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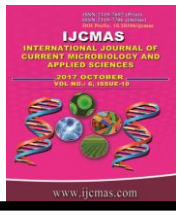

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# Vegetative Propagation of Pomegranate (*Punica granatum* L.) through Cutting- A Review

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**A B S T R A C T**

Pomegranate is commercially propagated by cuttings. Use of optimum concentration of IBA, type of cutting and optimum rooting media would help in rapid multiplication of pomegranate cuttings. The success percent of pomegranate cuttings depends on many factors such as conditions of the mother plant, rainfall, time of operation, temperature fluctuation, aftercare etc. Different environmental conditions, planting time also play an important role in rooting and growth of pomegranate cutting, whereas, the mist house growing condition was found effective in increasing the success rate of the pomegranate cuttings.

## Introduction

Pomegranate (*Punica granatum* L.) belongs to Punicaceae family and it is a semi arid fruit crop. Pomegranate could be propagated either sexually by seeds or vegetatively using stem cuttings. Layering and grafting of pomegranate trees is rarely done, because many different types of grafts have not been successful enough for use in commercial production (Hartmann *et al.*, 1997). Pomegranate is commercially propagated by cuttings. Cuttings are the easiest method for pomegranate propagation with 12-20 cm in length and pencil size in diameter and use of hardwood or semi-hardwood rooting hormone is possible. The rooting capability of cuttings varies from cultivar to cultivar, location to location, season to season and age of the branch. The success percent of pomegranate cuttings depends on many factors such as conditions of the mother plant, part of the tree from where the cuttings are made, time of operation, rainfall, temperature fluctuation, aftercare etc. Besides, different environmental conditions growth regulators also play an important role in rooting and growth of pomegranate cutting. Gurjar and Patel (2007) noticed that the number of sprouts per cutting was highest when hardwood cuttings of pomegranate cv. Ganesh were treated with 4000 ppm IBA and planted in a mixture of soil, sand and leaf mould. Gautherest (1969) reported that auxin, natural or artificially applied, is a requirement for initiation of adventitious root on stem cuttings. Ghosh *et*

*al.,* (1988) have recorded that IBA is more effective than NAA on rooting, survival and highest rooting has occurred with 5,000 ppm IBA. With this, there are other studies (Jain and Parmar, 1996; Navjot and Kahlon, 2002; Scaloppi and Martins, 2004; Tripathi and Shukla 2004; Tripathi and Shukla, 2004) indicating that successful results are recovered from different concentrations of either IBA or other rooting hormones.

## Effect of bio-regulators on the rooting of pomegranate

Today, IBA and NAA are still the most widely used auxins for rooting stem cuttings. It has been repeatedly confirmed by several workers that auxin is required for initiation of adventitious roots on stems and indeed it has been shown that divisions of the first root initian cells are dependent upon either applied or endogenous auxins (Tanabe, 1982). Singh (1994) observed that the best rooting was observed in hard wood cuttings of pomegranate cv. Jalore seedless with IBA at the rate of 1000 ppm. The treatment of pomegranate hardwood cuttings with IBA (12000 ppm) increased rooting Success (Melgarejo *et al.,* 2000). In the quick dip method 10 sec to 1 min treatment was beneficial for inducing root in pomegranate stem cutting (Saroj *et al.,* 2004; Singh 2014).The hardwood cuttings of pomegranate gave the highest percentage survival when treated with IBA at the rate of 2000 ppm (Upadhyay and Badyal, 2007). Jain and Parmar (1993) noticed that the maximum percentage of establishment in pomegranate cuttings when treated with IBA 1000 ppm and boron at the rate of 50 ppm. 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). Auxin application has been found to enhance the histological features like formation of callus and tissue and differentiation of vascular tissue. 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. Similar experiments have been carried out by different workers in pomegranate on various parameters of cuttings and root formations with minimum time with respect to the various concentrations of growth subastances (Purohit and Shekarappa, 1985; Shamet *et al.,* 1988; Reddy and Reddy, 1990; Shukla, 2004; Scaloppi and Martins, 2004; Lakhani and Gajipara, 1998; Sharma *et al.,* 2009; Polat and Caliskan, 2009). Krieken *et al.,* (1993) reported that IBA might enhanced the rooting by increase of internal free IBA, or synergistically modify the action of IAA or due to synthesis of endogenous IAA. Girdling increased the length of roots in stem cuttings and the number of shoots and their length were also improved significantly (Yesiloglu *et al.,* 1997).

## Effect of rooting media on the rooting of pomegranate

In case of rooting media, 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). 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. Deol and Uppal (1990) observed that hardwood cuttings of pomegranate planted in river silt showed the highest rooting percentage. The hardwood cuttings of pomegranate gave the maximum percentage of rooting when planted in a

mixture of sand and vermiculite and minimum in sand (Ansari, 2013). Baghel and Saraswat (1989) obtained the highest survival percentage when pomegranate cuttings were planted in river silt. Gurjar and Patel (2007) observed that the survival percentage of rooted cutting was significantly increased when hard wood cuttings of pomegranate were planted in a combination of soil, sand and leaf mold. Khattak and Khan (2005) concluded that pomegranate cuttings gave the highest number of roots in a combination of silt and FYM medium. Alikhani *et al.,* (2011) concluded that pomegranate cuttings gave the longest root (50.90 cm) when grown in sand than mixture of sand and peat. Batista *et al.*, (2011) reported that hard wood cuttings of pomegranate when planted in coconut fibre showed the highest shoot length. The cuttings grown in a mixture of coir pith and FYM gave maximum length of root might be due to better texture and porosity of coco-peat, as it enables the downward movement of water and nutrients (Singh *et al.,* 2002).

## Effect of growing condition on the rooting of pomegranate

In plant propagation, the different environment viz., glass house, net house, poly-house and mist chamber have been widely used for rooting of different types of cutting. Development of mist chamber is a major breakthrough in propagation of plants. Creating humid atmosphere by means of artificial mist around the planted cuttings either in concealed pot culture house or in open conditions has proved to enhance the process of rooting (Prolings and Therios, 1976). Intermittent mist is often used on cuttings because it reduces the temperature of the leaves, lowers respiration, and increases relative humidity around the leaf surface. Hussain *et al.*, (2012) reported that the cutting planted in plastic tunnel showed maximum rooting and survival percentage. The maximum percentage of rooted cutting, number of primary roots and average length of roots was noticed in mist chamber (Singh, 2014). The maximum rooting and survival percentage of pomegranate cutting was observed under mist chamber growing condition (Bose and Mandal, 1972; Ghosh *et al.,* 1988; Hore and sen, 1993; Hu *et al.*, 1993; Saroj *et al.,* 2008). Lynn and Hartmann (1957) reported that the mist chamber creates a humid atmosphere by means of artificial mist around the planted cuttings and enhanced the process of rooting.

## Effect of planting time on the rooting of pomegranate

In case of planting time, Seasonal timing or period of the year in which cuttings are taken can play an important role in rooting. Hambrick *et al.,* 1991) declare preparation time is important for rooting and late winter (February) is more suitable than early October. (Ansari 2013) reported that the most effect on rooting percentage and root numbers was obtained on 5 Jan and 4 Feb planting time. Hardwood cuttings with 20 cm length if separate in Feb or March will root fast and easily (Sheet, 2004). Singh (2009) observed that the maximum rooting percent, root number and root length was recorded under 15 Jan. Dhillon and Sharma (2002) observed that the highest percentage of rooting was recorded under 15 November. Saroj *et al.,* (2007) have reported the Pomegranate cultivar Jalore propagation both by hardwood and semi-hardwood cuttings in July followed by August and September was the best months for planting of cutting.

## Effect of type of cutting on the rooting of pomegranate

In case of type of cutting, the maximum sprouting percentage was observed under semi hardwood cuttings (Hussain *et al.,* 2012).

**Table.1** Rooting in pomegranate stem cutting with PGRs with other chemicals formulation

| Cultivar | Method of treatment | Type of stem cutting | Optimum concentration (mg/l) | References |
|---|---|---|---|---|
| Ganesh | Quick dip | Hardwood | 5000 IBA | Singh 2014 |
| Bhagwa | Soaking | Hardwood | 4000 IBA | Kumari 2014 |
| Nimali | quick dip | Hardwood | IBA500ppm+ 1% Borax | Kumari 2013 |
| Wonderful | quick dip | Hardwood | 1000 mg L–1 IBA + 500 mg L–1 GA3 | Sarrou 2014 |
| Ganesh | quick dip or prolonged dip | Hardwood | 2000 IBA or 1000 IBA | Singh *et al.*, 2009 |
| Ganesh | quick dip | Hardwood | 5000 IBA | Barche *et al.*, 2009 |

The use of hardwood stem cuttings is one of the least expensive and easiest methods of vegetative propagation. Generally 6-12 mm thick pomegranate cuttings induce maximum rooting (Purohit and Sekharappa (1985); Reddy and Reddy, 1990; Dhillon and Sharma, 1992; Chadha, 2001; Rajan and Markose, 2007). Sharma *et al.*, (2009) showed 100% survival of the hardwood and semi-hardwood rooted cuttings of pomegranate cv. Ganesh under open conditions to induce rooting in pomegranate cutting, different PGRs, other chemicals (Table 1).

In conclusion, all the above investigation shows that IBA treatment is better than the other form of treatments for pomegranate cutting development. It is proved that the success of rooting depends on the phytohormone with which the cuttings were treated and the genetic characteristics of investigated varieties. So increasing the production of pomegranate fruit cutting is one of the easy processes for developing the pomegranate plant as soon as possible.

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