carefully in the polythene bags with the help of dibbler without any injury to the buds. One third basal portion of the cuttings was inserted into rooting media. Each polythene bag (2 kg capacity) was planted with two cuttings were maintained and thus 6 bags with 12 cuttings were maintained under each treatment of each replication. The soil around the cuttings was tightly pressed and watered immediately. The experiment was replicated four times with 12 cuttings in each treatment and a total of 192 cuttings were tested in open filed condition. The percentage of sprouted cuttings, percentage of un-sprouted cuttings, percentage of dead cuttings, number of sprouts per cutting, average length of sprout (cm), average diameter of sprout (cm), number of leaves on new shoots, percentage of rooted cuttings, number of primary roots per cutting, length of longest root per cutting (cm), diameter of thickest root per cutting (cm), fresh weight of root per cutting (gm) and dry weight of root per cutting (gm) were recorded. Data recorded during the course of investigations were subjected to statistical analysis under randomized block design (Snedecor and Cochran, 1968).Valid conciliations were drawn after the determination of significance of difference between the treatments, at 5% level of probability. Critical difference was calculated in order to compare the treatment means.

Result and Discussion

Shoot characters

A perusal of table 1 shows that the effect of different concentration of IBA significantly affected the various shooting characters of hardwood cuttings in pomegranate. The maximum percentage of sprouted cuttings (71.0%) were recorded unber 500 ppm IBA while, the minimum percentage of sprouted cuttings (43.3%) were recorded under control. Bhatt *et al*. (2011) observed that the cuttings of *Citrus aurantifolia* (Swingle) treated with IBA @ 500 ppm showed the maximum sprouting percentage.

In respect of percentage of un-sprouted cuttings, treatment 500 ppm IBA showed the lowest percentage (15.5%) of un-sprouted cuttings. The maximum percentage of un-sprouted cuttings (33.6) was recorded under control. These findings are agreed with the findings of Bhatt *et al*. (2011).

In respect to percentage of dead cuttings, the treatment 1500 ppm IBA treatment with (13.3%) dead cuttings showed the best survival percentage of cuttings. While, the maximum percentage of dead cuttings (23.3%) were recorded under 1000 ppm IBA treatment. The present investigations are match with the result of Bhatt *et al*. (2011) in hard wood cuttings of *Citrus aurantifolia* and Pandey *et al*. (2012) in hardwood cuttings of *Gymnema sylvestre* (Gurmar) cuttings treated with 500 ppm IBA.

The maximum number of sprouts per cutting (9.10) were recorded under the treatment 500 ppm IBA followed, while, the minimum number of sprouts per cutting (6.29) were recorded under control. Tahir *et al*. (1998) noted that hardwood cuttings of guava treated with IBA @

Table 1 : Influence of different concentrations of IBA on the shooting of hardwood cuttings of Pomegranate (*Punica granatum* L.) cv. Ganesh.

Tratments	Percentage of sprouted cuttings	Percentage of unsprouted cuttings	Percentage of dead cuttings	Number of sprouts per cutting	Average length of sprouts (cm)	Average diameter of sprouts (cm)	Number of leaves on new shoot
IBA 500 ppm (T_1)	71.0	15.5	14.4	9.10	19.22	0.36	66.81
IBA 1000 ppm (T_2)	53.6	23.3	23.3	6.92	15.81	0.24	48.47
IBA 1500 ppm (T_3)	64.4	22.4	13.3	8.73	17.77	0.31	59.21
Control (T_0)	43.3	33.6	23.2	6.29	13.81	0.20	22.81
CD at 5%	1.01	0.80	1.46	1.00	1.99	0.08	8.33

Table 2 : Influence of different concentrations of IBA on the rooting of hardwood cuttings of Pomegranate (*Punica granatum* L.) cv. Ganesh.

Tratments	Percentage of rooted cuttings	Number of primary roots per cutting	Number of secondary roots per cutting	Length of longest root per cutting (cm)	Diameter of thickest root per cutting (cm)	Fresh weight of roots per cutting (gm)	Dry weight of roots per cutting (gm)
IBA 500 ppm (T_1)	69.14	40.03	91.40	27.88	0.22	1.77	1.02
IBA 1000 ppm (T_2)	58.47	31.03	76.36	23.57	0.17	1.53	0.56
IBA 1500 ppm (T_3)	64.81	37.66	80.77	26.03	0.20	1.64	0.71
Control (T_0)	26.25	24.55	66.70	15.99	0.15	0.70	0.27
CD at 5%	2.85	3.26	3.16	2.25	0.02	0.19	0.06

500 ppm performed with respect to various root and shoot development characteristics.

It is evident from the data that the maximum number of leaves per cutting (66.81) were recorded under the treatment 500 ppm IBA,while, the minimum number of leaves per cutting (22.81) were recorded under control. Bhatt *et al*. (2011) in hard wood cuttings of *Citrus aurantifolia* and Pandey *et al*. (2012) in hardwood cuttings of *Gymnema sylvestre* (Gurmar) observed best performance of IBA treatments with maximum number of leaves on new shoots.

The maximum average length of sprouts per cutting (19.22 cm) was recorded under 500 ppm IBA treatment. The minimum average length of sprout per cutting (13.81cm) was recorded under control treatment. These findings are little bit closer to with the results of Bhatt *et al*. (2011) in hard wood cuttings of *Citrus aurantifolia* with respect of IBA @ 500 ppm.

It is studied that treatment 500 ppm IBA obtained first rank in diameter of sprouts per cutting with an average diameter (0.36 cm), while, the minimum average diameter of sprouts per cutting (0.20 cm) was recorded under control during present investigation. Findings of present investigation match with the result of Bhatt *et al.* (2011) in hard wood cuttings of *Citrus aurantifolia* with respect of IBA @ 500 ppm.

Root characters

Among all the treatments, 500 ppm IBA treatment showed the highest percentage of rooted cuttings (69.81%). The minimum percentage of rooted cuttings (26.25%) was recorded under control. Oikonomou (1982) found that the IBA concentration @ 500 ppm is most effective for rooting percentage and root length. Pandey *et al*. (2012) revealed that the hardwood cuttings of *Gymnema sylvestre* (Gurmar) having three nodes are treated with 500 ppm IBA solution were suitable for maximum rooting. Shabha *et al*. (2013) revealed that the hard wood cuttings of *Bougainvillea peruviana* cv. Shubra treated with 500 ppm IBA achieved the highest rooting percentage. Mehraj *et al*. (2013) found that highest rooting percent in the stem cutting of Bougainvillea treated with IBA @ 500 ppm.

The highest number of primary roots per cutting (40.03) were recorded under the treatment 500 ppm IBA, while, the minimum number of primary roots per cutting (24.55) were recorded under control. These findings are little bit closer to with the results of Shabha *et al*. (2013) observed the best performance in maximum number of primary roots per cutting in hard wood cuttings of *Bougainvillea peruviana* cv. Shubra treated with 500 ppm IBA.

The maximum number of secondary roots per cutting (91.40) was recorded under the treatment 500 ppm IBA. The minimum number of secondary roots per cutting (66.70) was recorded under control. The present findings are little bit closer to Shabha *et al*. (2013) with the number of secondary roots per cutting of *Bougainvillea peruviana* cv. Shubra with the respect of IBA. Hossain (1990) found the bougainvillea gave the highest success when the cutting was treated at 500 ppm IBA. He also observed that this treatment also increased the number of primary and secondary roots per cutting.

The 500 ppm IBA treatment was found to give longest root with an average length of (27.88 cm). The minimum length of root per cutting (15.99 cm) was recorded under control during the present investigation. Shabha *et al*. (2013) revealed that the hard wood cuttings of *Bougainvillea peruviana* cv. Shubra treated with 500 ppm IBA achieved the higher root length of root per cutting.

With an average diameter of thickest root (0.22 cm) obtained highest rank under the treatment 500 ppm IBA, while, the minimum value (0.15cm) was obtained under control. Shabha *et al*. (2013) observed that the diameter of thickest root per cutting in hard wood cutting of *Bougainvillea peruviana* cv. Shubra with respect of IBA.

Among all treatments fresh weight of roots per cutting was recorded maximum (1.77gm) under the treatment 500 ppm IBA. The minimum fresh weight of root per cutting (0.70gm) was recorded under control. Hossain (1990) observed that the fresh and dry weights of root per cutting are found best when bougainvillea cuttings were treated at 500 ppm IBA.

The maximum dry weight of roots per cutting (1.02 gm) was recorded under the treatment 500 ppm. The minimum dry weight of roots per cutting (0.27 gm) was observed under control. Hossain (1990) observed that the fresh and dry weights of roots per cutting are found best when bougainvillea cuttings were treated at 500 ppm IBA.

Conclusion

Among various concentrations of IBA, it may be concluded that 500 ppm IBA showed the best performance under valley condition of Garhwal Himalaya, in terms of shoot and root characters.

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