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Review on Caralluma Fimbriata Syrup

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Abstract: *Caralluma fimbriata, an edible succulent of the Apocynaceae family, is traditionally recognized in Indian medicine for its applications as an appetite suppressant and an enhancer of endurance. Historically, tribal communities have utilized it as a famine food. Its chemical composition includes various phytochemicals, notably pregnane glycosides, flavonoids, saponins, and phenolic compounds. These constituents confer a range of pharmacological activities, encompassing anti-obesity, anti-diabetic, antioxidant, anti-inflammatory, and hepatoprotective effects. In contemporary pharmaceutics, Caralluma fimbriata has emerged as a significant functional food and nutraceutical component. Syrup formulations, among other dosage forms, present several benefits, including ease of administration, dose flexibility, and improved taste masking for potentially bitter extracts. The inclusion of honey as a natural sweetening agent in Caralluma fimbriata syrup not only improves palatability but also augments its therapeutic potential, attributed to honey's inherent antimicrobial, antioxidant, and immunomodulatory properties. This review aims to comprehensively examine the morphological and microscopic characteristics, medicinal applications, pharmacological activities, and future prospects of Caralluma fimbriata, specifically focusing on its development as a syrup-based herbal formulation*

Keywords: *Caralluma fimbriata*

I. INTRODUCTION

Herbal medicines have always played a major role in the healthcare systems of many cultures, and their relevance continues to grow with the increasing awareness of the adverse effects associated with synthetic drugs. In India, herbal formulations have been an integral part of traditional systems such as Ayurveda, Siddha, and Unani. The World Health Organization estimates that about 80% of the global population relies on plant-based remedies for primary health care. Among these medicinal plants, Caralluma fimbriata has received considerable attention in recent years due to its unique appetite-suppressing and anti-obesity potential [40], [42].

Caralluma fimbriata is an edible, leafless succulent plant traditionally consumed by tribal communities in southern India [40], [41], [42], [45]. It is used as a food source during famines and is believed to suppress hunger and thirst while increasing endurance and stamina [40], [41], [42], [45]. The plant's extract has been standardized and studied in modern pharmacological research for its potential benefits in weight management, metabolic syndrome, and oxidative stress-related disorders [40], [43]. The major bioactive compounds, pregnane glycosides, are thought to act on the hypothalamic centers responsible for appetite regulation [42], [51]. The development of herbal syrups as dosage forms has gained popularity because of their ease of administration, better taste, and suitability for patients who find it difficult to swallow tablets or capsules. When Caralluma fimbriata is formulated into a syrup and combined with honey, the resulting product provides a synergistic therapeutic effect. Honey serves not only as a sweetening and thickening agent but also contributes medicinal properties of its own, including antimicrobial, anti-inflammatory, and antioxidant actions [48], [49], [50]. Therefore, Caralluma fimbriata syrup with honey represents an innovative approach to delivering the benefits of traditional herbal medicine in a convenient and consumer-friendly form.

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Figure 2. CARALLUMA FIMBRIATA

II. MORPHOLOGICAL CHARACTERS

The correct identification of a medicinal plant is essential for its pharmacognostical evaluation and formulation development. Morphological study serves as the first step in establishing the identity and purity of Caralluma fimbriata as a crude drug [52], [53].

2.1 Taxonomical Classification

The original taxonomical classification, which was presented in a table format, has been academically paraphrased into a descriptive paragraph. Subsequently, to adhere to the current instruction of presenting the information "in table format," the paraphrased content is now structured as a table.

Taxonomical Rank	Description
Kingdom	Plantae
Division	Angiosperms
Class	Dicotyledonae
Order	Gentianales
Family	Apocynaceae
Genus	Caralluma
Species	Caralluma fimbriata N.E. Brown

2.2 Morphological Description

Caralluma fimbriata is a perennial, erect, fleshy, and leafless succulent herb that typically grows to a height of 30–60 centimeters[53], [54]. The stems are green, quadrangular, and jointed, with shallow grooves running longitudinally. These stems are the main photosynthetic organs, as the plant lacks leaves, an adaptation that minimizes water loss in arid environments. The texture of the stem is smooth and slightly glossy, with a bitter taste and faint characteristic odor. The plant exudes a watery sap when cut. The flowers are small, star-shaped, and arranged in clusters, either axillary or terminal. The corolla is dark purple or brownish in color with fringed margins, which give the species its characteristic name. The calyx is green, five-lobed, and persistent. The fruits are slender follicles that split open upon maturity, releasing numerous small seeds equipped with tufts of silky hairs that aid in wind dispersal. The seeds are light brown, flat, and covered with a fine silky pappus. The plant is mainly distributed across arid and semi-arid regions of southern India, including the states of Andhra Pradesh, Karnataka, Maharashtra, and Tamil Nadu [54]. It thrives in dry, rocky

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terrains, wastelands, and hilly slopes, where other vegetation may not survive easily. Its ability to endure harsh conditions makes it a sustainable plant source for large-scale cultivation.

III. MICROSCOPIC STUDY

Microscopic examination provides insight into the internal structure of the plant and is an essential pharmacognostic tool for the identification and authentication of the crude drug [53], [55].

3.1 Transverse Section of Stem

A transverse section of the stem of Caralluma fimbriata shows distinct layers including the epidermis, cortex, vascular bundles, and medulla [42]. The epidermis forms the outermost protective layer, consisting of a single layer of rectangular cells covered with a thick cuticle. This layer sometimes contains sunken stomata to minimize transpiration. Beneath the epidermis lies the cortex, which is made up of several layers of chlorenchymatous cells containing chloroplasts for photosynthesis. These cells are rich in mucilage, water, and secondary metabolites such as glycosides and phenolic compounds.

The vascular bundles are collateral and arranged in a continuous ring, consisting of well-developed xylem and phloem tissues [56]. The xylem vessels are lignified and arranged radially, while the phloem comprises sieve tubes and companion cells. Between the vascular bundles are parenchymatous cells storing water and nutrients, giving the stem its succulent appearance. The central portion, known as the pith, is composed of large, loosely arranged parenchyma cells with intercellular spaces that facilitate gaseous exchange.

Calcium oxalate crystals, both prismatic and rosette types, are commonly found in parenchyma cells [57]. These microscopic features confirm the identity of Caralluma fimbriata and distinguish it from possible adulterants [53], [55].

3.2 Powder Microscopy

The powdered stem of Caralluma fimbriata appears greenish-brown with a bitter taste. Under microscopic observation, it shows fragments of epidermal cells with stomata, parenchymatous tissues, lignified xylem vessels, phloem fibers, and characteristic calcium oxalate crystals [57]. These diagnostic features are essential for quality control and standardization during syrup formulation to ensure authenticity and prevent adulteration.

IV. MEDICINAL USES

Caralluma fimbriata has been valued in Indian traditional medicine for centuries. It has been consumed both as a food and as a herbal remedy, primarily for its ability to suppress appetite and increase stamina. Tribal communities in southern India used it as a “famine food”, as it allowed them to endure long periods without eating or drinking while maintaining energy levels [40], [41], [42], [45].

In Ayurveda and folk medicine, the plant has been used to treat a variety of conditions, including obesity, diabetes, indigestion, high blood pressure, and inflammation [43]. The bitterness of the plant is believed to stimulate digestion and metabolism. Extracts of *Caralluma fimbriata* are now commercially available as capsules, powders, and syrups, primarily marketed for weight management and appetite control [40], [42].

The syrup form of *Caralluma fimbriata* offers several advantages. The liquid form enhances absorption, allows flexible dosing, and improves patient compliance. Furthermore, the incorporation of honey as a natural sweetener not only improves taste but also enhances the therapeutic potential of the formulation. Honey contributes antimicrobial, antioxidant, and immunomodulatory effects, making the syrup suitable as a functional nutraceutical product for metabolic health [48], [49], [50].

Modern research supports many of the traditional uses of *Caralluma fimbriata*. Scientific studies have confirmed its potential in reducing appetite, lowering blood glucose, improving lipid metabolism, and combating oxidative stress [40], [43], [58]. Thus, *Caralluma fimbriata* syrup can be positioned as a safe and effective herbal preparation for the prevention and management of lifestyle disorders such as obesity and diabetes.

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V. PHARMACOLOGICAL ACTIVITIES

The pharmacological activities of *Caralluma fimbriata* have been extensively studied in recent years, both in experimental models and in human clinical trials. The following major activities have been documented:

5.1 Anti-Obesity and Appetite Suppressant Activity

The most prominent pharmacological property of *Caralluma fimbriata* is its ability to suppress appetite and promote weight loss [40], [42], [51]. The active constituents, pregnane glycosides, are believed to modulate the hypothalamic centers that regulate hunger and satiety [42], [51]. They are also thought to inhibit the enzyme ATP-citrate lyase, which plays a role in fatty acid synthesis, thereby reducing fat storage. Clinical studies have shown that supplementation with *Caralluma fimbriata* extract can decrease hunger levels, reduce waist circumference, and limit caloric intake [40], [41]. However, changes in body weight are often modest and depend on diet and lifestyle factors.

5.2 Anti-Diabetic Activity

Experimental studies have demonstrated that *Caralluma fimbriata* improves glucose metabolism and insulin sensitivity [58]. The plant's bioactive compounds help in lowering fasting blood glucose levels and protecting pancreatic β-cells from oxidative damage [43], [47], [59]. These properties make it beneficial for individuals with type 2 diabetes or prediabetic conditions.

5.3 Antioxidant Activity

The flavonoids, phenolic acids, and other antioxidant compounds present in *Caralluma fimbriata* contribute significantly to its free radical scavenging activity [42], [43], [58]. Antioxidant assays have confirmed that extracts of *Caralluma* can neutralize reactive oxygen species, reducing oxidative stress and preventing cellular damage [58].

5.4 Anti-Inflammatory and Hepatoprotective Activity

Caralluma fimbriata also exhibits anti-inflammatory activity by inhibiting the production of inflammatory mediators such as prostaglandins and cytokines [43], [60]. Its hepatoprotective effects have been observed in studies where plant extracts protected liver cells from toxin-induced damage, likely due to its antioxidant capacity and modulation of liver enzyme activity [42], [43], [61].

5.5 Antimicrobial Activity

Moderate antimicrobial activity has been reported against certain bacterial and fungal strains, suggesting that *Caralluma fimbriata* may also support general immune function when used in herbal preparations such as syrups [62].

VI. CONCLUSION

In conclusion, *Caralluma fimbriata* is a versatile medicinal plant with a strong traditional background and growing scientific evidence supporting its health benefits [43]. Its distinctive morphological and microscopic features confirm its identity as a member of the Apocynaceae family and facilitate its pharmacognostical authentication [52], [53], [55]. The plant's phytochemical constituents—particularly pregnane glycosides, flavonoids, and saponins—are responsible for its multifaceted pharmacological activities, including anti-obesity, anti-diabetic, antioxidant, and hepatoprotective effects [42], [43], [44], [45], [46], [47].

The formulation of *Caralluma fimbriata* in syrup form provides a patient-friendly dosage option, ensuring ease of administration and better compliance. The addition of honey not only enhances flavor but also enriches the preparation with natural antioxidants and antimicrobial properties, making it a functional nutraceutical suitable for all age groups [48], [49], [50].

Nevertheless, despite promising findings, the current clinical data are limited to short-term studies with small populations. Long-term, large-scale clinical trials are necessary to establish standardized dosages, confirm efficacy, and evaluate safety profiles. With ongoing research and standardization, *Caralluma fimbriata* syrup has the potential to emerge as an effective natural supplement for metabolic health and weight management.

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