Diversified and Providential Plant *Mussaenda glabrata* (Family: Rubiaceae): A Review Study on Ethnopharmacological & Phytochemical Attributes.

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Abstract

Mussaenda glabrata (genus: Mussaenda, family Rubiaceae) is an evergreen shrub with tremendous pharmacological properties used for generations. This article aims to provide detailed information on M. glabrata. Extensive search on available electronic databases and research papers was done to stumble across on diverse pharmacological activities with the ethnomedicinal use of this species. The presence of various phytochemical constituents has been reported showing significant distinction on the bioactive possessions. This current review could be an elaborated outline on the possible pharmacological principles from reported studies. Nevertheless, isolation of relevant phyto constituents and advanced exploration on probable underlying mechanisms of them remain under investigation.

Keywords: *M. glabrata, ethnopharmacology, pharmacological activities & phytochemical activities.*

Introduction

WHO reports around 80 % of the global population still relies on herbal medicine and most modern drugs are obliged to medicinal plants. For decades natural substances have elongated serving as sources of therapeutic drugs for folks that in turn comply with drug discovery combining phytochemical, biological and molecular approaches (Firenzuoli & Gori, 2007).

Epidemiological evidence suggests that dietary supplement of plant play important role in human health and in the treatment of certain chronic diseases including cancer, CVD, diabetes, Alzheimer disease, CKD etc (Trichopoulos & Willett, 1996). However, attentive efforts need to be made to proper identification, recognition and isolation of medicinal derivatives in designing of disease prevention strategies (Sofowora et al.,2013).

As stated by National Pharmacovigilance Protocol for Ayurveda, Siddha and Unani Drugs (2008), the communal role of plants in different maladies is materialized by their employment in major systems of medication corresponding to the underlying rational evidences. Cultivation of medicinal plants with laboratory based synthetic molecules is counting as the foundation of chemical scaffold and ethnopharmacological investigation.

An organized and collective data could provide definite important lead compounds against various pharmacological targets. By terms of pharmaceutics plant derived compounds are futurestructural varieties that positively have generous welfare in human civilization (Sen & Samanta, 2015) (Singh, 2001). In recent years, increasing attention has been paid to the exploration of naturally occurring health remedies because of the upgrading consumer demand for natural product than the synthetic moiety (Khlif et al., 2015).

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For decades *M. glabratahave* been used in Chinese and Fijian traditional medicine. Folks use different parts of the plant in treating jaundice, hyperacidity, ulcers, leprosy, urine output, wound healing, swelling (Vaidyaratnam & Warier, 1993) (Kirtikar & Basu, 1987), fever and cough (Sijuet al., 2010a) (Patil & Joshi, 2011). Flowers are used as antidote in mushroom poisons and rescind early pregnancy (Dictionary of Chinese Traditional Medicine, 1986). Leaves decoction is used to purge intestinal worms (Uphof, 1959). The juice of the root is used to treat discolorations on the tongue, juice of bark in body ache, diarrhea and dysentery and the sepals are used as diuretic (Jayasinghe et al., 2002). Very few species have been explored for chemical and biological studies *M. glabrataand* this review focuses on chemical constituents and biological activity of the plant that could be intended as a guide for future research.

Methodology

A wide-ranging bibliographi search was done on electronic databases (PubMed, Google Scholar, Scopus, ScienceDirect, Classical text books of Ayurveda) and conference papers on the specific specie to execute a significant review on phytochemical and pharmacological potentials of this plant that might provide a detailed outline on the prospective ethno pharmacological assessment. No limit was placed on the search time frame in order to repossess all appropriate papers. About 38 papers have been reviewed including journal articles and proceedings to stretch a modernized formulation in medicinal valuation.

Plant Profile

Mussaendasare progressively popular for their eye-catching color throughout all year round. This plant group is accounted as ornamental shrubs with floral beautifications suited to tropical or subtropical climates (Whistler, 2000). This is the most cold tolerant of the cultivated musseandas. It is sometimes treated as an annual in the Gulf Coast states. *Mussaenda glabrata (syn: M. frondosa)* commonly known as dwarf mussaenda or dhobi tree belongs to family Rubiaceae (coffee family) (Huxley et al.,1999) and is distributed in south asia, east asia like India, Sri Lanka, Assam, Nepal, Andaman and Nicobar, Vietnam, Indonesia, Indo-China to Malaysia etc. The plant prefers a sunny position with soil pH 7 (Huxley, 1992).

This species is often grown in round bunches. The plant is 6 to 9 feet tall. Leaves are broadlyovate on round base with 6-10 x 4-6 cm length and caudate acicular at peak. Leaves are oval shaped, widely elliptic, shortly acuminate and more or less pubescent (Huxley, 1992). The leaves are lighter green and the clustered flower have orange to yellow color, tube-shaped corollas with a single white puffy calyx lobe. Cymes are terminal, lax and tomentose. Corollas are funnel shaped with 2.5-3 cm length. Flowering time is mainly from April to November. The vertical, branching stem has a shrubby crown.

Taxonomical hierarchy of *M. glabrata*

Kingdom:	Plantae
***Clade*:**	Tracheophytes
***Clade*:**	Angiosperms
***Clade*:**	Eudicots
***Clade*:**	Asterids
Order:	Gentianales
Family:	Rubiaceae
Genus:	*Mussaenda*
Species:	*M. glabrata.*
Synonym: *M. frondosa L*	

Other Forenames

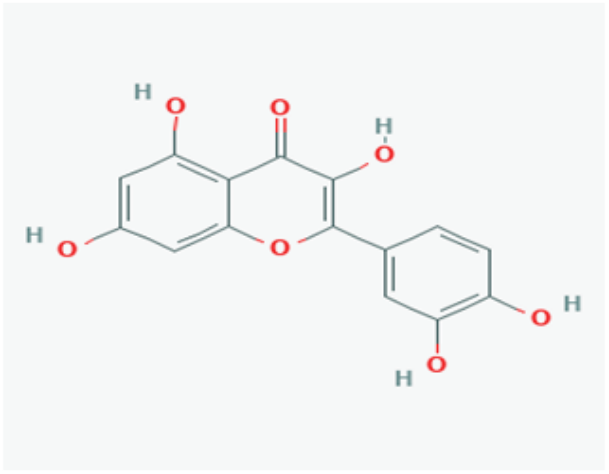
Bengali: Nagaballi
Hindi: Bedina
Kannada: Belloti
Malayalam: Vellila
Sanskrit: Shrivati
Tamil: Vellimatantai
Marathi: Bhutakesha

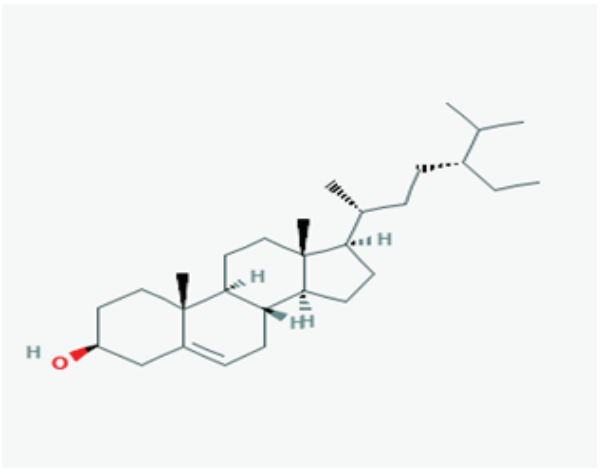
Phytochemical Review of *M. glabrata*

Table 01: Literature Review of Phytochemicals reported in *M. glabrata.*

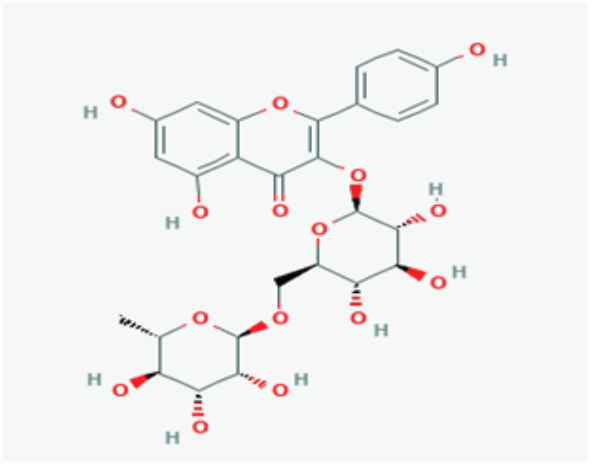
Part studied	Phytoconstituents	Reference
Methanolic leaf extract	Iridoids, flavonoids, and triterpenes , astragalin, isoquercetrin, and kaempferol-3-o-beta rutinoside	Ranarivelo et al., 1990
Ethyl alcohol leaf extract Chloroform leaf extract	Quercetin (QE), rutin, hyperin, ferulic acid, synaptic acid, beta-sitosterol, saponins, gallic acid	Michael, 1998 Aswathi et al., 2017
Ethyl alcohol leaf extract Aqueous leaf extract	Carbohydrates, steroids, alkaloids, terpenoids, flavanoids, tannins and poly phenols	Shanthi & Radha , 2020 Sreelakshmi et al., 2015
Methanolic rootextract	Proteins, saponins, glycosides and cardiac glycosides.	Menon & Sasikumar, 2011
Flower extract	Anthocyanins, hyperin, quercetin, rutin, beta sitosterolglucoside, ferulic and sinapic acids	Khare, 2007

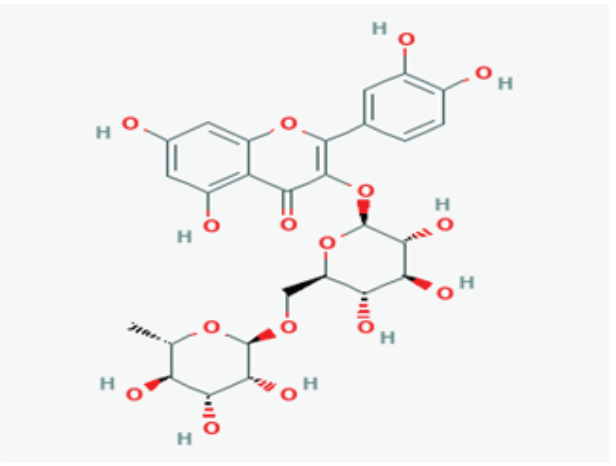
Sahadevan (2017) reported isolation of Mussaenin A from the root of M. glabrata that induces apoptosis in the liver cancer cells by down- regulation of the anti-apoptotic factors and up regulation of the pro-apoptotic factors.



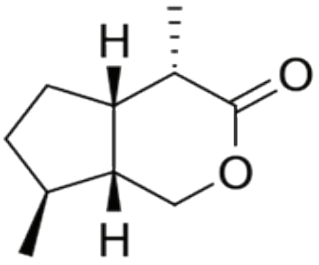


Quercetinβ-sitosterol





kaempferol-3-o-betarutino side Rutin



Iridoid

Figure 01: Reported Phytochemical Constituents Found in M. glabrata

Phrmacological review of *M. glabrata*

Table 02: Literature Review of Pharmacological Activities Present in *M. glabrata.*

Pharmacological Activities	Part/Extract	Reference
Antioxidant Activity	Ethanolic & aqueous whole plant extract	Siju et al., 2010a
	Ethanolic root extract	Menon & sasi kumar, 2011
	Methanolic root extract	Koul & Cha udhary, 2011
	Methanolic leaf extract	Wesley et al., 2009
Anti inflammatoryActivity	Methanolic root extract	Menon & sasikumar, 2011
	Chloroform, water, DCM, methanol extract (leaf, stem, and callus)	Manasa et al., 2017
Anthelmintic Activity *Pheretimaposthuma* *Raillietinaspiralis* *Ascaridiagalli*	Ethanolic & aqueous whole plant extract	Siju et al., 2010b
Diuretic Activity	Ethanolic whole plant extract Ethanolic & aqueous leaf extract	Sreelakshmi et al., 2015
Antifungal Activity *Trichophytonmentagrophyt es, Trichophytonsimii* *Aspergillusniger* *Rhizopus*	Methanolic, ethyl acetate, chloroform & n-hexane leaf extract	Shanthi & Radha, 2020 Basavaraja et al., 2011

Hepatoprotective Activity	Alcoholic & aqueous leaf extract	Sambrekar et al., 2010
Antibacterial Activity Coagulase negative *staphylococcus, Staphylococcus aureus Salmonella typhi, Salmonella paratyphi A, Salmonella paratyphi B, Pseudomonas aeroginosa, Klebsiellapneumoniae, Vibrio cholerae*and *Escherichia coli*	n-hexane, dichloromethane and methanolic extract (leaf, bark & stem)	Jain, 1991 Jayasinghe et al., 2002
	Methanolic, ethyl acetate, chloroform & n-hexane leaf extract	Shanthi & Radha, 2020 Basavaraja et al., 2011
	Aqueous extract	Joshi et al., 2010
Hypolipidemic Effect	Methanolic leaf extract	Wesley et al., 2009
Analgesic Activity	Chloroform bark extract	Basavaraja et al., 2011
Anticancer Activity	Methanolic leaf extract	Pappachen & Sreelakshmi, 2017
Wound Healing Activity	Alcoholic & aqueous extract	Suhas & Joshi, 2011
Anti Stress Activity	Ethanolic root extract	Koul & Chaudhary , 2011

M. glabrata mucilage is found to be used as a good binding agent that eventually reduces drug release rate and sustains drug release from drug (Dilip et al.,2010).

Conclusion

Extensive literature review revealed enormous potential ethno-pharmacological activities against various diseases performed *in vivo & in vitro* models. The bioactive phytoconstituents which are present in the plants are mainly alkaloid, tannin, glycoside,saponin, phenolic compound, lignin, flavonoids and so on that confirmed notable roles in drug development strategy. Further pharmacological and chemical studies should be carried out on this plant to explore and enrich our medicinal region due to their specific promising activities.

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