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Review Article

*Limnophila Conferta (*Scrophulariaceae): A review on chemical and medicinal importance

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ABSTRACT

Limnophila conferta is an aquatic plant which is grown in muddy region. It is edible in many places like Chattisgarh, Bihar, Jharkhand and Orissa.The present paper deals with a detail literature review on *Limnophila conferta* which belonging to the family Scrophulariaceae. Taxonomy, isolated phytoconstituents and pharmacological application are described in paper**.** Various volatile oils are found in this plant like phellandrene, ocimene, farnesene, selinene, terpinene 4 ol etc and flavonoid nevadensin. Traditionally plant has been employed for treatment of skin diseases and swelling. Many experiments revealed that plant extract and isolated phytoconstituents are shown positive pharmacological activities on antimicrobial, antiinflammatory, anthelmintic, cytotoxic and wound healing activity.

Key Words: Aquatic plant, *Limnophila conferta*, *Limnophila* genus, Muchri sag, Phytoconstituents

INTRODUCTION

India has dense forests as well as rich flora that are widely distributed throughout the country. Forests are full of medicinal plants and these plants play an important role in traditional system of medicine. People use traditional as well as folklore medicine from generation to generation as domestic recipes or communal practice for the protection and restoration of their healthcare. The uses of traditional medicine and medicinal plants have been observed in developing countries for the maintenance of good health [1]. Furthermore the industrialised societies have realised towards the use of medicinal plants, extraction, phytochemical constituents and development of several drugs from traditionally used herbal plants and remedies [2]. Present review is an effort to compile the literature of *Limnophila conferta* and to draw attentions of researchers towards traditional herbal medicine used by rural people. So that researchers can investigate medicinal potency of this plant scientifically in future.

Limnophila conferta (Scrophulariaceae) is an aquatic, perennial, prostate and creeping plant. Its natural habitats are rivers, lakes, ponds as well as marshy lands [3]. It is grown in an aquatic environment like rice fields where the waters are found. It is locally known as Muchri in Oraon and Hemcha sag in Santhal [3]. It is edible plant and eaten by all tribes of Chattisgarh, Bihar, Jharkhand, West Bengal and Orissa. Morphologically plant leaves are green, lanceolate shaped, toothed margin and acute apex. It bears single white coloured flower borne in the leaf axis. The plant has been employed traditionally to treat various skin diseases and inflammatory diseases in the indigenous system of medicine [4-6]. Polar solvent plant extract of *Limnophila conferta* is used in various cosmetic composition in the form of serum, lotion, an emulsion, cream, hydrogel, mask, stick, patch, hygiene product for the scalp, make up product and nail varnish[7].

TAXONOMY

Limnophila conferta belongs to limnophila genus. Its species is commonly known as marshweed. Characteristics of this genus plants are annual or perennial herbs and are grown in wet habitat like marshes and some are an aquatic. Leaves are lanceolate shaped, pinnate, serrate margin and aerial leaves as well as submerged leaves are whorled arranged. Some species have flowers solitary in the leaf axils, and others have flowers in inflorescences [8, 9].

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The taxonomy of *Limnophila conferta* plants are given below [10].

Domain	:	Eukaryota
Kingdom	:	Plantae
Phylum	:	Tracheophyta
Class	:	Magnoliopsida
Order	:	Lamiales
Family	:	Scrophulariaceae
Genus	:	Limnophila
Botanical name	:	*Limnophila conferta* Benth

MATERIALS AND METHODS

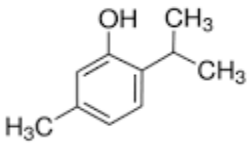
The literature survey of various journals as well as web sites was done regarding *Limnophila conferta.* The phytoconstituents isolated and identified from the plants are reported in literature were noted. At the time pharmacological activity shown in literature by the plants were recorded.

CHEMICAL CONSTITUENTS

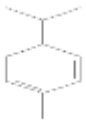
Phytochemicals which are derived from plants often used to describe the large number of primary as well as secondary metabolic compounds. These are provided protection against attacks and plant diseases. They also exhibit a number of protective functions for human consumers [11]. Literature revealed 11 phytoconstituents which are found in plant and need to investigate new phytoconstituents undergoing in research [12, 13]**.** Phytoconstituents which are found in *Limnophila conferta* are given in table 1.

Molecular structures of compounds

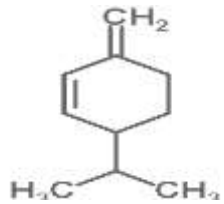
Nevadensin



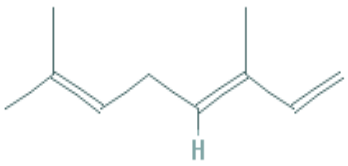
Thymol



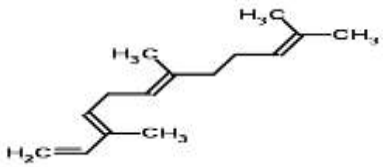
α Phellandrene



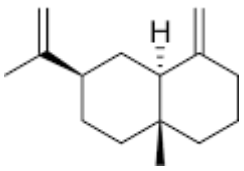
β Phellandrene



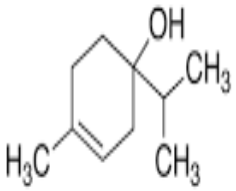
Ocimene



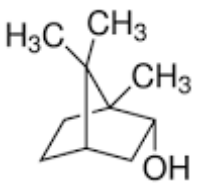
Farnesene



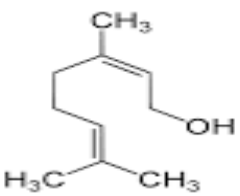
Selenene



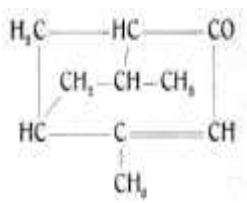
Terpinen 4 ol



Borneiol



Nerol



Dihydroumbellulone

PHARMACOLOGICAL ACTIVITIES

Pharmacological study involves examining the interactions of chemical substances with living system to understand the properties of drugs and their actions. It involves examining the different classes of drugs are used therapeutically and how they are handled by human body and their role in society for their healthcare [14]. Some of the pharmacological studies of *Limnophila conferta* which has been performed by researchers are given in table 2.

RESULT AND DISCUSSION

Phytochemical research of this plant revealed that flavonoid and terpenoids are present. Bioflavonoid nevadensin and various types of terpenoids like nerol, borneol, ocimene, thymol etc. which are found in these plants. Presence of these bioactive substances plant extracts have significant positive biological activities like wound healing, antimicrobial, antibacterial antiinflammatory, cytotoxic and anthelmintic etc. Although research investigators have been investigated many works in the field of isolation and structure elucidation of phyto chemicals and pharmacological activities of this plant, but many works which are still unexplored. This paper is an effort to compile the literature review of *Limnophila conferta* on the view of taxonomical, phytochemical and pharmacological studies which are reported. The objective of this study is an effort to draw attention of researchers towards investigation of bioactive molecules and medicinal importances of this plant which remains to explore. In conclusion *Limnophila conferta* is an important medicinal plant that rural people used as recipe or in communal practice in their healthcare traditionally. This review can help researchers in drug development programme in this direction to undertake further investigation toward biochemicals and pharmacological importance of this plant scientifically in near future.

Table1. List of phytoconstituents isolated from *Limnophila conferta*

phytoconstituents	**IUPAC name**	**Molecular formula**	**Classes of phytochemicals**	**Plant parts**	**References**
Nevadensin	(5,7-dihydroxy-6,8,4′-trimethoxyflavone	C18H16O7.	Flavonoid	Ariel part	[13, 14]
Thymol	2-isopropyl-5-methylphenol	C10H14O	Essential oil	Ariel part & roots	[13]
α Phellandrene	2-Methyl-5-isopropyl-1,3-cyclohexadiene	C10H16	Essential oil	Ariel part & roots	[13]
B -Phellandrene	3-Methylene-6-(1-methylethyl)cyclohexene	C10H16	Essential oil	Ariel part & roots	[13]
Ocimene	cis-3,7-dimethyl-1,3,7-octatriene	C10H16	Essential oil	Ariel part & roots	[13]
Trans farnesene	3,7,11-trimethyl-1,3,6,10-dodecatetraene	C15H24	Essential oil	Ariel part & roots	[13]
Selinene	α:(2R,4aR,8aR)-2-Isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,8a-octahydronaphthalene	C15H24	Essential oil	Ariel part & roots	[13]
Terpinen-4-ol	**4**-Methyl-1-isopropyl-3-cyclohexen-1-**ol**	C10H18O	Essential oil	Ariel part & roots	[13]
Borneol	1,7,7-Trimethyl-bicyclo[2.2.1]heptan-2-ol	C10H18O	Essential oil	Ariel part & roots	[13]
Nerol	3,7-dimethyl-2,6-octadien-1-ol	C18H16O7.	Essential oil	Ariel part & roots	[13]
Dihydroumbellulone	5,7-dihydroxy-2-phenylchromen-4-one	C10H16O	Essential oil	Ariel part & roots	[13]

Table 2- Pharmacological activities of *Limnophila conferta*

Pharmacological activity	Methods	References
Anti-inflammatory activity	Carragenan induced rat paw edema	[13]
Wound healing activity	Incision, excision, dead space wound.	[13]
Cytotoxic activity	Dalton's lymphoma ascites tumour and Ehrlich ascites tumour	[13]
Anthelmintic activity	Tape worms model, earth worm model and round worm model	[13, 18]
Antibacterial activity	Disk diffusion and broth micro dilution methods	[13]
Antimicrobial activity	Disk diffusion and broth microdilution methods	[12]

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