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Caralluma lasiantha: A review on it's vital role in Indian Traditional Medicine

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ABSTRACT

Caralluma is a genus used as traditional medicine. *Caralluma lasiantha* is medicinally important due to existence of pregnane glycosides, which may possess various biological activities. This article thoroughly reviewed about the usage of C. lasiantha in traditional medicinal system, phytochemicals present in it, profile identification studies, anti-hyperglycemic effect, antibacterial, antifungal, cytotoxic and antioxidant activities.
Keywords: C*aralluma lasiantha,* Indian traditional medicine, Profile Identification Cytotoxic, Antibacterial, Antifungal.

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INTRODUCTION

Plants are showing good pharmacological activity due to existence of secondary metabolites in them [1]. A plant in which one or more parts of it possess substances that are with medicinal usage or which is a precursor for the development of useful drugs is known as medicinal plant [2].Since primordial days, plant based products have been used as drugs for the treatment of a variety of diseases and also a lot of new medicines are produced by plants. Therapeutic use of plants and plant products are well known from ancient days. Vivid folk systems of medicine were developed from generation to generation across the globe. On the other hand due to random usage of antibiotics, micro organisms have developed more resistance. Therefore, now a days, traditional medicine and natural bio active molecules are gaining much importance to give alternate antibiotics from different natural resources like plants. Chemical compounds which are produced by plants show good antimicrobial activity, because they are able to break the cytoplasmic membrane of bacteria [3].

In folkaric medicine as well as in ancient system of medicine like ayurveda and unani, some plants of asclepiadaceae are reported to be useful in particular ailment. The medicinal value of is due to the existence of different compounds like alkaloids, steroids, steroidal glycosides, cardiac glycosides, flavonoids and flavones glycosides [4]. The family Asclepiadaceae which consists of 200 genera and 2500 species includes caralluma also as one of genus [5, 6] and is grow in dry places of the world. *Caralluma* species have been used as emergency foods in India and Pakistan for centuries [7]. The etymology of '*Caralluma*' is derived from the Arabian word, 'qarh al-luhum', meaning wound in the flesh or abscess [8]. *Caralluma* is also expressed as the synonym of Boucerosia but it differs from Boucerosia by its floral parts [8], the species of caralluma which are present in India are found to be edible and also appears as a part of traditional medical system of India. In the present trend*, Caralluma* is receiving a very good importance from researchers due to existence of saponins and flavanoids, which contain immunostimulating activities [9]. In Ayurvedic medicine the more important bioactive chemical constituents are saponinns, flavanoids and poly phenols [10] Zakaria et al 11] reported *Caralluma* contain prominent anti inflammatory and anti tumor activity, whereas antioxidant and hypolipedimic activities were reported by Tatiya et al [12]. Venktesh et al [13] proved their antihyperglycaemic activity. Khan and Khatoon [14] reported its use in treating and joint pains and antipyretic properties. From literature survey it is proved that other species of caralluma exhibit anti microbial activity due to the presence of tannins, flavanoids and sterols in them [15]. For example Naik and Jadge [16] proved that aqueous extracts of *Caralluma adscendens* were effective against pathogenic bacteria like *S. typhi, E. coli* and *Pseudomonas aeruginosa and petroleum extract of same plant is effective against S. aureus and E. coli* [17]. A series of biological activities including antimicrobial activity can be explained due to existence of pregnane glycosides [18], stogmasterol and other further constituents [19]. Suresh Babu et al [20] provided a scientific validation for the traditional knowledge of tribals of Chittoor District, India for their usage of *Caralluma umbellata Haw* to cure stomach disorder and pain. For this purpose, antibacterial activity of *Caralluma umbellata Haw* was studied on Gram positive (*Bacillus subtillis* and *Bacillus cereus*) and Gram negative bacteria (*Escherichia coli* and *Staphylococcus aureus*). Differential antibacterial activity of extracts, phytochemicals of *Caralluma umbellata* and their pharmacological activities, antibacterial nature of steroidal glycosides, flavonoids and flavone glycosides were explained.

ABOUT *CARALLUMA LASIANTHA*

Caralluma lasiantha (syn. *Boucerosia lasiantha* with local names - Sirumankeerai in Tamil / Kundeti Kommulu in Telugu) [21] belongs to the family Asclepiadaceae. *C. lasiantha* is used as indoor ornamental plant and it is succulent in habit [22]. It grows naturally in Anantapur, Chittoor and surrounding places of Andhra Pradesh, India. Fresh root less plant (Ten grams) is used twice a day for three days to decrease the body heat [23].

PHYTOCHEMICAL INVESTIGATION OF CARALLUMA LASIANTHA:

Ealier researchers isolated two new bisdesmosidic C-21 steroidal (pregnane) glycosides existing in *C. lasiantha* and named as lasianthoside-A (caralasigenin 3-O-b-D-glucopyranosyl(1→4)-b-D-digitalopyranoside-20-O-a-L-rhamnosyl(1→6)-b-D-glucopyranoside), lasianthoside-B (caralumagenin 3-O-b-D-glucopyranosyl(1→4)-b-D-digitalopyranoside-20-O-a-L-rhamnosyl(1→6)-b-D-glucopyranoside) (Fig.1)

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(steroidal glycosides) and Luteoline-4-O-neohesperiodoside (Fig.2) (flavone glycoside) [24]. Different solvents are able to extract different phytochemicals based on their polarity [25]. Steroidal glycosides were extracted from C.lasiantha in their studies, using polar solvents like alcohols [24].

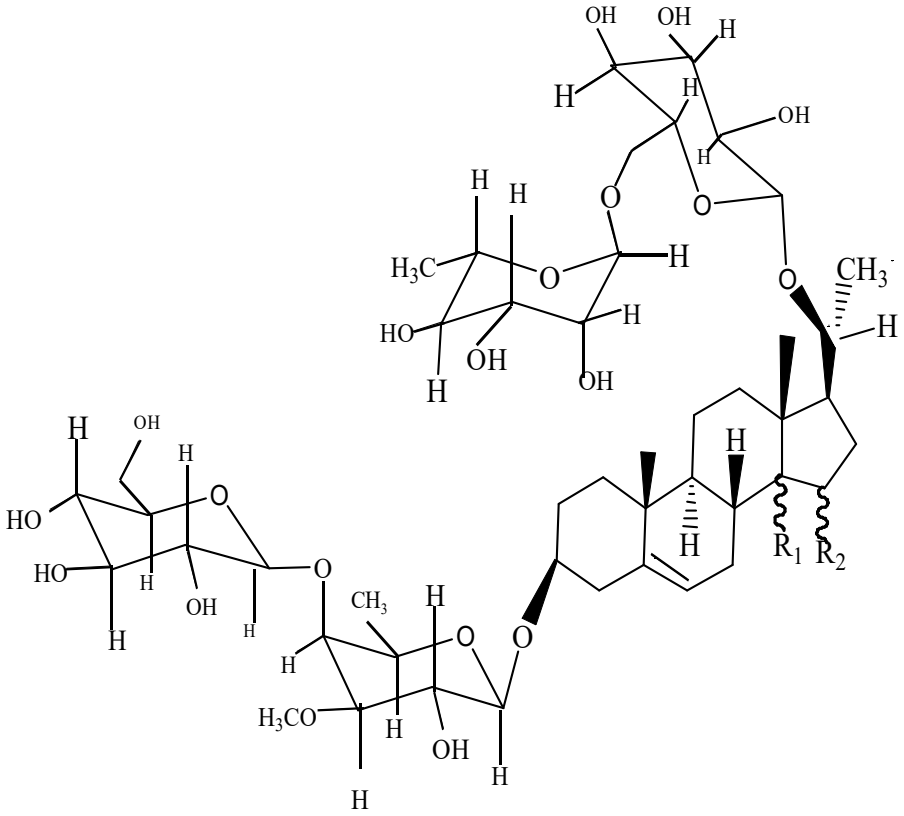

Fig 1: lasianthoside-A and lasianthoside-B Lasianthoside-A -R_1, R_2 = Δ^{14-15}, Lasianthoside-B -R_1 = β-OH, R_2 = H R_1 = β-OH, R_2 = H

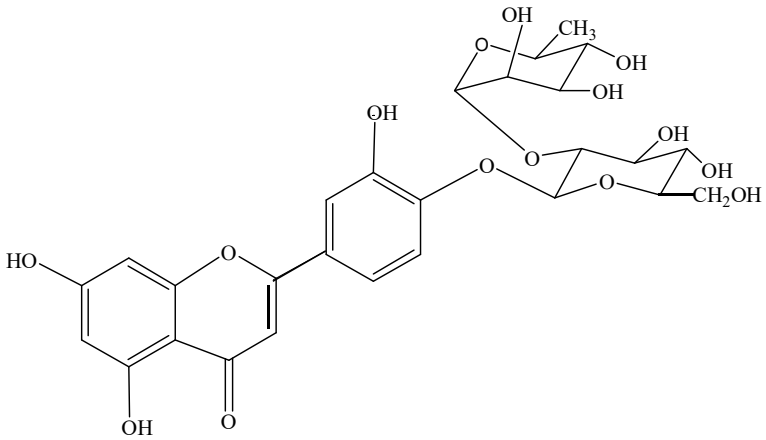

Fig 2: Luteoline-4-O-neohesperiodoside

IDENTIFICATION STUDIES OF CARALLUMA LASIANTHA:

Identification of different species from *Caralluma* genus is a great difficulty due to their more intermediate forms in their habitat [26] and standard quality control profile is absent. Hence, Pavan Kumar et al [27] established a set of standardized parameters for correct identification of four *Caralluma* species (*Caralluma lasiantha*, *Caralluma umbellata*, *Caralluma attenuata* and *Caralluma diffusa*) and determine genuinity. A set of parameters (like powder characteristics, physicochemical evaluation, HPTLC fingerprint profile, and quantitative estimation) were used for correct identification of phytoconstituents of these raw materials. pH of the dried materials was found to be in the acidic range of 5 to 6.8. The raw materials were found to be extracted high in aqueous indicating high content of water soluble compounds. The percentage aqueous extractive value was found to be highest with 47.63±2.10 in *C. lasiantha* to the lowest in *C. attenuata* with 35.09±0.92%. Earlier the genetic composition of various species of Caralluma R.Br. (Caralluma attenuate, Caralluma fimbriata, Caralluma stalagmifera, and Caralluma longipetala) as well as Boucerosia Wight & Arn. (Boucerosia lasiantha and Boucerosia umbellate) was assessed for its efficient conservation and management [26]. RAPD (Random Amplified Polymorphic DNA fingerprints) were used to estimate genetic diversity/similarity. DNA polymorphism among these six species of Caralluma was carried out using arbitrary primers OPA, OPB, OPD and OPN series. The size of amplified products was varied from 100 bp to 1200 bp highest number of bands was generated by OPB7 and revealed 73% polymorphism across the specie of Caralluma. The results showed that all the six species of Caralluma had different banding composition.

TISSUE CULTURE OF CARALLUMA LASIANTHA:

Lack of cultivation techniques as well as unsystematic collection of C. lasiantha and its over exploitation for commercial purposes are leading to fast disappearing and threatened extinction. For mass propagation and conservation of *C. lasiantha,* a procedure was outline by Aruna et al [28] in which effect of medium, explants and cytokinins was studied on shoot induction, maximum shoot sprouting frequency and maximum number of shoots. For shoot induction, mature explants were cultured on Murashige and Skoog (MS-1962) medium, Gamborg's B5, woody plant medium and 6-benzyladenine (BA). Maximum shoot sprouting frequency and rooting was observed when the nodal explants were cultured on MS medium containing BA and NAA (naphthalene acetic acid) respectively. About 75% survival rate of *C. lasiantha* was observed by establishment of rooted plants in soil. Aruna et al [29] presented a protocol which describes callus induction from stem segments and indirect organogenesis of Caralluma lasiantha. Taking into account of response, fresh and dry weight of the callus, MS (Murashige and Skoog) medium was proved to be best for callus studies and organogenesis. In combination to MS, the concentrations for auxins and cytokinins for generation of optimum amount of callus (2,4-dichlorophenoxyacetic acid - 3mg/l and 6- benzyl adenine – 0.1mg/l), maximum response (6- benzyl adenine - 1 mg/l and 2-iP: 2-isopentenyladenine – 0.5 mg/l) and for in vitro rooting (Naphthalene acetic acid – 0.1mg/l). Medium concentrations were optimised for callus formation, maximum response and in vitro rooting. The survival rate for successfully establishment of In vitro regenerated plantlets in soil was found to be 70%.

CYTOTOXIC STUDIES OF CARALLUMA LASIANTHA:

Madhuri et al [30] studied anti proliferative properties of methanolic extracts of Caralluma R.Br. (Caralluma attenuate, Caralluma fimbriata, Caralluma stalagmifera, and Caralluma longipetala) as well as Boucerosia Wight & Arn. (Boucerosia lasiantha and Boucerosia umbellate) against A375 human malignant melanoma and A431 human skin cancer cells. A dose dependent increase of cell growth inhibition was observed. IC50 (% inhibition in cell proliferation - µg/ml) of *Boucerosia lasiantha* (BL) was found to be 7.28±0.18. The observed anti-proliferation and induction of apoptosis cell death in skin cancer cells of these plant extracts was attributed to flavanoids and phenolic compounds available in them. *Invitro* cytotoxic nature of methanolic, aqueous and hydro methanolic extracts of these four caralluma species was carried out for dosage fixation for further exploration of their therapeutic efficacy [31]. Extracts were studied for their toxicity by MTT and trypan blue dye exclusion models against a panel of cancer, normal origin cell lines and EAC cells. The toxicity of these extracts is in the order: methanolic > hydro methanolic > aqueous extract. The extracts were found to be moderately toxic and showed dose dependent response and non selective as reflected by

uniform CTC50 values independent of cell line origin. The observed cytotoxicity may be from phytoconstituents (flavone glycosides and saponins).

ANTIOXIDANT ACTIVITIES OF CARALLUMA LASIANTHA:

The antioxidant efficacy of these methanolic plant extracts of *Caralluma* and *Boucerosia* was evaluated [32]. Cellular antioxidant activity was demonstrated by the inhibitory concentration 50% (IC50) of reactive oxygen species (ROS). For *Boucerosia lasiantha* (BL) inhibition occurred at a concentration of 50±2.00 µg/ml. According to them Redox properties of phenolic hydroxyl groups of *Caralluma* and *Boucerosia* extracts allow them to act as reducing agents, hydrogen donating antioxidants and oxygen quenchers. Based on the results in this study, all the selected plant species could inhibit intracellular free radicals. Hence, dietary polyphenolics from *Caralluma* and *Boucerosia* extracts supply substantial antioxidants and hence provide health promoting advantage to the consumer.

HYPERGLYCEMIC ACTIVITIES OF CARALLUMA LASIANTHA:

In view of significant side effects or high anti-hyperglycemic potential of currently available oral anti-hyperglycemic agents, Harsha Kumar investigated the antihyperglycemic / hypoglycemic effect of methanolic extracts of *Caralluma lasiantha* and compared with Chromium Picolinate on hyperglycemia induced by Cafeteria-Diet in Wistar albino rats. For this study, Cafeteria-Diet was fed for 90 days to induce Hyperglycemia. Throughout the study, oral administration of *Caralluma lasiantha* (10, 20, and 40 mg/kg b.w.) and Chromium Picolinate (10 mg/kg b.w.) was done once per day. On different experimental days, serum glucose levels were determined and beneficial effect of Caralluma lasiantha were observed. The results show that extracts of *C. lasiantha* was able to significantly reduce the serum glucose level in dose dependant manner. The observed anti-hyperglycemic activity of *Caralluma lasiantha* extract was attributed to the available pregnane glycosides, flavonoid glycosides, and luteolin neohesperidoside in it. Based on experimental results, *Caralluma lasiantha* was suggested as a food supplement or an adjunct treatment for hyperglycemia [33]. Harsha Kumar correlated his results with the earlier studies on Calluma genus plants like *Caralluma sinaica, Caralluma attenuate* and *Caralluma tuberculata.*

ANTIBACTERIAL AND ANTIFUNGAL ACTIVITIES OF C.LASIANTHA:

Antibiotic nature of *Caralluma lasiantha* was predicted based on its usage to reduce body heat in Indian traditional medicinal system [23]. It is well known fact that pharmacological activities of either natural or synthetic molecules depends on different moieties and functional groups present on them [34, 35, 36, 37]. So, in our recent studies, antibacterial activity of *Caralluma lasiantha* extracts was studied and reported against both Gram (+) bacteria (*B. subtilis, S. aureus , Streptococcus Sps, , B. megaterium*) and Gram (-) bacteria (*E. aerogenes, K.pneumonia, E. Coli, P. aeruginosa)* [38]. Minimum Inhibitory Concentration (MIC) of stem and root extracts was studied. Higher inhibition growth by caralluma lasiantha extracts against Gram (+) bacteria was explained. The chemical structures of phytochemicals present in *C. lasiantha* were correlated with their antibacterial activities. Anti-inflammation activities were also related to C.lasiantha extracts through their antibacterial activities. Similarly, based on antifungal activity of *Caralluma lasiantha* extracts against eight fungi (*Aspergillus, Candida, Cryptococcus* and *Trichoderma*), *Caralluma lasiantha* was suggested as a substitute to control storage fungi [39] in view of side effects of synthetic fungicides [40] and consumers demand for natural antimicrobials for pest management without any harm to environment [41].

CONCLUSION

Caralluma lasiantha is a potential source for phytochemicals with medicinal usage. As thorough literature collection shows that few pharmacological activities (antibacterial, antifungal, cytotoxic and antihyperglycemic) are reported so far, C. lasiantha is a plant which can be further explored for other biological activities.

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