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Effect of seed treatments on germination of Karoda (*Carissa carandas* L.) cv. local

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Abstract
The research experiment was conducted at Horticultural Research Farm, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during the year 2018. The Experiment was laid out in completely randomized design involved 11 different seed treatments including control. The effect of different seed treatments on various parameters of germination were studied on karonda seeds. Among various treatments applied, Seeds soaked in cow dung slurry for 24 hours recorded maximum seed germination (62.67%), speed of germination (2.20) and required minimum mean germination time (15.03 days). While, seeds soaked in GA_3 100 mg/l for 24 hours took minimum days (21.00) for germination.

Keywords: Germination, cow dung slurry, GA_3, mean germination time, speed of germination

Introduction
Karonda (*Carissa carandas* L.) is an important, minor underexploited fruit crop has origin in India. It is popularly known as "Bengal currant" or "Christ's Thorn". It belongs to family Apocynaceae with chromosome number 2n = 22. There are about 30 species in genus the Carissa being native of tropics and subtropics of Asia, Africa, Australia and China (Arif *et al*., 2016) [2]. 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, Chhattis Garh, Orissa, Gujarat, Madhya Pradesh and Rajasthan (Singh *et al*., 2014) [10]. 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. The germination percentage and seedling growth are affected by pre-sowing seed treatments in different fruit crops. To get higher and proper germination, seed require special treatments like scarification, 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 research experiment was conducted under net house (50% Shade) in College Nursery, Horticultural Research Farm, Department of Horticulture, B. A. College of Agriculture, Anand Agricultural University, Anand during 2018. The whole experiment comprised of 11 treatments *viz*, T_1 - Soaking of seeds in tap water for 24 hours; T_2 - Hot water treatment (60 ± 5°C) for 10 minutes; T_3 - Soaking of seeds in cow dung slurry for 24 hours; T_4 - Soaking of seeds in cow urine (10%) for 24 hours; T_5 - Seed soaking in 5% H_2SO_4 (for 2 minutes) + wash in distilled water; T_6 - Soaking of seeds in GA_3 50 mg/l for 24 hours; T_7 - Soaking of seeds in GA_3 100 mg/l for 24 hours; T_8 - Soaking of seeds in GA_3 150 mg/l for 24 hours; T_9 - Soaking of seeds in thiourea 1% for 1 hour; T_{10} - Soaking of seeds in thiourea 2% for 1 hour and T_{11} - Control which were replicated thrice in completely randomised design. The fully ripe karonda fruits of sweet type were collected from Horticulture Research Farm of Anand Agricultural University in the month of June. The seeds were extracted carefully. The seeds were washed with water to remove the mucilaginous covering over the seed surface. The seeds were shade dried. After treatment seeds were sown in polythene bag of size of 22×9 cm, previously filled

with potting mixture which was prepared by mixing 1 part of soil, 1 part of FYM and 1 part of vermicompost (1:1:1). The polythene bags were placed in flat beds and 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 (Carbendezim 50% WP) was drenched twice during the course of experiment. The observations regarding germination percentage, days required for germination, speed of germination, mean germination time were taken.

Result and Discussion

Seed germination (%)

The data presented in Table 1 revealed that seeds Soaked in cow dung slurry for 24 hours (T_3) recorded significantly the maximum germination (62.67%) followed by treatment T_7 and T_6. This might be due to the presence of growth promoting substance (auxins) in cow dung which enhanced the germination in karoda. Similar results were obtained by Shinde and Malse (2015) [8] and Shirol *et al.* (2005) [9] in khirnee and Parmar *et al.* (2018) [7] in jackfruit.

Number of days taken for germination

Significantly the minimum days taken for germination (21.00 days) were recorded with soaking of seeds in GA_3 100 mg/l for 24 hours (T_7) followed by treatment with cow dung slurry (T_3). GA_3 might have induced early germination by increased hydrolysis of starch and their translocation to growing tip which might have boosted the growth by increased cell multiplication and elongation resulting in rapid plant growth. Similar results are in line with the findings of Nimbalkar *et al.* (2012) [4], Anjanawe *et al.* (2013) [1] in papaya and Palepad *et al.* (2017) [5] in custard apple and Chiranjeevi *et al.* (2017) [3] in aonla.

Table 1: Effect of seed treatments on different germination parameters of karonda seeds

Treatments	Germination (%)	Number of days taken for germination	Speed of germination	Mean germination time (Days)
T_1 : Soaking of seeds in tap water for 24 hours	45.33	24.67	1.42	16.29
T_2 : Hot water treatment (60 ± 5°C) for 10 minutes	25.33	28.67	0.69	18.91
T_3 : Soaking of seeds in cow dung slurry for 24 hours	62.67	23.67	2.20	15.03
T_4 : Soaking of seeds in cow urine (10%) for 24 hours	48.67	27.00	1.42	17.93
T_5 : Seed soaking in 5% H_2SO_4 (for 2 minutes) + wash in distilled water	38.00	27.33	1.16	18.01
T_6 : Soaking of seeds in GA_3 50 mg/l for 24 hours	59.33	24.00	2.05	15.61
T_7 : Soaking of seeds in GA_3 100 mg/l for 24 hours	60.67	21.00	2.08	15.36
T_8 : Soaking of seeds in GA_3 150 mg/l for 24 hours	49.33	25.67	1.69	15.74
T_9 : Soaking of seeds in thiourea 1% for 1 hour	47.33	24.33	1.40	17.43
T_{10} : Soaking of seeds in thiourea 2% for 1 hour	42.67	26.00	1.28	17.87
T_{11} : Control	22.67	29.00	0.63	21.04
S.Em. ±	2.96	0.95	0.15	0.88
C.D. at 5%	8.68	2.79	0.45	2.57
CV %	11.24	6.46	18.46	8.83

Speed of germination

It is evident from Table 1 that maximum speed of germination (2.20) was observed with seeds soaked in cow dung slurry for 24 hours which was statistically at par with treatments of GA_3 100 mg/l and 50 mg/l. This might be due to presence of growth promoting substance (auxins), biologically active substances, microbes and weak acids in cow dung which showed rapid and vigorous growth of seeds. Similar results were also obtained by Pamei *et al.* (2017) [6] in teak and Vijaylakshmi and Renganayaki in *Pterocarpus santalinus* L.

Mean germination time

The data presented in Table 1 revealed that seeds soaked in cow dung slurry for 24 hours (T_3) recorded significantly the minimum mean germination time (15.03 days) which was at par with treatments T_7, T_6, T_8, T_1 and T_9. This could be due to the moisture conservation in seeds and it also enhanced the water absorption through imbibition process. Ultimately, it increases the germination process by activating enzymes required for the process of germination. Also, the availability of organic matter present in the soil increased due to decomposition process done by microbes incorporated in cow dung slurry which showed rapid growth of seeds.

Conclusion

The result obtained from research experiment concluded that, application cow dung slurry as seed soaking treatment to karonda seeds for 24 hours was most effective in increasing the seed germination (%), accelerate speed of germination and shorten the germination time. However, seed treated with GA_3 100 mg/l for 24 hours, required less number of days to germinate.

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