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A Review: Multiplication of *Grewia asiatica* L. (Phalsa) via Cutting

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ABSTRACT

Asexsually phalsa plant can be propagated through cuttings as well as layering. Both, sort of cutting and time of planting greatly influence rooting of phalsa. However, the time of preparation of cuttings in phalsa altogether influenced the success of root commencement, the best time of cuttings preparation and planting is identified with the climatic conditions and physiological state of the plant. Auxin application has been found to expand the histological highlights like development of callus and division of vascular tissue. The best establishing was generally found in cuttings taken from the lower part of the shoots. In propagation of phalsa plant, misting have been extensively utilized for establishing of various sorts of cutting.

Keywords: *Phalsa, Propagation, Cutting, Auxins, Rooting.*

INTRODUCTION

Phalsa (*Grewia asiatica* L.), is one of the important arid and semi arid, hardy fruit crop suitable for cultivation in the large area of waste land regions with adverse soil and climatic conditions where other fruit crops fails to survive and produce profitable yield. Except higher alititudes, it can be grown in any climate. It behaves evergreen in regions having no winter and produce more flushes resulted in yields of poor quality fruits. Mature plants can tolerates the low temperature for a short period.

Phalsa plant can tolerate as high as 45ºC (Pujari, 2012) which makes it an ideal fruit crop preferred for dry land horticulture and silvi-horticulture. Fruits of phalsa are sub-acidic and good source of vitamin – A, C and minerals. Mostly fruits are consumed as fresh fruit but has excellent properties for processing. Fruits shows cooling effects on the human body whereas unripe fruits reported to alleviates inflammation and is administed in respiratory, cardiac, blood disorders as well as in fever reduction (Morton, 1987). Basket made from the pruned shoots are strong and can be used for packing, handling puposes during transportation of fruits and vegetables. Pruned shoots are also used for supporting vegetable crops and extract fiber for ropes preparation.

Sexual propagation method of Phalsa is very common in India.

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Seed lose viability greatly within three months when stored in ambient condition and hence, fresh seed from fully ripe fruits should only be sown. Also seedlings have long phase of juvenility and there is no uniformity in growth, yield and quality of fruits. Propagation by rooting of hardwood cuttings is also possible in Phalsa (Samson, 1986). Hardwood cutting and time of planting influence rooting of *Grewia asiatica* (Singh et al., 1961). Jadhav (2007) showed that the time of preparation of cuttings in phalsa greatly affected the extent and success of root initiation, the optimum time of cuttings preparation and planting is related to the physiological condition of the plant and climatic conditions. Both time of cutting collection and rooting success varies with the climatic condition and prevailing outdoor temperature.

The stem cuttings can give good rooting and survival, when cuttings are taken in December (Bal et al., 2000). Improved climatic conditions under different plant propagating structures like mist chamber, greenhouse, net house etc are now widely utilized in plant propagation. Improved climatic conditions under different plant propagating structures like mist chamber, greenhouse, net house etc are now widely utilized in plant propagation. Intermittent misting makes a continuous film of water on the leaves, thus reducing transpiration by increasing moisture around the leaf surface and keeping the cutting turgid until rooting take place (Langhans, 1955). In this way, Creating humid atmosphere by means of artificial mist around the planted cuttings prevents damage even from bright sunshine, proved to enhance the process of rooting (Prolings & Therios, 1976). Some success has been achieved in rooting of hardwood cuttings in phalsa with the use of synthetic auxin, especially Indole-3-butyric acid (Jauhari, 1960).

Srivastava (1996) observed that the maximum root length, number of roots per cutting and percentage survival was observed under 2000 and 3000 ppm concentration of IBA with hard wood cutting of phalsa. Bio-regulators are to be used to improve its maximum rooting ability (Yadav & Rajput, 1969). Hence, it is possible that optimum use of bio regulators and suitable planting time would help for multiplication in propagation of phalsa cuttings. Rooting efficiency would be better when it is done in control conditions such as mist chamber.

Effect of Time

The time of preparation of cuttings in phalsa affected the extent and success of root formation, the suitable time of cuttings preparation and planting is related to the physiological condition of the plant and conditions (Singh et al., 1961). This may be affected by season and several factors such as temperature, light and nutrient availability to the rooting and survival percentage of cuttings. The minimum rooting percentage during winter may be credited to temperature level at the planting time.

Srivastava (1996) reported that the maximum root length, number of roots and survival percentage of hard wood cutting of phalsa observed under 2000 and 3000 ppm concentration of IBA. Quite a lot of factors such as species and specific variety needs, position of shoot, source, cutting type, condition of stock plant, wounding or leaf removal, girdiling of stock plant, time or season of cutting and growing conditions such as use of hormones, rooting media, mist, bottom heat, fertilizer, and light greatly influenced the rooting capacity of stem cuttings in plants (Hartmann et al., 2002). Kumar et al. (2007) showed that the rooting of Phalsa cuttings was recorded under July planting time. October to December were not found suitable forcuttings. July is found suitable for rooting of Phalsa cuttings.

Singh et al. (1961) reported that the rooting percentage was maximum in stem cutting of phalsa under July-August planting time. The time of preparation of cuttings in phalsa greatly affects the extent and success of root formation, the best time of cuttings preparation and planting is related to the physiological condition of the plant and climatic conditions. This may be affected by

season and several factors such as light, temperature and nutrient availability to the rooting and survival percentage of cuttings. Cuttings of winter season might have been carrying maximum inhibitor to induce roots or they might have higher nitrogen to carbohydrate ratio to produce roots in the cuttings. Lower temperature may also be one the reason for lower rooting in winter season cuttings as it slow down the process of root initiation.

Singh (2015) showed that the highest rooting percentage, length of shoot, diameter of root and number of sprouts was observed under June planting time. Kumar et al. (2007) in which they have tried different seasons and found best rooting of Phalsa cuttings in the month of July in open and mist conditions. Singh (2017) recorded that the maximum number of sprouted cutting, survival percentage of cutting, length of longest sprout, percentage of rooted cutting, number of primary roots, and length of root diameter of root was recorded under August planting time. Better partitioning coefficient in cuttings was observed higher when planted on 30th July planting time (Devi et al., 2016).

Effect of Auxins Concentration

Application of major growth regulators to induce rooting namely IBA, IAA, and NAA gained importance over time in propagation of phalsa plant through stem cuttings. (Raju & Prasad, 2010, & Singh et al., 2011). Yadav et al. (1969) observed that the roots from the phalsa cutting sinitiated from cambium, secondary phloem and medullary rays in the xylum. Singh and Kumar (1967) reported that highest percent of rooting number of roots, length of rootin cuttings of Phalsa when middle part of shoots were taken and treated with 2500 ppm concentration of IBA. As per Tanabe (1982), auxin is required for commencement of unusual roots on stems and in reality it has been uncovered that divisions of the primary root beginning cells are dependent upon endogenous auxins. Srivastava (1996) showed that the treatment of hard wood cutting of Phalsa with IBA (2000 and 3000ppm) maximum the root length, number of roots and percentage of survival. Similarly, Srivastava et al. (1998) observed the best results in rooting of Phalsa cuttings treated with 2000ppm IBA when compared with 100 and 300 ppm concentrations of IBA.

Some success has been achieved in rooting of hardwood cuttings in Phalsa with the use of synthetic auxin, especially Indole-3-butyric acid (Jauhari, 1960). The best rooting in Phalsa hardwood cuttings was obtained treatment with IBA at 200 ppm. Highest root length, rooting percentage and number of roots is showed that hardwood cutting treated with IBA 400 ppm + NAA 200 ppm. Survival of the plants develop through hard wood cuttings treated with IBA 400 ppm + NAA 200 ppm, IBA 100 ppm and IBA 400 ppm was found the maximum (Singh et al., 2015). Davis and Haissig (1990) reported that including a little level of certain phenoxy mixes to either IBA or IAA enhanced rooting and formed superior root system than those got when phenoxy mixes are utilized alone.

Singh et al. (2015) recorded that the cuttings treated with 2000 ppm concentration of IBA, best performed in all aspects, as maximum rooting and survival percentage, length of shoot and root, diameter of root and sprouting in shoot. The maximum number of sprouted cutting, survival percentage of cutting, length of longest sprout, diameter of thickest sprout, number of leaves, percentage of rooted cutting, number of primary roots, diameter of thickest root, length of longest root, fresh and dry weight of root was recorded under 1000 ppm concentration of IBA (Singh, 2017). Application of the Indole-butyric acid (IBA) trigger the histological characters such as formation of callus and differentiation of vascular tissues (Mitra & Bose, 1954). Singh (2017) recorded that the maximum number of sprouted cutting, survival percentage of cutting, length of longest sprout, percentage of rooted cutting, number of primary roots, diameter of root and length of root was recorded under August planting time. Growth regulators have been shown to regulate various aspects of plant growth and development including cell elongation, cell division and cell differentiation.

Singh et al. (2016) observed that the maximum survival of cutting was recorded under 2000 ppm concentration of IBA. Singh (2015) observed that the cuttings treated with IBA 2000 ppm performed best rooting percentages. Maximum number of rooting, and length of rootis observed that hardwood cutting treated with 200 ppm concentration of IBA. (Ghosh et al., 2017). The maximum number of rootsunder optimum concentration of IBA may be attributed to the increased rate of respiration, accumulation of maximum level of amino acids at their bases in the auxin treated cuttings than untreated cuttings.

Ratnamala et al. (2014) showed that the hardwood cuttings treated with at 200 ppm concentration of IBA recorded the highest values for root and shoot parameters, viz., minimum number of days taken for sprouting, highest number of sprouts, number of leaves, leaf area per cutting, leaf chlorophyll content per cutting, fresh and dry weight of the shoot, percentage of rooted and survival cuttings, number of roots, length of the root, fresh and dry weight of the root and percentage of establishment of rooted cuttings in the main field. Better partitioning coefficient in cuttings was observed higher when planted on 30th July and treated with NAA 300 ppm (Devi et al., 2016). Roots induced by auxin showed a highly increased number of vascular strands in relation to its concentration. Use of the auxin has appeared to influence cell division in the vascular cambium, cell development and control of separation into various sorts of cambial outcomes in accomplishment just as expansion of growth of shoots in the woody stem (Mellerowicz et al., 2001).

Effect of Type of cutting

The maximum rooting was typically found in cuttings taken from the lower bit of the branch. This was referred to the chance of higher gathering of starches and grouping of endogenous root-advancing substances that were delivered in buds and leaves (Hartmann & Kester, 1983). Ghosh et al. (2017) showed that the maximum percentage of rooting, number of primary root and length of root is observed under hardwood cutting. Highest percentage of survival cutting, number of primary root and length of root was observed under *Grewia asetica* L. basel portion of cutting (Singh et al., 2018). Ratnamala et al. (2014) was recorded under minimum number of days taken for sprouting, maximum number of sprouts, number of leaves, leaf area per cutting, leaf chlorophyll content, fresh and dry weight of the shoot, percentage of rooted cuttings, number of roots per cutting, length of the longest root, survival percentage of cuttings, fresh and dry weight of the root were observed under hardwood cuttings. In *Grewia optiva*, IBA (250 mg/l) in the rainy season was most effective a maximum of 80% and 70% rooting in juvenile and mature cuttings, respectively (Swamy, 2002). Kathrotia and Singh (1995) showed that the highest rooting and survival percentage of Phalsa hardwood cuttings recorded under 200 ppm concentration of IBA.

Effect of Rooting Media

Establishing of phalsa stem cuttings and the consequent root development was seen as impacted by the establishing medium. Among the few establishing media, sand is broadly utilized, as it is effectively accessible and the most affordable. Sand comprises of basically no mineral supplements and has no buffering limit. It is generally utilized as a solitary medium or in mix with natural materials (Sadhu, 1986). Singh et al. (2018) showed that the maximum percentage of rooted and survival cutting, number of primary root and maximum length of root was observed under M_2 (Vermi compost) rooting media. The highest survival percentage of cutting, number of primary roots, percentage of rooted cutting and length of root was observed under vermi compost rooting media (Singh et al., 2018).

Effect of Growing condition

In plant proliferation, the misting have been extensively utilized for establishing of various sorts of cutting. Creating humid climate by methods for fake fog around the planted cuttings either in covered pot culture house or in open conditions has demonstrated to build the way toward establishing (Prolings 7 Therios, 1976). Mist house growing condition

is often used on cuttings because it reduces the leaves temperature, increases relative humidity around the leaf surface and lowers respiration (Singh, 2018).

Langhans, (1955) said that discontinuous fog is regularly utilized on cuttings since it diminishes the temperature of the leaves, brings down breath, and expands relative dampness around the leaf surface. Singh et al. (2015) recorded that the highest survival and rooting percentage, length of shoot and root, diameter of root and sprouting of was recorded under mist house protected condition. Singh et al. (2018) observed that the maximum success of rooting was showed under mist house growing condition.

CONCLUSION

Rainy season was found to be the most appropriate time for planting in term of survival and rooting of cuttings. It can be suggested that best rooting in phalsa hardwood cuttings was obtained with the IBA treatment which gives the over all best performance under mist conditions to produce tallest plant of phalsa within a short time and thus, recommend for its commercial vegetative multiplication.

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