Phyto-Pharmacology of *Caralluma Adscendens* Roxb: A Review

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**ABSTRACT**

Many herbal remedies have been employed in various medicinal systems for the treatment and management of various diseases. The plant *Caralluma adscendens* has been used in different systems of traditional medication for the treatment of disease and ailments of human being. It is reported to contain various glycosides, flavonoids and steroids. It has been reported as an anti-inflammatory, antioxidant, anti-diabetic, analgesic, anti ulcers, antibacterial, hypoglycemic activities. There are also reports available for traditional uses of this plant for its dermatitis, anti-obesity, as a bloat, wound healing activities. Many isolated constituents from *Caralluma adscendens* lack the reports of pharmacological activities, which support its further pharmacological activities.

**Key words:** *Caralluma adscendens*, Phytochemistry, Pharmacological activities.

**INTRODUCTION**

Plants have played a significant role in maintaining human health. Herbal medicine is based on the premise that plant contains natural substance that can promote health and alleviate illness. In recent times, focus on plant research has increased all over world and a large body of evidence has collected to show immense potential of medicinal plants used in various traditional systems. Today, we are witnessing a great deal of public interest in the use of herbal remedies. Herbal drugs or medicinal plants, their extracts and their isolated compound have demonstrated biological activities. Such have been used and continued to be used as medicine in folklore for various disorders. Ethno pharmacological studies on such herbs important plant continued to interest investigators throughout the world.

Herbal drugs have been used since ancient times as medicines for the treatment of range of diseases. Medicinal plants have played a key role in world health. In spite of the great advances observed in modern medicine in recent decades, plants still make an important contribution to health care. Medicinal plants have become the focus of intense study In terms of conservation and as to whether their traditional uses are supported by actual pharmacological effects or merely based on folklore. On such plant, *Caralluma adscendens* invites attention of the researcher worldwide for its pharmacological activities ranging from anti-inflammatory to anticancer activities. *Caralluma adscendens* Roxb. Belongs to family Asclepiadaceae.

Synonym: - *Caralluma fimbriata*, Common Name: - Ranshbar, Maked Shenguli, Shindala Makadi, Vernacular Name: Q Kullee moofiyan, Kallimudayan (Tamil), Karallamu (Telegu), Yugmaphallottatna (Sanskrit), shindala makadi (Marathi).

This plant grows throughout India, in deciduous and hilly areas. The latex cell usually contains latex rich in triterpines, other constituents includes alkaloids of Indole, Phenanthrine, Indozolidine, Glycosides, Saponin, Tannins. Many members are used in folk medicine in their countries.

Is a variable herb, up to 1m in height with fleshy, almost leafless stem, deep purple, brown or yellowish white flower and 10-20 cm long slender follicles, distributed in India from Andhra Pradesh up to 600 m, a few varieties have been reported. The herb is consumed as a vegetable and also made into a pickle. The herb contains hydrocarbons N- pentatriacontane and glycosides. The genus *Caralluma*
(Asclepiadaceae), which are comprises about 200 genera and 2500 species. The member of the genus is small plant, erect, fleshy. They have four grooved stems, round shape devoid of leaves and small flowers in several varieties of dark Colors. The species of Caralluma found in India are edible and form part of the traditional medicine system of the country.\[19\]

The key phytochemical constituents of the herb are pregnane glycoside (25%), Flavone glycoside (chemotaxonomic marker), Saponin glycoside (10%), and Megastamine glycoside, Bitters (3%), Sitosterol and Tomentogenin.\[6-7\]

### TRADITIONAL USES

Wild plant species *Caralluma adscendens* (Kundaetikommulu) used as food by tribal people by Andhra Pradesh. For chutney purpose,\[18\] a few varieties have been reported that herb is consumed as a vegetable and also made into a pickle.\[2, 4\]

In addition to Caralluma species commonly used in treatment of rheumatism, diabetes, leprosy, antipyretic and anthelmintic, for tumor, fungal diseases, snake, scorpion bite and antinociceptive activity.\[11\] Caralluma species have shown anti-inflammatory, anti-nociceptive,\[13\] antidiabetic,\[13-14\] gastric mucosa protecting, anti ulcer and cytoprotective properties. The species of Caralluma found in India are edible, their medicinal properties includes anti-inflammatory, anti-nociceptive, antioxidant, antiulcer, ant diabetic, carminative, antipyretic. Caralluma extract have also found to be appetite suppressant a properties which is well known to Indian tribals and hunters. Indian folklore record their to be appetite suppressant a properties which is well known.

In 1976, dry plant material from *Caralluma fimbriata* was extracted with petroleum ether, benzene, ethanol; Pet ether extract gave a waxy solid which on spectral analysis. The benzene extract gives three comp. After chromatography a glycoside was partially identified.\[22-23\]

In 1999, flavone glycoside isolated from three Caralluma species.\[24\]

In 2009, Phytochemical studies of botanicals: Hoodia gordonii and *Caralluma* species. They describe a phytochemical study of a species of Caralluma genus. *Caralluma adscendens* var. *fimbriata*, which is also known as “Indian Hoodia”. Phytochemical investigation of a commercially available Caralluma sample was undertaken in order to generate better understanding of the chemical constitution of this species and to develop marker constituents for development of quality control methods. The chromatographic separation of methanolic extract of Caralluma species resulted in isolation of one new pregnane glycoside (Carallumoside A) and seven known steroid derivatives namely, Caraumbellogenin, Carallumoside B, boucerin, Caraumbelloside I, II, and III, and boerharigenin B. Most of the known compounds were previously reported from other species of Caralluma genus.\[25\]

In 1983, Qualitative chemical test was performed for the presence of different class of constituents in *Caralluma adscendens* plant extracts; these include alkaloids, flavonoids, saponins, tannins, etc.\[26\]

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In 2002, the key phytochemical constituents and potentially active molecules in *Caralluma fimbriata* include pregnane glycosides, flavone glycosides, megastigmene glycosides, bitter principles, saponins and various flavonoids.[27]

In 2007, Pregnanes and Pregnan Glycosides isolated from *Caralluma fimbriata* shows Appetite Suppressant Dietary Supplement. Plant reported to be rich in steroidal glycosides. Several other species of *Caralluma* have been reported to contain a wide range of pregnane glycosides; however there has not been any phytochemical study on *C. fimbriata* till today. As a part of our ongoing phytochemical investigation, we have isolated pregnanes and pregnane glycosides from *C. fimbriata*. Isolation and structure elucidation of these compounds using various spectroscopic techniques (HR-MS, FT-IR, 1D and 2D NMR).[28]

In 2010, *Caralluma fimbriata* (Slimaluma®) is an edible succulent cactus that belongs to the family Asclepiadaceae. Its key ingredients are pregnane glycosides, flavone glycosides, megastigmene glycosides, bitter principles, saponins and various other flavonoids. The appetite suppressant action of *C. fimbriata* could be mainly attributed to the pregnane glycosides. These compounds seem to have peripheral and central effects. In the adipose tissue, pregnane glycosides reduce lipogenesis.[29]

In 2006, an oxypregnane steroidal glycoside, known as P57, is the only reported active constituent from hoodia. Extract of Hoodia gordoni (*Caralluma fimbriata*) is one of the most popular herbal supplements claimed to possess appetite suppressant properties.[30]

**PHARMACOLOGICAL STUDY**

**Antibacterial activity**
In 2003 Tatiya A.U. et al observed Antibacterial activity of various extracts of stem of *Caralluma adscendens* was studied against B. Pumilus, E. coli, and S. aureus. Pet ether extracts shows antibacterial activity.[31]

**Anti-inflammatory activity**
In 2009 D.R. Jadge et al observed screening of *Caralluma adscendens* for Anti-inflammatory activities. Anti-inflammatory activity of aqueous and ethanolic extracts of whole plant of *Caralluma adscendens* in rats. The anti inflammatory activity was evaluated by using Digital Plethysmometer. The study was carried out by using dose of 250 mg /kg of ethanolic and aqueous extract orally. All extract showed significant activity for all dose as compared to diclofenac sodium.[32]

**Hypoglycemic activity**
In 2009 Mali K et al observed screening of *Caralluma adscendens* for hypoglycemic activity.[33]

**Antioxidant and Hypolipidemic activity**
In 2010 Tatiya A.U. observed various extracts of *Caralluma adscendens* were evaluated by alloxan induced (150 mg kg-1 i.p.) diabetic rats and oral glucose tolerance test. Fasting blood glucose estimation was done at 0, 30, 90 and 150 min after treatment. Lipid profile and body weight measurements were done on day 0, 7, 14 of the study. Antioxidant effects were also evaluated using Diphenyl-1-Picylhydrazyl (DPPH), *in vitro* lipid peroxidation and reductive ability methods. The treatment showed significant lowering of blood glucose in the treated diabetic rat from 273.1±4.01 to 82.1±1.4* mg dL-1 by butanolic extract of *C. adscendens*, 150 min after the treatment (*P < 0.01). It also showed significant decrease in total cholesterol, LDL, triglyceride and TC /HDL and an increase in HDL in the treated diabetic animal group. Glucose tolerance was also improved. *In vitro* antioxidant activity showed that the butanolic extract exhibited potent free radical scavenging effects. All the results were compared with standard drug Glibenclamide.[34]

**Effect of Caralluma Fimbriata extract on appetite, food intake and anthropometry in adult Indian men and women.**
In 2007 Rebecca Kuriyana et al observed Effect of *Caralluma Fimbriata* extract on appetite, food intake and anthropometry in adult Indian men and women. Waist circumference and hunger levels over the observation period showed a significant decline in the experimental group when compared to the placebo group. While there was a trend towards a greater decrease in body weight, body mass index, hip circumference, body fat and energy intake between assessment time points in the experimental group, these were not significantly different between experimental and placebo groups. Caralluma extract appears to suppress appetite, and reduce waist circumference when compared to placebo over a 2 month period.[35]

**Clinical trial Research**
In 2006 A. Jagtap et al observed Toxicological evaluation of *Caralluma Fimbriata* extract in wistar rats. Assessment of acute and sub chronic oral toxicity and mutagenicity of hydro alcoholic extract of *Caralluma fimbriata* (CFE). Acute and sub chronic oral toxicity studies were performed in accordance with OECD guideline 423 and 407 respectively. The Salmonella typhimium reverse mutation test (Ames test) was performed in accordance with OECD guideline.[36]

**Report on the Safety of Caralluma fimbriata and its Extract**
A famine food – suppressing appetite and quenching thirst. Legend has it that hunting tribes chewed chunks of the Caralluma cactus to suppress hunger and thirst when on a long hunt. Most importantly to determine safety, there are
no adverse event reports on the Indian subcontinent over the centuries of use.\(^\text{[50]}\) Caralluma fimbriata is listed as a vegetable in The Wealth of India, the Indian Health Ministry’s comprehensive compilation on medicinal plants.\(^\text{[5]}\) Key phytochemical ingredients include pregnane glycosides,\(^\text{[37-38]}\) flavone glycosides,\(^\text{[39]}\) megastigmance glycoside,\(^\text{[40]}\) bitter principles, saponins, various flavonoids.\(^\text{[41]}\)

**Proposed Mechanisms of Action for Weight Reduction and Safety**

It is postulated that the pregnane glycosides and perhaps other constituents in Caralluma fimbriata prevent fat accumulation via blocking citrate lyase. This would be similar to the mechanisms proposed for another product from India, Garcinia cambogia.\(^\text{[42]}\) This is important for two reasons. In addition, clues as to how Caralluma fimbriata works to reduce weight may emanate from our knowledge of Garcinia cambogia. The active component in Garcinia cambogia is hydroxycitrate (HCA),\(^\text{[42]}\) and HCA has been reported to cause weight loss in humans without stimulating the central nervous system.\(^\text{[43]}\) Because it is a competitive inhibitor of ATP-citrate lyase, an extra mitochondrial enzyme involved in the initial steps of de novo lipogenesis.\(^\text{[42]}\) Consequently, HCA reduces the transformation of citrate into acetyl coenzyme A, a step necessary for the formation of fatty acids in the liver. In addition to its effect of citrate lyase, the postulated blocking of malonyl Coenzyme A by Caralluma fimbriata could further lead to a decrease in fat formation in the metabolic pathway. Again similar to Garcinia cambogia,\(^\text{[42]}\) Caralluma fimbriata is reported to suppress appetite hypothesized to be secondary to effects on the appetite control center of the brain. HC has been demonstrated to reduce food intake in animals suggesting its role in the treatment of obesity and has been demonstrated to increase the availability of serotonin in isolated rat brain cortex that could affect satiety.\(^\text{[44-49]}\) More specifically, it is believed that the pregnane glycosides in Caralluma fimbriata inhibit the hunger sensory mechanisms of the hypothalamus.

**GENERAL STUDY**

**In vitro propagation of pharmaceutically valuable varieties of Caralluma adscendens from nodal explants**

In 2009 Aruna V et al observed a procedure for in vitro propagation of pharmaceutically valuable varieties of Caralluma adscendens from nodal explants is described. The highest shoot multiplication with 80% frequency was achieved within one month on Murashige and Skoog’s medium supplemented with 8.87 \(\mu\)M BA. Shoot multiplication occurred in subsequent subcultures in culture bottles on MS medium. Regenerated shoots were rooted on half strength MS medium supplemented with NAA (0.54 \(\mu\)M) in all the three varieties.\(^\text{[54]}\)

**Appetite suppressant**

In 2006 Mary Shomon et al observed Caralluma for Weight Loss Indian Cactus is Promising Appetite Suppressant and Diet Aid. Caralluma fimbriata is a succulent plant, in the cactus family, that has been used as a natural appetite suppressant in India for centuries. It’s another new arrival in the family of various cactii that are being used for their appetite suppressant, blood sugar lowering, and weight loss properties, much like the increasingly popular hoodia gordonii from the Kalahari Desert in Africa.\(^\text{[51]}\)

In 2007 Jen Cully et al observed Caralluma fimbriata is the newest all-natural appetite suppressant to the global market and Millennium Health supplement is thrilled to add this great new product to its line of bulk ingredients.\(^\text{[52]}\)

**Other Actions of Caralluma**

In folklore medicine, plants of the Caralluma species have been used to treat diabetes. In a study using streptozotocin diabetic mice, acute or sub acute treatment with C. Arabica caused a statistically significant lowering of circulating blood glucose levels.\(^\text{[53]}\) Streptozotocin-induced diabetes is a model for Type I diabetes mellitus. Accordingly, in these insulin deficient mice, the Caralluma species was able to lower blood glucose suggesting an “insulin-like” action, an increase in insulin release, and/or an ability to sensitize the animal to lesser amounts of insulin. However, one oddity was that in this particular study the glucose tolerance to a glucose challenge appeared better in the control animals even though baseline sugars were higher in control. Similar to C. arabica, extracts from C. attenuata were found to be antihyperglycemic in alloxan-diabetic rats.\(^\text{[54]}\) Animal studies suggest that C. arabica extract is anti-nociceptive and anti-inflammatory.\(^\text{[55-56]}\) Using the hot plate and writhing methods in albino mice and the tail-flick method in Wistar rats, the nociceptive properties of C. arabica were shown. This occurred when the extract was placed on the skin indicating transdermal absorption. The lesser accumulation of edema in the in paws injected with carageenan indicated anti-inflammatory properties as well. This property was localized to a specific pregnane glycoside from C. umbellate,\(^\text{[57]}\) C. Arabica also has been shown to possess anti-gastric ulcer and cytoprotective properties against damage produced by phenybutazone, indomethacin, ethanol, sodium hydroxide, and/or cold restraint stress.\(^\text{[58]}\) The protective effect was postulated to be via multi mechanisms, including increased gastric production of prostaglandins and mucin and reduced gastric acidity.

**Overall View of Caralluma fimbriata and Extract**

All current evidence points to the safety of Caralluma fimbriata extract at the recommended doses. Believe that Caralluma
fimbriata is safe to consume at recommended doses based on the following:

1. The cactus has been in the food chain of India for years and has not been associated with any significant adverse side effects.
2. Caralluma fimbriata is listed in the Wealth of India as a famine food and by various individuals on the internet as a safe-to-consume food.
3. Various testimonials by doctors and scientists confirm its safety.
4. Testimonials by individuals who regularly consume the product describes its safety.
5. The daily dose of the extract contains the same concentration of ingredients as commonly eaten daily in the raw vegetable.
6. A study to determine LD50 did not disclose toxicity, and it was reported that the LD50 exceeded 5g/kg.
7. Two clinical studies composed of 44 individuals consuming the extract failed to reveal any significant adverse events.

A systematic review of the efficacy and safety of herbal medicines used in the treatment of obesity[58]

Waist and hip circumference Caralluma fimbriata and CQ with or without IG significantly decreased waist size, Food intake: Decreases in appetite or amount of food or energy intake with a supplement containing ephedra and caffeine and Caralluma fimbriata were shown (not significant) but hydroxy citric acid (HCA-SX) with or without Gymnema sylvestre decreased the amount of food intake efficiently. A natural compound containing Capsicum and other lipotropic nutrients did not significantly change energy intake.

CONCLUSION

Caralluma adscends is commonly found in hilly areas throughout India. The plant is used as anti-inflammatory, analgesic, anti-oxidant, anti-tyrpic, anti-diabetic. It is reported to contain glycosides, flavonoids, saponins, steroids, tannins etc. The pharmacological and clinical studies reported in the review confirm the therapeutic value of Caralluma adscends. Less information available regarding the chemical constituents of this plant. There is lack of phytochemical and phytoanalytical studies of this plant with the availability of primary information, further studies can be carried out like phyto-pharmacology of different extract, identification and pharmacological studies of isolated compound.

REFERENCES

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