Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2015, 7(7):1167-1171

Review Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Phytochemical and pharmacological review of *Andrographis echiodies*

D. Mathivanan and S. R. Suseem*

Pharmaceutical Chemistry Division, School of Advanced Sciences, VIT University, Vellore, Tamil Nadu, India

---

ABSTRACT

Andrographis echiodies is an Acanthaceae family plant it is used for many medicinal purposes in South Asia like India and China. This medicinal plant was extracted by different solvents and its medicinal properties were identified by various technique. Based on the literature, this plant possess pharmacological properties like antimicrobial activity, anti-inflammatory, diuretic, anthelmintic, analgesic, antipyretic, hepato-protective activities and antioxidant effect. It contains plenty of phytochemical constituents such as glycosides, flavanoids, flavones, steroids, tannins, carbohydrate, glycosides and alkaloids.

Keywords: *Andrographis Echiodies*, Acanthaceae, Medicinal properties, phytochemical Analysis

---

INTRODUCTION

Plants are containing more number of medicinal properties and it should be used to treat many diseases in humans. It contains plenty of medicinally bio-active compounds which are used to cure many diseases across the world. India is one of the countries contains more than45,000 plant species, out of that 15,000-20,000 plants are showing good medicinal properties, but currently 7,000-7500 plants only used for medicinal purposes [1]. Herbal drug companies are growing very fast in international market because modern medicine causes some health hazards problem [2]. *Andrographis echiodies* plant is located in dry land of south Asian countries. The leaf juice of *A.echiodies* is used to cure fevers. Genus of *Andrographis* family plants are used to cure various diseases like goiter, liver diseases, fertility problems, bacterial, malarial and fungal disorders[3] [4]. *Andrographis echiodies* boiled with coconut oil is used to decrease the falling and graying of hair[5].

Taxonomical Classification
Kingdom : Plantae,Plants
Subkingdom : Tracheobionta – Vascular plants
Superdivision: Spermatophyta – Seed plants
Division : Magnoliophyta – Flowering plants
Class : Magnoliopsida – Dicotyledons
Subclass : Asteridae
Order : Scrophulariales
Family : Acanthaceae – Acanthus family
Genus : *Andrographis* Wall. ex Nees – false waterwillow
Species : *Andrographis echioides* (L.) Nees – false waterwillow[6]

Vernacular names
Common name: False Waterwillow
Tamil : Gopuram tangi
Gujarati : Kalukariyatum
Malayalam : Pitumba
Marathi : Ranchimani
Oriya : Lavalata

Figure: 1 *Andrographis echiodies* plant

Habitat
Andrographis echiodies is an herbaceous plant widely located indry area of southern Asain countries [7].The flowering season of *Andrographis echiodies* is March-June, October-December [8] **.Figure 1** shows the habitat of *Andrographis echiodies* plant.

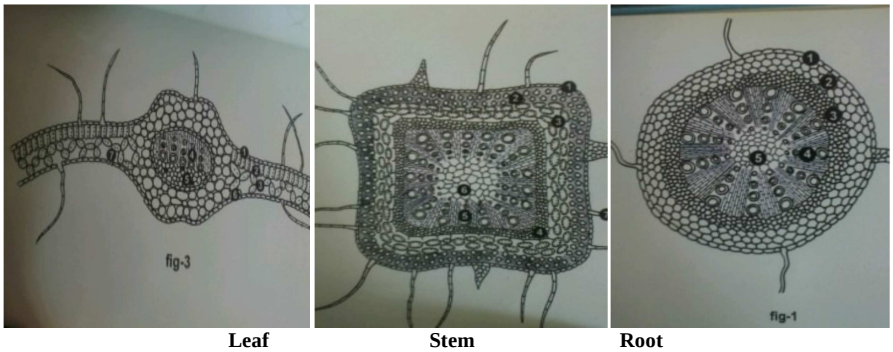
Morphology
Andrographis echiodies plant contains more number of branchlets to 50 cm long. Leaves are elongated form with approximately parallel sides to broad rounded apex and a tapering base and are sub-sessile with glandular hairs on both abaxial and adaxial surface. The stem is slightly quadrangular with hairs on its surface. The plant shows Raceme type of inflorescence not exceeding the leaves and is scarcely branched. The calyx of the flower is with sub equal lobes, lanceolate with glandular hairs. Corolla is white with brown tinge. It is tubular, showing the 2+3 lipped condition, which are unequal. Stamens-2, exserted and straight, style slender, with capitate stigma. The capsules are ovoid, sparsely hairy, pointed above and narrowed below. The average number of the capsule per plant is 38,seed are yellow in colour and ovoid. Four seeds per capsule, 1.5mm across and glabarous. By The free hand sections, the anatomical characters of root stem and leaf were observed [9].**Figure:2**shown the morphological character of the plant *A.echiodies.*

LEAF: The transverse section of leaf shows the upper and lower epidermis with glandular hairs. The mesophyll, in between the epidermis is made of palisade cells and spongy cells. The palisade parenchyma cells compactly arranged without any intercellular spaces. The spongy cells are loosely arranged with intercellular space and air cavities for gaseous exchange. In the midrib region the stele is surrounded a layer of compactly arranged parechymatous cells. The stele is limited by the boarded parenchyma cells. The xylem is facing the upper epidermis where the phloem is towards the lower epidermis [9]. The transverse section of leaf is shown in **Figure:2**.

STEM: T.S of the stem shows the well-defined epidermis with epidermal hairs. It is followed by the hypodermis and the chlorenchymatous cortex. The xylem elements are spherical in shape. The xylem is endarch. The phloem is encircling the xylem. Prominent pith is present in the centre. The pith cells are polygonal and are compactly arranged [9]. The transverse section of stem is represented in **Figure:2.**

ROOT: The outermost covering of the root is the epidermis which is composed of single layer of barrel shaped epidermal cells. It lacks stomata and cuticle. The epidermis is followed by the compactly arranged parenchymatous cortex. Secondary growth is present. The phloem is towards The epidermis and the xylem are at the centre [9].

Figure:2 shown the transverse section of root of *A.echiodies*.



Leaf Stem Root

Figure:2 Transverse sections of *Andrographis echiodies* Leaf, Stem and Root

Part used from *Andrographis echiodies*

Whole plant, leaves and stem.

Chemical constituents from *Andrographis echiodies*

From the leaves extract of *A.echiodies*, various chemical constituents were isolated dihydroechioidinin , skullcap avone 1 2'-methyl ether, echioidinin, echioidin, skullcap avone 1 and 2'-O-b-D-glucopyranoside[10].

Some of the other chemical constituents present in the *A. echiodies* are more than 17 compounds such as borneol (2.6%), cyclohexanol 2,4 dimethyl phenol (1.89%), 3,4 altroson (3.5%), n-deconoicacid (15.29%),Squalene (22.57%), vitamin E (7.40%), Methoprene (1.53%), 2-nonenlolOxirane,octyl-, 2, 2-cyclopentene-1-undecanoic acid, ketone, 1,5-methylbicyclo [2.1.0] pent-5-ylmethyl (10.61%) and 2,5-cyclohexadiene-1,4- dione, 2, 5-dihydroxy-3-methyl -6- (1-methylethyl) bicycle heptan -3- one, 2,6,6-trimethyl (1à,2á,5à) (1.60%), (-)-3-á-Acetoxy-5-etienic acid(3.0%). The medicinal propities of these compounds needs further research which can pave way to further applications and utility of *A. echioides* in pharmaceutical field [11].

Pharmacological Activity of *Andrographis echiodies*

Diuretic Activity

Diuretic activity of petroleum ether and chloroform extract of *Andrographis echiodies* leaves was studied by Raama Murthy et al (2012). Chloroform extract of *A.echiodies* exhibited significant diuretic activity as evidenced by increased total urine volume and the urine concentration of Na^+, K^+ and Cl^-. The result of the work indicates that plant can be used for future work and its effective against free radical mediated diseases [12].

Antimicrobial Activity

Petroleum ether, chloroform, acetone and methanol extract of *A. Echioides* leaves and stems were screened for its preliminary phytochemical analysis. The antimicrobial activity of the crude extracts was evaluated by Sermakkani *et al.,* (2011) against *Candida albicans* [13].

Anthelmintic Activity

Padma *et al*., (2012) evaluated the anthelmintic activity of ethyl acetate, methanol and aqueous extract of whole plant of *Andrographis echioides* against *Pheretima posthuma*. The results revealed that the test extracts of *A. echioides* exhibited significant anthelmintic activity at concentration of 50 mg/ml. The use of *A. echioides* as an anthelmintic has been confirmed and further studies are suggested to isolate the active principles responsible for the promising activity[14].

Hepatoprotective and Antioxidant effect

In this study the methanolic extract of *A. echioides* was investigated for its hepato protective and antioxidant effects against acetaminophen induced hepatotoxicity in wistar albino ratswas studied by Basu *et al.,* (2009) [15].

Anti-inflammatory, Analgesic and Antipyretic activity

Basu *et al.,* (2009) evaluated the anti-inflammatory, analgesic and antipyretic activity of ether, chloroform, and ethyl acetate extract of *Andrographis echioides* in rats and mice. The results suggest that different extracts of *A.echioides*

produce antinociceptive, anti-inflammatory and anti-pyretic activities that could be due to the effect of one or a combination of the bio-active components in each extract [16].

Anti-ulcer activity

Anti-ulcer activity of ethanol extract of *Andrographis echioides* was evaluated by Ramasubramania Raja *et al.*, (2014). The extracts have shown potential anti-ulcer activity in all the tested models [17].

Synergistic effect

Sankaran Rajkumar *et al.,* (2012) studied the synergistic Leaves of *Andrographis echioides* is subjected to Soxhlet extraction using ethanol as solvent. The plant alcoholic extract was examined against 4th instar larvae of *A.aegypti* with gradually increasing concentration from 50 to 250mg/L using WHO protocol. From the results it can be concluded that synergistic effect of *A. echioides* as a more powerful arsenal for control of *A.aegypti* [18].

Phytochemical Analysis of *Andrographis echiodies*

The whole plant of *Andrographis echiodies* contains more number of phyto-constituents that are extracted using various solvents depending upon the polarity of these compounds. The isolated compounds are listed below Kanchana *et al*.,(2014) reported that petroleum ether, chloroform, ethyl acetate and hydro-alcoholic extracts contains flavonoids, saponins, tannins, phenols, terpenoids and steroid [5].

Raama Murthy *et al.*,(2012) reported the presence of glycosides, flavanoids, flavones**,** steroids, tannins, carbohydrate, glycosides**,** alkaloids, proteins, amino acids andsaponins in petroleum ether and chloroform extract [12].

Sermakkani *et al.,* (2011) reported that petroleum ether, chloroform, acetone and methanol extract contains alkaloids, flavonoids, glycosides, steroids, phenols, tannins and saponins[13].

Padma *et al.*, (2012) reported that ethyl acetate, methanol and water extract contains alkaloids, flavonoids, glycosides, phenols, phytosterols, proteins, saponins, tannins and triterpenoids [14].

Ramasubramania Raja*et al*.,(2014) reported the presence of alkaloids, flavonoids, terpenoids, tannins,volatile-oils, amino acid, cardiac glycosides, gums and phytosteroids in ethanol extract[17].

Table 1: Works reported on *AndrographisEchiodies*

S.No	Parts used	Activity	Chemical constituents	Reference
1	Leaves	Synergistic effect	_	SankaranRajkumar et al (2012)
2	Leaves	_	Chemical constituents of 17 compounds	Nirubamaet al (2014)
3	Leaves	Diuretic activity and Phytochemical Constituents	_	Raama Murthy et al (2012)
4	Whole plant	Phytochemical screening and Antimicrobial activity		Kanchana et al (2014)
5	Whole plant	Preliminary phytochemical and Antimicrobial activity	_	Radha et al
6	Whole plant	Chemical Constituents and Anti-Inflammatory Activity	_	Yang Shen et al (2013)
7	Whole plant	Anthelmintic Activity	_	Padma et al (2012)
8	Leaves	Hepatoprotective and antioxidant effect	_	Basu et al (2009)
9	Leaves	Anti- inflammatory, Analgesic and Antipyretic activities	_	Basu et al (2009)
10	Whole plant	Antiulcer activity	_	Ashok Kumar(2011)

CONCLUSION

Review on *Andrographis echioides* showed that it contains enormous amount of phytochemical constituents. In addition, it possesses wide range of pharmacological activities. Hence the plant can be used to treat many diseases, and can be used in various pharmaceutical formulation and drug development studies.

REFERENCES

[1] Ankita Kataky and Handique. *Asian Journal of Science and Technology,* **2010**, 6: 113-118
[2] Alok Sharma, Shanker, Lalit Kumar Tyagi, Mahendra Singh and Ch.V.Ra. *Academic Journal of Plant Sciences*,**2008**, 1(2): 26-36.

[3] Kirtikar et al In Indian medicinal plants, 3. NewDelhi: Periodical Experts **1975**.
[4] Zulfkar Latief Qadrie, Beena Jacob, Anandan, Rajkapoor and Mohammed Rahamath Ulla. *Pak J Pharm Sci*, **2009**; 22 :123-125.
[5] Kanchana Nirubama, Rubalakshmi. *World Journal of Pharmacy and Pharmaceutical Sciences*, **2014**; 3(5):702-710.
[6] Pandi Kumar. *Indian J Tradit Knowl*, **2007**; 6:579-82.
[7] John T Kartesz. *Andrographis echioides* (L.) Nees false water willow natural resources conservation service united state department of Agriculture **1964**.
[8] Nandkarni . Indian materia medical popular book depot:Bombay, **1976**; 101-102
[9] Anandanayaki and Uma. *International Journal of Advances in Pharmacy, Biology And Chemistry IJAPBC*, **2014**;3(3) 2277 – 4688.
[10] Jayaprakasam Damua, Gunasekara, *Phytochemistry*, **1999**; 1(3): 92-97.
[11] Nirubama, Kanchana and Rubalakshmi. *Int. J. Curr. Res. Biosci. Plant Biol*,**2014**; 1(3):92-97
[12] Raama Murthy Rajaraman and Meera. *IJPCS* **2012**; 1(4):1315-1321
[13] Sermakkani Radha and Thangapandian *Pharma Science Monitor*, **2011**;2 (2): 92-101
[14] Padma Sarojini, Devi, Manjunatha, Philip and Venkata Raju *Journal of Pharmacy Research*, **2012**.; 5(9): 4801-4803.
[15] Basu, Rupeshkumar and Kavitha *journal of biological sciences*, **2009**; 9(4):351-356.
[16] Basu, Rupeshkumar and Kavitha *international journal of pharmacology*,**2009**; 5(4):251-256.
[17] Ramasubramania Raja *Journal of Pharmacognosy and phytochemistry* **2014**, 3 (3): 39-49.
[18] Sankaran Rajkumar Arulsamy Jebanesan, Rajarathinavelu Nagarajan . *Asian Pacific Journal of Tropical Biomedicine*, **2012**; 1588- 1591.