PHYTOCHEMISTRY & PHARMACOLOGICAL ACTIVITY OF CARISSA CARANDAS (KARONDA) AN OVERVIEW

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Abstract

This article review comprises information regarding Phytochemistry and Pharmacological Activity of Carissa carandus- species of flowering shrubs belonging to family Apocynaceae and class Magnoliopsida.

Carissa carandas also known as Carissa salicina or Echites spinosus is commonly known as Karandang, Kerenda or Karonda. This plant mainly flourishes in the regions with high temperatures and it is abundant in the western ghats of Konkan, in the western coastal states of Maharashtra and Goa also it is grown on a limited scale in Rajasthan, Gujrat, Bihar, West Bengal and Uttar Pradesh. It is also found in other South Asian countries like the lowland rain forest of Sri Lanka and in Pakistan, Afghanistan, Nepal & Bangladesh. VItamin C, Anthocyanins, Flavonoids, Glycosides, Alkaloids, Carbohydrates, Sterols, Terpenoids, Tannins and Saponins are the major chemical constituents found in Carissa Carandas.

It is mainly rich in Iron, Vitamin C, Vitamin A, Calcium & Phosphorus. Carissa Carandus is mainly used as herbal medicine in ancient times, Fruits of which were anciently used to treat acidity,indigestion, fresh and infected wounds, skin disease, urinary disorder and diabetic ulcer etc. Decoction of leaves is used to treat fever, diarrhea and earache. Roots provides anti-helmintic medicine for itches and insect repellents. Fruits have many different uses; Some use it to prepare pickle as it contains pectin which is an useful ingredient in chutney, rest use it as faux cherry in cakes pudding and other preparation.

Keywords: Carissa Carandas, Biological activity, Flavonoids, Echites spinosus, Carissa salicina.

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1. INTRODUCTION

Carissa carandas also known as Carissa salicina or Echites spinosus is commonly known as Karandang, Kerenda or Karonda. This plant mainly flourishes in the regions with high temperatures and it is abundant in the western ghats of Konkan, in the western coastal states of Maharashtra and Goa also it is grown on a limited scale in Rajasthan, Gujrat, Bihar, West Bengal and Uttar Pradesh. It is also found in other South Asian countries like the lowland rain forest of Sri Lanka and in Pakistan, Afghanistan, Nepal & Bangladesh.[1] Colonial British in India also used this to prepare jelly, jams and syrups etc. It was used in the Great Hedgw of India(1803-1879 CE), because it is easy to grow, drought resistant, is a sturdy shrub that grows in a variety of soils and also ideal for hedges as it growsrapidly, densely and needs little attention.[2] Carissa carandus,commonly known as Karonda is widely used to prepare pickle along with it has a wide anti-microbial, anti-fungal, anthelmintic, anti-diabetic,anti-inflammatory and antioxidants benefits[11]. VItamin C, Anthocyanins, Flavonoids, Glycosides, Alkaloids, Carbohydrates, Sterols, Terpenoids, Tannins and Saponins are the major chemical constituents found in Carissa Carandas.[9]

It is also a high source of Vitamins, antioxidants and minerals[16]. Research has shown that Karonda contains important plant chemicals, some of which have antioxidant, analgesic, anti-inflammatory, hepatoprotective, anti hyperglycaemic, hypolipidemic and wound healing properties. Some of these chemicals are listed below:[10]

- Alkaloids, Flavonoids, saponins, Cardiac glycosides, triterpenoids, salicylic acid in the root extracts,
- Alkaloids, Glycoside, tannins, terpins in the leaf extracts,
- Polyphenols, flavonoids and flavanones in the extract of unripe fruits.
- Karonda fruits are also rich in Vitamin C, Vitamin A, calcium, phosphorus and iron.
- Seeds of Carissa spinarum or wild Karonda have over 10 % protein, 22.4% oil.[9]

Different parts of Karonda serve different medicinal effects.

[A] Roots of Karonda plants were used in the treatment of:-

- Stomachache, to improve appetite and digestion
- Deworming
- Reducing itchiness[17]

[B] Unripe Karonda fruit is used as:

- An astringent
- Appetizer
- Anti pyretic
- Anti diabetic
- Rheumatism
- Mental illness
- Gastrointestinal disorder[18]

[C] Leaves of Karonda plants are used as:

- Fever that keeps coming back
- Diarrhea
- Ear pain
- Inflammation in the mouth [3]

Plant Profile

Habit:

An evergreen thorny shrub upto 4m, has greenish white bark on young shoots and greyish brown on mature stems.[8]

Leaves:

Leaves are broadly ovate to oblong in shape, measuring up to 7 cm long and 4 cm wide, with broadly cuneate to rounded base and apiculate apex.

Stems:[12]

Stems have spines which are simple to slightly forked, measuring about 5 cm.

Flowers:
White color, clusters in 2-5 flowers, scented, seen in February to June.

Fruits:[19]
Globose berry, appears from March to August and get ripened in the month of May- December

Taste:
Slightly acidic when fully ripened.

Seed:[20]
The plant is grown from seed sown in August and September

Botanical Description
The fruits are used in the treatment of skin infection and leaves are a remedy of fevers, ear-ache and syphilitic pain.[13] It is also reported to have gut-stimulatory effect and thus is useful in the treatment of constipation and diarrhoea.[7]

Scientific Classification:[23]

Kingdom	Plantae-Plants
Division	Traceophyta
Order	Gentianales
Family	Apocynaceae
Genus	Carrisa
Species	C. carandas

Origin
Karonda (Carissa carandas) which is known as "Christ Thorn Tree" is a hardy, evergreen, spiny and indigenous shrub widely grown in India[25]. It is found wild Bihar, West Bengal and South India.[24] It is grown commonly as a hedge plant and in commercial plantations in the Varanasi district of Uttar Pradesh.

Chemical Composition
The chemical constituent of C. carandas are flavonoids, steroids, carbohydrates, alkaloids, volatile oils and others[14]. It has been analysed that pentacyclic oleanane triterpenes, β-amyrin, methyl oleanolate, oleanolic acid, ursane triterpene and ursolic acid are isolated mainly from the roots of C. carandas.[6]

Phytochemicals
Six natural products were isolated from the fresh leaves of Carissa carandas including ursolic acid, ursolic acid-γ-lactone, 27-O-Z-p-coumaryl ursolic acid, 23-hydroxy ursolic acid, uvaol and ursolic aldehyde, Their structure eludication was done by modern spectroscopic techniques including H-NMR, C-NMR and comparison with reported data.[5]

Phytochemicals & Parts in which they are found[26]

S.No.	**Chemical Constituent**	**Parts**
1	Lupeol	Root
2	16b-Hydroxybetulinic acid	Root
3	Lupa-12,20(29)-dien-3b,28-diol	Root
4	Ursolic acid	Root
5	Urs-12-ene-3b,22b-diol	Root
6	Me ursolate	Root
7	α-Amyrin	Root

8	Carissic acid	Leaf
9	Carissic acid methyl ester	Leaf
10	Carissic acid monoacetate	Leaf
11	Carissol	Fruit
12	Oleanolic acid	Root
13	Carandinol	Leaf
14	Betulinic acid	Leaf
15	Carindone	Root
16	(+)-Carissone	Root
17	Nerolidol	Flower
18	Farnesol	Flower
19	Camphene	Flower
20	Menthol	Flower
21	p-Cymene	Flower
22	α-Terpineol	Flower
23	Piperitone	Flower
24	Citronellal	Flower
25	(±)-Linalool	Flower

Biological Activity

Carissa carandas have shown an extensive range of evidence for its cardiotonic, hepatoprotective, free radical scavenging and xanthine oxidase inhibitory, histamine-releasing, antirheumatic, antibacterial, antiviral and anticonvulsant activity.[15]

Pharmacological Activities:

- Antioxidant and cytotoxic property

Anti-inflammatory and antipyretic activity:
Anti-diabetic activity:
Anti-convulsant activity:
Anti-cancerous activity and antioxidant potentials:

Hepatoprotective activity: - Cardiovascular activity Antimicrobial activity Anticandidal action Anthelmintic activity Antibacterial activity Neuropharmacological and diureticactivities Antimalarial activity [4]

Organoleptic & Histochemical Characteristics

Organoleptic & Histochemical characteristic of different part of Carissa carandas are as follows:

Parts used	**Macroscopic study**	**Microscopic study**	**Powder study**
Leaves	Type: simple, opposite and ovate with short petiolate; apex: obtuse; base: round and asymmetric cordate; margin: entire; surface: glabrous; venation: reticulate; colour: dark green (upper surface) and light green (lower surface) [33]	Presence of wavy-walled epidermal cells with thin cuticle, containing anisocytic stomata. Covering and glandular trichomes are present. Upper epidermis consists of single-layered parenchymatous cells, followed by bilayered radially elongated palisade cells[31]. These cells are surrounded by 3–4 layers of spongy parenchyma and lower epidermal cells. Mid-rib consists of upper epidermis, followed by single layer of parenchymatous hypodermis. Presence of collenchyma below hypodermis[32]. Collenchyma cells are surrounded by chlorenchymatous cells. Bicollateral vascular bundles are followed by calcium oxalate crystals and starch grains	Colour: greenish-brown; it shows pericyclic fibres, calcium oxalate crystals, glandular trichome and xylem vessels[35]
Bark	Shape: small, thin with flat or sometimes slightly curved pieces; surface: rough and smooth, longitudinal striations; colour: brownish-grey (outer surface) and grey (inner surface); fracture: short [36]	A wide zone of stratified cork is seen, with lenticels; secondary cortex is composed of thin-walled, elongated, parenchymatous cells containing stone cells; cortical fibres are present in single or sometimes in groups of 2–3; Presence of secondary phloem containing calcium oxalate crystals, and starch grains are scattered in cortical cells and phloem parenchyma[29]	Colour: greyish-brown; it shows stone cells, calcium oxalate crystals and starch grains (simple or compound)[37]

Root	Macroscopic: root considerably long, often irregularly bent, woody and cylindrical; rusty or yellowish-brown; 1–1.5 cm thick; surface: smooth; fracture: hard; odour and taste: not distinct [38]	Presence of stratified cork consists of lignified tangentially elongated cells; secondary cortex is composed of 1 or 2 layers of thin-walled cells which are very narrow in size; secondary phloem composed of several cavities, found just beneath the secondary cortex in a ray pattern; stone cells are found scattered in phloem regions; phloem rays are uni- or biserriate containing calcium oxalate prism; cambium is not prominent; and secondary xylem consists of xylem vessels, fibres, tracheid and even xylem parenchym [30]	Colour: yellowish-brown; it shows stratified cork, lignified xylem fibres, stone cells, calcium oxalate and starch grains (simple, round to oval)[39]
Stem	Shape: cylindrical; surface: smooth surface with internode; fracture: not prominent and ridges are absent; colour: dark green[40]	Presence of single-layered epidermal cells, surrounded by hypodermis and cortex. The cortex is composed of 4- to 5-layered parenchyma cells. Lignified fibres are scattered in the cortical region. Non-lignified pericyclic fibres are seen in the bicollateral vascular bundles. Pith is present at the centre of the section.[28]	Lignified fibres, xylem vessel, starch grains, calcium oxalate crystals and epidermal cells

2. CONCLUSION

Our study of paper reveals all the pharmacological properties of Carissa carandas (Karonda). [11]. A higher gross heat value of this species indicates its higher potential to be used as a good fuel source. It shows many pharmacological properties and has been in use since ancient times.

Because of the abundant medicinal properties shown by different parts of whole plants it has been widely in use and further research on this plant will be highly useful for our human health.

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