

***Hemionitis arifolia* (Burm.f.) T. Moore: A Promising Medicinal Plant in the Fight Against Cancer- A Review**

Milkuri Chiranjeeva Reddy^{1*}, Mhaiskar Priya Rajendra², D. Ravivarma³, Bheemreddyvala Venkateshwar Reddy³, CH. Bhargavi⁴ and Yerrawada Naveen³

¹Head, Department of Silviculture and Agroforestry,

Forest College and Research Institute, Mulugu, Siddipet District (Telangana), India.

²Head, Department of Forest Ecology and Climate Science,

Forest College and Research Institute, Mulugu, Siddipet District (Telangana), India.

³Department of Silviculture and Agroforestry,

Forest College and Research Institute, Mulugu, Siddipet District (Telangana), India.

⁴Assistant Professor, Department of Silviculture and Agroforestry,

Forest College and Research Institute, Mulugu, Siddipet District (Telangana), India.

(Corresponding author: Milkuri Chiranjeeva Reddy*)

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ABSTRACT: *Hemionitis arifolia*, commonly known as the Indian dwarf fern, is a small, terrestrial fern with rich phytochemical properties. It is primarily found in India, Laos, Sri Lanka, Vietnam, and other countries in tropical Southeast Asia. This versatile plant exhibits antibacterial, hypoglycemic, anti-fungal, anti-oxidant, anti-inflammatory, and potential anti-cancer activities. Studies have shown that *Hemionitis arifolia* extracts possess antibacterial properties, particularly against *Escherichia coli*. This indicates its potential as an antimicrobial agent. Additionally, the plant has demonstrated hypoglycemic and anti-diabetic properties, making it a promising candidate for managing diabetes. It also exhibits anti-fungal, anti-oxidant, and anti-inflammatory activities. Despite its medicinal potential, *Hemionitis arifolia* has been relatively overlooked in pharmacogenetic and phytochemical studies. However, further research and understanding of this remarkable fern could revolutionize the field of herbal medicine and contribute to alternative remedies. It has a wide range of healing properties. Its antibacterial, hypoglycemic, anti-fungal, anti-oxidant, anti-inflammatory, and potential anti-cancer activities make it a valuable asset in the realm of natural medicine. As we continue to explore the potential of natural remedies, *Hemionitis arifolia* stands as a beacon of hope, reminding us of the incredible healing power of nature.

Keywords: *Hemionitis arifolia*, medicinal plant, phytochemical properties, anti-diabetic, anti-fungal, anti-oxidant, anti-inflammatory and anti-cancer.

INTRODUCTION

In India, we are fortunate to have a rich heritage of ancient medicinal systems that have been practiced for over 3000 years. These systems have deep-rooted social acceptance and are known for their utilization of medicinal herbs, making it one of the oldest, richest, and most diverse cultural traditions (Prashant *et al.*, 2011). In recent decades, there has been a renewed interest in plants and plant-derived products as a source of medicine. However, despite the economic value of higher plants, pteridophytes (ferns and fern allies) and angiosperms have unfortunately been neglected in pharmacogenetic and phytochemical studies (Singh *et al.*, 2010). Herbal medicine, also known as botanical medicine or phytomedicine, is considered more affordable, easily accessible, and culturally acceptable due to the perception that it has fewer adverse effects than synthetic pharmaceuticals (Carlson, 2002). Medicinal plants are those that contain substances that

can be used to treat illnesses or alleviate pain (Okigbo *et al.*, 2008). The number of higher plant species utilized for medicine is estimated to be between 1 and 50,000 (Schippmann *et al.*, 2002) India boasts a diverse range of medicinal plants, including pteridophytes, which offer a plethora of opportunities for screening their medicinal properties and potential benefits for human and plant diseases (Ahmad *et al.*, 1998). Despite their importance, pteridophytes have been largely overlooked in terms of phytochemical and antimicrobial research, although their ethnobotanical significance has been studied by various authors (Ahmad *et al.*, 1998). Pteridophytes, often referred to as the "reptile group" of plants, are among the earliest vascular plants. Unfortunately, their uses are not well-known among indigenous communities, primarily due to their limited availability compared to flowering plants. However, pteridophytes play a crucial role in the biodiversity of our planet. It is high time we delve into the untapped potential of pteridophytes and uncover their hidden

medicinal properties, contributing to the field of herbal medicine and expanding our knowledge of alternative remedies in which one of the pteridophyte is *Hemionitis arifolia* (Ahmad *et al.*, 1998).

Hemionitis arifolia. *Hemionitis arifolia* (*H. arifolia*) (Burm.F.) T. Moore (family: Pteridaceae) is a small, terrestrial, rhizomatous fern. Locally called as Raama baanam (Telugu).

SCIENTIFIC CLASSIFICATION

Kingdom	:	Plantae
Clade	:	Tracheophytes
Division	:	Polypodiophyta
Class	:	Polypodiopsida
Order	:	Polypodiales
Family	:	Pteridaceae
Subfamily	:	Cheilantheae
Genus	:	<i>Hemionitis</i>
Species	:	<i>arifolia</i>

TYPIFICATION

Asplenium arifolium Burm. f., Fl. Ind. 231. 1768 — *Hemionitis arifolia* (Burm. f.) T. Moore, Index Fil. 114. 1859. — *ParaHemionitis arifolia* (Burm. f.) Panigrahi, Amer. Fern J. 83(3): 90. 1993. Lectotype: van Rhede tot Drakestein, Hortus Indicus Malabaricus 12: 21, t. 10, 1703. Epitype (designated here): India. West Bengal: Burdwan, Kanchannagar, near bridge above canal, 30 m, 21 Nov 2007, J. Mazumdar 59 (Mazumdar, 2015).

DISTRIBUTION AND HABITAT

H. arifolia, also known as the Indian dwarf fern, is a captivating and unique plant that can be found primarily in India, Laos, Sri Lanka, Vietnam, and possibly other countries in tropical Southeast Asia, including China and Taiwan. This fern exhibits a fascinating growth pattern, as it can thrive both as an epiphyte, growing on trees, and as a terrestrial plant. Its natural habitat is characterized by a moist and humid environment, typically found within dense tree foliage. The tropical setting where this fern flourishes is bright, receiving indirect sunlight, while also providing ample shade (Rajapriya, 2022).

PHYTOCHEMICAL PROPERTIES

Preliminary phytochemical screening of methanolic extract of *Hemionitis arifolia* showed the presence of phenols, saponins, tannins, steroids, flavonoids, glycosides and carbohydrates (Rakkimuthu *et al.*, 2018).

Table 1a: Phytochemical screening of *Hemionitis arifolia* (Burm.) Moor.

Parameters	Result
Total ash	6.03±0.03% w/w
Acid insoluble ash	1.11±0.05% w/w
Water soluble ash	3.99±0.14% w/w
Water soluble extractive value	19.56±0.24% w/w
Alcohol soluble extractive value	6.42±0.11% w/w
Chlorophyll a	7.74 µg/ml
Chlorophyll b	3.09 µg/ml
Total chlorophyll	10.805 µg/ml
Total carotenoids	2.437µg/ml

(Joy and Bindu 2017)

Table 1b: Phytochemical screening of *Hemionitis arifolia* (Burm.) Moor.

Name of the Solvent extract	Alkaloids		Flavonoids Shinoda test	Carbohydrates Molish's test	Reducing sugars Benedict's test	Cardiac glycosides Legal's test	Steroids Salko-Wski's test	Proteins		Starch Iodine test
	Mayer's test	Dragen-dorff's test						Biuret Test	Xantho-protein test	
Acetone	-	-	+	+	+	+	+	-	-	-
Ethanol	-	-	+	+	+	+	+	-	-	-
Choloroform	-	-	+	+	+	+	+	-	-	-
Ethylacetate	-	-	+	+	+	+	+	-	-	-
Petroleumether	-	-	+	+	+	+	+	-	-	-
Methanol	-	-	+	+	+	+	+	-	-	-
Hexane	-	-	+	+	+	+	+	-	-	-
Dichloromethane	-	-	+	+	+	+	+	-	-	-

- = absent + = present

(Hima Bindu *et al.*, 2012)



***Hemionitis arifolia* (Burm.) Moor**

PHARMASGONY

Antibacterial activity. *Hemionitis arifolia* were tested by agar diffusion and tube dilution assay. Both the crude and alcoholic extracts of vegetative and reproductive leaves of *H. arifolia* showed considerable antibacterial activity against Gram negative test strain of *Escherichia coli* (MTCC-739) (Karmakar and Mukhopadhyay 2011).

Hypoglycaemic and anti-diabetic properties. Krishna Kumar *et al.* (2016) studied about Antidiabetic evaluation of *Hemionitis arifolia* leaves by in vitro methods. Gas chromatography mass spectrometry (GC-MS) analysis revealed the presence of nine compounds and the Phyto constituents screened were 1. 4-(chloromethyl)-1-azabicyclo-(2.2.2) octane (18.26%), 2,4-Nitrobenzoic acid, 2,4,6-trichlorophenyl ester (18.70), 3. Decanoic acid, 2-hexyl-, methylester (19.91), 4. N-(4-(chlorophenyl) isothiazol-5-yl)-2-methylpiperidin-2-imine (21.73), 5. Pregnane-3,20-dione, 17,21-((methylborylene)bis(oxy))-5a- (23.76), 6. Retinoic acid, 5,8-epoxy-5,8-dihydro (24.80), 7. Androst-5-en-3-one, 19-acetoxy-4, 4-dimethyl-, oxine (26.14), 8. Choestan-26-oic acid, 3,7,12-trihydroxy-, 9. Benzamide, N-(4-chlorotetrahydro-3-thieryl)-3, 5- dimethoxy, s-dioxide (31.52). The nine compounds identified provide positive light upon anti-diabetic works and drug could be formulated in future for diabetic condition (Gayathiri *et al.*, 2019).

Anti-fungal activity. Sahayaraj *et al.* (2009) studied about the Antifungal activity of *Hemionitis arifolia* fern extracts on causative agents of groundnut early leaf spot and rust diseases

Anti-oxidant activity. Priya *et al.* (2021) evaluated the *H. arifolia* hydroalcoholic leaf extracts' anti-oxidant capacity. The hydroalcoholic leaf extract's capacity to neutralise free radicals was assessed using the DPPH+, ABTS+, reducing power assay, and nitric oxide test.

Anti-inflammatory Activity. The aqueous extracts of *H. arifolia* inhibited the heat induced haemolysis of RBCs and provided evidence for stabilization as an additional mechanism of their anti-inflammatory effect, this effect may possibly inhibit the release of lysosomal content of neutrophils at the site of inflammation (Antonysamy *et al.*, 2017).

Anti-cancer Activity. Gayathiri *et al.* (2019) studied about the Phytochemical properties of *H. arifolia* by using gas chromatography and mass spectroscopy which showed the mass spectrum of seven bioactive constituents. The bioactive compounds found to act as anti-fungal, anti-bacterial, anti-cancerous agents, fluorinating agent, pharmaceuticals, dye, nematicides, pesticides, chemotherapeutic agents, compounds curing fibrosis, obesity and diabetes.

CONCLUSIONS

In conclusion, *H. arifolia* stands as a remarkable and medicinally important plant, revered for its multitude of healing properties. Its historical significance, coupled with its diverse range of medicinal uses, make it a

valuable asset in the realm of herbal medicine. From its potential as an anti-inflammatory agent to its ability to aid digestion and promote respiratory health, *H. arifolia* has proven itself to be a versatile and effective remedy. As we continue to explore the potential of natural remedies, *H. arifolia* remains a beacon of hope, reminding us of the incredible healing power nature holds. With further research and understanding, this extraordinary plant has the potential to revolutionize the field of medicine and improve the well-being of countless individuals around the world.

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