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Effect of sucrose and auxins on rooting of karonda cuttings, *Carissa carandas* L

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ABSTRACT

The experiment was conducted at Agricultural Research Institute, Rajendranagar, Hyderabad on vegetative propagation of karonda by cuttings. Karonda cuttings were treated with different concentrations of sucrose and auxins viz 2 and 4 per cent sucrose; 7000, 8000 and 9000 ppm IBA and 1000, 2000 and 3000 ppm NAA along with control (water dip) and the experiment was replicated thrice. Treated cuttings were planted in polybags, kept in shade and analyzed for various rooting parameters. The results indicated that IBA 8000 ppm recorded highest number of roots (10.89) which was at par with IBA 9000 ppm (10.44) followed by 4 per cent sucrose (9.99) and lowest was recorded in control (3.77). The maximum length of longest root per cutting was observed in case of IBA 8000 ppm (6.56 cm) which was at par with 9000 ppm IBA (6.35), 4 per cent sucrose (6.31 cm) and IBA 7000 ppm (6.12 cm) whereas control recorded only 2.57 cm root length. IBA 8000 ppm recorded highest rooting percentage (34.44%) and lowest (13.33 %) was observed in control.

Keywords: Propagation; auxins; sucrose; rooting; cuttings; IBA

INTRODUCTION

Karonda (*Carissa carandas* Linn syn *Carissa congesta* Wight) belonging to the family Apocynaceae is indigenous to India and is found wild in Bihar, West Bengal and south India and in commercial plantations in the Varanasi district of Uttar Pradesh (Banik et al 2012). It is an exceedingly hardy shrub that flourishes well on lands with high temperatures and wide range of soils. 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). 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 appetiser and antiscorbutic and is useful in burning sensation, skin diseases, scabies and pruritus. The roots are anthelmintic, stomachic and antiscorbutic and are useful in stomach disorders, intestinal worms, scabies and pruritus (Imran et al 2012). Under the changing world trade scenario it can be exploited on a commercial scale as a fruit for the processing industries. It is rich source of iron (39.10mg/100 g) and carbohydrates (67.10 mg/100 g edible portion). The raw and ripe fruits are used to prepare preserved products like jam, jelly, squash and pickle (Peter 2007). 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 very little information is available in the literature on propagation techniques of the karonda the present study was undertaken to raise karonda plants through treatment of the cuttings with various concentrations of sucrose and auxins.

MATERIAL and METHODS

The experiment was conducted during 2012 at Agricultural Research Institute, Rajendranagar, Hyderabad. The experiment was laid in RBD comprising of nine treatments viz T_1 (2% sucrose), T_2 (4% sucrose), T_3 (7000 ppm IBA), T_4 (8000 ppm IBA), T_5 (9000 ppm IBA), T_6 (1000 ppm NAA), T_7 (2000 ppm NAA), T_8 (3000 ppm NAA) and T_9 (control/water dip) which were replicated thrice with30 cuttings per replication. Sucrose solutions of 2 and 4 per cent were prepared by dissolving 20 and 40 g of sucrose respectively in distilled water and the volume in each concentration was made up to 1000 ml with distilled water. The auxin concentrations of 7000, 8000 and 9000 ppm by dissolving 7.0, 8.0 and 9.0 g IBA respectively and 1000, 2000 and 3000 ppm by dissolving 1.0, 2.0 and 3.0 g NAA respectively were prepared in small quantity of ethyl alcohol and the volume in each concentration was made up to 1000 ml by adding distilled water.

Uniform, healthy and disease and pest free semi-hardwood cuttings of pencil size thickness were selected from mother plants from Agricultural Research Institute, Rajendranagar in August. From the selected branches 20 cm long cuttings having 4 to 5 nodes were taken from semi-hardwood portion of the branches. Black polythene bags of 15 x 22 cm size and 300 gauge thickness were filled with potting mixture of red soil, FYM and sand in a proportion of 1:1:1 along with 1 g of carbendazim per cubic meter of potting mixture as prophylactic measure to prevent the disease occurrence and were kept in shade condition. The basal 1.5-2.0 cm portion of the cuttings was treated with different treatments immediately after detaching from the plant and planted in polybags containing potting mixture.

Weeding and watering was done at regular intervals as per need. The medium was drenched with carbandazim (0.15%)

at fortnightly interval to check disease incidence. The data on various root/rooting parameters were taken 2 months after the establishment of the cuttings. At the end of the experiment the cuttings were scored for number of roots per cutting, root length (cm) and rooting percentage (%). The data thus obtained were evaluated using the analysis of variance (ANOVA).

RESULTS and DISCUSSION

The observations given in Table 1 reveal that among the treatments IBA 8000 ppm recorded maximum number of roots (10.89) which was at par with IBA 9000 ppm (10.44) followed by 4 per cent sucrose (9.99). All the treatments recorded higher number of roots as compared to control (3.77). The increase in number of roots was probably due to hormonal effect and accumulation of other internal substances and their downward movement as reported in citrus species (Pandey et al 2003). These results are also in accordance with Bandopadhyay et al (1982) who found that IBA increased number of roots in *Carissa* species. Ribeiro et al (2010) also found highest number of roots with IBA 7500 ppm in *Prunus* species and indicated that auxin application could provoke an earlier or faster root growth. The effect of sucrose on increasing root length was also observed in karonda, mulberry and phalsa (Verma et al 1971) and olive (Wiesman and Lavee 1995). Generally carbohydrates supply energy and carbon skeleton for the synthesis of organic compounds which are used for root formation.

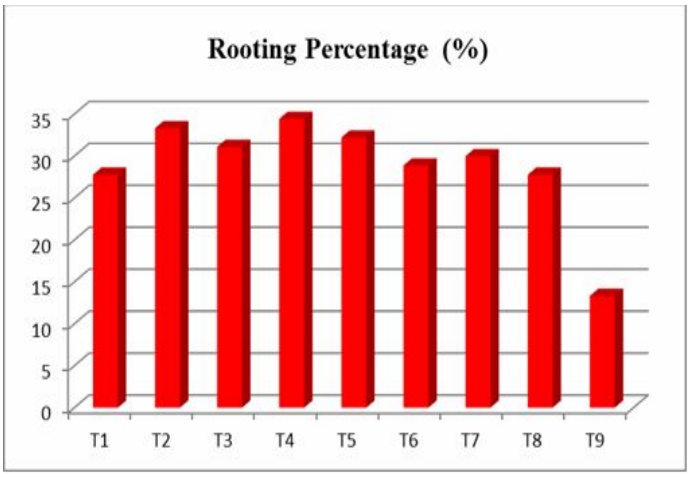
Maximum length of longest root per cutting was observed in treatment (T_4) (6.56 cm) which was at par with T_5 (6.35 cm), T_2 (6.31 cm) and T_3 (6.12 cm) followed by T_7 (5.16 cm), T_6 (5.06 cm), T_8 (4.84 cm) and T_1 (4.82 cm) and were at par with each other. Control (T_9) recorded least root length (2.57 cm). The increase in length of roots in cuttings treated with auxins 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). The results are also in accordance with the findings of Misra and Jaiswal (1993) in karonda who observed longest root length with 10000 ppm IBA. On other hand the better response of sucrose might be due to the reason that carbohydrates are known as building blocks which act as necessary 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).

The data pertaining to rooting percentage as influenced by sucrose and auxins were statistically significant and presented in Table 1 (Fig 1). IBA 8000 ppm showed higher rooting percentage (34.44)

Table1. Effect of sucrose and auxins on rooting of karonda cuttings at 60 days after planting

Treatment	# Roots/cutting	Length of longest root (cm) per cutting	Rooting percentage (%)
T_1- 2% Sucrose	6.00	4.82	27.78 (31.79)
T_2 - 4% Sucrose	9.99	6.31	33.33 (35.21)
T_3 - 7000 ppm IBA	8.66	6.12	31.11 (33.89)
T_4 - 8000 ppm IBA	10.89	6.56	34.44 (35.93)
T_5 - 9000 ppm IBA	10.44	6.35	32.22 (34.57)
T_6 - 1000 ppm NAA	7.77	5.06	28.89 (32.50)
T_7 - 2000 ppm NAA	8.09	5.16	30.00 (33.21)
T_8 - 3000 ppm NAA	7.00	4.84	27.78 (31.79)
T_9 - control/water dip	3.77	2.57	13.33 (21.14)
Mean	8.06	5.31	28.76 (32.22)
SEm±	0.17	0.15	1.86 (1.28)
$CD_{0.05}$	0.53	0.46	5.64 (3.84)

The figures in parentheses are angular transformed values



T_1 - 2% Sucrose T_2 - 4% Sucrose T_3 - 7000 ppm IBA
T_4 - 8000 ppm IBA T_5 - 9000 ppm IBA T_6 - 1000 ppm NAA
T_7 - 2000 ppm NAA T_8 - 3000 ppm NAA T_9 - control/ waterdip

Fig 1. Effect of sucrose and auxins on rooting percentage

compared to control (13.33). Similar results were obtained by Tyagi et al (1999) in *Carissa*. Other growth regulators and sucrose concentrations also showed more rooting percentage than control. The response of IBA could be that it is slowly degraded by the auxin degrading enzyme linked system (Sharma et al 2009). Likewise Weaver (1972) suggested that since IBA translocates poorly it is retained near the site of application and is therefore very effective. 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 as mentioned by Torkashvanda and Shadparvar (2012) in hibiscus. 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 affects rooting by reducing the level of nitrogen which is essential for rooting process (Yeboah et al 2009). This may be the reason due to which sucrose produced higher rooting percentage compared to control.

CONCLUSION

As the successful rooting of cuttings was determined both by number of roots formed and by root elongation and growth it shows that IBA 8000 ppm was best in rooting performance of karonda cuttings followed by IBA 9000 ppm and 4 per cent sucrose compared to control. The sucrose treated cuttings gave almost equal response as IBA. Hence IBA and sucrose could be recommended for treating karonda cuttings.

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