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Review Article

## A Review on Two Endemic Species of Genus *Premna* and their Conservational Importance

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### ABSTRACT

The genus *Premna* (Lamiaceae-APG IV) consists of about 200 species that are native mainly to the tropical and subtropical Asia, Africa, Australia and the Pacific islands. The species of *Premna* are well known for their medicinal properties and have been used in Indian traditional system of medicine especially for diarrhoea, stomach and hepatic disorders. The aim of this review is to highlight two endemic species *Premna rajendranii* and *Premna paucinervis* and their importance of conservation. This review also helps to summarize the recent advances in the studies on genus *Premna*, its endemic status and their distribution in Western Ghats.

**Keywords:** Endemism, Western Ghats, *Premna rajendranii*, *Premna paucinervis*

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### INTRODUCTION

The genus *Premna* L. was described by Linnaeus (1771) with two species, *Premna integrifolia* L. and *Premna serratifolia* L. from the collections of Paul Hermann from Sri Lanka and Koenig from Peninsular India (Munir 1984). The generic name '*Premna*' is derived from the Greek 'premon', meaning tree stump, which specifies the short and twisted trunks of *P. serratifolia* L., the first collected species of this genus (Dianita, 2017). *Premna* is one of the largest woody genera in the mint family and widely distributed in the tropical and subtropical regions of Australia, Africa and Asia (Harley *et al.*, 2004). According to Santapau and Henry (1973), there are 25 species of *Premna* in India. During the taxonomic revision of Indian Verbenaceae, Rajendran and Daniel (2002) recognized 31 species and 6 varieties of *Premna*. Recently, Prabhu Kumar *et al.* (2013) reported the discovery of a new species *Premna rajendranii* from Chinnar and Madukkarai hill ranges of Western Ghats in Kerala and Tamilnadu. Apart from this, a research team comprising Robi, Augustin, Sasidharan and Udayan (2013) rediscovered an endemic and rare species of *Premna viz.*, *Premna paucinervis* (C. B. Clarke) Gamble from the Vagamon hills

along South Western Ghats of Kerala after a lapse of 140 years of its original type collection by R.H. Beddome (1872) from Anamalais, Western Ghats (Tamilnadu) (Bose, 2014). The genus *Premna* included earlier in the family Verbenaceae was recently transferred to the Lamiaceae family based on molecular data (A.P.G. 2009).

### IMPORTANCE OF GENUS PREMNA

The *Premna* genus can be used traditionally in treating various ailments like rheumatism, asthma, dropsy, cough, fever, boils and scrofulous disease's (Thirumalai *et al.*, 2011). A phytochemical review of literatures indicates the genus *Premna* to be rich source of the iridoid glycosides, diterpenoids and flavonoids. Furthermore, other classes of secondary metabolites like sesquiterpenoids, triterpenoids, isoflavones, lignans and xanthenes are known to be isolated from different species of *Premna*. The isolated secondary metabolites from this genus have been reported to display interesting biological activities including antioxidant, antibacterial, anti-inflammatory, cytotoxic and hepatoprotective. The essential oil obtained from *Premna* species has displayed antibacterial property (Rekha *et al.*,

2015). Ethno medical uses of *Premna* species can be categorized (i) as anti-inflammatory – either to treat asthma, rheumatism, gout, pains, fevers; (ii) to improve immune system and treat cold and cough; (iii) for stomach disorders such as diarrhoea, dysentery, febrifuge, stomach ache; (iv) for wound healing and treating skin diseases; (v) to treat bacterial (for example, tuberculosis, leucorrhoea) and malarial infections; (vi) to treat migraine, headache, and neuralgia problems; and (vii) to treat hypertension, diabetes, liver- and cardiac-related problems (Dianita, 2017). With this small review itself we can conclude that *Premna* species have proved to be useful in treating various disorders in humans but still there is need of conducting further phytochemical, pharmacognosical and pharmacological studies on these species which can help in future research work (Kabra *et al.*, 2015).

## ENDEMISM

Endemism was first defined about 200 years back to describe taxa restricted to small geographical areas. It is a term applied to taxa that are confined to a specified geographical area or ecological unit (Heywood, 1995). In modern times, taxonomic units that are confined to a narrow phytogeographic range because of their isolation by geographical (spatial), ecological or temporal (genetic, adaptive, etc.) barriers are called endemics. Naturalists and Botanists have recognized the occurrence of endemic plants for centuries. A.P. de Candolle applied the concept of endemism in describing the distribution of organisms to a restricted habitat or geographic area isolated through ecological or temporal barriers (Singh *et al.*, 2015). Factors thought to influence endemism include fragmented habitats and variation in climatic and edaphic conditions within short distances in montane areas, leading to isolation of small species populations subject to differentiation (Henket *et al.*, 2004). In the last quarter of the twentieth century, especially in the late 1980s and 1990s, the term endemism came for wider use. Many taxa in checklists and Red Lists became labelled as endemics. For scientists and students in the field of ecology and biogeography, endemism became a central issue (Hobohm, 2014).

Endemic species are totally dependent on a single area for their survival, and by virtue of their restricted ranges, are often the most vulnerable (Myers, 1988). The degree of endemism for an area is often cited as a measure of the uniqueness of the flora and prioritizing sites for conservation (Myers *et al.*, 2000). Studies on endemics are helpful to (i) understand the history of past vegetation, (ii) identify taxonomic relationships, (iii) characterize floristic regions, (iv) determine optimal design of conservation units and (v) prioritize conservation strategies (Richardson, 1978; Street, 1978; Dhar and Kachroo, 1983; Gentry, 1986; Takhtajan, 1986; Dhar, 2002). The countries/regions rich in endemism have attained great importance in biodiversity studies. The resource value of some of the endemic plants of India is known for medicinal, ornamental, food, fodder and forage values, floricultural potential, and as wild relatives of crop plants. Analysis on the distribution of endemic angiosperms in different phytogeographical region shows that, the Western Ghats has maximum number of (2116) endemic taxa (Singh *et al.*, 2015).

## WESTERN GHATS

The Western Ghats forms an unbroken chain of mountain ranges along the west coast of Indian peninsula for almost 1600 km (Venu, 2006). The high floristic richness and high concentration of endemic plants in the region has attracted many biogeographers to explore. The region has been dealt

under Malabar (Rana, 2001). Based on the distribution of the endemic species, Western Ghats is divided into two subdivisions as northern Western Ghats and southern Western Ghats. An analysis on endemic diversity shows that Western Ghats has 2116 endemic species of which the highest concentration is found in southern Western Ghats with 1278 species while the northern Western Ghats is represented by 354 species. Distribution of 459 taxa is common to both northern and southern Western Ghats. Southern Western Ghats is a continuous complex hill system comprising Nilgiris, Anaimalai, Palni, Agasthyamalai and Kalakkad hills which provide unique habitats and niches suitable for endemic taxa. On the basis of endemic diversity, southern Western Ghats may be divided into four subdivisions. The northern most part includes the area between the Coorg to Palakkad gap, secondly the area between the Palakkad gap to Nelliampathy Plateau to Palni hills, thirdly region between Periyar river to Cardamon hills to Kambam valley and the Shen cotta pass to Agasthyamalai and Travancore coast (Vajravelu and Vivekananthan, 1996). The southern Western Ghats comprises of 62% of the total endemic plants of Western Ghats, while the northern Western Ghats contributes 22%. The southern part which corresponds to former Travancore, the hills south of Palakkad gap and Agasthyamalai comprises 64% of the total endemic tree species of the Western Ghats while 25% is restricted to this area alone (Singh *et al.*, 2015). Only by conserving areas of high endemism like Western Ghats will we be able to further study the ecological, life history, and physiological factors influencing endemics while simultaneously protecting areas of variable habitat (Henket *et al.*, 2004).

## PREMNA RAJENDRANII-A NEW ENDEMIC SPECIES

*Premna rajendranii* is a new endemic species reported from Kerala by Prabhu Kumar *et al.* (2013) and this was collected from Chinnar wildlife sanctuary, Kerala, and later collected the same specimens from scrub jungles of the Madukkarai Hills, Coimbatore District, Tamilnadu. The detailed studies have revealed that the species is related to *P. mollissima* and *P. corymbosa*, but it shows difference in many characters (K.M Kumar, 2013).

## Morphological Description

A small tree, 3–4 m high, stem glabrous. Leaves 4–6 × 2–4 cm long, ovate, cordate or cordato-ovate with acute apex, villous on both sides; petiole 1.2–1.8 cm long, hairy. The leaves are foetid when bruised. Panicles terminal in a compact corymb. Flowers white-cream, 5–6 mm long. Calyx cup-shaped, two-lipped and four-lobed, lobes obtuse, densely pubescent, 2–2.2 × 0.4 mm. Corolla creamy white, 4 mm wide, zygomorphic, two-lipped with four lobes, the upper lip is emarginate, c. 2 × 1.2 mm, obtuse; the lower one three-lobed, c. 2.1 × 1.4 mm, obtuse, the middle lobes larger, somewhat exceeding the upper one. Corolla tube 2–3 mm long, throat is densely villous. Stamens 4, didynamous, included within corolla, glabrous; filament pair small c. 2 mm and large c. 2.6 mm long. Anthers c. 0.5 mm long. Style yellow with reddish brown stigma, globose, glabrous, bifid, 4–5 mm long. Ovary c. 0.7 × 1 mm; drupe globose, 4 mm wide, black when ripe.



### Habitat and Ecology

Usually seen on the slopes of scrub jungles and borders of dry deciduous forests. In Kerala the plant is distributed in the Chinnar Wildlife Sanctuary, one of dry thornforests located in the rain shadow region of Western Ghats of Idukki district, Kerala, India. The Sanctuary lies in Idukki district, Kerala, between latitudes 10°14'57.84" and 10°21'25.2"N and longitudes 77°54'8.12" and 77°15'50.04"E (Sankar, Easa and Nair 2000). Many endemic, threatened and critically endangered plants are reported from this sanctuary (Sasidharan 1999). In Tamil Nadu this species is collected from the Madukkarai hills. It is located at 10.9° N, 76.97° E along the hill sides of the southern Western Ghats of Coimbatore, Tamil Nadu which is part of the Nilgiri Biosphere Reserve. The temperature ranges from 47.5 °C to 16 °C, respectively (Jayanthi et al., 2011).

### PREMNA PAUCINERVIS-A REDISCOVERED ENDEMIC SPECIES

During the botanical survey in Vagamon forest areas in southern Kerala, a *Premna* plant was collected which is distinct from the other *Premna* spp. reported from the Western Ghats. Further study identified this to be *Premna paucinervis* (C.B. Clarke) Gamble, which was never collected after 1872 (Rajendran & Daniel, 1994). *P. paucinervis* was first collected by R.H. Beddome (1872) from Anamalais, Western Ghats (Tamil Nadu) and treated under *Premna purpurascens* Thwaites. Clarke (1885) considered this as *P. Purpurascens* Thwaites var. *paucinervis* but later, Gamble (1924) treated this as a distinct species and named it as *P. paucinervis*. The recent collection was from Vagamon forest area of Kottayam district is a rediscovery of this endemic plant, outside its type locality, after a lapse of 140 years. After crucial examination and further comparison with the original description and type specimen available at K (280, Holotype!) and MH (Acc. No. 39876!), its identity has been confirmed as *Premna paucinervis* by Robi, Augustin, Sasidharan and Udayan (Roby et al., 2013). The study on the leaf, stem, bark of *P. paucinervis* for its phytochemical constituents and antifungal activity has proved the presence of secondary metabolites along with activity against various fungal strains. More purification needs to be done and checked for more resistant type of micro-organisms. Further research on *P. paucinervis* is necessary for elucidating the active principles and their mode of action (Steffy et al., 2018).

### Morphological description



*Premna paucinervis* is an epiphytic climber (sometimes lithophytic); stem terete, glabrous and lenticellate; branchlet subterete, dark brown, young parts sparsely pubescent, with raised circular or semi-circular leaf scars. Leaves opposite-decussate, lamina chartaceous, ovate, elliptic-oblong, 4–17 × 4–7.5 cm, acute to obtuse at base, entire to slightly repand at margins, abruptly acuminate at apex, membranous, glabrous on both surfaces, minutely puberulous on nerves beneath, pungent smell when bruised; lateral nerves 4–6 pairs, prominent beneath, marginally looped, nervules reticulate; petioles slender, 2–4.5 cm long, slightly swollen at both ends (visible only in live specimens), axially channeled, puberulous, glabrous when mature. Inflorescence terminal corymbs, composed of 3–4 opposite branched cymes, peduncle red colored, ±5 cm long, slender, obtusely 4-angular, pubescent, slightly sulcate between angles; bracts foliaceous, lanceolate; bractlets subulate, 3 mm long. Flowers sessile, 2 mm across, minute. Calyx cupular, 2-lipped, 5-toothed, 1 × 1 mm, pubescent; lower lip subentire; upper lip minutely 3-toothed, ciliate at margins. Corolla infundibular, 2-lipped; lower lip 3-lobed, lobes obovate, obtuse; upper lip 1-lobed, entire; tube narrow, ±2 mm long, densely villous at throat. Stamens 4, didynamous, epipetalous; filaments filiform, 2–3 mm long, slightly exerted, slightly villous; anthers ovoid, 2-celled. Ovary obovoid, truncate at apex, 1 × 1 mm, glabrous; style slender, 2 mm long; stigma 2-lobed, divaricate, lobes equal, subulate. Drupes obovate, flattened at the poles, c. 4 × 3 mm, surface punctuate, dark blue when ripe; fruiting calyx saucer-shaped c. 2 mm across, pubescent, margin undulate, slightly divided; seeds obovoid, 3 mm long, smooth.

### Habitat and Ecology

It inhabits in near rocky areas on the banks of river. The associated plant species found in the habitat are *Tarenna canarica* (Bedd.) Bremek., *Diospyros nilagirica* Bedd., *Humboldtia vahliana* Wight, *Diospyros hirsuta* L.f., *Syzygium laetum* (Buch.-Ham.) Gandhi, *Blachia umbellata* (Willd.) Baill. The habitat is prone to destruction because of the Rubber plantation activities and encroachment. Flowering and Fruiting occurs between March to June and it is locally rare.

### CONSERVATION STATUS

Each one of these two endemic plants were Collected from different areas of Western Ghats; the extent of occurrence is estimated to be less than 500 km<sup>2</sup>. So far, in all these habitats we could locate only a few populations and the number of individuals per population is also less, that are too prone to destruction in the near future due to various human activities like rubber plantation and also flowering and fruiting of these species are very rare. The status is assessed



here as Data Deficient (DD) pending further studies (K.M Prabhu *et al.*, 2013).

## CONCLUSION

Genus *Premna* has immense importance because of its efficacy towards various diseases. Currently in Ayurvedic medicinal field almost all the species of *Premna* mainly *P.serratifolia*, *P.tomentosa* and *P.latifolia* are being used. So there is an urgent need to take steps towards their conservation especially in the case of newly reported and rediscovered species *P.paucinervis* and *P.rajendranii* which needs further studies. And due to the lack of proper flowering and fruiting, sustainable growth methods are urgently required. Screening of these plants' diversity for morphological, biochemical and genetic levels will enable the researchers to realize the existing population of *Premna* and hence be useful in its conservation and sustainable utilization.

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