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KARONDA (CARISSA CARANDAS LINN.) AN UNDERUTILIZED FRUIT: A RAY IN POTENTIAL PHYTOCONSTITENTS

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ABSTRACT

In India, Karonda Fruits, Which Are Still Underutilized and Proves Effective to Satisfied Nutrition Demand. Fruits Are One of The Most Vital Component of The Foods Known to Be Consumed by Humans Since Beginning of Human Race. Several Underutilized Fruits Are Unfamiliar, Unknown and Less Eaten. However, Underutilized Fruits Have Not Yet Received Much Awareness as Antioxidant Sources Compared to Commercial Fruits. These Fruits Are Neglected Due to Ignorance Factor, Lack 0f Information, Unavailability, Deficient in These Fruits Promotional Campaigns, Difficulty in Storage and Harvesting. Now, These Fruits May Be Included in The Health Promotion Campaigns. In This Review Article Related to Different Study Aspects of The Fruit Karonda, Includes the Importance Of Morphological And Microscopically Study And Preliminary Phytochemical Investigation In Karonda Of Fruit Along With Its Nutritional Value.

KEYWORDS: Carissa carandas; Karonda fruits; Apocynaceae; Triterpenoids; Carissin; Under utilized fruit.

INTRODUCTION

Carissa carandas belongs to the dogbane family Apocynaceae found to be widely distributed throughout India. The shrub is commonly known as karonda ‘Christ’s thorn’. The scientific classification of plant is

- Classification Kingdom: Plantae

- Class: Angiosperms
- Sub-class: Eudicots
- Superorder: Asterids
- Order: Gentianales
- Family: Apocynaceae
- Genus: Carissa
- Species: Carandas



Carissa Carandas Linn. (Karaunda) is a widely used medicinal plant throughout India and popular in various indigenous system of medicine like Ayurveda, Unani and Homoeopathy. Karonda (Carissa carandas) is found in throughout India mainly in the semi-arid regions. Karondais an evergreen shrub or short stature tree fruits are green in colour and turn to white to reddish purple at maturity. These are round to oblong, sweet, though slightly acidic, juice when fully ripe. Karonda tree is widely cultivated in the home gardens, farmer's fields and orchards as hedge plant. Karonda wood is hard, straight-grained and use for firewood purpose. The green plant serves as a protective hedge around agricultural holdings. Apart from Karonda, Natal plum (Carissa grandiflora), Carissa bispinosa, Carissaedulis, Carissa ovata and Carissa are other cultivated species. There are more than 25 species in genus Carrissa Out of these, 5 species are indigenous to India. Karonda is a medium sized, thorny

shrub It has a greenish white bark on young shoots and greyish brown on mature stems. The spines are straight and 1-3 cm long. At times, these are also forked. Its leaves are opposite, generally 2-3 cm x 1-1.5 cm, and ovate. They are green with shine above and a dull green shade below. Old leaves keep shedding throughout the year. New buds also keep sprouting through the year, though more during spring. Karonda flowers from February to June. The flower of these are white, scented and produced in clusters of 2 to 5 flowers. It is a well suited to arid climate and grown well at higher temperature. It is commonly uses for making ledge for orchards.

All parts of the plant are used in traditional medicine. Traditionally the plant has been used in the treatment of scabies, intestinal worms, pruritus, biliousness and also used as antiscorbutic, anthelmintic. The notable biological activities reported are analgesic, anti-inflammatory, antipyretic, cardiotonic and histamine releasing. The plant is also an alternative source of oil, hydrocarbon and phytochemicals. Medicinal plants are a major source of biodynamic compounds of therapeutic values and are basis of many traditional medicines throughout the world for thousands of years. Herbal medicine is still the mainstay of about 75–80% of the world population, mainly in the developing countries for primary healthcare not because they are inexpensive but also for better cultural acceptability, better compatibility with the human body and minimal side effects. However among the estimated 250,000-400,000 plants species, only 6% have been studied for biological activity and about15% have been investigated phytochemically.

Karonda is commonly used as a condiment or additive to Indian pickles and spices. It is a very hardy, drought-tolerant plant that thrives well in a wide range of soils. karonda fruit is a rich source of iron and contains a fair amount of Vitamin C. Mature fruit contains high amount of pectin The fruits are used for pickle making. It is also used for Jam. Jelly, Squash, Syrup, Chatney etc. There are good demand Karonda products in market. Karonda has good nutrition value. It is rich in Iron, The fruits also contains vitamin C and It is antiscorbutic and very useful for cure of anaemia. (Table 1). Karonda fruits are used in many ayurvedic formulations and us to their nutritional values. The extract of root is used for Chest pain. The extract of leaves is used for fever. The study conducted at Indian Horticultural Research Institute, Bangalore revealed that fruit are rich in Thiamine (B1), Riboflavin (B2), Pantothenic acid (B5), Pyridoxine (B6), Biotin (B7), Folic acid (B9).

Fruits have been reported to contain carisol, epimer of αamyrin, linalool, β-caryophyllene, carissone, carissic acid, carindone, ursolic acid, carinol, ascorbic acid, lupeol, and β-sitosterol.

- **Fruit morphology:** Carissa carandas fruits were subjectively evaluated for color, shape and appearance. The Carissa carandas fruits were dissected and seed and pulp were separated manually to record pulp and seed weight. Edible portion was calculated. Weight (g) Average fruit weight was determined by weighing the randomly selected ten fruits in an electronic balance and the average was calculated. Breadth (cm) Average fruit breadth was measured randomly selected ten fruits along horizontal axis touching each other on a graph sheet and the breadth was measured and average calculated. Length (cm) Average fruit length was assessed by placing ten randomly selected fruits along vertical axis touching each other on a graph sheet and the length was measured and average calculated. Volume (ml) Fruit volume was determined by measuring randomly selected ten fruits by amaranth seed displacement method (Anonymous, 1983). Ten fruits were used for displacement and the mean was calculated. **Density (g/cm3) Fruit density was calculated from weight and volume of Carissa carandas fruits (Anonymous, 1983) by using the formula.** Chemical characteristics Chemical composition influences sensory properties, shelf life and value addition potentials. Moisture (%) Moisture content of fruits was determined by standard procedure of AOAC (Anonymous, 1990). Difference in the weight of the samples before and after drying was considered as moisture content and was calculated by the following formula. Total minerals (%) Total mineral content of fruit was analyzed by igniting known weight of sample in a muffle furnace for four hours at 600 °C and weighed (Anonymous, 1990). The difference in weight was taken as to the minerals weight of ash. Total minerals calculated by the formula.

Dietary habits are the habitual decisions of an individual or culture makes when choosing what food to eat and determined mainly by the availability of foods locally and local practices. A healthy diet may improve or maintain optimal health by giving an individual proper nutrition and protecting them from various diseases. Generally, nutrients are those substances which have health promoting as well as health protective activity. Broadly nutrients can be divided into two types- macro nutrients and micro nutrients. Macro nutrient includes protein, carbohydrate, lipid or fat and crude fibre. On the other hand, micro nutrient includes different minerals, vitamins, antioxidants etc. Reactive oxygen species (ROS) are

generally produced during the various metabolic processes in our body. These ROS are involved in the onset of many diseases such as cancer, rheumatoid arthritis, and atherosclerosis as well as in degenerative processes associated with ageing.[1] Almost all organisms are well protected against free radical damage by enzymes such as superoxide dismutase and catalase, or compounds such as ascorbic acid, phenolic compounds, tocopherols and glutathione.[2] When the mechanism of antioxidant protection becomes unbalanced by factors such as aging, deterioration of physiological functions may occur. However, the antioxidants present in human diet are of great interest as possible protective agents to help the human bodies reduce oxidative damage. It has been reported that the antioxidant activity of plant materials are well correlated with the content of their phenolic compounds.[3,4] Phenolic compounds are potent antioxidants as they have beneficial effect on human health in fighting diseases by scavenging the reactive oxygen species (ROS)5. In India, many vegetables, fruits and plant based foods are known to have such health promoting and

Nutrient content of carissa carandas fruits.

Sr. No.	Nutrient	Amount
1	Energy	364 kcal
2	Protein	2gram
3	Fat	10 gm
4	Mineral	3gm
5	Fiber	1.81 gm
6	Carbohydrates	67gm
7	Calcium	160 gm
8	Iron	39 gm
9	Moisture	18 gm
10	Ash	0.78 gm
11	Sugars	11.58 gm

Nutraceutical properties: C. carandas fruits have been used as a dietary supplement or medicinal food for centuries and are of increasing importance to consumers. A natural ‘food colorant cum nutraceuticals supplement’ was prepared from the ripe karonda fruits. The formulation had been named as ‘Lalima’. 1 ml of this pigment suspension formulation is sufficient to give lovely red colour to one serving of any colourless beverage (100 ml) such as lemonade. One serve of such supplemented beverage may in addition contain 469.2 µg anthocyanin, 12.7 mg flavonoids, 14.1 mg phenol, with total antioxidant activities to be 390 µM Trolox Equivalent.[10] At present, many commercial fruit products are available in the market hence the present review will possibly act as bridge between nutraceutical food and

industrial pharmaceutical potentials of C. carandas. The fruit juice containing major phenolic compounds such as ferulic acid, rutin, cyanidin-3-glucoside, flavonoid and anthocyanin compounds has downregulated the induction of inflammatory inducible nitric oxide synthase as well as cyclooxygenase-2 (COX-2) in lipopolysaccharide-stimulated macrophages. The nutraceutical contents including carbohydrate, protein, crude fibre and ascorbic acid were found to be present in C. carandas fruits. These contents have reflected their high nutraceutical properties and therapeutic value, which makes them to be used as dietary supplements. Even they would be used in several beneficial ways because of their antioxidant activity. Fruit extracts of Artocarpus chaplasha and C. carandas obtained from Bangladesh were evaluated for antioxidant potential. Different concentrations of fruit extracts such as 50%, 70% and pure form were prepared in methanol, ethanol and acetone (in water). The total phenol and total flavonoid contents were determined using Folin– Ciocalteu and aluminium trichloride methods. In addition to this, the antioxidant effect was evaluated by DPPH assay. Total phenol content and in-vitro antioxidant activity were found highest in 70% of acetone extract and were lowest in 100% of acetone extract. However, the flavonoid content was recorded highest in both pure ethanol fruit extracts. From all investigation, it was suggested that among two fruit extracts, C. carandas had contained higher phenolic content and antioxidant activity in all solvents.

Fruits are useful in treatment anorexia and insanity. The fruit exudes much gummy latex when being cooked but the rich-red juice becomes apparent and is used in cold beverages. The sweeter types may be eaten raw but the more acid ones are best stewed with plenty of sugar. (Kaistha and Kier, 1962; Jayakumar et al., 2015a; Jayakumar et al., 2015b). The ripe fruit is cooling and acidic; used to treat sore throat, mouth ulcer and skin disorders

- **Nutraceutical properties:** C. carandas fruits have been used as a dietary supplement or medicinal food for centuries and are of increasing importance to consumers (8, 9). A natural ‘food colorant cum nutraceuticals supplement’ was prepared from the ripe karonda fruits. The formulation had been named as ‘Lalima’. 1 ml of this pigment suspension formulation is sufficient to give lovely red colour to one serving of any colourless beverage (100 ml) such as lemonade.
- **Processed product of carissa carandas:** Carissa carandas fruit is full of calcium, iron, vitamin C, vitamin A, and other nutrients used as food and treatment of many ailments

like anorexia, diarrhea, anemia, blood sugar stabilization etc. It freezes well and can also be kept in the fridge for long time or pickled in brine or canned with sugar.

Food and Nutritional value of carissa carandas fruit components Qty present

Total acids	9 to 11 mg per 100 g
Total Protein	0.39-o.66 g %
Total crude fat	2.57-4.63 g%
Carbohydrate	0.51-0.94 g%
Sugar	7.35-11.58 g%
Iron	150 mg %
Calcium	115 mg%
Phosphorus	66 mg%
Energy	(kcal/g) 338-342/Ib
Calories	745-753/kg
Ash	0.66-0.78g%
Moisture	83.17-83.24 g%

- **Ayurvedic formulations:** The plant Carissa carandas is used as ingredient in a number of ayurvedic formulations. Marmagutika used in the treatment of vital organs, like diseases related to brain, heart, urinary system. Hridyamahakashaya is employed in the treatment of heart disease. Kalkantaka rasa, 'juice' or 'essence' used for mental disease. Marichadivati used in the treatment of diseases of respiratory conditions and black pepper is the first ingredient of this medicine.

- **Traditional uses:** At industrial scale, Karonda is mainly used for making pickle, jelly, jam, squash, syrup and chutney. The ripe fruit emits gummy latex when it is cooked, but yields a rich red juice which becomes clear when it is cooled, so this is used as a refreshing cooling drink in summer. In many part of India fruits are commonly caring with green chilies to make a tasty dish taken with chapattis. Unripe fruit is good appetizer; astringent, ant scorbutic, cooling, acidic, stomachic, anthelmintic and leaf decoctions are given in the commitment of remittent fever. Traditional healers of Chhattisgarh use the different plant parts to cover the cancerous wounds and to kill the maggots. In Konkan, India, root is pulverized with horse urine, lime-juice and camphor as a remedy for the itch. Two drops of plant oil is given with half cup of honey for controlling worms of minors.

- **Phytochemical constituents:** Pino et al. isolated the volatile flavor constituents of the karanda fruits; isoamyl alcohol, isobutanol, and β-caryophyllene being the major

constituent. Fruits were reported to contain a mixture of volatile constituents including 2-phenly ethanol, β-caryophylline, linalool, isoamyl alcohol, benzyl acetate and a novel tri terpenic alcohol, carissol. C.congesta contains crude protein 13%, polyphenols7.8%, fixed oil 5.3% hydrocarbons 58% and free acid 31.4%. Higher gross hest values of this species indicate that it can be used as fuel source. Essential oil from C. congesta was found to contain coumarin. The roots of C.congesta have volatile principles including 2-acetyl phenol, Lignan, carinol from root of C. congesta sesquiterpenes, namely carissone and carindone. Triterpenoid constitutes as well as tannins, and a new isomer of urosolic acid namely carissic acid found in leaves. It has been reported that fresh leaves of C.congesta contain four pentacyclic triterpenoids including one new constituent carissin.

- **Anticancer activity:** Anti-cancer activity was shown in the extracts of C. carandas fruits in chloroform, nhexane and methanol on the lung cancer cells and human ovarian carcinoma cells.

- **Anti-diabetic activity:** Fraction of fruits were evaluated for anti-diabetic activity in alloxan induced diabetic rats by Itankar et al.[41] It is reported that the methanol extract and its ethyl acetate soluble fraction have significantly lowered the increased blood glucose levels at dose level of 400 mg/ kg p.o. after 24 hrs, as compared to diabetic control.

- **Adaptogenic activity:** The ethanolic fruit extract and lanostane triterpenoid isolated from the C. Carandas were screened for adaptogenic activity using swimming endurance, anoxia stress tolerance and cyclophosphamide induced immunosuppression model. The levels of RBC, Hb, WBC, organ weight and body weight suppressed by cyclophosphamide were estimated. It was observed that extract and lanostane triterpenoid significantly increased the swimming endurance, anoxia stress tolerance and normalized the RBC, Hb, WBC, changed organ and body weight suppressed by cyclophosphamide demonstrate that extract and isolated compound showed significant adaptogenic activity.

- **Anthelmintic activity:** The various concentrations (50, 100, and 150 mg/ml) of the different solvent extracts of C. carandas (petroleum ether (60-80), chloroform and ethanolic unripe fruits extract) were tested in in-vitro for anthelmintic potency by the determination of time of paralysis and time of death of the worm.[53] The workers used piperazine citrate (15 mg/ml) as standard drug and they concluded from that the unripe

fruits extract of C. carandas L. causes earthworm paralysis, and also its death after some time. The result indicated that the ethanolic extract possess potent anthelmintic activity, than that of other solvent extracts due to the availability of some important phyto constituents.

- **Antiviral activity:** The ethanolic fruits extract of C. carandas possess effective antiviral activity against polio virus at 6 µg/ml HIV-1,Sindbis virus at 3 µg/ml and herpes simplex virus at 12 µg/ml.[42]

- **Antimicrobial activity:** The ethanolic extract of fruit has powerful antibacterial action against different test bacteria like B. subtillis, S. aureus, E. coli, S. faecalis, S. typhimurium and P. aeruginosa. Moreover ethanolic extract has also showed extensive anticandidal action.

CONCLUSION

The traditional medicinal value of Carissa carandas fruit is used to improve female libido and to remove worms from the intestinal tract. The fruits has antimicrobial and antifungal properties and its juice used to wounds healing properties. The fruit have an analgesic World Scientific News 96 (2018) 217-224 -223- action as well as an anti-inflammatoryproperties. The juice can be applied to the skin to relieve the skin problems. It is now considered as a valuable source of several curative uses and traditional medicinal system

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