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Review Article

Carissa: A Review on Antimicrobial Evaluation of Diverse Species Extract

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Abstract

This is a medicinal plant which is common name *Carissa species* and belongs to family *Apocynaceae*. This plant has to different biological activities and this is natural product or impotence source of biologically active ingredients. They are the source for the synthesis of many impotents drugs are use to modern medicine. Numerous biologically active plant components have been discovered by ethno pharmacological evaluation. This review in brief study of *Carissa* species of plants leaves with helps of different extraction methods and evaluation of antimicrobial activity. It is pats such as leafs, roots, fruits barks, and steam haves medicinal properties are use to help in human and animal disease. Different and modern technique employed in the extraction of phytochemical of *Carissa* species plants study these plant in available different medicinal activities. The antimicrobial activities of *Carissa* species revealed a potential antibacterial activity against several bacterial includes *Staphylococcus aureus coli*, Escherichia coli, Staphylococcus aureus, Methicillin-resistant *Staphylococcus aureus* (MRSA), *Bacillus subtilis, Salmonella, Escherichia coli* DSM 1103, *pseudomonas aeruginosa, aeruginosa* ATCC 35032. This current review presents a compressive analysis of the medicinal application of Carandas plum.

Keywords: Antimicrobial Activity; *Carissa Species*; Antibacterial Activities; Medicinal Plant; Drug Resistance

Introduction

It is the hardy drought-tolerant plants thrive well in a wide range of solids. Common names in English include Bengal currant Christ's thorn, *Carissa* species. *Carissa* species is a flowering shrub in the family Apocynaceae. It produces berry-sized fruits that are commonly used as a condiment in Indian pickle and spices [1]. It is widely spread in the sub-tropics and tropics climate of the Himalayas, Maharashtra, Madhya Pradesh, Rajasthan, Uttar Pradesh, Bihar and West Bengal. This plant of Hindi name Karonda. The Karonda is famous for its whitish –pick berry –sized fruits. It is also found other Sought Asian countries like in the lowland rain forests of Sri Lanka and in Pakistan, Nepal, Afghanistan, and Bangladesh [2]. The plant is growing from seed sown in August and September. The first monsoon shower is planting time. Plants rose from seed start bearing two year after planting. Vegetative propagation is practiced in the form of budding and inarching. Cuttings may also succeed. Flowering starts in March and in Northern India the fruit ripens from July to September [3]. Isolation of many terpenoids has been reported [4]. In particular mixture of sesquiterpene namely caisson and carindone as a novel type of C31 terpenoids have been reported. Another ingredient is pent acyclic tri terpenoids carissin [5]. *Carissa carandas* is rich in iron, vitamin C, vitamins, calcium and phosphorus [6]. This medicinal plant research has potentiated human with diverse constituents with can be use natural preservative for the inhibition of different pathogens [7]. Therefore, this review provides complete investigation of *Carissa*

species plant leaves and brief review of antimicrobial activities with different extraction procedures [8].

Distribution of *Carissa* species

Carissa native range is Africa to India-China, Australia to New Caledonia, and has been introduction into the Bahamas, China, Central America, Jamaica, Indonesia, Malaya, Mexico, Nicaragua, the Philippines, Taiwan, Trinidad- and the USA [9].

General impotence of *Carandas plum* Plant

This plant of use traditional medicine health care and dramatically increased throughout to the world [10]. Scientist is research of new phytochemical constituents that can be used to developer use full antimicrobial for the treatment of infection disease [11]. Each thought plants are rich in wide properties of secondary metabolites that have antimicrobial properties very few of them are being explored in the developments and synthesis of novel antimicrobial [12].

Description and distribution

It is found grown in wild in India, Malaysia, South and Africa in India. It grows in Bihar, Best Bengal, Gujarat, Utter Pradesh state of India. It is the growth in suited to arid climate and well at higher temperature [15]. It required optimum range of Ph from 5.0 to 8.0 for their better growth. They are ready for planting after 6-7 months of this process. The plant start bearing flower in December-March and the fruits gets matured in the month of April-June [16].

Phytochemical constituents of *Carandas plum*

Genus *Carissa* is rich in different class of primary and secondary metabolites, including carbohydrate, lipids, proteins, and Phenolic including carbohydrates, lipids, Phenolic including flavonoids and tannins, terpenoids, coumarone, lignin, glycoside, tannins, and steroids [17]. Extensive work has been carried out by researchers to distinguish several compounds from the leaves, stem, roots, and wood of the *Carissa* species. 93 compounds from *C. Spinarum* 27 polyphones, 27 lignin 23 terpenoids, 8 steroids, 2 polyphones 4 lignin, 20 terpenoids, and 2 terpenoids have been extract [20]. From the genus *Carissa* total of 35 Poly phenol including Phenolic acids and flavonoids were isolated from the roots of carandas plum 21. Five felonies compounds the caffeine acid and *Carissa* one compounds (two Phenolic (caffeine acidic methyl ester) two flavonoids [18].

Traditional use of *Carandas plum*

The leaf of *Carandas* plum has much medicinal property and provided benefit of human and animals. Different part of this plant is use in antimicrobial property and this plant is use to treatment in anthelmintic and anti malarial agents. This plant of extraction was found effective against stomach-ache, diarrhea, and dysentery [19]. *Carandas* plum was used to stop to stop bleeding after the delivery, treat ulcers and muscle cramps, and to clear the worm- infested wounds in animals. Other medicinal applications include fever, skin disease, asthma, cataracts, anaemia, constipation, gastric ulcer, infertility, and hypertension and kidney complications [20].

Carissa Species plants different extract

Antimicrobial activity

Various crude extracts and isolated compounds and different nature resources, especially from the plants, have always been observed as a rich source of chemical compounds for controlling bacterial and fungal infection. Different assay that have been use in the literature for the screening of the plant extract for the antimicrobial activity are the agar disk different assays, Agar dilute assays, broth micro dilution assays and minimum inhibiter concentration assays [39]. MIC was proposed to be the most prominent and accurate method to check microbe (bacterial/fungi) resistance to an antimicrobial drugs or agents. The overview are reported antimicrobial assays of leaves, root, and stem extracted of different cassia species agents Gram positive and gram negative bacteria stains and same human pathogen are present [40]. Previous study reveals good antimicrobial activity of all port of plants (leaves, root, stem, and fruits of *Carissa* species against human pathogens such as *Bacillus subtilis, Pseudomonas aeruginosa, Enterococcus faecalis, Escherichia coli, Klebsiella Pneumoniae, Salmonella typhi*. The root extract of *C. spinarum* was found most active against. P. Aeruginosa at MIC of 8.0ml and Staphylococcus aureus at MIC of 312µg/mlN contrast, fruit extract of C. Carandas showed good activity against *K. Pneumonia* and *S. Aureus*, with the same MIC of 0.3125mg/ml [41]. Similarly, n- butanol fraction from the root and leaves extract of *C. macrocarpa* (syn. *C. grand flora*) showed maximum antibacterial activity against S. Epidermidis with MLC of 0.24 (root) and 0.56mg/ml (leaves), and S. Aureus with MLC of 0.82mg/ml and 0.67mg/ml (leaves). Essential oil of the stem of *C. macrocarpa* has also shown good antimicrobial activity against Salmonella enteric and B. Subtilis (MIC 0.46mg/ml). The overall comparative study so that *C. carandas* are most effective against bacterial pathogens [42]. Whereas, against fungal pathogens (*Alternaria solani, C. albicans, Aspergillus flavus, and Penicillium monotricale*), only the eth-

yle acetate fraction from *C. spinarum* root extract (Syn. C. opaca) MIC 7.8 µg/ml and essential oil from the fruits of C. macrocarpa (MIC0.46mg/ml have been screened by Awasthi., et al. [43]. No data are available on the antifungal activity of other *Carissa species*. Additional, ursolic acid and 3β-hydroxyolean-11-en-28,13β-olide (from *C. macrocarpa* leaves and fruits, respectively and dehydrocarissone, carindone (from the wood of *C. spinarum*, 2hydroxyacetophenone, carinol and cairisson from the root of *C. spinarum*, [54] have also been reported for their antibacterial activity. The compound, 3β-hydroxyolean-11-en28, 13β-olide, was found most active towards *S. Aureus, C. coli, and p. Aeruginosa* with MIC value of 0.o6mg/ml [44]. The about literature the quantitative data in terms of low MIC value supported the broad-spectrum antibacterial potential of *C. species*, however, the antifungal potential of *Carissa* species need to be the explored [45].

Antibacterial activity

While investigating antibacterial activity of the extracts of leaves, roots, stems of *Carissa carandas* using disc diffusion assay, MIC, minimum bacteria concentration, total activity, mean and standard deviation were calculated. *Streptococcus aureus* was found to be the most susceptible organism followed by *B. Subtilis* and *E. coli*. Flavonoids of roots showed the best activity against B. Subtilis (IZ = 15 mm, MIC = 0.312 mg/ml, MBC = 0.156 mg/ml, TA = 3.20 ml/g. Results revealed that extracts of *Carissa Carandas* have good antimicrobial potency and may be exploited for antimicrobial drugs [46]. In another study, the dichloromethane and toluene extract of the leaves of *C. Carandas* showed better result against *Staphylococcus aureus* and *Klebsiella pneumonia*. The fruit extract of *Carissa carandas* in dichloromethane exhibiter high antibacterial against *E. col*i the fruit extract in ethyl acetate shows the better result against all the strains of bacteria. In another investigation carried out on the root extract of *C .opaca*, the sample exhibited considerable antimicrobial activities against *B. subtilis*, *E. Coli, P. Aeruginosa, Candida albicans* and *Aspergillus Niger* with zones of inhibition ranging from 10 to 13mm as compared to the standard drug amoxicillin with zones of inhibiter 13-17mm under similar conditions. The roots of *C. opac*a can provide new leads for future antimicrobial drugs. Future antibacterial study on naringin 65 and ursolic 6 acid isolate from the leaves of *C. spinarum* has similar antibacterial activity and they completely inhibit the pathogenic gram negative bacteria with cause diarrhea and dysentery [47].

Antiviral activity

In a certain investigation, an aqueous total extract preparation of the roots of *C. edulis* exhibited remarkable Anti HSVs activity in vitro and in vivo for both wild type and resistant strain of HSV. The extract significantly inhibited formation of plaques in Vera E6 cells infect with 100 plaque forming unit of wild type stains of HSV (7501 HSV-1 AND Ito – 1262 HSV -2) or resistance stains of HSV (TK(-) 7401H HSV-1 and AP (r) 7401H HSV -1 by 100% at 50 mg/ml in vitro with animal cell Cytotoxicity (CC50 = 480mg/ml). When the extract was examined for in vivo efficacy in a marine model using Bal/C mice infect with wild type or residence stains of HSV, the extract, at an oral dose of 250mg/kg, significance delayed the onset of HSV infection by over 50%. It also increase the survival time of the treated infection mice by between 28 and 35% related to the infected the untreated mice p0.05 vs [49]. Control by students t-test) the mortality rate for mice treated with extract was significance reduce by between 70 and 90% as compared with the infect untreated mice that exhibited 100% mortality. No acute toxicity was observed in mice at the oral therapeutic dose of 250 mg/kg. These results suggest that the root aqueous extract of C. edulis contain potent anti- viral agents against HSVs that can exploited for development of an alternative remedy for HSVs infection. A separated investigation on the hexane extract of C. edulis displayed moderate activity against feline herpes virus 1 with EC50 70% mg ml and SI value 2. On the other hand, excellent activity was exhibited with the hexane extracts of *C. edulis* against canine distemper virus [50].

Future Recommendation

The present study recommends exploring the unexplored

Figure 1: *Carissa Carandas.*
Source: https://images.app.goo.gl/q1ogMCaZUVRYC3ZE6.

Figure 2: *Carissa Spinarum.*
Source: https://images.app.goo.gl/sNrpCc2hNcQMNCiU9.

Figure 4: *Carissa bispinosa.*
Source: https://images.app.goo.gl/nqquhu3sVRoxV3Rz6.

Figure 3: *Carissa macrocarpa.*
Source: https://images.app.goo.gl/4M3kzys972wT4RKT89.

Figure 5: *Carissa edulis.*
Source: https://images.app.goo.gl/Jhg4j8LtV7d4GtJB7.

Scientific name	*Carissa carandas*
Kingdom	Plantae
Class	Angiosperm
Subclass	Eudicots
Order	Gentian ales
Family name	*Apocynaceae*
Genus	Carissa
Species	*Carandas plum*

Table a: Taxonomical Classification [13].

S. No.	Plant Parts	Colour	Test	Size
1.	Leaves	Green	Tar, Souris-sweet	4-6inch long and 2-3inch wide
2.	Bark	Grey	Tart	1-3inch
3.	Fruits	Red	Sour, tart	3-6mm
4.	Flower	White	Bitter	30-50mm

Table b: Macroscopic properties [14].

S. No.	Plant Species	Part Used	Test For Micros	Minimum Inhibitor Conc.	Reference
1.	*Carandas plum*	Leaves	*S. typhi*	12	Reference No [21]
			Enterococcus faecalis	16	
			Shigella flexneri	24	
			Citrobacter spp.	14	
			Gonococci spp.	21 mm	

Table 1: Antimicrobial activity of *Carissa Carandas plum.*

S. No.	Plant Species	Part Used	Test For Micros	Minimum Inhibitor Conc.	Reference
1.	*Carissa spinarum* plant	Fruits	*Staphylococcus aureus, Bacillus subtilis, Salmonella typhi, subtilis, Escherichia coli* *Escherichia coli* ATCC 25922	600ml	Reference No [22]
2.	*Carissa spinarum*	Leaves	*Pseudomonas aeruginosa* ATCC 35032 *Proteus mirabilis Staphylococcus aureus* ATCC 25923	0.5	Reference No [23]
3.	*Carissa Spinarum*	Leaves, roots, stem, stem, bark	*Mycoplasma mycoides*	0.02mg/ ml	Reference No [24]
4.	*Carissa Spinarum*	Root, Leaf	*MRSA, E. Coli, Proteus, Pseudomonas fluorescence*	6.25ml	Reference No[25]
5.	*Carissa Spinarum*	Root, leaf, and bark	*Escherichia coli* DSM 1103 *Staphylococcus aureus* ATCC 25923	3.12ml	Reference No[26]
6.	*Carissa Spinarum*	Root	*Escherichia coli, Bacillus subtilis, Staphylococcus aureus, Streptococcus species*	123 ml	Reference No [27]

Table 2: Antimicrobial activity of *Carissa spinarum plant.*

S. No.	Plant Species	Part Used	Test For Micros	Minimum Inhibitor Conc.	Reference
1.	*Carissa Macrocarpa*	Root	*Escherichia coli, Bacillus subtilis, Staphylococcus aureus, Streptococcus species*	125ug/ml	Reference No [28]
2.	*Carissa. macrocarpa*	Fruits	*Escherichia coli, Pseudomonas aeruginosa, faecalis*	10-20ml	Reference No [29]
3.	*Carissa macrocarpa*	Leaf	*Escherichia coli,*	0.62ml	Reference No [30]
4.	*Carissa macrocarpa*	Fruits, Stem	*Salmonella enteric, Staphylococcus aureus*	0.45-7.5	Reference No [31]
5.	*Carissa macrocopa*	Stem, root and leaf	*Staphylococcus aureus, Escherichia coli, Staphylococcus epidermidis*	0.24-2.69ml	Reference No [32]

Table 3: Antimicrobial activity of *Carissa macrocarpa.*

S. No.	Plant Species	Part Used	Test For Micros	Minimum Inhibitor Conc.	Reference
1.	*Carissa edulis*	Leaves	Antiviral	0.05	Reference [33]

Table 4: Antimicrobial activity of *Carissa Edulis* Plant.

S. No.	Plant Species	Part Used	Test For Micros	Minimum Inhibitor Conc.	Reference
1.	*Carissa Bispinosa*	Leaves	*S. aureus, E. coli.*	1.25ml	Reference No[34]
			S. aureus	3.9ml	
			S. Pyogenes	7.8ml	
			E. faecalis	7.8ml	
			C. albicans	7.7ml	
			C. glabrata	3.9	
2.	*Carissa bispinosa*	Stem	*S. aureus*	1.2ml	Reference No [35]
			S. pyogenes	4.76ml	
			E. Faecalis	1.2ml	
			C. albicans	1.2ml	
			C. glabrata	1.2ml	

Table 5: Antimicrobial activity for *Carissa bispinosa* Plant.

S. No.	Plant Species	Part Used	Test For Micros	Minimum Inhibitor Conc.	Reference
1.	*Carissa spinarum*	Roots	*Candida albicans,*	0.05-0.1ml	Reference No [36]
2.	*Carissa spinarum*	Roots	*Candida albicans*	0.007ml	Reference No [37]
3.	*C. macrocarpa*	Fruits	*Candida albicans*	0.46ml	Reference No [38]

Table 6: Antifungal activity of *Carissa Spinarum.*

species of the gens Carissa e.g. *C. bioviniana, C. haematocarpa, C.tetramera, and C. tetramer*, from their chemical and pharmacological profile. Further analysis of Phyto constituents from *C. bispinosa* is required to be obtaining new bioactive compounds with significant biological applications. Moreover, clinical evaluation and in vivo models of crude extraction and pure compounds of *Carissa* species are still required to be standardised. Further, the determination of the mechanism of molecules activity of the plants extract and it is chemical compounds within the animal models systems still needs to be explored.

Conclusion

Carissa genus is a key contribution of valuable Phyto constituents, and various *Carissa* species have been screening for their nutrients, bioactive constituents and pharmaceutical aspect, which are important good health. The present of review is focused on the research carried out on various aspects of any five species of *Carissa* (*C. spinarum, C. carandas, C. macrocarpa,* and *C. bispinosa*, *Carissa edulis*). A total of 121 compounds (35polypenol (Phenolic acid and flavonoids,) 30lignans, 41terpenoid, 7 steroids, 2 coumarins, and 6 cardiac glycosides) have been extracted from *C. spinarum, C. carandas, C, macrocarpa*. No reports are available on the isolation of chemical constituents *Carissa haematocarpa, Carissa pichoniana* among all the compounds, only a few compounds have been screening/tested for different biological activity. For example, lupeol (1), oleuropein (20), carissol (12), and α-amyrin (21), extracted from *C. spinarum*, have been tested herpes simplex viruses. Among all the *Carissa* species, most of the pharmacological activity were tested on C. spinarum and *Carissa carandas*, whereas *C. macrocarpa, Carissa edulis* was use to evaluate antimicrobial activity .The most extensively used ports from various reported activity were the roots, fruits, barks and leaves of *C. spinarum* and *C. carandas, C. macrocarpa C. bispinosa*. The review article concludes that crude extracts from different ports of Carissa species possess significant Antimicrobial activity, antiviral, antifungal and antimicrobial activity at a concentration between 100 and 500mg/kg. Toxicity studies revealed that *C. spinarum C. carandas* could be used at up to a 5000mg/kg dose level without any effect harmful. The various phytochemical constituents such as alkaloids, phenol, terpenoids, tannins, coumarins, coumarins, saponins, and glycosides in the leaves, stem, bark, and roots. The entire plants of *Carissa* species are the reason behind all pharmacological activities. These investigations support the traditional use of the genus *Carissa* to treat several ailments, including information, diabetes, malaria, cold, fever, liver and heats disease. The riches of the Carissa fruits in antioxidants, vitamin C, and malaria validation their use as a food additive in various food preparations. Although several compounds of *Carissa* species (*C. macrocarpa, C. bispinosa, C. spinarum and C. carandas, C edulis*) have been isolated, all these compounds are still not explored for their biological activities. The currents study is intended to help researches to cknolege the therapeutic potential of all plant species of the Carissa genus.

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