Journal of Pharmacognosy and Phytochemistry 2017; 6(6): 803-806

Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(6): 803-806
Received: 12-09-2017
Accepted: 14-10-2017

**K Dey**
Department of Fruit Science, Bidhan Chandra Krishi Viswaviyalaya, Mohanpur, Nadia, W.B, India

**A Ghosh**
Department of Fruit Science, Bidhan Chandra Krishi Viswaviyalaya, Mohanpur, Nadia, W.B, India

**A Mani**
Department of Post Harvest Technology, Bidhan Chandra Krishi Viswaviyalaya, Mohanpur, Nadia, W.B, India

**FK Bauri**
Department of Fruit Science, Bidhan Chandra Krishi Viswaviyalaya, Mohanpur, Nadia, W.B, India

**AN Dey**
Department of Forestry, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, W.B, India

**Correspondence**
**A Ghosh**
Department of Fruit Science, Bidhan Chandra Krishi Viswaviyalaya, Mohanpur, Nadia, W.B, India

# Root generation of Karonda (*Carissa carandas* L.) cuttings in response of sucrose and IBA

**K Dey, A Ghosh, A Mani, FK Bauri and AN Dey**

**Abstract**
This experiment was conducted at Bidhan Chandra Krishi Viswavidyalaya on vegetative propagation of Karonda by hardwood cuttings. The cuttings were treated with different concentrations of sucrose (2%, 4% and 6%) and IBA (7500 ppm, 8000 ppm and 8500 ppm) along with control and the experiment was replicated thrice. Treated cuttings were planted in polybags and kept in shade. The experimental results indicated that IBA 8000 ppm recorded highest rooting percentage (39.43%) followed by 4 per cent sucrose (37.12%) and lowest was recorded in control (23.13%). The maximum root length was observed in IBA 8000 ppm (6.85cm) followed by 4 per cent sucrose (6.49 cm) whereas control recorded only 4.15 cm root length.

**Keywords:** Cutting, IBA, Karonda, Sucrose

## Introduction

Karonda (*Carissa carandas* L.) popularly known as 'Christ's thorn' is an important minor fruit crop of tropical and subtropical areas and an important crop of arid zones. It has excellent potential to be used for horticultural plantations in marginal and wastelands, owing its hardy nature with wide adaptability to saline sodic soils with high pH level (Rai and Misra, 2005) [8]. The crop is grown for making beautiful juvenile hedge and because of the presence of axillary spines it can be a very good bio-fence (Sharma and Banyal, 2010) [11]. The *C. carandas* has been recognized in different systems of traditional medicine to cure various diseases. The unripe fruit is thermogenic, aphrodisiac, appetiser and antipyretic and is useful in vitiated conditions of Pitta and Kapha, hyperpiesia, diarrhoea, anorexia and intermittent fevers. The ripe fruit is appetizer and antiscorbutic and is useful in burning sensation, skin diseases, scabies and pruritus (Imran *et al*., 2012) [4]. The fruits possess appreciable amount of jelly grade pectin and acidity, hence a large number of processing factories during the last decade have been built for making commercial jelly and a product by the name 'Nakal cherry' which closely resembles the canned cherry fruits (Rai and Misra, 2005) [8]. Besides, the fruits are one of the richest sources of iron (39.1 mg/100 g). The vegetative propagation by cuttings has advantage in the maintenance of good agronomic characteristics, encouraging the production and multiplication of true to type plants. As scarce information is available in the literature on propagation techniques of the karonda, the present experiment was undertaken to raise karonda plants through treatment of the cuttings with different concentrations of sucrose and IBA.

## Materials and Methods

### Study area

The experiment was conducted at polyhouse of ICAR-AICRP on Fruit, Mondouri, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia (West Bengal), during monsoon in the year 2016.

### Preparation of stem cuttings

Healthy and uniform hardwood cuttings were obtained from 4-5 year old plants. From the selected branches, 25 cm long having 4 to 5 nodes and 1.0-1.2 cm thick cuttings were taken from hardwood portion of the branches. Cuttings were dipped in fungicide solution (Bavistin) for 2-3 minutes and subsequently washed in distilled water and kept in shade for 10 minutes before giving the treatment. After that cuttings were briefly dipped in the treatment solution and were planted in polythene bags filled with substrate (Sand: Soil: FYM @ 1:2:1). In this study, there were four levels of sucrose and IBA treatments ($T_1$- Sucrose 2%, $T_2$- Sucrose 4%, $T_3$- Sucrose 6%, $T_4$- IBA 7500 ppm, $T_5$- IBA 8000 ppm, $T_6$- IBA 8500 ppm and $T_7$- Control/only clean water) with three replications and each replication consisted of forty cuttings. The polybags were then kept in the polyhouse and watered regularly.

**Observation recorded**
Observations were recorded daily up to 60 days after planting (DAP). The observation recorded were –

**Rooting success percent**
It was calculated by using this formula -

$$\frac{\text{Total number of cuttings success}}{\text{Total number of cuttings planted in all replicates}} \times 100\ (\%)$$

**Days taken for sprouting**
The treated cuttings were observed daily under each treatment for its sprouting. The number of days required for first sprouting was recorded.

**Number of sprouts**
The number of sprouts in each cutting on the 60th day after planting in the polybag was recorded.

**Number of leaves**
The number of leaves in each cutting on the 60th day after planting in the polybag was recorded.

**Shoot length (cm)**
The total length of the shoot per cutting in each treatment was recorded by vernier calipers on 60th day after planting.

**Number of roots**
The total number of adventitious roots per cutting was counted under each treatment on 60th day after planting.

**Root length (cm)**
The total length of the longest root per cutting in each treatment was recorded by vernier calipers on 60th day after planting.

**Root diameter (cm)**
The diameter of the root per cutting in each treatment was recorded by vernier calipers on 60th day after planting.

**Experimental design and statistical analysis**
The experiment was laid out in Completely Randomized Design (CRD) with 7 treatments and 3 replications. Analysis of variance (one way classified data) for each parameter was performed using op stat software (online version). The statistical analysis was done by following Completely Randomized Design (CRD) as per Gomez and Gomez (1983) [3]. The significance of different sources of variation was tested by error mean square by Fischer-Snedecor's 'F' test at probability level of 0.05 percent.

**Results and discussions**
**Rooting success percentage**
A perusal of Table 1 indicated that the rooting success percentage was influenced significantly by sucrose and IBA treatment. The highest percentage (39.43%) was recorded under $T_5$ (8000 ppm IBA) followed by $T_2$ (4% sucrose) (37.12%) and the minimum success percentage of cutting (23.13%) observed under $T_7$ (Control). The response of IBA could be that it is slowly degraded by the auxin degrading enzyme linked system (Sharma *et al.,* 2009) [10]. Deepika *et al.*, (2015) [2] suggested that, since IBA translocates poorly, it is retained near the site of application and is therefore very effective. The application of IBA might have an indirect influence by enhancing the speed of transformation and movement of sugar to the base of cuttings and consequently rooting as mentioned by Torkashvand and Shadparvar (2012) [13] in hibiscus. Also the production of adventitious roots in plants is controlled by growth substances and auxins play a key role in this process. On other hand sucrose treatment was also effective in karonda rooting. The rooting in woody cuttings is chiefly influenced by the concentration of carbohydrate. Sucrose is good source of carbohydrate which gives direct energy to the cuttings. High sugar level affect rooting by reducing the level of nitrogen which is essential for rooting process (Yeboah *et al.,* 2009) [14]. This might be the reason due to which sucrose produced higher rooting percentage compared to control.

**Days taken for sprouting**
Results (Table 1) represent that days taken for sprouting of cutting of *Carissa carandas* L. ranged from 10.35 to 15.55 DAP. Minimum duration (10.35 DAP) was obtained in $T_2$ followed by $T_5$ (12.35 DAP) and maximum duration (15.55 DAP) was obtained in $T_7$ treatment. Early sprouting might be due to the reason that sucrose is a good source of carbohydrate which supply direct energy to the cuttings which leads to early sprouting.

**Number of sprouts/cutting**
The data pertaining to number of sprouts/cutting as influenced by sucrose and IBA were statistically significant and presented in Table 1. Highest number was found in $T_2$ (3.93) and least (1.85) was in $T_7$. 4% sucrose gave more number of sprouts followed by IBA. The better performance with the use of sucrose could be explained by the larger carbon skeleton provided by this carbohydrate, resulting in higher availability of biosynthetic building blocks. (Correa *et al*., 2005) [1].

**Table 1:** Effect of Sucrose and IBA on Karonda cuttings.

| Treatments | Rooting success (%) | Days taken for sprouting | Number of sprouts/cutting |
|---|---|---|---|
| $T_1$ (2% Sucrose) | 26.48 (30.96) | 14.15 | 2.71 |
| $T_2$ (4% Sucrose) | 37.12(37.52) | 10.35 | 3.93 |
| $T_3$ (6% Sucrose) | 31.25(33.97) | 13.37 | 3.57 |
| $T_4$ (IBA 7500 ppm) | 28.64(32.34) | 14.04 | 3.35 |
| $T_5$ (IBA 8000 ppm) | 39.43(38.88) | 12.35 | 3.87 |
| $T_6$ (IBA 8500 ppm) | 35.05(36.29) | 13.26 | 3.74 |
| $T_7$ (Control) | 23.13(28.74) | 15.55 | 1.85 |
| S.E(m) ± | 0.013 | 0.021 | 0.019 |
| C.D | 0.039 | 0.064 | 0.059 |

**Number of leaves**
Data regarding number of leaves are presented in table 2, which states that number of leaves was significantly affected by sucrose and IBA concentrations. The average number of leaves (13.59) was highest under $T_2$ (4% sucrose) treatment followed by $T_5$ (8000 ppm IBA) treatment (13.05). The

average number of leaves on new sprout per cutting (9.71) was lowest under $T_7$ (Control) treatment. The more number of leaves with sucrose might be because of more number of sprouts with same treatment. As more number of leaves are produced they start manufacturing photosynthates, which may contribute to initiation of rooting. Rapidly developing buds sometimes tend to promote root formation, whereas buds in the rest period may inhibit root development (Deepika *et al*., 2015) [2].

**Shoot length (cm)**

In the hardwood cutting treated with IBA at 8000 ppm (14.62 cm) and sucrose 4% (14.55 cm) concentration over control (12.21 cm) recorded maximum shoot length. The effect of IBA is known to stimulate both cambial activity and xylem development in many woody species and is required for formation of the primordium initial cell. The increase in shoot length might be attributed to the well developed root system in such cuttings which might have tended to promote shoot growth by ensuring adequate mobilization of water and nutrients from the soil or substrate to the growing apex. Consequently, there is a faster growth rate of the newly emerged shoots as reported by Pratima and Rana (2011) [7] in Kiwifruit. The better performance with the use of sucrose could be explained by the larger carbon skeleton provided by the carbohydrate present within it, resulting in higher availability of biosynthetic building blocks. (Correa *et al.*, 2005) [1].

**Table 2:** Effect of Sucrose and IBA on Karonda cuttings.

| Treatments | Number of leaves | Shoot length (cm) |
|---|---|---|
| $T_1$ (2% Sucrose) | 10.25 | 13.15 |
| $T_2$ (4% Sucrose) | 13.59 | 14.55 |
| $T_3$ (6% Sucrose) | 11.04 | 13.82 |
| $T_4$ (IBA 7500 ppm) | 10.75 | 13.72 |
| $T_5$ (IBA 8000 ppm) | 13.05 | 14.62 |
| $T_6$ (IBA 8500 ppm) | 12.72 | 14.15 |
| $T_7$ (Control) | 9.71 | 12.21 |
| S.E(m) ± | 0.020 | 0.022 |
| C.D | 0.061 | 0.066 |

**Number of roots**

The effect of auxins on the number of roots that are observed in the hardwood cuttings treated with IBA 8000 ppm concentration (10.96) followed by sucrose 4% (10.42) concentration performed better over all other treatments (Table- 3). The increase in number of roots was probably due to hormonal effect and accumulation of other internal substances and their down-ward movement as reported in citrus species (Pandey *et al*., 2003) [6]. The application of IBA may have an indirect influence by enhancing the speed of transformation and movement of sugar to the base of cuttings and consequently rooting. These results were also in conformity with Ribeiro *et al*., 2010 [9] who found highest number of roots with IBA 7500 ppm in Prunus species and reported that auxin application could provoke an earlier of faster root growth which is important for quality and quantity. Root primordial requires auxins, which are elicited by externally applied auxins and also known to allocate carbohydrates to the base of the cuttings. Endogenous auxin level might have been supplemented by exogenously applied auxin bringing about certain anatomical and physiological changes that resulted in more number and length of primary roots. The effect of sucrose on rooting could be explained that generally carbohydrates supply energy and carbon skeleton for the synthesis of organic compounds which are used for root formation (Deepika *et al*., 2015) [2].

**Root length (cm)**

The effect of sucrose and IBA on the root length observed in the hardwood cutting treated with IBA 8000 ppm concentration recorded highest (6.85 cm) compared to cuttings raised under control (4.15 cm) (Table-3). The increase in length of roots in cuttings treated with growth regulators may be due to the enhanced hydrolysis of carbohydrates, accumulation of metabolites at the site of application, synthesis of new proteins, cell enlargement and cell division induced by the auxins (Singh *et al*., 2011) [5]. Kesari *et al*., (2010) [12] studied the investigative effect of auxin on rooting of Pongamia pinnata and concluded that auxin concentrations affects the beginning rooting, number of roots and length of roots. On other hand the better response of sucrose might be because carbohydrates are necessary ‘‘building blocks’’ and energy source for plant tissues. The availability of carbohydrates is often considered exclusively as an energetic requirement and carbon skeleton source to drive root development (Correa *et al*., 2005) [1].

**Root diameter (cm)**

In the hardwood cutting treated with IBA at 8000 ppm (0.97 cm) and sucrose 4% (0.85 cm) concentration over control (0.38 g) recorded maximum root diameter. It is believed that with increased IBA levels, root diameter also increased. This phenomenon might be attributed to greater metabolic activity and maximum utilization of sugar and starch after hydrolysis from stem (Torkashvand and Shadparvar, 2012) [13].

**Table 3:** Effect of Sucrose and IBA on Karonda cuttings.

| Treatments | Number of roots | Root length (cm) | Root diameter (cm) |
|---|---|---|---|
| $T_1$ (2% Sucrose) | 8.76 | 5.03 | 0.45 |
| $T_2$ (4% Sucrose) | 10.42 | 6.49 | 0.85 |
| $T_3$ (6% Sucrose) | 9.45 | 5.64 | 0.63 |
| $T_4$ (IBA 7500 ppm) | 9.13 | 5.25 | 0.55 |
| $T_5$ (IBA 8000 ppm) | 10.96 | 6.85 | 0.97 |
| $T_6$ (IBA 8500 ppm) | 9.88 | 6.04 | 0.76 |
| $T_7$ (Control) | 8.05 | 4.15 | 0.38 |
| S.E(m) ± | 0.024 | 0.020 | 0.023 |
| C.D | 0.073 | 0.062 | 0.071 |

**Conclusion**

From the above discussion, it may be concluded that various levels of sucrose and IBA had a large impact on the success, survival and rooting in cuttings of Karonda (*Carissa carandas* L.) within a short period of time. IBA @ 8000 ppm followed by sucrose 4% were found to be the best treatments may be recommended for the commercial vegetative propagation of Karonda by stem cuttings.

**References**


1. Correa LDR, Paim DC, Schwambach J, Fett-Neto AG. Carbohydrates as regulatory factors on the rooting of Eucalyptus saligna Smith and Eucalyptus globulus Labil. Plant Growth Regul. 2005; 45:63-73.
2. Deepika KV, Sharma G, Singh D, Mishra G. Effect of sucrose and auxins on rooting of Karonda cuttings, *Carissa carandas* L. Int. J. Farm Sci. 2015; 5(4):139-144.
3. Gomez KA, Gomez AA. Problem data. In Wiley Inter Science Publication (eds. John Wiley and Sons) Statistical Procedures for Agri. Res., (2nd edition). New York, USA, 1983, 275-315.

4. Imran MA, Begum G, Sujatha K, Mallaiah B. Effect of adenine sulphate (ads) with cytokinins on multiple shoot production in Carissa carandas. Int. J. Pharma. Bio-Sci. 2012; 3(1):473-480.
5. Kesari V, Das A, Rangan L. Effect of genotype and auxin treatment on rooting response in stem cuttings of pongamia pinnata a potential biodiesel plant. Current Sci. 2010; 98(9):1234-1237.
6. Pandey A, Patel RM, Agrawal S, Sharma HG. Effect of plant growth regulator on rooting and survival percentage of different species of citrus cuttings. The Orissa J. Hort. 2003; 31:42-44.
7. Pratima P, Rana SV. Effect of pre-conditioning treatments, IBA and collection time on the rooting of semi- hardwood cuttings of kiwifruit (Actinidia deliciosa Chev). Int. J. Farm Sci. 2011; 1(2):30-36.
8. Rai R, Misra KK. Micropropagation of Karonda (*Carissa carandas*) through shoot multiplication. Scientia Hort. 2005; 103:227-232.
9. Ribeiro MM, Collado LM, Antunes MA. The influence of indol-3-butyric-acid in Prunus laurocerasus vegetative propagation. Acta Hort. 2010; 885:277-282.
10. Sharma N, Anand R, Kumar D. Standardization of pomegranate (*Punica granatum* L.) propagation through cuttings. Biol. Forum – an Int. J. 2009; 1(1):75-80.
11. Sharma SK, Banyal SK. Rehabilitation of marginal lands through karonda cultivation. Intensive Agri. 2010, 6-12.
12. Singh B, Singh S, Singh G. Influence of planting time and Iba on rooting and growth of pomegranate (*Punica granatum*) 'Ganesh' cuttings. Acta Hort. 2011; 890:183-188.
13. Torkashvanda AM, Shadparvar V. Rooting in Hibiscus rosa- sinensis (yellow double hybrid') by indole butyric acid and rooting substrates. Int. J. Plant, Animal and Env. Sci. 2012; 2(2):194-197.
14. Yeboah J, Lowor ST, Amoah FM. The rooting performance of shea (*Vitellaria paradoxagaertn*) stem cuttings as influenced by wood type, sucrose and rooting hormone. Scientific Res. Essay. 2009; 4(5):521-525.