

# Research and Development in Karonda (*Carissa carandas*), a Semi Wild Fruit in India

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## Abstract

**Karonda (*Carissa carandas*), a fruit of dryland which is a widely grown indigenous shrub in India and is able to flourish in marginal and wasteland where other crops of commercial importance are unsuitable. Collection, conservation and evaluation, a process of crop improvement for characterization and selection of elite plants, are being successfully performed in different parts of India and standardized its vegetative technique of propagation. Its fruits have been utilized in processed products such as in the preparation of jam, jelly, squash, syrup and chutney and is in great demand in the international market.**

## INTRODUCTION

Karonda (*Carissa carandas*) which is known as 'Christ Thorn Tree' is a hardy, evergreen, spiny and indigenous shrub widely grown in India. It is found wild in Bihar, West Bengal and South India. It is grown commonly as a hedge plant and in commercial plantations in the Varanasi district of Uttar Pradesh. It is a non-traditional fruit crop which thrives well as a rainfed crop. Once established, the plant hardly needs any care and gives yield with minimum management.

## STUDY

### Uses and Importance

Fruits are sour and astringent in taste, and are a rich source of iron and vitamin C. Its fruits have antiscorbutic properties and are a very useful in the cure of anaemia. Ripe fruits are sub-acidic to sweet in taste with a peculiar aroma and can be used in the preparation of fruit products such as jelly, sauce and *Carissa* cream or jellied salad. The unripe fruits are sour and astringent and can be used for pickles, sauces and chutneys as reported by Bose et al. (1999).

### Varietal Development of Karonda

There are no well established varieties of karonda although the cultivated types are classified according to fruit colour a green-fruited, pink-fruited and white-fruited by Singh (1969). However, the differences in shape and size of fruits are limited across all three types.

At Konkan krishi idyapeeth (KKV), Dapoli, three plants namely No. 2, No. 5 and No. 2 (from another location) were reported to be promising by Bhagwat (1984). Kumar and Singh (1993) also reported that in eastern Uttar Pradesh (India) identified 4 types of fruit, viz. green, white with pink blush, green with purple blush and maroon. Average fruit weight ranged from 1.6 to 4.7 g and average number of seeds per fruit from 5 to 11. Wide variation was also observed in the biochemical composition of the fruit, with total

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soluble solids ranging from 3 to 4.5%, ascorbic acid from 10.26 to 17.94 mg/100 g, reducing sugars from 0.93 to 2.4% and non-reducing sugars from 0.57 to 1.33%.

### **Soil and Climate Specification**

Since karonda is very hardy and drought tolerant, it also thrives well throughout the tropical and subtropical climates. Heavy rainfall and waterlogged conditions are not desirable. It can be grown on a wide range of soils including saline and sodic soils (Bose et al., 1999).

### **Research Works on Propagation Standardization**

It is commonly grown from seeds. The fresh seeds are sown in nursery during August-September. One year old seedlings are transplanted when seedlings propagation is done.

Rai and Mishra (2005) reported that the shoot tips from field grown, mature plants of *Carissa carandas* cv. Pant Sudarshan were cultured on Murashige and Skoog's (MS) basal medium supplemented with benzyladenine (BA) and indolebutyric acid (IBA) during different seasons. The maximum sprouting rate was obtained with 1.5 cm long explant collected in spring season (February-March) followed by those collected in summer season (April-June). Shoot proliferation was highest on MS basal media supplemented with 3.0 mg L<sup>-1</sup> BA. Rooting of microshoots was noted to be the best in 1/2 MS plus 0.8 mg L<sup>-1</sup> IBA and 0.2 mg L<sup>-1</sup> naphthalene acetic acid (NAA). The rooted plantlets were successfully acclimatized in vermiculite:sand:soil (1:1:1) potting mixture.

### **Fertilizers and Chemicals Application in Karonda**

Karonda plants grown as protective hedges require limited fertilization. Manuring however is beneficial. Its plants slowly get exhausted after taking 2 crops and show symptoms of die back. Therefore, 10-15 kg well rotten farmyards manure or compost/plant applied before flowering is useful (Chadha, 2003).

Mishra and Jaiswal (1998) reported on the effect of gibberellic acid (0, 250, 500, 750 or 1000 ppm), applied 6 times at monthly intervals on the growth of 9-month-old seedlings of *C. carandas*. Seedling height and stem diameter increased with increasing concentration of gibberellic acid. The best treatment for promoting early growth was gibberellic acid at 1000 ppm.

Singh and Mishra (2006) grew seedlings in sand culture to study the effects of nitrogen supply on growth and uptake of other macro and micro nutrients and to determine the leaf nitrogen concentration required for maximum growth of plants. They found that the increasing nitrogen supply increased the leaf nitrogen content whereas increasing nitrogen levels decreased the leaf iron content however, when nitrogen was omitted from the nutrient solution, the leaf iron content increased significantly. Other nutrients did not influence by the variable nitrogen supply. For better plant growth and production, the nitrogen level must be maintained in the range of 0.99 to 0.37%.

### **Flowering and Fruit Setting in Karonda**

Karale et al. (1990) reported that variation in flower characteristics, fruit setting and mode of pollination was studied in 10 umbels on each of 12 shrubs of *Carissa carandas*. Variation was found in number of flower buds (14.6 to 22.6) per umbel, lengths of buds, petals and pedicels, petal number (4 to 6), number of umbel segments (1 to 6) and flower colour. There was an initial fruit set of (73.06%) by self-pollination, but this only gave a final set of 24.24%. With natural pollination the fruit set was 32.02%. The initial fruit set was highest in shrubs with the most umbel segments and concluded that the number of segments could therefore be used as a selection index for high yields in the future.

### **Post Harvest Management of Karonda Fruit**

The fruits harvested at maturity can be stored for a week at room temperature whereas fruit harvested at ripe stage are highly perishable and can only be stored for 2-3 days or for 6 months in SO<sub>2</sub> solution @ 2,000 ppm as reported by Chadha (2003).

### **Crop Improvement in Karonda by Introduction and Selection Methods**

Bose et al. (1999) reported the improvement of this crop can be accomplished by two methods – Introduction and Selection methods. Collection of superior types from exotic sources of *Carissa* sp. namely *Carissa edulis* (EC 35932) and *Carissa grandiflora* (EC 37515) have been introduced from USA at the Regional Station of NBPGR, Jodhpur. Owing to xerophytic nature of these species, plants have very well adopted in Western Rajasthan and the existing population of the fruit crop is mostly originated which shows variability in morphological characters like plant size, canopy, umbel segments, flowers and fruit characters due to heterozygosity, so selection can be used as a crop improvement method in karonda.

Mehra and Arora (1982) also reported that diversity in *Carissa* occurs in North-Western India particularly in Mount Abu, Western Ghats and Khandala in Maharashtra which offers a great deal of scope for improvement of karonda by seedling selection.

### **Value Addition of Karonda Fruit**

Singh and Singh (1998) reported that the fruits of 2 types of *Carissa carandas* (Red-green and White-yellow), collected from India in which fruits from the Red-green type were significantly larger (weight, length and width) than those from the White-yellow type, particularly at the mature stage. Differences in seed size followed the same pattern. The length and width of White-yellow fruits were found to differ to a higher degree between the 2 developmental stages compared with the Red-green fruits. Singh and Singh (1998) further, showed that White-yellow fruits are more suitable for pulp-based uses like making jam, jelly, chutney, pickles and preserves. Such fruits were less sour than Red-green fruits.

Chaudhary et al. (2007) reported that the physicochemical changes in karonda (*Carissa carandas*) jelly during storage were found to be organoleptically acceptable for a period of 4-5 months. After that, the jelly started changing to brownish colour at ambient temperature. The total soluble solid, acidity, total sugar, reducing sugar, browning, flavour, texture, taste and after taste increased with storage period while ascorbic acid, non-reducing sugar, colour and appearance and overall acceptability decreased at ambient temperature.

Manivasagan et al. (2007) reported that two karonda types i.e. pink and green for making pickle and qualitative changes taking place during storage period of four months. The results showed that pH, T.S.S./acid ratio, ascorbic acid, non-reducing sugars, organoleptic values decreased whereas acidity, reducing sugar and browning increased during storage. The TSS and total sugars decreased in pickles prepared from pink and green type and observed that pickles prepared from pink type of karonda was of good quality as compared to sweet pickle.

### **CONCLUSIONS**

Research information on Karonda is lacking in India as well as abroad. However, these hardy, evergreen, spiny and indigenous shrubs widely grown in India have the richest of iron mineral among the fruit crops. Therefore, further research work on; varieties specification including molecular markers for selection among the wild species and preparation of commonly accepted products are needed for this minor fruit crop due to its economic importance and health care.

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## **Tables**

Table 1. Proximate composition of karonda fruit (fresh fruit).

| Constituent (values/100 g edible portion) |       | Minerals (mg/100 g) |       |
|---|-------|---------------------|-------|
| Moisture                                  | 91.00 | Calcium             | 21.00 |
| Protein                                   | 1.10  | Phosphorous         | 38.00 |
| Carbohydrates                             | 2.90  | Iron                | 39.10 |
| Fat                                       | 2.90  |                     |       |
| Fibre                                     | 1.50  |                     |       |
| Calorific value                           | 42.00 |                     |       |

Anon. (1950, 1979).

Table 2. Proximate composition of karonda fruit (dry fruit).

| Constituent (values/100 g edible portion) |        | Minerals (mg/100 g) |       |
|---|--------|---------------------|-------|
| Moisture                                  | 18.20  | Calcium             | 0.16  |
| Protein                                   | 2.30   | Phosphorous         | 0.06  |
| Carbohydrates                             | 67.10  | Iron                | 39.10 |
| Fat                                       | 9.60   | Mineral matter      | 2.80  |
| Calorific value                           | 364.00 |                     |       |

Anon. (1950, 1979).

Table 3. Physical characteristics of fruits of selected lines of karonda as reported by Misra and Jaiswal (1998).

| Selected lines | Fruit length (cm) | Fruit diameter (cm) | Fr. wt. (g) | Seeds/frt | Flesh (%) | Seed (%) | Fruit colour    |
|----------------|-------------------|---------------------|-------------|-----------|-----------|----------|-----------------|
| PK 1           | 2.16              | 1.70                | 3.53        | 4.48      | 87.30     | 12.30    | White pink      |
| PK 4           | 2.24              | 1.71                | 3.74        | 5.61      | 87.85     | 12.15    | Green purple    |
| Pant manohar   | 2.14              | 1.70                | 3.50        | 3.95      | 88.28     | 11.72    | White dark pink |
| Pant Sudarshan | 2.17              | 1.96                | 3.47        | 4.68      | 88.48     | 11.52    | White pink      |
| Pant Suvarna   | 2.25              | 1.67                | 3.63        | 5.89      | 88.25     | 11.75    | Green purple    |
| S. Em $\pm$    | 0.02              | 0.01                | 0.11        | 0.20      | 0.43      | 0.40     | -               |
| CD at 5%       | NS                | 0.03                | 0.30        | 0.60      | NS        | NS       | -               |

