



A REVIEW ON *CARISSA CONGESTA*: PHYTOCHEMICAL CONSTITUENTS, TRADITIONAL USE AND PHARMACOLOGICAL PROPERTIES

V. DEVMURARI*, P. SHIVANAND and N. P. JIVANI

Smt. R. B. Patel Mahila Pharmacy College, ATKOT – 360040 (Guj.) INDIA

ABSTRACT

Various herbal drugs individually or in combination have been recommended for the treatment of different diseases. The *C. congesta* commonly known as “karanda” has been recognized in different systems of traditional medicines to cure various diseases. It contains several phytochemical constituents belonging to terpenoid category. The root is attributed with bitter, stomachic; antidiarrhoeal, vermifuge and antianthelmintic properties. The unripe fruit is used medicinally as an astringent. The ripe fruit is taken as an antiscorbutic and remedy for biliousness. The leaf decoction is valued in cases of intermittent fever, diarrhoea, oral inflammation and earache. Additionally *C. congesta* has shown wide range of evidences for its cardiotoxic, hepatoprotective, free radical scavenging and xanthine oxidase inhibitory, histamine releasing, antirhumatic, antibacterial, antiviral and anticonvulsant activity. A higher gross heat value of this species indicates its higher potential to be used as good fuel source.

Key words: Karanda, Phytochemical constituents, Traditional uses, Pharmacological.

INTRODUCTION

Carissa congesta Wight (syn. *C. carandas* Auct., formerly widely shown as *C. carandas* L.) belong to *Apocynaceae*. It is called kerenda in Malaya, karaunda in India; Bengal currant or Christ's thorn in South India; namdaeng in Thailand; caramba, caranda, caraunda and perunkila in the Philippines.¹ This species is a rank-growing, straggly, woody, climbing shrub, usually growing to 10 or 15 ft (3-5 m) high, sometimes ascending to the tops of tall trees; and rich in white, gummy latex. The branches, numerous and spreading, forming dense masses, are set with sharp thorns, simple or forked, up to 2 in. (5 cm) long, in pairs in the axils of the leaves. The leaves are evergreen, opposite, oval or elliptic, 1 to 3 in (2.5-7.5 cm) long; dark-green, leathery, glossy on the upper surface, lighter green and dull on the underside. The fragrant flowers are tubular with 5 hairy lobes, which are twisted to

* Author for correspondence; Ph.: 02821 – 288349; E-mail: viraldev1985@gmail.com

the left in the bud instead of to the right as in other species. They are white, often tinged with pink, and borne in terminal clusters of 2 to 12. The fruit, in clusters of 3 to 10, is oblong, broad-ovoid or round, 1/2 to 1 in. (1.25-2.5 cm) long; has fairly thin but tough, purplish-red skin turning dark-purple or nearly black when ripe; smooth, glossy; enclosing very acid to fairly sweet, often bitter, juicy, red or pink, juicy pulp, exuding flecks of latex. There may be 2 to 8 small, flat, brown seeds. The karanda is native and common throughout much of India, Burma and Malacca and dry areas of Ceylon; is rather commonly cultivated in these areas as a hedge and for its fruit and the fruit is marketed in villages.² The karanda was first fruited in the Philippines in 1915 and P. J. Wester described it in 1918 as "one of the best small fruits introduced into the Philippines within recent years." The present review will possibly act as bridge between traditional claim and modern therapy of *C. congesta*.



Fig. 1: Stem, fruit, flower, leaf and bark of Carrisa Congesta

Traditional uses

C. congesta is the best known as member of the genus as it has been used as a traditional medicinal plant over thousands of years in the Ayurvedic system of medicine as it is practiced on the Indian sub continent. Thus, traditional uses of *C. congesta* are well established. The root is credited with bitter, stomachic, antidiarrhoeal and antianthelmintic properties. The ripe fruits are utilized in curries, tarts, puddings and chutney. When only slightly under ripe, they are made into jelly. Green, sour fruits are made into pickles in India. With skin and seeds removed and seasoned with sugar and cloves, they have been popular as a substitute for apple in tarts. The unripe fruit is used medicinally as an astringent. The ripe fruit is taken as an antiscorbutic and remedy for biliousness. The fruits have been employed as agents in tanning and dyeing. British residents in India undoubtedly favored the karanda

as being reminiscent of goose berries. Karanda leaves have furnished fodder for the tussar silkworm. The leaf decoction is valued in cases of intermittent fever, diarrhea, oral inflammation and earache. A paste of the pounded roots serves as a fly repellent. The root is employed as a bitter stomachic and vermifuge and it is an ingredient in a remedy for itches. The roots contain salicylic acid and cardiac glycosides causing a slight decrease in blood pressure. The white or yellow wood is hard, smooth and useful for fashioning spoons, combs, household utensils and miscellaneous products of turnery. It is sometimes burned as fuel.^{3,4}

Phytochemical constituents

The roots of *C. congesta* have yielded a number of volatile principles including 2-acetyl phenol.^{5,6} Pal et al.⁷ have reported a new lignan, carinol from root of *C. congesta*, whereas other studies carried out by have led to isolation of a mixture of sesquiterpenes, namely carissone and carindone as a novel type of C₃₁ terpenoid.⁸⁻¹⁰ The leaves were reported to have triterpenoid constituents as well as tannins, and a new isomer of urosolic acid namely carissic acid was also found.^{11,12} Fruits of this plant were reported to contain a mixture of volatile constituents including 2-phenyl ethanol, linalool, β-caryophylline, isoamyl alcohol, benzyl acetate and a novel triterpenic alcohol, carissol. Enzymatic mild hydrolysis of polar glycoside from the plant yielded odesoside H, digitoxigenin and the sugars D-glucose and D-digitalose. Moreover, *C. congesta* contains crude protein 13%, polyphenols 7.8%, fixed oil 5.3 %, hydrocarbons 58 % and free acid 31.4 %. Higher gross heat values of this species indicate that it can be used as fuel source. Essential oil from *C. congesta* was found to contain coumarin. In the Figure 2, different chemical constituents of *C. congesta* are shown.

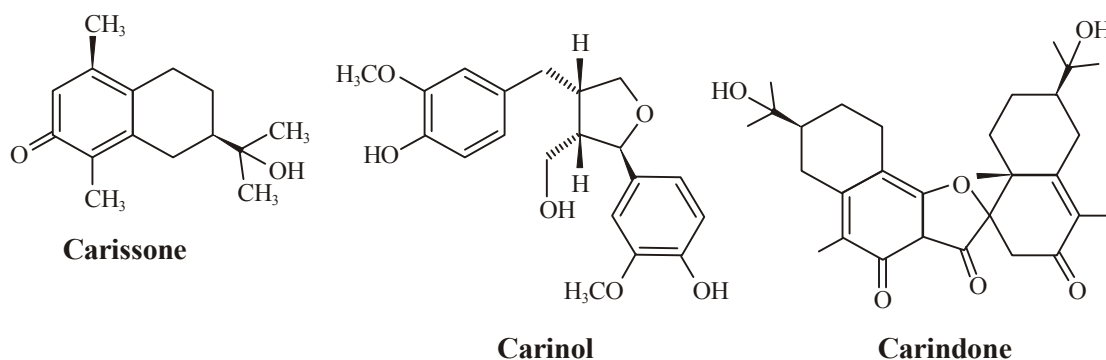


Fig. 2: Phytochemical constituents of *C. congesta*

It has been reported that fresh leaves of *C. congesta* contain four pentacyclic triterpenoids including one new constituent carissin and two hitherto unreported compounds.

The structure of the new triterpenoid has been elucidated as 3- β -hydroxy-27-E-feruloyloxyurs-12-en-28-oic acid. Complete assignment of the protons of the compounds has also been made based on 2D NMR studies¹³.

Pharmacological activities

Anticonvulsant action

It has been reported that ethanolic extract of *C. congesta* has powerful anticonvulsant action on electrically and chemically induced seizures by some unknown mode of action¹⁴.

Cardiotonic activity

The alcoholic extract of roots of *C. congesta* exhibited cardiotonic activity and prolonged blood pressure lowering effect. An amorphous water-soluble polyglycoside possessing significant cardiac activity has been isolated. The cardiac activity of water soluble fraction has been attributed to the presence of the glucosides of odoroside¹⁵.

Free radicals scavenging and xanthine oxidase inhibitory activity

The free radical scavenging activity of ethanolic and aqueous extracts of *C. congesta* has been evaluated, *in vitro*, using 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging method and compared with ascorbic acid, quercetin and apigenin. The plant has demonstrated good DPPH radical scavenging activity.

Inhibitory effects towards the *in vitro* reaction of hypoxanthine and xanthine oxidase (XO) was also carried out in the presence of plant extract, aglycones quercetin, and apigenin along with allopurinol XO inhibitory activity of plant extracts, was comparable with aglycones but less than allopurinol¹⁶.

Potential hepatoprotective and antioxidant activity

It has been proved that *C. congesta* has hepatoprotective and antioxidant action by Chatterjee et al.¹⁷ They have used Wistar albino rats to estimate serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), serum alkaline phosphatase (SALP), uric acid, total protein content and total bilirubin content. They have measured antioxidant action by estimating lipid peroxidation, reduced glutathione (GSH), super oxide dismutase (SOD) and catalase (CAT) activity in liver.

Histamine releasing activity

It has been proved that *C. congesta* has histamine releasing effect that was observed

by estimating plasma histamine in cats, histamine content in rat hind-limb perfusate and histamine content of the lung tissue¹⁸.

Antimicrobial action

It has been reported that ethanolic extract of *C. congesta* has potent antibacterial action against different test bacteria like *B. subtilis*, *S. aureus*, *S. faecalis*, *E. coli*, *P. aeruginosa* and *S. typhimurium*. Moreover, ethanol extract has also showed considerable anticandidal action.¹⁹

Antiviral action

It has been reported that ethanolic extract of *C. congesta* possess potent antiviral activity against Sindbis virus (SINV) at 3 µg/mL, polio virus (POLIO), at 6 µg/mL HIV-1, and herpes simplex virus (HSV) at 12 µg/mL.²⁰

It was known that roots of *C. congesta* had antirhumatic property²¹. Isolated carissone derivatives exhibited an antizymotic, antibacterial and atropine like spasmolytic activity.²² The lipase activity of fruit has also been studied.²³ An aqueous extract of the root demonstrated anthelmintic, spasmolytic, cardiogenic and hypertensive action in a preliminary pharmacological screening.²⁴ It is reported that *C. congesta* has also good antipyretic activity.

CONCLUSION

Nowadays, herbal drugs are widely used as curative agent for different ailments. Concentrated extract of *C. congesta* can be found in various herbal preparations, which are readily available in the market. *C. congesta* preparations have broad range of distribution in the market and employed by practioner of natural health for the treatment of rheumatism. In the traditional system of medicine, *C. congesta* plant is used as cardiogenic, hepatoprotective, free radical scavenger and xanthine oxidase inhibiting agent, histamine releasing agent, antirhumatic, stomachic; antidiarrhoeal, vermifuge, anthelmintic, astringent, antiscorbutic, antibacterial, antiviral and anticonvulsant. Moreover, it has good potential to be used as potent energy source.

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