

**A REVIEW ON: ENHYDRA FLUTUANS LOUR WITH ITS PHARMACOLOGICAL APPLICATION**Himanshu C. Chaudhari<sup>1\*</sup>, Vishakha G. Patil<sup>2</sup> and Kiran P. Patil<sup>3</sup>

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**ABSTRACT**

Enhydra Fluctuans Lour a medicinal plant commonly known as halencha belonging to family *asteraceae*. It played an important role since ancient times in treating various kinds of diseases. It enlarging great important for its therapeutic potential. Enhydra Fluctuans is one such plant which is semiaquatic herbaceous vegetable plant with serrate leaves which is available abundantly in India especially in the North Eastern states. It has immense potential as medicinal plant and also has many beneficial effect. The leaves are slightly bitter, cure inflammation, skin diseases, laxatives, bronchitis, leucoderma, billiousness and good in small pox. It also reported having anticancer, antioxidant, antidiabetic, antidiarrheal, hepatoprotective even neuropharmacological effect. These activities can be attributed mainly to presence of phytochemicals such as flavonoid, alkaloid, saponins, tannins, phenols, and carbohydrates and nutritional value including  $\beta$ carotene, enhydrin, and so on. This review aims at compling the potential benefits of Enhydra Fluctuans Lour based on its pharmacological activity.

**KEYWORDS:** Enhydra Fluctuans, Pharmacological activity, Phytochemical, Anticancer, Flavonoid.**INTRODUCTION<sup>[1,2]</sup>**

Enhydra Fluctuans Lour (Family-*Asteraceae*) is a medicinal plant and is a small genys of marsh herb distributed in tropical and subtropical regions. The plant is prostate spreading annual herb. Use of plant as a source of medicine has been an ancient practice and is an important component of the health care system in India. In India many forms of alternative medicine are available for those who do not want conventional medicine or who cannot be helped by conventional medicine. In the last decade there has been considerable interest in resurrecting medicinal plant in wasterm medicine and integrating their use into modern medical system. This plant is also an edible semiaquatic herbaceous vegetable plant with serrate leaves grows all over India especially in estern state. The leaves which are slightly bitter are use to treat inflammation, skin diseases and small pox. Enhydra Fluctuans is one such plant with a wide range of therapeutic application and has been used for years as traditional medicine in remote areas of Indomyanmar biodiversity. It is one of the 25 global biodiversity hotspot acknowleged currently. Very less importance has been given to its prevalence in the north eastern region of India specifically and its common use amongst the rural population. It is mainly used for its analgesic, anticancer, antioxidant, antimicrobial, antidiarrheal, hepatoprotective and even neuropharmacological effect.

**Classification<sup>[3]</sup>**

Kingdom: Plantae  
Division: Magniliophyta  
Class: Magnoliopsida  
Order: Asterales  
Family: *Asteraceae*  
Genus: Enhydra  
Species: Fluctuans Lour

**Vernacular name<sup>[3]</sup>**

English: Marsh Herb, Water Cress  
Hindi: Harkush  
Assamese: Helenchi  
Bengali: Helencha  
Oriya: Hidimicha

**Synonyms**

Enhydraangallis Gardner  
Meyerafluctuans (Lour) Spreng

**Chemical Constituent<sup>[4]</sup>**

Plant is rich in protein and is a good source of  $\beta$ carotene. It also contain saponins, myricyl alcohol, kaural, cholesterol, sitosterol, glucoside, sesquiterpene lactone including germacrunolide, enhydrin, fluctuanin and fluctuandin. A number of diterpenoid acids and their isovalerate and angelate derivatives, stigmasterol, cholesterol, glucoside, other sterol and gibberellins A9 and A13 have been isolated from this plant.

**Characteristics**<sup>[5]</sup>

Climate: Tropical

Habitat: Hydrophytic

Habit: Herb

Flower colour: Beige, White

**Botanical Description**<sup>[6]</sup>

Commonly known as water cress or Marsh Herb. It is a trailing marsh herb growing annually also floating on water. Stem 30-60 cm long rooting at the nodes leaves are sessile, 2.5 -7.5 cm in length, linear to oblong acute or obtuse and stalk less and margins are distinctly dented. Flower are white to greenish white in colour. Stem are fleshy hairy and branched 30 cm or more in length. Rooting can be seen at the lower nodes, the fruits are enclosed by rigid receptacle-scale, pappus is absent.



**Fig. 1: a whole plant of enhydra fluctuans.**

<http://bdwb.wildwingsindia.in/share.php?id=B5AnDiAsAsEnFlx>

**Geographical prevalence**<sup>[3,7]</sup>

This species is possibly of indochinese origin, which occurs in tropical Asia and Africa. It is common to all countries of Southern Asia like Bangladesh, India, Indonesia, Myanmar, Malaysia, Sri Lanka, Thailand, Vietnam etc. *Enhydra fluctuans* is a hydrophytic plant mostly found on wet roadside canal and marshy waste places between the month of November to January. It is highly prevalent in Bangladesh, Malaysia, China and the rest of South East Asia and tropical Africa. In India this plant is predominantly found in the North Eastern region and mostly in Assam. The plant is commonly found in the state. A study also reported its common prevalence in other districts of Assam such as Golaghat, Karbi, Anglong, Lakhimpur, Dibrugarh and Jorhat. In Dhemaji district and Majuli island of Assam also this plant is abundantly found in Thoubal district of Manipur. *Enhydra fluctuans* is a common plant used for treating a range of diseases. Jaintia hills in Meghalaya and Agartala in Tripura is also considered to be a zone rich in this plant source.<sup>[3]</sup>

**Ethnopharmacology**<sup>[8,9]</sup>

In Cachar district of Assam the steam of the plant is used in gastric acid ulcers and the whole plant is used in the treatment of constipation. *Enhydra fluctuans* is also considered as a wild edible food plant by the Shan tribe of Assam. The Shan tribe of Assam is a Sino-Tibetan race of Mongoloid stock whose ancestors migrated from South West China. A study was carried out in the district of

Golaghat, Karbi-Anglong, Lakhimpur, Dibrugarh and Jorhat of Assam where *Enhydra fluctuans* was found to be a supplementary food source and young shoots as cooked vegetables. The plant locally called as Helechi, is also considered as a folk medicine by certain population of Dibrugarh district where the aerial part of the plant are crushed finely and applied over pimples. In Thoubal district of Manipur, this plant known as Kamprektujombi locally is used by the Meitei-Pangal community for treatment of diabetes. They practice the extract obtained by boiling the plant cut into pieces at the nodes. The whole plant is also used by Muslim herbalist of this region in treating kidney stone by drinking the liquid of boiled leaves mixed with sugar in a prescribed ratio. In Meghalaya, the Jaintia tribe locally call it as Kyanbathingcha and use the leaf juice in skin diseases and as laxative and orally prescribe it in liver diseases. *Enhydra fluctuans* is also considered as a wild edible plant in Majuli and Darrong district of Assam. Studies have also been carried out on the phagocytic properties of this plant extract from sample collected from Agartala in Tripura as well.

**Phytochemicals**<sup>[3,10]</sup>

Different extract of *Enhydra fluctuans* have been tested for the presence or absence of primary and secondary bioactive compound like carbohydrates, proteins, oils, alkaloids, flavonoids to name a few. It has been found to be a rich source of flavonoid and moderate presence of alkaloid, tannins, phenolics and carbohydrates have been reported.<sup>[3]</sup> *Enhydra fluctuans* is a good source of  $\beta$ -carotenes and protein and various other component like saponins, myricyl alcohol or triacontanol, phytosterol like cholesterol, sitosterol, stigmasterol and stigmata-5, 22, 25 triene-3p-ol glucosides a number of diterpenoid acids and their isovalerate and angelate derivatives, sesquiterpene lactones including germa-cranolide like enhydri, fluctuanin, fluctuanidin, several kaurene derivative, 4-hydroxy-farnesyl acetate and gibberellin studies with its leaf oil reveals the presence of several component among which major component are myrcene (37%) and limonene (28%) the other component reported less than 5% are  $\alpha$ -pinene,  $\beta$ -ocimene, camphor,  $\alpha$ -humulene, linalool, 1-octane-3-ol and longiverbenone apart from this 1,2-dihydroperylladehydes and cis/trans-4-isopropenylcyclohexane carboxaldehydes are newly found compound from leaf. Two flavonoid isolated from ethyl acetate fraction of plant are baicalien-7-O-glucoside and baicalein-7-O-diglycoside which are reported to have cytotoxic activity as well as analgesic and anti-inflammatory activity. An isoflavone glycoside 4,5,6,7-tetrahydroxy-8-methoxyisoflavone-7-O-beta-D-galactopyranosyl-(1-->3)-o-beta-D-xylopyranosyl-(1-->4)-o-alpha-1-rhamnopyranosides was reported from the methanolic extract of *Enhydra fluctuans* Lour and is considered as a novel bioactive constituent from the water extract of leaves of this plant 24 kDa arabinogalactan is reported and the leaves have a (1-3)-linked  $\beta$ -D-Galp main chain substituted at 0-6 by (1,6)-linked  $\beta$ -D-Galp side chain. The letter residue are

substituted at 0-3 by (1,3)-, (1-5)-, and (1,3,5)-linked  $\alpha$ -1 araf chains and nonreducing end units of  $\alpha$ -1 Araf and  $\beta$ -d Galp. Also the aqueous extract of revealed the stimulation of a biological response of the carbohydrate polymer of the plant. The structure and stereochemistry of sesquiterpene lactone were elucidated from Enhydra Fluctuans by NMR techniques and chemical reaction.

### Pharmacological activity

#### 1) Anti-Inflammatory Activity<sup>[11]</sup>

The flavonoid isolated from leaves of Enhydra Fluctuans shows anti inflammatory activity by inhibiting COX2 and 5-LOX moreover, flavonoid isolated from leaves of Enhydra Fluctuans exhibits in vitro on key enzymes of arachidonic acid cascade involve in the mediation of Inflammation. Based on it invitro antiinflammatory activity of flavonoid fraction was evaluated by using carrageenan induced paw odema and cotton pelled induced granuloma. It significantly reduced the inflammation in such cases.

#### 2) Analgesic Activity<sup>[3]</sup>

The methanolic extract of Enhydra Fluctuans gives orally at the dose of 250 and 500 mg, 1kg was evaluated for its analgesic activity using the acetic acid induced writhing and the tail-flick method. The extract showed promising activity in both test. The total flavonoid are responsible for 27.05% and 55.49% protection against acetic acid induced writhing response in swiss Albino mice when administered orally at doses 200mg/kg and 400mg/kg.

#### 3) Antioxidant Activity<sup>[11]</sup>

The antioxidant potential of crude methanol extract of as well as chloroform, ethyl acetate and n-butanol soluble fraction of Enhydra Fluctuans Lour which is widely used in Imdigenous system of medicine for different purpose were studied. The crude extract and all the fraction showed free radical scavenging activity when tested in different models. Among all the fraction the ethyl acetated fraction exhibit the highest free radicals. Scavenging activity in all the tested models comparing to crude extract and n-butanol fraction.

#### 4) Hepatoprotective activity<sup>[10]</sup>

The hepatoprotective potential of Enhydra Fluctuans against carbon tetrachloride induced oxidative damage in rats was evaluated by sannigrah et al. Result showed the flavonoid rich ethyl acetate fraction to have significant hepatoprotective activity. Probably due to the extract ability to inhibit lipid peroxidation and increase the antioxidant enzymatic activity. Ccl4 induced elevation of 5GOT, 5GPT significantly decrases because of petroleum ether, chloroform, ethyl acetate and ethanol extract of aerial part of Enhydra Fluctuans and it also induced extensive necrosis and steatosis.

#### 5) Antidiabetic uses & Antimicrobial Activity<sup>[11]</sup>

A study carried out by the meiter-pangal community of the thoubal district of manipur states that Enhydra extract can be effectively used as an antidiabetic plant by

boiling and cutting it at the nodes. It was also found that the tribal practitioner of the marakh seet of the Garo tribe living in mymensingh of Bangladesh used twelve medicinal plantvfor treatment of diabetis out of which Enhydra Fluctuans is one of them. It also found that Enhydra Fluctuans have potent antimicrobial activity against many gram positive as well as gram negative organism. Some of them are *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus typhi*, *Staphylococcus aureus*, *Shigella boydii*, *Bacillus subtilis* and it also having antifungal activity against selected fungi like *Aspergillus niger* and *Fusarium spp*, *Asperigillus Fumigates* etc.

#### 6) CNS Depressant/Antistress Activity<sup>[6]</sup>

Roy et al. studied Neuropharmacological effect of three fraction of aerial parts of Enhydra Fluctuans using mice models. Results showed significant spontaneous motility depressant sedative anticonvulsant and antistress activity.

#### 7) Anticancer Activity<sup>[11]</sup>

Flavonoid isolated from Enhydra Fluctuans (FEF) were screened for anticancer activity against Earlich's ascites carcinoma (EAC) bearing swiss albino mice. Two flavonoid baicalein 7-O glucoside and baicalein 7-O diglucoside were isolated from the ethyl acetate fraction. Treatment with FEF caused a significant decrease in the tumour cell volume and increase of life span.

#### 8) Anti-diarrheal Activity<sup>[12]</sup>

Uddin et al studied the methanol and aqueous extract of the Enhydra Fluctuans that showed antidiarrheal activity on castor oil induced diarrhea. The methanolic extract moderately inhibited growth of *S.dysenteriae*, *S.boydii* and *S.flexneri* the aqueous extract inhibited growth of *S.aureous*, *S.dysenteriae* and *S.boydii*.

#### 9) Neuroprotective potential<sup>[11]</sup>

Identification and characterization of new medicinal plants to cure neurodegenerative diseases and brain injuries resulting from stroke is the major and increasing scientific interest in recent years. The indian system of medicine out of the numerous medicinal plants showing promising activity in neuropsychopharmacology Enhydra Fluctuans is one of them. Some neuropharmacological effect of three fractions (Benzene, Chloroform & Ethyl Acetate) of methanolic Extract of Enhydra Fructuans were studied in mice using various models. The study conclude that fifferent fraction of Enhydra Fructuans aerial parts posseses central nervous system depressant activity.

#### 10) Phagocytic and Cytotoxic Activity<sup>[11]</sup>

The aqueous extract of this plant have showed effective result on neuttophill phagocytic function. Different concentration of the leaf extract were subjected to study its effect on different invitro methods of phagocytosis such as neurophill locomotion, chemotaxis, Immunostimulant activity of phagocytosis of killed

candid albicans and qualitative nitro blue tetrazolium test using human neutrophils.

#### REFERENCES

1. Kirtikar KR, Basu BD. Indian Medicinal Plants. Sri Satguru Publications, Delhi, 2002; VIII: 1360.
2. Patil KS, Majumder P, Wadekar RR. Effect of Enhydrafluctuans Lour leaf extract on phagocytosis by human neutrophils. *Journal of Natural Remedies*, 2008; 8(1): 76–81.
3. Mr.Chaitanya J Sonawane, Mr.Atul A Patil, Mr. Vikrant M Patil, Prof.Paresh A Patil. *A Asian Journal of Pharmaceutical Reserch*, 11(4): Dec-2021; 1-3.
4. Ghani A. Medicinal plant of Bangladesh. *Asiatic Society of Bangladesh, Bangladesh*, 2003: 3-17, 215, 323.
5. Dokosi OB. Herbs of Ghana. Ghana University Press, Accra, Ghana, 1998.
6. Roy SK, Mazumder U, Islam A. Pharmacological evaluatio of Enhydra fluctuans aerial parts .for central nervous system depressant activity *Pharmacologyonline*, 2011; 1: 632-643.
7. Md. Ramjan Ali\*, 'Md. Mustahsan Billah, MD. Mahadi Hassan, Syed Masudur Rahman Dewan, Md. Al-Emran. *Research J. Pharm. and Tech*, September 2013; 6(9): 927-929.
8. Chakraborty R, De R, Devanna N, Sen S. North East India an ethnic Storehouse of Unexplored Medicinal Plants. *J Nat Prod Plant Resour*, 2012; 2(1): 143-152.
9. Pandey AK, Bora HR. Edible plants of Shan Tribe of Assam. *Ancient Science of Life*, 1997; XVI(4): 258-276.
10. Sagarja Saha and Santanu Paul. *Journal of Pharmacognosy and Phytochemistry*, 2019; 8(2): 888.
11. Upasana Sarma, Vedant V Borah, Kandarpa KR saikia, N.K. Hazarika. *International Journal of Pharmacy and Pharmaceutical Sciences*, 2014; 6(2): 2.
12. Uddin SJ, Ferdous MS, Rouf R, Alam MS, Sarker MAM, Shilpi JA. Evaluation of Anti- diarrhoeal activity of Enhydra fluctuans. *J Med Sci.*, 2005; 5(4): 324-327.