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Studies on effect of different pre - sowing treatments on germination of karonda (*Carissa carandas* L.) seeds

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Abstract
Karonda is propagated through seeds, cuttings, graftings, air layering and stooling. The seeds of karonda are quite hard and having low germination percent, but it is propagated through seeds. Considering the constraints of low seed germination percentage the trail was undertaken at K.R.C. College of Horticulture, Arabhavi during 2016-2017 to study the effect of different chemical treatment along with water soaking treatment. Among the different treatments maximum percent of germination (83.30) was observed with water soaking treatment for eight hours. Control treatment recorded lowest percent of germination (63.30).

Keywords: *Carissa carandas* L, Karonda, germination

Introduction

Karonda (*Carissa carandas* Linn.) is native to India and grows wild in Maharashtra, Rajasthan, Uttar Pradesh, West Bengal and Bihar. It is popularly known as "Bengal currant" or "Christ's Thorn". Other names are karamanda, karavanda, kaunda, kalivi, natal plum in India. In Kannada it is called as 'Kavalikayi'. It belongs to family Apocynaceae with chromosome number 2n = 22. Karonda is an important minor indigenous underexploited fruit crop of India. It has recently attained importance as an arid zone horticulture crop because of its hardy nature and its nutritious fruits.

Karonda is a woody, evergreen dichotomously branched, spiny shrub grows to height of 10-15ft. Leaves are opposite, small, ovate and shiny. Flowers are white in colour produced in terminal cyme. It is preferred very much as a protective hedge in Gujarat and Punjab. It is sometimes grown as an ornamental plant due to its beautiful cherry like fruits. Karonda is best suited as a live protective fence due to the presence of axillary spines and formation of profuse leaves on crowded branches. It has excellent potential to be used for horticultural plantations in marginal and wastelands, owing to its hardy and xerophytic nature with wide adaptability to saline sodic soils with pH up to 10 (Bankar *et al*., 1994 and Chundawat., 1995) [2, 3]. Fruits are generally harvested at immature stage for vegetable purpose, while fully ripen fruits are consumed fresh or processed (Malik *et al*., 2010) [8].

The dried fruits are good source of iron (39.10mg/100 g), pectin and contain fair amount of vitamin C.

Fruits are used in preparation of jelly, jam, syrup, murabba and chutney (Kumar *et al*., 2007) [7]. The unripe fruits yield milky white latex which can be used in preparing chewing gum and rubber. The unripe fruits of karonda are medicinally used as an astringent. The ripe fruit is sweet, cooling, appetiser and antiscorbutic and is useful in controlling burning sensation, skin diseases, scabies, pruritus (Imran *et al*., 2012) [6] and particularly suitable for tarts and puddings. It is also used in curing anaemia.

Though the fruits are being used for different purposes, it has not yet been exploited on a commercial scale. There exists a great variation in size, shape and colour of the fruits. Based on the fruit colour, three types are available – green, pink and white (Singh 1967) [9]. Based on taste, it can be further grouped into two types – sweet and sour. As the crop is highly cross-pollinated, large variability exists in natural population. The seed is quite hard and germination is low. Still the fruit crop is commercially propagated by seeds. The objective of present study was to improve the seed germination to standardize the pre-sowing treatments for raising the crops.

Materials and Methods

The investigation on seed germination in karonda was carried out in the Department of Fruit Science, Kittur Rani Channamma College of Horticulture, Arabhavi, during 2016-2017. The experiment was laid out with 9 treatments T_1 - Control, T_2 - KNO_3 1% for 2 hours,

T_3 - KNO_3 1% for 1 hour, T_4 - GA_3 500ppm for 1hour, T_5 - GA_3 50ppm for 1hour, T_6 - Thiourea 1% for 2 hours, T_7 - Thiourea 1% for 1 hour, T_8 - Water soaking for 8 hours and T_9 - 50 °C hot water soaked for 10 minutes with three replications. Observation on days taken for initiation, 50 percent germination and maximum germination was recorded till 90 day after sowing. Observation on seed germination percentage, shoot length (cm), root length (cm), fresh weight of seedling (g), dry weight of seedling (g) and seedling vigour index – I was recorded at 90 days after sowing.

Result

The data in the Table 1 revealed that, minimum number of days taken for initiation of germination was recorded in T_2 - KNO_3 1% for 2 hours (9.33) which was on par with T_8 - water soaking for 8 hours (9.66) and maximum number of days taken for initiation germination was highest in T_4 - GA_3 500ppm for 1hour (12.00). Significantly minimum number of days taken for 50 per cent was observed in T_2 - KNO_3 1% for 2 hours (14.00) which was on par with T_3 - KNO_3 1% for 1 hour (14.66) and T_8 - water soaking for 8 hours (14.66). Whereas maximum number of days taken for 50 per cent germination was recorded in T_4 - GA_3 500ppm for 1 hour (16.33). Lowest number of days taken for maximum germination was observed in T_8 - water soaking for 8 hours (19.00) which was on par with T_2 - KNO_3 1% for 2 hours (19.66) and T_3 - KNO_3 1% for 1 hour (20.33). Whereas, highest number of days taken for maximum germination was recorded in T_4 - GA_3 500ppm for 1 hour (22.00).

The data in the Table 2 revealed that, highest shoot length was recorded in T_8 - water soaking for 8 hours (19.33) followed by T_7 - Thiourea 1% for 1 hour (18.83) and T_6 - Thiourea 1% for 2 hours (18.33). Whereas, lowest shoot length was recorded in T_1 - Control (11.33). Highest root length was recorded in T_3 - KNO_3 1% for 1 hour (13.00) which was on par with T_7 - Thiourea 1% for 1 hour (12.33), T_8 - water soaking for 8 hours (12.00), T_6 - Thiourea 1% for 2 hours (12.00) and T_4 - GA_3 500ppm for 1 hour (12.00). Whereas, lowest root length was recorded in T_1 - Control (10.00). Seedling fresh weight was recorded maximum in T_8 - water soaking for 8 hours (3.53) followed by T_7- Thiourea 1% for 1 hour (3.43).Whereas, minimum fresh weight was recorded in T_1 – Control (2.14). Significantly highest dry weight of seedling and seedling vigour index - I was recorded in T_8 - water soaking for 8 hours (1.53 and 2612.00) whereas, lowest dry weight of seedling and seedling vigour index - I was recorded in T_1 - Control (0.60 and 1348.00), respectively.

Discussion

Priming with KNO3 and hydro – priming both improved germination, positive effect of chemical stimulators such as KNO3 on seed germination is related to creating a balance between hormonal ratios in seed and reducing the growth preventable materials, like ABA (Ali *et al.,* 2010). Similarly days taken for initiation germination is less in seeds soaked in water may be due to soaking the seeds in water at room temperature helps in softening the seed coats, removal of inhibitors and reduces the time required for germination and increases germination per cent age (Hartman and Kester, 1979). Hydro-priming improved seedling emergence rate due to enhanced supply of soluble carbohydrates to the growing embryo, which was caused by an increase in α-amylase activity. Rapid and uniform emergence of seedlings due to seed priming enable the plants to use available resources efficiently, leading to increase in biomass and yield (Ghassemi *et al*., 2014). The seedlings that emerged early are vigorous. Since the germination percentage, seedling length and seedlings fresh weight were found highest hence this would be the reason for higher dry weight and vigour index of seedlings.

Table 1: Effect of chemical treatments on germination characters of karonda seed

Treatments	Days taken for initiation of germination	Days taken for 50% of germination	Days taken for completion of germination	Germination %
T_1 - Control	11.00	16.00	21.33	63.30 (52.74)*
T_2 - KNO_3 1% for 2 hours	9.33	14.00	19.66	68.32 (55.85)
T_3 - KNO_3 1% for 1 hour	10.66	14.66	20.33	65.00 (53.70)
T_4 - GA_3 500ppm for 1hour	12.00	16.33	22.00	66.70 (54.78)
T_5 - GA_3 50ppm for 1hour	10.00	15.00	21.00	75.00 (60.10)
T_6 - Thiourea 1% for 2 hours	11.33	15.00	21.00	73.32 (58.92)
T_7 - Thiourea 1% for 1 hour	11.00	15.33	21.33	71.66 (57.85)
T_8 - Water soaking for 8 hours	9.66	14.66	19.00	83.33 (65.95)
T_9 - 50 °C hot water soaked for 10 minutes	11.00	16.00	21.32	68.30 (55.76)
SEm±	0.40	0.44	0.49	1.56
CD@5%	1.19	1.32	1.47	4.64

( )*Values in parenthesis are arc sign transformation data

Table 2: Effect of chemical treatments on growth parameters of karonda seed

Treatments	Length of shoot (cm)	Length of root (cm)	Fresh weight of seedling (g)	Dry weight of seedling (g)	Seedling vigour index
T_1 - Control	11.33	10.00	2.14	0.61	1348.00
T_2 - KNO_3 1% for 2 hours	14.70	10.33	2.61	0.91	1665.00
T_3 - KNO_3 1% for 1 hour	16.60	13.00	3.08	0.98	2027.00
T_4 - GA_3 500ppm for 1hour	14.00	12.00	2.59	0.87	1727.00
T_5 - GA_3 50ppm for 1hour	17.00	11.83	2.75	1.17	2162.00
T_6 - Thiourea 1% for 2 hours	18.33	12.00	3.10	1.31	2223.00
T_7 - Thiourea 1% for 1 hour	18.83	12.32	3.43	1.37	2233.00
T_8 - Water soaking for 8 hours	19.33	12.00	3.53	1.53	2612.00
T_9 - 50 °C hot water soaked for 10 minutes	13.65	10.65	2.41	0.83	1660.00
SEm±	0.53	0.36	0.10	0.03	68.16
CD@5%	1.57	1.08	0.31	0.10	202.50

Conclusion

Germination of karonda seeds and morphological characters of karonda seedlings can be enhanced when seeds were soaked in water upto 8 hours.

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