Short Communication

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Effect of stem cuttings and IBA concentrations on rooting and percentage success in karonda (*Carissa carandas* Linn.) under semi-arid ecosystem of western India

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Karonda (*Carissa carandas* Linn.), a xerophytic plant can be grown commercially in semi-arid ecosystem of Western India as protective hedge and block plantation. It is native to India and popularly known as Bengal currant or Christ's thorn. It is now considered as important arid and semi-arid zone fruit crop because of its hardy nature and its nutritious fruits (Bhavya *et al*., 2018). Therefore, it can 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). Fruits of karonda are used for preparation of value added products like pickles, chutneys, jelly, candy and Nakal cherry. Nakal cherry'closely resembles the canned cherry fruits (Rai and Misra, 2005). According to Dey *et al*. (2017), the karonda fruits are one of the richest sources of iron (39.1 mg/100 g). It is mainly propagated by seeds, which leads a different degree of variation among the population. Various elite clones of karonda have been identified at different places from its variable indigenous genetic resources (Athani *et al*., 2005; Mishra, 2007, Singh *et al*., 2015) which have to be multiplied vegetatively for their popularization and adoption in farmer's field. Different asexual propagation methods have been recommended by several workers from different parts of country with variable degree of success viz., air layering (Ghosh *et al*., 2011), chip budding (Ghosh *et al*., 2011), softwood grafting (Bhavya *et al*., 2018), wedge grafting (Ghosh *et al*., 2011), hardwood cutting (Dey *et al*., 2017) and micro-propagation (Rai and Misra, 2005). However, comparative study of hard and semi-hardwood cutting is lacking. Therefore, the present experiment was undertaken to study the comparative advantage of using semi-hardwood and hard wood cuttings when treated with different concentrations of IBA under semi-arid ecosystem of western India.

The present work was carried out at Central Horticultural Experiment Station (ICAR-CIAH), Godhra. The experiment was laid out under factorial Randomized Block Design with 6 treatments and 3 replication (Cochron and Cox, 1992). The experimental material consisted of 20 cm long stem cuttings with three nodes obtained from the middle portion of six months old and one year old shoots for semi-hardwood and hardwood cuttings respectively. The cuttings were collected during the month of July from three year old healthy mother plant of karonda cv. Thar Kamal. Six concentrations of IBA viz. 1000 ppm, 2500 ppm, 5000 ppm and 7500 ppm were applied on the basal part of each cutting while in case of control, cuttings were untreated. Then these treated cuttings were planted in 2 kg capacity poly-bags containing growing media of Soil, FYM and sand in equal proportion. Overhead water sprinkling over the cuttings was done daily in the morning hours. Subsequently the stem cuttings were carefully maintained and examined during the experimental period. There were 20 cuttings per treatment per replication. The different root and shoot growth parameters were measured after 8th week of planting. Further, success percentage and root length were also recorded. The collected data were analyzed statistically and per cent data were angularly transformed and the critical differences (C.D.) at 0.05 level of probability were worked out for comparing the means.

A perusal of Table 1 indicated that various root and shoot growth characters were significantly influenced by type of cuttings and IBA concentrations. Among different types of cuttings, significantly semi-hardwood cuttings recorded higher number of primary (3.51) and secondary roots (24.28) in comparison to hardwood cuttings. Similarly higher number of shoots per plant (4.20) and success (35.00 %) percentage were observed with semi-hardwood cuttings while hardwood cuttings recorded only 3.18 shoots/plant and 19.50 % success. Similar kind of observations was made by Tripathi *et al*. (2014) at CHES, Chethali. Generally carbohydrates provide energy and carbon skeleton for the synthesis of organic compounds which are used for root formation (Deepika *et al*., 2015). The increase in number of roots was probably due to 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 Singh *et al*. (2015) who found that various factors influenced rooting in lemon cuttings. Results regarding effect of growth regulators on various characters of karonda cuttings showed that IBA 5000 ppm was found most effective for improving success percentage (49.75 %), number of primary roots (5.00), secondary roots (35.75) and shoots per plant (6.25) over other concentrations of IBA including control. In general, IBA 5000 ppm was found to improve number of roots, shoots and success percentage in both the types of cuttings. Semi-hardwood cutting with IBA 5000 ppm recorded higher success

percentage (61.10 %), number of primary roots (7.75), secondary roots (35.75) and shoots per plant (6.50) over hardwood cuttings which recorded 38.40 % success, 4.25 number of primary roots, 35.00 secondary roots and 6.0 shoots per plant. Application of auxin which might have caused hydrolysis and translocation of carbohydrates and nitrogenous substances at the base of cuttings and resulted in accelerated cell division and cell elongation in suitable environment (Singh *et al*., 2015). These results were in agreement with those obtained by Dey *et al*. (2017) and Bhavya *et al*. (2018) in cuttings of karonda while Ghosh *et al*. (2011) in karonda air layers. In conclusion, Karonda can be successfully propagated through semi-hardwood cuttings in the month of July by treating them with IBA @ 5000 ppm.

Table 1. Effect of stem cuttings and IBA concentrations on rooting, number of shoot and success percentage in Karonda.

IBA Conc. (ppm)	Av. number of Primary roots			Av. number of Secondary roots			Av. number of shoots/plant			Success (%)		
	HWC	SHWC	Mean	HWC	SHWC	Mean	HWC	SHWC	Mean	HWC	SHWC	Mean
Control	1.8	2.00	1.90	10.25	11.20	10.72	1.10	2.50	1.80	2.30 (8.13)	5.15 (12.92)	3.72 (10.52)
IBA 1000	2.20	2.75	2.47	18.80	18.50	18.65	1.50	2.60	2.05	8.70 (17.60)	18.20 (25.25)	13.45 (21.42)
IBA 2500	2.75	3.10	2.92	22.03	21.10	21.56	2.10	3.90	3.00	15.30 (21.39)	30.00 (33.21)	22.65 (27.30)
IBA 5000	4.25	5.75	5.00	35.00	35.75	35.37	6.00	6.50	6.25	38.40 (38.29)	61.10 (51.41)	49.75 (44.85)
IBA 7500	3.50	4.00	3.75	30.40	31.05	30.72	4.60	5.00	4.80	30.25 (33.52)	50.10 (45.06)	40.17 (39.29)
IBA 10,000	3.00	3.50	3.25	27.01	28.09	27.59	3.80	4.70	4.25	22.06 (28.38)	45.50 (42.42)	33.78 (35.40)
Mean	2.91	3.51		23.92	24.28		3.18	4.20		19.50 (24.55)	35.00 (35.04)	
CD (p=0.05)	T= 0.04 C=0.02 T X C=0.05			T= 0.41 C=0.17 T X C=0.29			T= 0.08 C=0.03 T X C=0.05			T= 0.89 C=0.36 T X C=0.63		

HWC- Hard wood cutting, SHWC-Semi Hard wood cutting

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