Ecology, Phytogeography, and Botanical Characterization of *Cyphostemma setosum* (Roxb.) Alston (Vitaceae): A Comprehensive Review of a Neglected Medicinal Climber

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Abstract- **Background: *Cyphostemma setosum* (Roxb.) Alston, a lesser-known climber of the Vitaceae family, is indigenous to rocky outcrops and dry deciduous forests in India and in certain regions of East Africa. Despite its distinctive morphology and longstanding use in traditional medicine, this species has not been studied extensively. Its botanical, ecological, and pharmacological attributes remain inadequately understood, especially when compared to those of more prominent family members, such as *Cissus quadrangularis.* This review aimed to provide a comprehensive overview of the current knowledge concerning *C. setosum,* encompassing its taxonomic classification, phytogeographical distribution, ecological adaptations, ethnomedical relevance, and pharmacological potential. The objective was to identify research gaps and propose a future research agenda to promote systematic investigation and species conservation. Methods: A critical examination of peer-reviewed articles, herbarium records, published literature from online botanical databases (POWO, JSTOR Plants, eFlora of India), and ethnobotanical studies was performed. Comparative insights from related species, such as *C. vitiginea* and *C. auriculatum,* were also considered to contextualize C. setosum. Findings: This species is taxonomically distinct and is characterized by setose stems, trifoliate leaves, and tendrils opposite leaves. It inhabits xerophytic and rocky environments, which suggests its potential for drought tolerance. Although phytochemical and pharmacological evidence is lacking, ethnobotanical sources have suggested its use in treating wounds, inflammation, and gastrointestinal issues. To date, no conservation, anatomical, or molecular studies have been conducted. Conclusion: *Cyphostemma setosum* is a species with untapped medicinal potential that is ecologically resilient, yet scientifically underexplored. Multidisciplinary research encompassing taxonomy, phytochemistry, ecology, and ethnopharmacology is urgently required to conserve, validate, and sustainably utilize this climber.**

Index Terms- ***Cyphostemma setosum,*** **Ecological adaptations, Ethnomedicine, Pharmacological potential, Phytogeography, Taxonomy**

I. INTRODUCTION

Climbing plants depends on external structures rather than on their own tissues. These species develop root systems in soil near the ground **[1].** Using specialized mechanisms, such as twining stems, tendrils, hooks, or adhesive roots, vertical supports are mounted. Vertical growth improves the access to sunlight and pollinators, thereby increasing reproductive success. Climbing plants wind around or attach to other plants during their life cycles. Unlike self-supporting plants, climbers allocate fewer resources to mechanical support tissues, focusing on vertical elongation and reproduction **[2].** This allows for efficient vertical space exploitation while minimizing energy costs. Approximately 5000–10,000 climber species exist in the angiosperms. In economically disadvantaged countries, rural populations rely on traditional medicines **[3].** In Vitaceae, *Cyphostemma* is the second largest genus after *Cissus,* with approximately 200 species. Morphological variations make species distinction difficult. Limited sampling and insufficient descriptions have created uncertainty. Earlier molecular studies have proposed three main clade matching distributions in Madagascar, Asia, and continental Africa **[4].**Recent phylogenetic understanding has led to a classification highlighting divergent evolutionary paths of *Cyphostemma* (Planch.) **[5].** *Cyphostemma* has diverse life forms, including woody lianas, herbaceous climbers, perennial herbs, shrubs, and small trees, many of which have lost their tendrils. This variation demonstrates the adaptive radiation of the genus across habitats **[6].** The genus *Cyphostemma* has been subject to taxonomic debate.

Planchon (1887) classified it as the *Cissus* sect. *Cyphostemma* Planch within Vitaceae. Alston (1931) elevated Cyphostemma to genus status based on unique morphological characteristics. This revision represents a significant advancement in recognizing *cyphostemma* as a distinct lineage within Vitaceae. Phytochemical analyses have identified bioactive constituents in ethanolic and methanolic extracts of *Cyphostemma setosum* (Roxb.) **[7,8].** Methanolic extracts from powdered aerial parts show antioxidant **[9].** and antibacterial 4 activities. An in vivo study of ethanolic leaf extract in mice supports the traditional use of C. setosum for its antinociceptive properties **[10].** Diabetes mellitus, the most prevalent endocrine disorder, is characterized by insulin deficiency that causes elevated blood glucose levels and metabolic disturbances **[11].** Plant-derived pharmaceuticals are recognized for managing diabetes, with fewer adverse effects than synthetic alternatives**[12].** *Cyphostemma setosum* (Roxb.) is traditionally used as a poultice for ulcerations and wounds, with toasted and oiled leaves applied to tumorous lesions **[13].** Pharmacological studies have shown that the methanolic extract of shade-dried aerial parts of C. *setosum* exhibits significant in vitro antioxidant activity and in vivo anti-ulcer effects **[14,15]. S**upporting its ethnomedicinal applications. Pharmacognosy has evolved into a multidisciplinary science that focuses on the evaluation of the purity, potency, and consistency of plant-derived compounds. This evolution has been driven by analytical techniques, high-throughput screening, and in silico methods. Genomic, transcriptomic, and proteomic approaches have been integrated into research on natural products using molecular pharmacognosy **[16].**According to ethnobotanical reports from the Thoda tribes of Nilgiris, India, *Cyphostemma setosum* has been recognized as an effective traditional treatment for peptic ulcers **[17].** Local healers across Tamil Nadu use the aerial parts for ulcer treatment **[8,19].** While researchers often identify gaps within their studies to address in subsequent research, conducting literature reviews is a more reliable approach to identifying research gaps. These reviews systematically uncover gaps and unexplored areas within existing knowledge, providing a foundation for further inquiry, such as by revealing gaps in the Path-Goal Theory of Leadership application **[20].** Definitions may include "mapping," which refers to synthesizing data to demonstrate the scope of an area. Scoping studies differ from systematic reviews in that they typically do not evaluate research quality **[21,22].** They also differ from literature reviews in that they require critical re-examination **[23].** Researchers use scoping studies to assess the research scope and nature, determine systematic review feasibility, disseminate findings, and identify gaps in the literature **[24].** Despite its ecological and therapeutic importance, many Vitaceae climbers remain poorly understood. The genus *Cyphostemma,* comprising species from tropical Africa and Asia, includes several locally important but poorly documented species **[25,26].** *Cyphostemma setosum* (Roxb.) Alston grows in arid, rocky areas of East Africa and India and is used in traditional medicine. This species, notable for its trifoliate leaves and succulent berries, lacks a comprehensive documentation of its distribution, anatomy, and adaptations. This review consolidates the existing knowledge on botanical characteristics, distribution, and ecological attributes.

Synonyms [27]

i. *Cissus acida* Wall
ii. *Cissus psammophila* Gilg & Brandt
iii. *Cissus setosus* Roxb.
iv. *Cyphostemma psammophilum* (Gilg & Brandt) Descoings
v. *Vitis setosa* (Roxb.) Wall. ex Wight & Arn.

Common name: Bristly Wild Grape

Vernacular names [28]

i. Hindi : Harmal
ii. Kannada: Talavaranaballi
iii. Marathi : Khajgolichavel
iv. Tamil : Kangu kelari, Kauri, Pulinaralai, Pulipirandai, Sangugelari, Sugambal
v. Telugu : Barrebacbali, Pullabachali

Taxonomy of Cyphostemma setosum (Roxb.) Alston

Kingdom : Plantae
Phylum : Streptophyta
Class : Equisetopsida
Subclass : Magnoliidae
Order : Vitales
Family : Vitaceae
Genus : *Cyphostemma*
Species : *Cyphostemma setosum* (Roxb.) Alston

II. BOTANICAL DESCRIPTION OF *CYPHOSTEMMA SETOSUM* (ROXB.)

This herb exhibits a prostrate growth habit with striate, thinly pubescent stems adorned with capitate glandular hairs and tendrils. The leaves are sessile or subsessile, with three (5) narrowly obovate to obovate leaflets, featuring obtuse or acute apex. The leaf margins are irregularly serrate-crenate, with glandular serrations and a cuneate base. The upper

surface is sparsely pilose or glabrescent with capitate-glandular hairs, while the lower surface is sparsely pilose and capitate-glandular along the nerves. The petiolules of the median leaflet extend up to 1 cm, and the stipules extend up to 1 cm. The leaves are lanceolate, elongated, sparsely pubescent, and have glandular margins. The cymes on the short lateral branches were lax and trichotomous. The bracts and bracteoles were 2 mm long, linear, and pubescent. Peduncles extend up to 3 cm with stem-like indumentum, whereas pedicels reach 5 mm with pubescent and capitate-glandular hairs. The flower bud is 2.5 mm long, oblong-cylindrical, pilose, or glabrescent, with central constriction. The calyx is subentire, pilose, 0–5 mm long. The ovary is glabrous or glandular, with a 1–5 mm style and an indistinct stigma. The immature fruits are ellipsoid, glabrous, or sparsely glandular **[29].**

<< Insert Figure 1 Here >>

Figure 1 Botanical illustration of *Cyphostemma setosum,* showing trifoliate leaves, setose stems, leaf-opposed tendrils, and globose berries.

III. TAXONOMIC POSITION AND DIAGNOSTIC TRAITS

3.1 Taxonomic Placement and Nomenclatural History

Cyphostemma setosum (Roxb.) Alston belongs to the Vitaceae family, a taxonomically diverse group comprising over 900 species globally and approximately 14 genera (Verdcourt, 1993). The genus *Cyphostemma* is distinguished from related genera such as Cissus and Vitis by its fleshy calyx, unisexual or functionally bisexual flowers, and leaf-opposed tendrils. This genus is particularly prevalent in tropical Africa and parts of Asia **[30].** Owing to floral and fruiting characteristics that more closely align with those of *Cyphostemma,* Alston reclassified this species from its original designation as *Cissus setosa* Roxb. in the Flora Indica to the genus *Cyphostemma.* The currently accepted name is as follows:

3.2 Diagnostic Morphological Traits

The distinctive morphological characteristics of *Cyphostemma setosum* (Roxb.) Alston facilitates precise differentiation from other genera within the Vitaceae family, and from its congeners within the *cyphostemma* **[31].** The most notable feature of this species is its densely bristled stem, which is covered in stiff, dispersing setose hairs that are particularly prominent on petioles and young shoots. Beyond serving as a diagnostic trait, this bristly indumentum may also function as an adaptive mechanism to deter herbivory and mitigate water loss in arid environments. The plant exhibits a unique trifoliate leaf arrangement, with each leaf comprising three ovate to lanceolate leaflets, characterized by acute apices and serrated margins. These leaflets have a rough, pubescent surface, distinct venation, and typically measure 5–10 cm in length.

The presence of leaf-opposed tendrils in *C. setosum,* a characteristic shared by numerous members of the Vitaceae family, serves as a significant taxonomic marker when considered alongside trifoliate leaves and stem bristles. This species is capable of climbing over rocks, low shrubs, or open ground using simple or occasionally bifid tendrils. The cymose inflorescence produces small actinomorphic greenish-yellow flowers, each approximately 2-3 mm in diameter. The ovary is superior and bicarpellary, leading to the development of globose berries comprising five sepals and five petals **[32].**

When fully ripe, the fleshy fruits are dark purple to black in color and are typically globose with a diameter of 8 to 10 mm. The oblong, grooved seeds usually found in 1–4 berries match the distinguishing characteristics of other *Cyphostemma* species **[33].** The plant grows from tuberous rootstocks that are frequently buried in rocky or gravelly substrates. This adaptation helps plants survive in nutrient-poor and dry environments throughout the year. Together, the trifoliate leaves, leaf-opposed tendrils, small cymose flowers, fleshy berries, and dense stem bristles make *Cyphostemma setosum* a unique taxonomic member of the family and ecologically appropriate for its natural habitats in southern Asia and East Africa.

<< **Insert Table 1 Here** >>

Table 1 Comparative diagnostic traits of *Cyphostemma setosum* and related Vitaceae species.

IV. PHYTOGEOGRAPHICAL DISTRIBUTION

Alston, as described by Roxb, demonstrates a disjunct yet ecologically coherent distribution pattern across South Asia and from eastern to southern Africa. This distribution indicates both local ecological adaptation and historical biogeographic dispersal **[34].** This species predominantly inhabits semi-arid and dry deciduous environments, which are characterized by shallow soils and pronounced seasonality. These environments are often confined to rocky outcrops, stony hillsides, and forest peripheries.

4.1 Global and Regional Occurrence

This species has consistently been documented across India, Sri Lanka, Tanzania, Mozambique, and Zambia. It was initially described in the Indian

subcontinent under the basionym, *Cissus setosa* Roxb. (Flora Indica). Its presence has been corroborated by verified herbarium records in the peninsular regions of India, including Telangana, Karnataka, Maharashtra, Andhra Pradesh, and Tamil Nadu, particularly in open hill slopes and scrub zones below 800 meters. Sri Lanka is found in the lowland and rock outcrop zones within the dry zone. In southern and eastern Africa, it inhabits the Mopane shrublands, dry savanna edges, and Miombo woodlands. The distribution of this species in Africa may suggest either vicariance associated with ancient Gondwanan lineages of Vitaceae, or pantropical dispersal through zoochory (fruit-mediated animal transport).

4.2 Habitat Affinities and Ecological Zones

Cyphostemma setosum exhibits ecological specialization within dry thorn scrub environments in tropical regions, particularly within the Champion and Seth types 5A and 5 B, which are categorized as southern tropical dry deciduous forests. This species is also present in talar habitats and xerophytic slopes as well as in ecotones between open grasslands and woodlands **[35].** In India, it frequently coexists with *Ziziphus oenoplia, Vitex negundo,* and *Carissa spinarum,* indicating a preference for open canopies and disturbed systems subject to intermittent drought stress. The resilience and potential ecological plasticity of the species are evidenced by the presence of bristly hairs on young growth and a tuberous rootstock, which may be considered functional traits adapted for survival in high-temperature, low-moisture environments.

4.3 Mapping and Distribution Visuals

Georeferenced data from the GBIF, JSTOR Global Plants, and eFlora of India datasets indicate a wide albeit uneven distribution. An ecological niche model that integrates temperature, precipitation, and elevation layers is likely to be highly effective. The regions of interest encompass India's Eastern Ghats and Deccan Plateau, the highlands of northern Mozambique, the arid zone separating Zambia and eastern Tanzania, and the fragmented populations in Southeast Asia. The potential under-reporting in these areas can be substantiated using a GIS-based distribution map, which is not included here.

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Figure 2 Geographic distribution of C. setosum across India and East Africa, based on GBIF and herbarium records.

4.4 Phytogeographical Implications and Research Gaps

Despite its extensive distribution, there is a paucity of information regarding the population-level status, genetic variability, and specific ecological tolerance of C. setosum. The ability to forecast conservation outcomes is limited by the absence of published climatic envelope models and bioclimatic mapping. Furthermore, molecular phylogeography has not been conducted to assess the differences between the African and Indian populations. Highland regions, such as the Ethiopian highlands and Western Ghats, possess limited herbarium specimens, thereby increasing the risk of cryptic diversity or misidentification with closely related taxa. To address distributional gaps and facilitate in situ conservation planning, it is imperative to conduct phytogeographical surveys utilizing remote sensing and herbarium validation, given the potential of this species as a drought-tolerant medicinal plant.

V. ECOLOGY AND HABITAT ADAPTATION

Cyphostemma setosum (Roxb.) Alston occupies a distinct ecological niche within dry deciduous and xerophytic environments. It is predominantly found in tropical and subtropical regions, often confined to rocky hillsides, granite outcrops, and gravelly slopes. Its natural distribution encompasses areas of eastern and southern Africa, as well as southern India and Sri Lanka. These regions are characterized by semi-arid to sub-humid climates, experiencing severe seasonal droughts and low soil fertility **[36].**

5.1 Adaptations to Xeric Environments

The morphological and anatomical features that enhance the drought resistance of *C. setosum* and its capacity to thrive in shallow soil environments are among its most significant adaptations. This species develops a tuberous rootstock, characterized by thicker underground storage roots that serve as reservoirs for water and carbohydrates. These features facilitate seasonal dormancy and subsequent re-emergence during the dry periods. Additionally, setose, bristly stems, and leaves, equipped with stiff trichomes, may serve dual functions: deterring herbivores and reducing transpiration through boundary-layer resistance.

Trifoliate leaves with serrated margins exhibit rough textures and a reduced leaf area, which contributes to minimizing water loss. In arid environments, these serrations may facilitate dew or fog capture. Regarding seasonal phenology, observations indicate that the species undergoes ephemeral growth cycles, characterized by senescence during the dry season following rapid vegetative growth and flowering shortly after the onset of monsoon rain. *C. setosum* exemplifies a ruderal–xerophytic ecological type

because of these characteristics, which collectively demonstrate a stress-tolerant strategy that emphasizes persistence and resource conservation over competitive growth **[37].**

<< Insert Figure 3 Here >>

Figure 3 Diagram of xerophytic adaptations: tuberous rootstock, bristly stems, and leaf morphology.

5.2 Community Ecology and Species Associations

Cyphostemma setosum is frequently found in association with other climbers and drought-adapted shrubs, such as *Cissus quadrangularis, Vitex negundo, Carissa spinarum,* and *Ziziphus oenoplia,* in the arid regions of India, as well as *Boswellia dalzielii, Commiphora* spp., and *Combretum molle* in the African savannas. Its climbing habit suggests ecological reliance on rocky substrates or low woody vegetation for support. This species is often located in degraded areas along road cuts, fallow lands, or village peripheries, indicating moderate tolerance for anthropogenic disturbance.

5.3 Ecophysiological Potential and Implications

Despite the limited availability of direct ecophysiological studies on *C. setosum,* its anatomical characteristics clearly illustrate mechanisms for water use efficiency, such as the allocation of resources from root to shoot and high resistance to edaphic stress, including granitic, lateritic, or shallow soils. The species is pollinated by generalist insects and its fleshy fruits are dispersed by birds or small mammals. These ecological strategies position *C. setosum* as a promising model species for investigating plant adaptation in semi-arid environments as well as for potential domestication in restoration ecology or dryland agroforestry.

VI. ETHNOBOTANY AND PHARMACOLOGICAL RELEVANCE

6.1 Ethnobotanical Characterization of *Cyphostemma setosum*

General Overview

Cyphostemma setosum (Roxb.), native to East Africa and the Indian subcontinent, is a herbaceous or semi-woody climber commonly found in rocky terrains and peripheries of dry deciduous forests **[38].** Although it is under-represented in official ethnobotanical databases, it shares numerous morphological characteristics and traditional applications with more renowned species within the Vitaceae family, such as *Cissus quadrangularis* and *C. vitiginea,* which have been extensively utilized for medicinal purposes in Siddha, Ayurveda, and tribal medicine **[39].** Similar to many other members of the Vitaceae family, *C. setosum* is valued for its tuberous roots, fleshy berries, and leafy shoots, all of which are traditionally used by indigenous and rural communities.

Nutritional and Ethnobotanical Utility

Similar to wild Vitis species, *C. setosum* berries are reportedly consumed in limited quantities by tribal communities and rural children as seasonal snacks or hunger suppressants despite the absence of comprehensive nutritional profiling. Plant parts from related species, such as *C. vitiginea* and *C. quadrangularis,* have been found to be rich in flavonoids, phenolic acids, mucilage, tannins, calcium, iron, and trace elements **[40].**

Documented Ethnomedicinal Uses

Although *Cyphostemma setosum* lacks formal pharmacological validation, it is frequently used in traditional medicines. The topical application of leaf or root paste to freshly cut, ulcerated, or irritated skin is believed to facilitate wound healing. Poultices made from crushed leaves, lime, or salt are traditionally used to treat sprains and swellings. For gastric distress, a decoction of the root combined with buttermilk was used to alleviate indigestion and stomach inflammation. Additionally, extracts from the stems or roots are applied externally as liniments to treat rheumatism and joint pain. These traditional applications closely resemble those of *C. quadrangularis,* which is extensively used in Southeast Asia and India for bone setting and inflammation management **[41,42].**

<< Insert Table 2 Here >>

Table 2 Ethnomedicinal uses of selected Vitaceae climbers in India.

VII. RESEARCH GAPS AND FUTURE DIRECTIONS

Cyphostemma setosum (Roxb.) Alston, a member of the Vitaceae family, remains one of the least explored species, despite its ecological distinctiveness and potential ethnopharmacological importance **[43].** This review highlights several critical research gaps across various disciplines, including pharmacology, ecology, phytochemistry, and botany, which hinder the comprehensive understanding and sustainable utilization of this climber.

7.1 Taxonomic and Anatomical Underrepresentation

Although *C. setosum* has been officially recognized and taxonomically validated, there is a paucity of anatomical and histological data available for this species. Standard botanical references do not include microscopic examinations of vegetative organs such as leaves, stems, and roots, and pharmacognostic studies have similarly omitted these analyses.

Comparative anatomical analyses of various *Cyphostemma* species could facilitate field-level identification and yield insights into their adaptive traits.

7.2 Phytochemistry and Bioactivity Profiling

Chromatographic analyses, including High-Performance Liquid Chromatography (HPLC), Fourier-Transform Infrared Spectroscopy (FTIR), and Gas Chromatography-Mass Spectrometry (GC-MS), **[44].** that elucidate the secondary metabolite profile of C. setosum have yet to be published. Given that related species, such as *C. vitiginea* and *C. auriculatum,* are known to contain compounds, such as alkaloids, flavonoids, and tannins, it is highly probable that C. setosum possesses a substantial yet unexplored repository of bioactive phytoconstituents. Moreover, this species has not undergone comprehensive screening for antioxidant activity (e.g., DPPH and FRAP assays), antifungal or antibacterial properties (e.g., agar well diffusion and Minimum Inhibitory Concentration [MIC]), **[45].** and in vivo pharmacological evaluations. In the context of future phytopharmacological research, these areas represent readily accessible opportunities, particularly concerning their anti-inflammatory, gastroprotective, and wound healing properties.

7.3 Molecular Phylogeny and Conservation Genomics

To date, no molecular phylogenetic analyses or DNA barcoding efforts, such as those involving the ITS, matK, or rbcL regions, have included *Cyphostemma setosum.* Given its distribution across geographically dispersed rocky habitats, its taxonomic position within the broader *cyphostemma* clade remains contentious, and the possibility of cryptic diversity cannot be dismissed. Furthermore, no conservation genomic or population genetic studies have been conducted to assess intraspecific variation or potential threat levels. Such investigations are essential for in situ conservation planning, particularly in light of the increasing habitat fragmentation resulting from developmental activities in the Deccan Plateau and the Eastern Ghats.

7.4 Ethnobotanical Documentation

Although there are anecdotal accounts of the traditional use of *C. setosum,* systematic ethnobotanical surveys or cross-cultural documentation regarding its medicinal applications are lacking. Engaging with tribal knowledge holders in Tamil Nadu, Karnataka, and Andhra Pradesh could aid in the formulation of sustainable harvesting guidelines and provide valuable insights into its role within traditional healing systems.

7.5 Suggested Future Research Agenda

We propose the following comprehensive research roadmap to address the identified gaps: Pharmacognostic standardization, including powder analysis, microscopy, and anatomical sectioning; preliminary and advanced phytochemical extraction and screening analyses (TLC, HPLC, and GC-MS); ethnobotanical field surveys encompassing interviews, herbarium verification, and documentation of usage; ecological niche modeling to map climate resilience using GIS; prioritization of conservation efforts through IUCN threat assessment and population monitoring; and positioning of the species within the regional evolution of *Cyphostemma* using phylogenetics and molecular barcoding. Employing such multidisciplinary approaches will ensure that C. setosum is not only conserved, but also thoroughly investigated for its ecological, therapeutic, and genetic potential.

VIII. CONCLUSION

Despite its taxonomic distinctiveness and ecological specialization within the family Vitaceae, C. setosum (Roxb.) remain largely underexplored in both applied and scholarly research. This review summarizes the current understanding of the species' morphological characteristics, phytogeographical distribution, habitat specificity, ecological adaptations, and ethnomedicinal significance. The presence of this species in rocky, seasonally dry habitats suggests a high degree of ecological resilience, supported by anatomical traits such as setose stems and tuberous roots. Preliminary ethnobotanical records and similarities with closely related taxa indicate potential pharmacological applications, particularly in wound healing and anti-inflammatory contexts. However, a significant gap in understanding its value persists due to the lack of molecular, phytochemical, and pharmacological studies. Future research involving field surveys, molecular characterization, and bioactive compound screening may elucidate the scientific, therapeutic, and ecological significance of C. setosum. In arid and semi-arid regions of Asia and Africa, identifying and cataloging such underutilized species is crucial for both biodiversity conservation and the advancement of sustainable natural product research.

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Figure 1. Botanical illustration of *Cyphostemma setosum,* showing trifoliate leaves, setose stems, leaf-opposed tendrils, and globose berries.

Figure 2 Geographic distribution of *C. setosum* across India and East Africa, based on GBIF and herbarium records.

Figure 3 Diagram of xerophytic adaptations: tuberous rootstock, bristly stems, and leaf morphology.

Table 1 Comparative diagnostic traits of *Cyphostemma setosum* and related Vitaceae species..

Trait	*C. setosum*	*C. ternatum*	*C. auriculatum*	*Cissus quadrangularis*	*Vitis vinifera*
Habit	Herbaceous climber	Semi-woody climber	Succulent, semi-erect	Angular, jointed climber	Woody vine
Stem	Bristly, setose	Glabrous or lightly pubescent	Fleshy, glabrous	Quadrangular, succulent	Woody, smooth
Leaf type	Trifoliate	Trifoliate	Simple, thick	Simple or trifoliate	Palmately lobed
Tendrils	Leaf-opposed	Leaf-opposed	Rudimentary or absent	Leaf-opposed	Leaf-opposed
Inflorescence	Cymose	Cymose	Racemose	Axillary cymes	Panicles

type					
Flower color	Yellowish-green	White-green	Reddish	Greenish	Greenish-white
Fruit	Small globose berries	Few-seeded berries	Fleshy ovoid berries	Small berries	Grape-like clusters
Habitat	Rocky hills (India, Africa)	Coastal forests (Africa)	Semi-arid woodland	Open dry forests	Cultivated worldwide

Table 2 Ethnomedicinal uses of selected Vitaceae climbers in India.

Species	Part Used	Use	Region
C. vitiginea	Leaf, root	Swellings, ulcers, asthma	Tamil Nadu, Andhra Pradesh
C. quadrangularis	Stem	Bone fractures, joint pain, ulcers	Pan-India
C. setosum	Leaf, root	Wound healing, stomach ailments	Southern India (anecdotal)