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A REVIEW ON CARISSA CARANDAS

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ABSTRACT

Carissa carandas is a usable food and remedial herbal plant of India, found to be extensively allocated throughout subtropical and topical areas. The plant has been utilized as a traditional remedial plant over thousands of years in the Ayurveda, Unani, and Homoeopathic system of medicament. Traditionally, whole plant and its parts were utilized in the treatment of various disorders. The major bioactive ingredients, which give remedial value to the plant, are alkaloids, flavonoids, saponins and large quantities of cardiac glycosides, triterpenoids, phenolic composites and tannins. Roots were reported to presence of volatile principles containing 2-acetyl phenol, lignan, carinol, sesquiterpenes (carissone, carindone), lupeol, β-sitosterol, 16 β-hydroxybetulinic acid, α-amyrin, β-sitosterol glycoside, and des-N-methylnoracronycine, however, leaves were testified the presence of triterpenoid constitutes as well as tannins. While, fruits have been reported to contain carisol, epimer of α-amyrin, linalool, β-caryophyllene, carissone, carissic acid, carindone, ursolic acid, carinol, ascorbic acid, lupeol, and β-sitosterol. Ethnopharmacological content of the plant has been credited due to anti-cancer, anti-convulsant, anti-oxidant, analgesic, anti-inflammatory AQ1,anti-ulcer, anthelmintic effect, cardiovascular, anti-nociceptive, anti-diabetic, antipyretic, hepatoprotective, neuropharmacological, and diuretic action, antimicrobial effect and cytotoxic capabilities, in-vitro anti-oxidant, and DNA damage inhibition, and constipation and diarrheal effect.

Keywords: Carissa carandas, flavonoids, hepatoprotective, anti-hyperglycemic action, DNA damage inhibition

INTRODUCTION

Carissa congesta Wight (syn. Carissa carandas Auct., formerly extensively shown as C. carandas L.), belongs to the dogbane family Apocynaceae [1], found to be widely distributed all over India. The shrub is generally known as karonda (Devanagari करोंदा), karamardaka (Sanskrit), Koromcha (Bengali), Bengal currant or Christ's thorn (South India), vakkay (Telugu), kilaakkaai (Tamil), and Karja tenga (Asam). Its fruits have been berry-sized, which are commonly used as a flavor or additive to Indian pickles and spices. Karonda has well appetizer activity, and the fruit is pickled before it gets ripened. Ripe karonda fruit contains high quantity of pectin thus it's also utilized in producing jelly, jam, squash, syrup, cocottes and chutney, which are of good demand in foreign market [2]. Karonda bushes are also capable for hedging in the habitat gardens, and are occasionally grown as a cosmetic manufactory due to its beautiful cherry-suchlike fruits. The plant is a hardy, drought-tolerant in nature that can be cultured in a wind range of soils. The species has been utilized as a conventional remedial plant over

thousands of years in the Ayurvedic, Unani, and Homoeopathic system of medication. Traditionally, entire plant and its parts were utilized in the treatment of various disorders. Its fruits are consumed to cure liver dysfunction, to reduce fever, to minimise the decomposition of blood while roots are utilized to enhance digestion. Fruits have heavy source of iron and vitamin C, therefore, ethnomedically the fruits are beneficial for curing anemia, as an astringent, antiscorbutic, and as a drug for biliousness. Its leaf decoction is applied against fever, diarrhea, and ear ache, whereas roots used as a stomachic, vermifuge, medication for itches, and insect repellent [3].

Table 1: Classification of plant

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

PLANT DESCRIPTION

Carissa carandas is an evergreen deciduous, generally 2-4 m tall plant of the family Apocynaceae. Its stem consists of white latex, with sharp spines on branches; the leaves are oblong and conical with 4-6 inch long and 2-3 inch wide, green in colour on the top and brown below. The plant have white colored flowers, sized 3-5 cm in diameter, the fruit is a berry, which is formed in bunches of 3-10 fruits, with 5-1 hard angles hooked upwards, glabrous with five to seven wings, woody, and fibrous. The fruit shape is globose to broad ovoid containing several seeds. Fresh fruits are pinkish white, while ripe fruit turn into red to dark purple. Ripe fruit color differs from white, green and pinkish red subject to the genotype. Seed 3-5 per fruit, blackish brown in color, flat, eleptical, and light in weight. Flowering starts in the month of January- February and fruits mature in May- June. Fruits are generally collected at the immature stage for vegetable purpose, fully ripen fruits are used up fresh or processed [4].

ORIGIN AND DISTRIBUTION

C. carandas is patented near the Himalayas; by certain botanists place the fruit's origin to Java. The plant is originate to be distributed in the Himalayas at the heights of 300-1800 m, in the Siwalik Hills, the Western Ghats, in Nepal, Afghanistan, India, Sri Lanka, Java, Myanmar, Malaysia, Australia, Pakistan, and South Africa. In India it is cultivated in the states of Bihar, Maharashtra, Orissa, West Bengal, Chhattisgarh, Gujarat, Rajasthan, Madhya Pradesh, and in the Western Ghats. In Maharashtra, the main area under this crop is distributed in sub mountain area such as Ratnagiri, Kolhapur, and Pune district [5]. Some of the important cultivated *Carissa* species besides *C. carandas* L. includes: *Carissa grandiflora* DC, *Carissa bispinosa* Desf., *Carissa spinarum* DC, *Carissa ovata*, *Carissa edulis* Vahl., *Carissa inermis* Vahl. Syn., *Carissa macrophylla*, *Carissa paucinervia* D.C., and *C. spinarum* L. Syn., *Carissa diffusa*, *C. carandas* and *C. spinarum* are native to India (Index Kewensis, 1985-190) while *C. grandiflora* is native to South Africa [3].

Nutritional composition of karonda fruits

Table 2: Nutritional composition of karonda fruits

S.no	Composition	Quantity (as per 100 gm of fresh fruit)	References
1.	Humidity	83.17-83.24 g	[6]
2.	Protein	0.39-0.66 g	[6]
3.	Fat	2.57-4.63 g	[6]
4.	Carbohydrates	0.51-0.94 g	[6]
5.	Fiber	0.62- 1.81 g	[6]
6.	Ascorbic acid	9-11 mg	[3]
7.	Energy	42.5 kcal	[3]
8.	Calcium	21 mg	[3]
9.	Phosphorous	28 mg	[3]
10.	Vitamin A	1619 IU	

Phytochemical constituents

Phytochemical screening of the different part of plant extract exposed presence of-

Table 3: Phytochemical constituents

S.no	Plant part	Chemical composition	Amount	Reference
1.	Root	Alkaloids, flavonoids, saponins.	small amounts	[7]
		Cardiac glycosides, triterpenoid, phenolic compounds, tannins.	large amounts	
		2-acetyl phenol, lignan, carinol, sesquiterpenes (carissone, carindone), lupeol, β-sitosterol, 16β-hydroxybetulinic acid, α-amyrin and β-sitosterol glycoside, and des-Nmethylnoracronycine, an acridone alkaloid	Trace amount	[8-12]
2.	Stem	sesquiterpene glucoside		[13]
3.	Leaves	triterpenoid constitutes as		[14-16]

		well as tannins, and a new isomer of urosolic acid namely carissic acid triterpene carandinol, betulinic acid, β-sitosterol-3-O-β- d-glucopyranoside, oleanolic acid, ursolic acid, and 4-hydroxybenzoic acid		
4.	Fruits	carisol, epimer of α-amyrin, linalool, β-caryophyllene, carissone, carissic acid, carindone, ursolic acid, carinol, ascorbic acid, lupeol and β-sitosterol, isoamyl alcohol, isobutanol, and β-caryophyllene being the major constituent	Major	[17,18,19]

Pharmacological activity of *C. carandas*

Anti-diabetic activity

Gaurav *et al*. [20] estimated the influence of the aqueous extract of *C. carandas* on alloxan produced and control Wister rats, and was found that the doses of 500 and 1000 mg/kg of the aqueous extract significantly ($p<0.05$) lower the blood glucose levels of alloxan produced diabetic Wistar rats at 4, 8 and 24 hrs. The workers concluded that the plant extract doses had both significant ($p<0.05$) hypoglycemic as well as anti- hyperglycemic effects.

Further, Itankar *et al*. [21] demonstrated anti-hyperglycemic action of the plant by showing methanol extract, and its fractions in alloxan prompted diabetic rats [21]. The employees reported that the alcoholic (methanol) extract and its ethyl acetate soluble portion have suggestively hypoglycemic effect at dose level of 400 mg/kg po after 24 hrs, as linked to diabetic control. Polyphenol constituent of alcoholic (methanol) extract and its ethyl acetate soluble portion were founded to be 15.8±1.2 mg and 18.55±0.34 mg (gallic acid equivalent/g extract), whereas, flavonoid content of both the extracts had been 2.92±0.03 mg and 1.534±0.30 mg (rutin equivalent/g extract) respectively. The researchers determined that the antihyperglycemic activity of ethyl acetate fraction over methanol extract is due to its partial purification achieved by fractionation which caused in increase in degree of polymerization, and segregation of secondary metabolites.

Anti-convulsant activity

Anti-convulsant action of the ethanolic root extract of C. carandas at the doses of 100, 200 and 400 mg/ kg, i.p. had been studied by Hegde etal. [7] on electrically, and chemically produced seizures. The extract at dose of 100-400 mg/ kg was significantly downgraded the duration of seizures produced by electroshock. Still, only 200 and 400 mg/ kg of the extract granted protection (25 and 50, respectively) on the mice. The same doses also defended animals from pentylenetetrazole- convinced tonic seizures and significantly delayed the attack of tonic seizures induced by picrotoxin, and N-methyl-dl-aspartic acid. The extract had no action on bicuculline-produced seizures. The authors concludedanti- convulsant activity of the ethanolic root extract ofC. carandas via non-specific mechanisms, since the extract degraded the time of seizures induced by maximal electroshock as well as decrease the latency of seizures induced by pentylenetetrazole, and picrotoxin.

Analgesic, anti-inflammatory, and anti-pyretic activities

Bhaskar and Balakrishnan [22], tested significant analgesic, anti- inflammatory and antipyretic effect of alcoholic and aqueous extracts from C. carandas roots in rat models. The alcoholic and aqueous extracts from roots of C. carandas were showed significant ($p<0.01$) analgesic, anti-inflammatory, and antipyretic activity at

the doses of 100 and 200 mg/ kg body weight. The researchers observed large percentage of reduction of abdominal contraction (72.67) ethanol extracts of C. carandas at a dose of 100 mg/ kg body weight in analgesic effect. Further, the ethanol and aqueous extracts of C. carandas were downgraded the formation of edema produced by carrageenan after 2 hrs, significantly.

Further, Hati et al. [23] estimated anti-inflammatory, and anti-pyretic capabilities of the methanol extract of C. carandas L. leaf. The extract at the dose of 200 mg/ kg body weight exposed maximum destruction of inflammation, i.e., 72.10, 71.90 and 71.80 at the end of 3 hrs with histamine, dextran and carrageenan produced rat paw edema respectively. The anti-pyretic effect was estimated by Brewer's yeast produced pyrexia in albino rats. The extract at the dose of 100 and 200 mg/ kg .o. showed significant anti-pyretic effect.

Additionally, Anupama et al.[24] investigated that the anti-inflammatory effect alcoholic (methanol) extract of dried fruit on carrageenan produced hind paw edema in albino rats. C. carandas had been extracted with petroleum ether, followed by methanol extraction. The methanol extracts of the dried fruits of C. carandas was given orally to the rats and show substantial action ($p \leq 0.05$) when matched with the control group.

Hepatoprotective activity

Hegde and Joshi [11], studied hepatoprotective effect of root ethanolic extract of C. carandas with CCl4 and paracetamol produced hepatotoxicity by decreasing the effect of serum marker enzymes, bilirubin and lipid peroxidation, and significant raise in the degrees of u that was ric acid, glutathione, super oxide dismutase, catalase, and protein in a dose dependent manner verified by the drop in the total weight of the liver and histopathological examination. Whereas, Bhaskar and Balakrishnan[25] were reported hepatoprotective action of the ethanol, and aqueous extracts of roots of C. carandas against ethanol produced hepatotoxicity in rats. The ethanol and aqueous extracts at a dose level of 100 mg/ kg and 200 mg/ kg have significant hepatoprotection by decreasing serum transaminase (serum glutamic pyruvic transaminase and serum glutamic oxaloacetic transaminase), alkaline phosphate, bilirubin and lipid peroxidation, while significantly boosted the levels of liver glutathione, and serum protein.

Neuropharmacological and diuretic activities

Saha etal. [26] Estimated methanolic extracts of C. carandas L. leaves for its neurological and diuretic action and related significant neurological effect of the plant. While, diuretic effect of the extract was proved by the electrolyte loss rate (Na/ K excretion ratio was 1.46 and 1.43 at the doses of 200 and 400 mg/ kg respectively) as that of the standard diuretic furosemide (1.48).

Anti-ulcer activity

Merai and Jadhav [27] estimated differentC. carandas extracts, given orally with the dose of 500 mg/ kg on several models of gastric ulcer, like as acetic acid produce habitual gastric ulcer, pylorus ligation and ethanol produce acute gastric ulcer. All extracts boosted the healing of acetic acid- produced chronic gastric ulcers ($p<0.05$). The employees concluded that the alcoholic extract of C. carandas displayed largely significant anti-ulcer activity.

Antimalarial activity

Malaria, an important parasitic illness, affects human health worldwide. Because of the expanded drug resistance to malarial parasites, there's a need to explore for new antimalarial medications from herbal source. Therefore, with the aforementioned aim Bapna etal. [30] Analyzed, in-vitro antimalarial effect of three different parts (leaf, stem bark and fruit) of the plant C. carandas, evaluated against Plasmodium falciparum 3D7 strain. Of the two solvent extract analyzed, methanolic extract displayed promising antimalarial effect (IC50 ranged between 13.57 and 69.63 µg/ mL) as compared to aqueous extracts (IC50 ranged between41.52 and> 100 µg/ mL). While, the host cell cytotoxicity was also tested on Madin-Darby canine kidney cell line using the MTT test that revealed no cytotoxicity in maximum dose tested.

CONCLUSION

C. carandas, an evergreen, deciduous shrub with immense therapeutic value has been audited with the aim to give a reference source for biology, phytochemistry, and conservation strategy for additional investigation on the plant. Ethnopharmacological studies strengthen the concept for utilizing C. carandas plant as a source to facilitate safe and effective herbal treatments for biological problems. Furthermore, the review aims to give a direction for additional clinical study.

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