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Review Article

A Perspective Overview on *Hygrophila auriculata*

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ABSTRACT

Hygrophila auriculata, belonging to the family Acanthaceae, is a promising medicinal plant with great economic potential. The medicinal value of *H. auriculata* has been appreciated in the ancient medical literature. The plant contains terpenoids, alkaloids, flavonoids, and is traditionally known as an aphrodisiac, renal tonic, and for its health-promoting properties. The plant is cultivated throughout India. However, systematic information on the different aspects of this species is not available. In this review, an attempt has been made to present this information.

Key words: *Hygrophila auriculata*, Phytochemistry, Pharmacological activity.

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INTRODUCTION

Hygrophila auriculata (Schumach.) Heine belongs to family Acanthaceae found in India. It is distributed in tropical and subtropical region in india in literature. The plant is used in cancer and tubercular fistula (Root and seeds used as tonic, for asthama and dysentery.[1] The leaf, root and seed of this plant are traditionally used for the treatment of inflammation, jaundice, hepatic obstruction, urinary infection, oedema, gout, diabetes, bacterial infection etc.[2]

VERNACULAR NAME[3]

Marathi: Kolshinda, Talimkhana, Sanskrit: Kokilaksa, Bengali: Kuliyakhara,Gujrati: EkharoHindi: Talmakhana Kannada: Kolavali, Marathi: Talikhana, Kalsunda Tamil: Golmidi, Urdu: Talmakhana.

DESCRIPTION[4]

Herbs, 40-100 cm tall with unbranched, subquadrangular stems with numerous fasciculate, swollen node, hispid with long hairs. Leavessub-sessile, lanceolate, 6-15×1.5-3 cm, acute, hairy, in whorls of 6 at each node, the two outer one smuch larger than the four inner ones. Thorns from the axils of leaves sharp, 2-3 cm long, yellowish-brown. Flowers in axillary clusters of eight at each node in 4 pairs. Bractslanceolate, hairy and ciliate, like the leaves; bracteoleslinear-lanceolate, 1.5-2 cm long, with hyaline margins in the lowerpart, hairyand ciliate with long white hairs. Calyx 4 partite; upper sepals broader unequal, longer than the other three, all linear lanceolate, 1.2-2 cm long,with hairy on the back and hyaline ciliate margin. Corolla purple-blue, 2-3 cm long, bilipped; tube 11-13 mm long, swollen at top; stamens didynamous 4; filaments glabrous. Ovary 2 celled with 4 ovule, capsuleslinear-oblong, 4 seeded 5-7 mm long, pointed. Seeds, ovate, compressed, hairy, hygroscopic,black.

PHYTOCHEMISTRY

Phytochemically, the whole plant contains phytosterols, tannins, carbohydrates, flavonoids, terpenoids, and sterols. Phalnikar *et al*, analyzed the oil from the seeds and reported the presence of uronic, palmitic, stearic, oleic, and linoleic acids.Apigenin-7-O-glucuronide and apigenin-7-oglucoside were isolated from the flowers and lupeol, betulin, and stigmasterol were isolated from the plant. Alkaloids, steroids, tannins, proteins, flavonoids, carbohydrates, fats, and oils were isolated from the roots. Moreover, the leaves show the presence of alkaloids, carbohydrates, proteins, steroids, glycosides, flavonoids, tannins, phenolic compounds, fats, and oils.[4]

The high-performance thin layer chromatography analysis revealed the presence of phytosterols, namely, β-sitosterol and lupeol. Maximum content of lupeol was found in the roots (0.25%), whereas the maximum content of β-sitosterol was found in the leaves (0.069%) of *Asteracantha longifolia*. Other isolated chemical constituents include betulin, 25-oxo-hentriacontanyl acetate, and methyl8-*n*-hexyltetracosanoate.[5]

CONCLUSION

In this systematic review, the pharmacologic studies conducted on *H. auriculata* indicate the immense potential of this plant in the treatment of conditions, such as diarrhea; inflammatory ailments, including liver and kidney disorders, as well as microbial and bacterial infections; cancer, and others. Regarding the plant, the studies indicate that this has an important antioxidant activity due to the presence of water-soluble compounds with potent free radical-scavenging effects, such as flavonoids, terpenoids, alkaloids, steroids, tannins that may be associated with the lower incidence and lower mortality rates of degenerative diseases in human. In spite of all these activities, a major work has been carried out on the chemical, biochemical, pharmaceutic,

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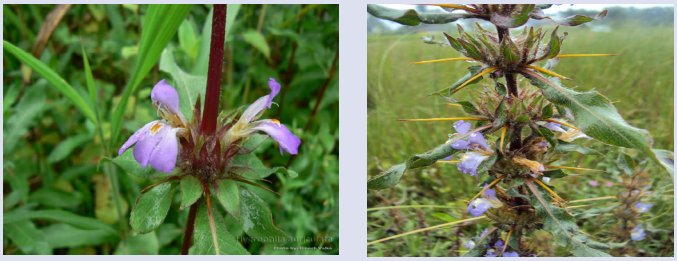

Figure 1: Entire Plant of *Hygrophila auriculata* (Schumach.).

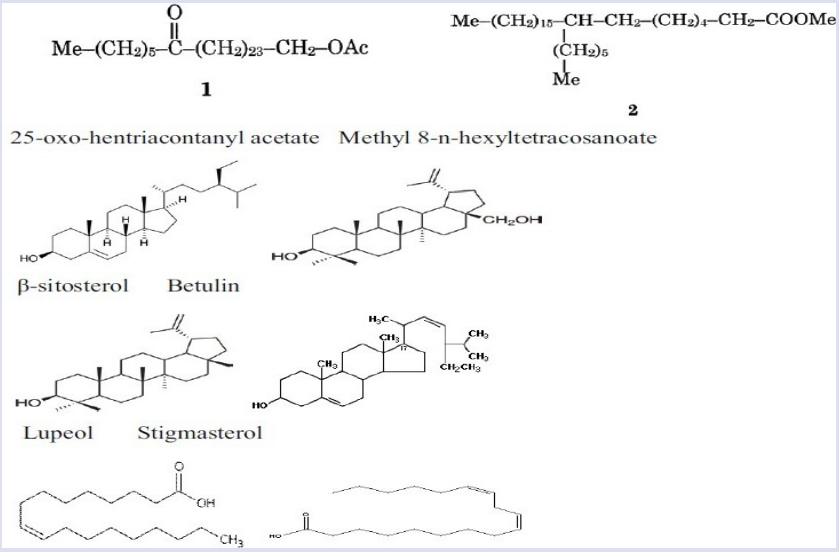

Figure 2: Phytochemical present in *Hygrophila auriculata* (Schumach).[5]

Table 1: Pharmacognostical Study.

S.No	Title	Journal Name	Vol / Issue / Year	Author	Conclusion
1.	Preliminary Phytochemical and Pharmacognostical Screening of the Ayurvedic Drug *Hygrophila auriculata* (K. Schum) Heine	Pharmacognosy Journal	Vol 3, Issue 23, 2013	Mohammed Safaraj *etal*[6]	Physico-chemical studies revealed alcohol soluble extractive (5.12%w/w), water soluble extractive (24.96), total ash (9.90), acid insoluble ash (1.48), water soluble ash (8.35% w/w), loss on drying (6.30% w/w), swelling index (2.0% w/w), foreign matter (1.10% w/w)

Table 2: Phytochemical investigation study. The phytochemical investigation of *Hygrophila auriculata* review strengthen the review of the article. The phytochemical investigation are listed below:

S.No	Title	Journal Name	Vol / Issue / Year	Author	Conclusion
2.	Ethnomedicinal, phytochemical and pharmacological updates on *Hygrophila auriculata* (Schum.) Hiene: an overview	Journal of Integrative medicine	Vol 16, Issue 5, 2012	Neeraj *et al*[7]	The plant contain flavonoids (apigenin, luteolin, ellagic acid, gallic acid and quercetin), alkaloids (asteracanthine and asteracanthicine), triterpenes (lupeol, lupenone, hentricontane and betulin), sterols
3.	Neuroprotective and antioxidant potential of terpenoid fraction from *Hygrophila auriculata* against transient global cerebral ischemia in rats	Pharmaceutical Biology	Vol 51, Issue 3, 2013	Rupesh Kanhere *et al*[8]	*Hygrophila auriculata* shows neuroprotective potential against tGCI induced oxidative stress.
4.	Studies on phytochemical screening, tannin content and their antibacterial activity of *Hygrophila auriculata* leaf extracts	International journal of current science	19 (4), 2016	Prasanna M *et al*[9]	The powerful antibacterial effect is attributed to the greater amount of tannin compound in the acetone leaf extract of *Hygrophila auriculata*

Table 3: Pharmacological investigation.

S.No	Title	Journal Name	Vol / Issue / Year	Author	Conclusion
5.	Preliminary studies on diuretic effect of *Hygrophila auriculata* (schum) heine in rats	International Journal of Health Research	Vol 2, Issue 1, 2009	S.Hussain *et al*[10]	diuresis induced by the n-butanol fraction was almost similar to that produced by the frusemide.
6.	Action of *Hygrophila auriculata* against streptozotocin-induced oxidative stress	Journal of Ethnopharm acology	Vol 104, Issue3	M. vijayakumar *et a1*[11]	Aerial parts of Hygrophila auriculata extract (HAEt, 100 and 250 mg/kg body weight) for 3 weeks showed significant reduction in blood glucose,
7.	Anti-endotoxin effects of terpenoids fraction from *Hygrophila auriculata* in lipopolysaccharide-induced septic shock in rats	Pharmaceutical biology	Vol 54, Issue 4, 2016	Safarajan hussain *et al*[12]	Terpenoid fraction (TF) from alcohol (70%) extract of the whole plant of *Hygrophila auriculata* and assess its anti-inflammatory activity.
8.	Phytochemical screening, anti-oxidant activity and in vitro anti-diabetic activity of aqueous, methanolic, ethanolic and chloroformic extracts of *Hygrophila auriculata*	International journal of pharmacy and pharmaceutical Science	Vol 6, issue 5, 2014	Archit rastogi *et al*[13]	The methanolic extract contained the maximum number of phytochemicals. The antioxidant activity, alpha amylase inhibition and glucose diffusion inhibition were all found to be high.
9.	Protective effect of ethanolic extract of *Hygrophila auriculata* seeds in cyproterone acetate-induced sexual dysfunction in male albino rats	Andrologia	9, 2019	Chaitali Ghosh *et al*[14]	*H. auriculata* has androgenic and antioxidant properties that can improve male infertility without metabolic toxicity.
10.	Experimental evaluation of *Hygrophila Schulli* seed extracts for antistress activity	Ancient science of life	Vol 37, Issue 1, 2017	Dayanandh Kannur *et al*[15]	HPLC analysis confirmed the presence of flavonoid Quercetin, the ethanolic and hexane extracts were found to increase the swim endurance time, both extracts lowered the elevated blood glucose, cholesterol as well as triglyceride levels in cold immobilization stress.
11.	*Hygrophila auriculata* (K. Schum) Heine: Ethnobotany, Phytochemistry and pharmacology	Asian journal of traditional medicine	Vol 5, Issue 4,2010	Sheeba *et al*[16]	Ethanobotanical and traditional uses as well as phytochemical and pharmacological reports about *Hygrophila auriculata*.

Figure 4: Biotechnological investigation.

S.No	Title	Journal Name	Vol / Issue / Year	Author	Conclusion
12.	Elemental analysis of some ethnomedicinaly important hydrophytes and marsh plants of India used in traditional medicine	Asian Pacific	Vol 2, issue 3, 2012	Somnath *et al*[17]	Total of 11 elements K^{+}, Mg^{+2}, Ca^{+2}, Na^{+}, Fe^{+2}, Mn^{+2}, Cu^{+3}, Mn^{+2}, Cu^{+3}, Cr^{+3}, Zn^{+2}, Pb^{+4} and Cd^{+2} have been measured by Atomic absorption method.

and pharmacologic aspects of the plant and hence, an extensive investigation, especially on its clinical efficacy is needed to exploit its therapeutic utility to combat diseases. As the global interest toward traditional medicines over the conventional treatment is increasing, due to safe and well-tolerated remedies provided by them for the chronic illness with lesser side effects, this review targets *H. spinosa* as a potentially safe and effective plant that has important medicinal values and benefits.

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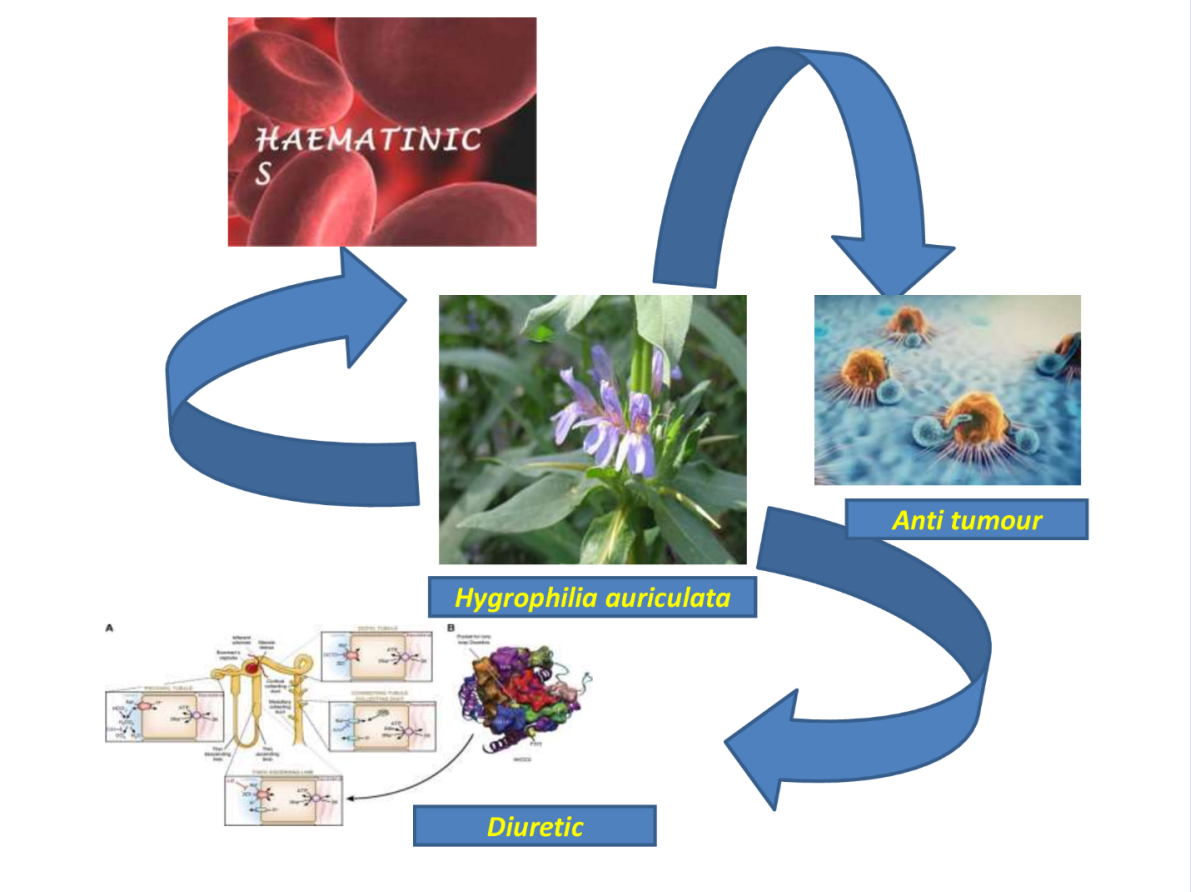
GRAPHICAL ABSTRACT



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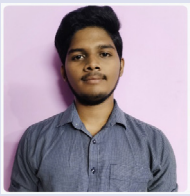

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