

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.912.234>

Effect of Seed Treatments on Seedling Growth of Karonda (*Carissa carandas* L.) cv. Local

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ABSTRACT

Keywords

Growth, GA₃, Cow
dung slurry,
Thiourea, Vigour
Index

Article Info

Accepted:
14 November 2020
Available Online:
10 December 2020

The present experiment was carried out at Horticultural Research Farm, Department of Horticulture, B. A. College of Agriculture, AAU, Anand during the year 2017-18 with the objective to study effect of different seed treatment on growth parameters of Karonda. The Experiment was laid out in completely randomized design involved 11 different seed treatments including control. Among various treatments applied, Seeds soaked in cow dung slurry for 24 hours recorded maximum seed germination (62.67%), Seedling vigour index-I (1744) and seedling vigour index-II (74.25). Length of tap root at 60 and 90 DAS (13.80 and 17.07 cm, respectively) was also observed maximum with the same treatment. While, seeds soaked in GA₃ 100 mg/l for 24 hours improved various growth parameters viz., seedling length (16.15, 24.05 and 28.43 cm), number of leaves per seedling (10.67, 18.53 and 27.60) at 30, 60 and 90 DAS, number of primary roots (27.07 and 34.67) and secondary roots (32.67 and 38.67) at 60 and 90 DAS and fresh as well as dry weight of seedling (3.12 and 1.20 g, respectively) at 90 DAS. While, seeds soaked in GA₃ 150 mg/l for 24 hours gave significantly maximum diameter of seedling (2.02 and 2.29 mm) at 60 and 90 DAS.

Introduction

Karonda (*Carissa carandas* L.) belongs to Apocynaceae family and is one of the important, minor underexploited fruit crop. It is originated in India with chromosome number $2n = 22$. It is popularly known as “Bengal currant” or “Christ’s Thorn”. There are about 30 species in the genus *Carissa* being native of tropics and subtropics of Asia, Africa, Australia and China (Arif *et al.*, 2016). Karonda is suitable for growing throughout subtropical and tropical climatic

zones of India. Major natural areas of occurrence of karonda have been observed in the states of Maharashtra, Bihar, West Bengal, Chhattisgarh, Orissa, Gujarat, Madhya Pradesh and Rajasthan (Singh *et al.*, 2014). It is very hardy shrub, flourishes well on lands with high temperatures and wide range of soils. It also grows successfully on marginal and wastelands. Seeds are recalcitrant and are relatively high in moisture content and possess a characteristic feature of losing their viability within 4-5 weeks. Hence, seeds of karonda should be sown just after

extraction from fruits. The seed is quite hard and germination is low. Application of some pre-sowing treatments to the seeds affects their germination percentage and seedling growth in different fruit crops. To get higher and proper germination, seed require special treatments like scarification including soaking in water, growth regulators, concentrated acid solution etc. which helps in promotion of early and higher percentage of seed germination with healthy and vigorous seedling.

Materials and Methods

The experiment was conducted during the year of 2018 under net house (50% shade) in College Nursery, Horticultural Research Farm, Department of Horticulture, B. A. College of Agriculture, AAU, Anand. The whole experiment comprised of 11 seed treatments viz, T₁- Soaking of seeds in tap water for 24 hours; T₂- Hot water treatment (60 ± 5°C) for 10 minutes; T₃-Soaking of seeds in cow dung slurry for 24 hours; T₄- Soaking of seeds in cow urine (10%) for 24 hours; T₅-Seed soaking in 5% H₂SO₄ (for 2 minutes) + wash in distilled water; T₆- Soaking of seeds in GA₃ 50 mg/l for 24 hours; T₇- Soaking of seeds in GA₃ 100 mg/l for 24 hours; T₈- Soaking of seeds in GA₃ 150 mg/l for 24 hours; T₉- Soaking of seeds in thiourea 1% for 1 hour; T₁₀-Soaking of seeds in thiourea 2% for 1 hour; T₁₁- Control. These treatments were replicated thrice in completely randomised design. The fully ripe fruits of sweet type karonda were collected from Horticulture Research Farm of Anand Agricultural University in the month of June. The seeds were extracted and washed with water to remove the mucilaginous covering over the seed surface. The seeds were shade dried. The treated seeds were sown in polythene bags having size of 22×9 cm, previously filled with potting mixture which was prepared by mixing 1:1:1 of each soil,

FYM and vermicompost. The polythene bags were placed in flat beds with proper space. Watering of seeds was done as soon as they were sown in polythene bags. Weeding and watering were done at regular intervals whenever needed. For protection of young karonda seedlings from any fungal attack at nursery stage, Bavistin (Carbendazim 50% WP) was drenched twice during the course of experiment. The observations regarding germination percentage, seedling length, seedling diameter, number of leaves, length of tap root, number of primary and secondary roots, fresh as well as dry weight and vigour index were taken at regular intervals.

Results and Discussion

Seed germination (%)

It is evident from Table 1 that seeds soaked in cow dung slurry for 24 hours (T₃) recorded significantly the maximum germination (62.67%) followed by treatment T₇ and T₆. This might be due to the presence of growth promoting substance (auxins) in cow dung which enhanced the germination in karonda. Similar results were obtained by Mistry and Sitapara (2020) in karonda, Shinde and Malse (2015) and Shirol *et al.*, (2005) in khirnee, Chaudhari (2017) in mango and Parmar *et al.*, (2018) in jackfruit.

Seedling length (cm)

The data presented in Table 1 revealed that significantly maximum length of seedling was observed at 30, 60 and 90 DAS in soaking treatment with GA₃100 mg/l for 24 hours (16.15, 24.05 and 28.43 cm, respectively) followed by treatment with cow dung slurry for 24 hours. This is might be due to GA₃ increase osmotic uptake of nutrients there by causing cell division and cell multiplication. GA₃ is well known for promotion of internodal cell elongation, there by leading to

increase in seedling length. Similar results were also obtained by Lay *et al.*, (2015) in papaya, Rajput (2017) and Yadav *et al.*, (2018) in custard apple.

Number of leaves

Maximum number of leaves was noticed in treatment with GA₃100 mg/l for 24 hours (10.67, 18.53 and 27.60, respectively) at 30, 60 and 90 DAS, followed by treatment with cow dung slurry for 24 hours. This might be due to activity of GA₃ at apical meristem, resulting in more synthesis of nucleoprotein responsible for increasing leaf initiation and leaf expansion. These results are in accordance with Nimbalkar *et al.*, (2012), Sharma (2016) in tamarind, Palepad *et al.*, (2017) in custard apple.

Seedling diameter

The results revealed that maximum diameter of seedling (2.02 and 2.29 mm, respectively) was observed in soaking treatment with GA₃ 150 mg/l for 24 hours at 60 and 90 DAS

followed by treatments T₇ and T₃. It might be due to, GA₃ increase osmotic uptake of nutrient and boost the growth by increasing cell division, cell elongation and cell multiplication in the cambium tissue of the stem portion. These results are in accordance with Ramteke *et al.*, (2015) in aonla, Joshi *et al.*, (2017) in chironji, Manthri and Bharad (2017) in guava.

Length of Tap root

Table 2 revealed that maximum length of tap root (13.80 and 17.07 cm, respectively) was resulted at 60 and 90 DAS in soaking with cow dung slurry for 24 hours (T₃) followed by treatment T₇ (GA₃ 100 mg/l). This might be due to the presence of growth promoting substances (auxins) and minerals like, N, P, K, Ca, Mg, S and other micronutrients which may be contributed in increased physiological activities of seedling, essential for cell division and enlargement. These results are in accordance with Shinde and Malse (2015) in khirnee, Chaudhari (2017) in mango.

Table.1 Effect of seed treatments on germination and growth parameters of karonda seedling

Treatment	Germination %	Seedling length (cm)			Number of leaves per seedling			Seedling diameter (mm)	
		30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	60 DAS	90 DAS
T ₁	45.33	11.38	18.57	24.36	7.60	15.20	21.60	1.83	2.04
T ₂	25.33	7.17	11.05	16.82	6.13	13.33	16.80	1.56	1.75
T ₃	62.67	14.05	22.80	27.97	10.13	17.87	26.53	1.91	2.16
T ₄	48.67	9.52	17.48	21.50	8.00	16.13	24.13	1.89	2.07
T ₅	38.00	9.32	17.20	21.30	7.33	14.67	19.47	1.79	1.92
T ₆	59.33	11.42	19.57	25.32	9.87	17.07	25.20	1.80	1.98
T ₇	60.67	16.15	24.05	28.43	10.67	18.53	27.60	1.96	2.19
T ₈	49.33	10.43	18.67	24.12	8.53	16.53	24.53	2.02	2.29
T ₉	47.33	9.10	17.50	21.60	7.87	15.47	23.20	1.88	2.03
T ₁₀	42.67	9.55	17.91	23.62	8.20	15.60	23.47	1.85	2.00
T ₁₁	22.67	7.12	10.58	15.83	5.47	13.20	16.47	1.44	1.69
S.Em. ±	2.96	0.38	0.57	0.74	0.26	0.38	0.59	0.04	0.07
C.D. at 5%	8.68	1.12	1.66	2.16	0.76	1.12	1.75	0.12	0.22
C.V.%	11.24	6.29	5.53	5.59	5.51	4.16	4.58	3.96	6.31

Table.2 Effect of seed treatments on root growth of karonda seedlings

Treatment	Length of Tap root (cm)		Number of Primary roots		Number of Secondary roots	
	60 DAS	90 DAS	60 DAS	90 DAS	60 DAS	90 DAS
T ₁	9.70	11.13	18.00	21.60	23.73	27.73
T ₂	6.15	9.00	12.47	19.80	22.60	25.87
T ₃	13.80	17.07	24.13	30.27	29.00	36.47
T ₄	8.77	11.00	20.20	23.00	26.67	28.87
T ₅	8.18	10.52	17.00	20.73	22.93	26.27
T ₆	10.26	14.13	23.73	28.27	28.27	35.20
T ₇	12.77	16.23	27.07	34.67	32.67	38.67
T ₈	9.93	13.47	22.20	25.87	27.80	30.87
T ₉	9.18	11.84	18.47	21.87	26.47	29.47
T ₁₀	8.82	11.70	19.27	23.07	27.00	30.80
T ₁₁	6.05	8.35	12.13	18.60	21.73	23.93
S.Em. ±	0.88	0.63	0.58	0.82	0.86	0.96
C.D. at 5%	2.57	1.85	1.71	2.41	2.53	2.78
CV %	8.83	8.96	5.17	5.84	5.68	5.40

Table.3 Effect of seed treatment on biomass and vigour of karonda seedling

Treatment	Fresh weight of seedling (g)	Dry weight of seedling (g)	Seedling vigour index- I	Seedling vigour index- II
T ₁	2.75	0.68	1101	30.89
T ₂	2.44	0.56	424	14.13
T ₃	3.10	1.18	1744	74.25
T ₄	2.84	0.91	1044	44.40
T ₅	2.63	0.63	808	24.23
T ₆	2.98	1.12	1503	66.71
T ₇	3.12	1.20	1722	72.76
T ₈	2.90	0.98	1201	48.55
T ₉	2.81	0.70	1021	32.85
T ₁₀	2.83	0.74	1006	31.45
T ₁₁	2.36	0.52	358	11.83
S.Em. ±	0.08	0.04	73.92	3.62
C.D. at 5%	0.23	0.11	216.81	10.61
C.V.%	4.81	7.75	11.80	15.25

Number of primary roots

The data presented in Table 2 indicated that highest number of primary roots (27.07 and 34.67, respectively) was observed at 60 and 90 DAS in treatment with GA₃ 100 mg/l for

24 hours which was superior over all the treatments. Vigorous root growth due to GA₃ might have resulted in more production of photosynthates and their translocation through phloem to the root zone, which might be responsible for increase in number of primary

roots. Similar results are in line with the findings of Patel *et al.*, (2016) in mango, Dhawale (2015) in tamarind and Anjanawe *et al.*, (2013) in papaya.

Number of secondary roots

It is evident from Table 2 that soaking treatment of GA₃ 100 mg/l for 24 hours recorded the highest number of secondary roots (32.67 and 38.67, respectively) at 60 and 90 DAS. GA₃ might be increase auxin level in the roots which stimulates more root initiation, more nutrient uptake and more translocation of photosynthates to root zone resulting in increased number of secondary roots. These results are in line with Anjanawe *et al.*, (2013) in papaya, Dilipet *et al.*, (2017) in rangpur lime and Rajput (2017) in custard apple.

Fresh weight of plant

It is evident from Table 3 that maximum fresh weight of seedling recorded in treatment with GA₃ 100 mg/l for 24 hours (3.12 g) which was followed by treatments T₃, T₆ and T₈ at 90 DAS. GA₃ influences on different plant parts, stimulating cell division, cell elongation, auxin metabolism, cell wall plasticity and permeability of cell membrane leading to enhanced growth. Similar results were also obtained by Anjanawe *et al.*, (2013) in papaya, Vasantha *et al.*, (2014) tamarind, Jaiswal *et al.*, (2018) in kagzi lime and Verma *et al.*, (2019) in aonla.

Dry weight of seedling

The data presented in Table 3 revealed that GA₃ 100 mg/l for 24 hours (1.20 g) recorded significantly maximum dry weight of seedling followed by treatment T₃ and T₆ at 90 DAS. Increase in dry weight of seedling is a result of improved mobilization of nutrients due to the application of GA₃, which might have

promote more production of photosynthetic product and translocate them to various plant parts which might have resulted in better plant growth and development. These results are in line with Vasantha *et al.*, (2014) in tamarind, Joshi *et al.*, (2017) in chironji and Verma *et al.*, (2019) in aonla.

Seedling vigour index-I

Table 3 revealed that soaking treatment with cow dung slurry for 24 hours showed significantly maximum seedling vigour index-I (1744) at 90 DAS which was followed by GA₃ 100 mg/l for 24 hour (1722). This is might be due to increased germination and seedling length which have contributed to higher seedling vigour index-I. These results are in accordance with Gurung *et al.*, (2014) in passion fruit, Chaudhari (2017) in mango and Rajput (2017) in custard apple.

Seedling vigour index-II

It is evident from Table 3 that soaking treatment with cow dung slurry for 24 hours showed significantly maximum seedling vigour index-II (74.25) at 90 DAS followed by GA₃ 100 mg/l and GA₃ 50 mg/l for 24 hours (72.76 and 66.71, respectively). The reason might be attributed to the increased dry matter production along with higher germination in seeds treated with cow dung slurry improve seedling vigour index-II. These results are in accordance with Rajput (2017) in custard apple.

Based on the results, it can be concluded that application of cow dung slurry as seed soaking treatment to karonda seeds for 24 hours was most effective in increasing the seed germination. It also gave significant effect by maximizing the length of tap root and improve seedling vigour index-I as well as seedling vigour index-II. The maximum growth of the seedling was observed in seed

soaking treatment with GA₃ 100 mg/l for 24 hours. However, seed soaking treatment with GA₃ 150 mg/l for 24 hours significantly maximized the diameter of karonda seedlings.

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How to cite this article:

Mistry, J. M. and Sitapara, H. H. 2020. Effect of Seed Treatments on Seedling Growth of Karonda (*Carissa carandas* L.) cv. Local. *Int.J.Curr.Microbiol.App.Sci.* 9(12): 1980-1986. doi: <https://doi.org/10.20546/ijcmas.2020.912.234>