



## PHYTOCHEMICAL PROFILE AND PHARMACOLOGICAL SIGNIFICANCE OF THE GENUS HEMIGRAPHIS: THERAPEUTIC POTENTIAL

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**ABSTRACT** In now a day's fast-paced world, herbs have gained renewed importance for health, daily life and sustainability. With increasing awareness about natural remedies and fewer side effects, human are turning back to plant based solutions. In the modern era, the value of herbs is immensely significant in human well-being. Herbs have been used in traditional medicine like unani, ayurveda systems. Several herbs are used in daily cooking and are rich in vitamins with minerals. They improve digestion and enhance flavour naturally. Hemigraphis colorata is one of them. They are most useful herbs. These are rich source of therapeutic properties which cure various types of human diseases. Recent studies have highlighted its antioxidant, antibacterial and anti-inflammatory properties. The plant grows in warm and humid environments and is highly valued for its ornamental effects.

**KEYWORDS :** Hemigraphis, Herbal Medicine, Phytochemical Properties, Phenolic Components,

### INTRODUCTION

The prevalence of metabolic and age-related disorders has dramatically increased as a result of the modern lifestyle's unbalanced dietary composition, low levels of physical activity, and environmental contaminants. Chronic systemic low-grade inflammation is a hallmark of several chronic diseases, including diabetes, cardiovascular disease, autoimmune diseases, breast, colorectal and pancreatic malignancies, and neurological diseases (1). In the global health system medicinal herbs have emerged as a possible source of therapeutic treatments for both humans and animals for preserving good health (2).

Herbal Medicine is the study and application of plants' therapeutic qualities. Approximately 2500 of the 20,000 or more native plant species in North America have historically been used by Native Americans. Traditional medicine, which contains substances derived from medicinal plants, is used by almost 80% of the public globally (3). Numerous phyto-chemical components found in plant extracts have been discovered as bio-active substances, and they may be the cause of the variety of medical effects of herbs (4).

**Phytogeography and Structure of Plant:** Hemigraphis alternata is indigenous to East Malaysian regions and has adjusted to the Indian climates (5). It has been extensively commercialized and brought as a decorative plant to tropical and subtropical nations in Asia, America, the Caribbean, and several islands in the Pacific and Indian oceans (6,7,8,9). The plant *H. alternata*, also known locally as Murikootti (Malayalam) and popularly referred to as Red Ivy or Purple Waffle Plant, is well renowned for its healing properties (10). The annual creeping perennial herb *H. alternata* is a herb that grows up to 30cm. The simple leaves are arranged in the opposite direction and have a toothed edge. The stem is upright, reddish-brown, and the leaf blades are reddish brown bottom and silver on top. In the past, this plant's leaves have been used to treat kidney stones, anemia, bleeding and diarrhea as well as to heal wounds (11). It is also used to induce sterility and as a contraceptive (12).

### Scientific Classification –

- Kingdom : Plantae
- Division : Tracheophyta (Spermatophyta)
- Class : Mangoliopsida (Dicotyledons)
- Order : Lamiales
- Family : Acanthaceae
- Genus : Hemigraphis
- Species : Colorata

### Synonyms:

- Blechum cordatum Leonard
- Goldfussia colorata (Blume) Moritz

- Hemigraphis alternata (Burm.f.) T.Anderson
- Hemigraphis colorata W.Bull
- Hemigraphis colorata L.
- Hemigraphis colorata (Blume) Hallier f.
- Ruellia alternata Burm.f.
- Ruellia colorata Blume



**Parts Utilized:** Mostly leaves are used for therapeutic purpose. The leaves are opposite, ovate to cordate about 2-8cm long and 4-6cm wide, well defined veins. 100 grams of fresh leaves contain approx. 0.351grams of potassium (13,14, 15).

Hemigraphis alternata leaves contain Tetramethyl-2-hexadecen-1-ol, which has the highest affinity for blocking COX-1. It is more affinitized for Aspirin as a medicine of comparison. Cyclooxygenase 1 (COX-1) is one of the pharmacological objectives of anti-inflammatory medications. This indicates that Hemigraphis alternata leaves include active ingredients that may be added to medications to reduce inflammation (16).

### Phytochemical Properties:

**Antibacterial Properties:** Antibacterial selection showed the benzene extract demonstrated that maximum zone of inhibition against the pathogen Acinobacter species and S.aureus due to the presence of phenolic compounds (17,18).

**Anti-Diabetic Properties:** Study of n-hexane and ethanol extraction of plant reviled that dropping of blood glucose in glucose induced rats. The effect was attributed to steroids and coumarins present in the extract (19).

**Wound Healing Properties:** The wound tightening and epithelialisation were quicker in Hemigraphis leaf paste used mice compared to control. In the Hemigraphis treated lesions, the drug

adhered on the wound and stopped the discharges from wound within a few hours after the use (20,21).

**Anti-inflammatory Properties:** In vitro anti-inflammatory examine was carried out by HRBC membrane equilibrium method. The anti-inflammatory effects of extraction of Hemigrapshis may be due to the existence of flavonoids, tannins, and phenols etc phytochemicals (22).

**Anti – Oxidative Properties:** The extraction of Hemigrapshis leaf having reducing antioxidant and DPPH scavenging activities. Phenolic combinations are active hydrogen donor that makes them a good antioxidant (22). The phenolic acids like chlorogenate, cinnamate, coumarate, gallate and ferulate are present in the plant herbs as pro-oxidants and shows free radical scavenging activity (23).

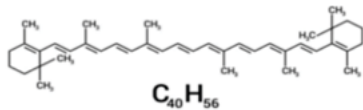
**Anthelmintic Properties:** The studied reported that the different extracts of Hemigrapshis showed anthelmintic properties against Indian earthworms (*Pheretima posthuma*) at concentration of 20mg/ml, 40mg/ml and 80mg/ml. It is shown that the standard Albendazole medicine (80mg/ml) showed the effect at 10 minutes and the 80mg/ml concentration of fresh juice extraction revealed the effect at 21 minutes where the high concentrations of aqueous and ethanolic extracts showed the effect at 28 and 43 minutes respectively (24).

**Anti-cancer Activity:** Sasidharan et al., reported that anti-cancer action of the extracts of Hemigrapshis against Skin cancer cell line-A431 and normal cell HEK-293 indicated cytotoxicity in dose dependent manner. It was concluded that the cell toxicity was primarily result of apoptosis and cell nuclear damage (25).

**Anti-diarrhoeal Properties:** Rahman et al. shown that methanol and ethyl acetate extract of Hemigrapshis indicated anti-diarrhoeal activities against castor oil induced anti-diarrhoeal test in mice. The treatment continued the time for induction as well as lower the frequency of defecation in a dose dependent way (22).

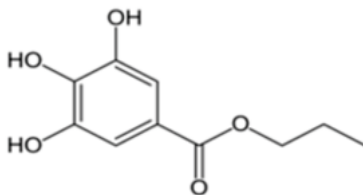
### Pharmacological Components

Phytochemicals or pharmacological components are a collection of secondary metabolites that have beneficial properties. The plant have rich source of primary and secondary metabolites comprising of phenols, saponins, flavonoids, terpenoids, coumarins, carbohydrates, carboxylic acid, xanthoproteins, tannins, proteins, alkaloids, steroids, and sterol (26). Many studies suggest that Beta- Carotene is the main chemical components of Hemigrapshis. Phenolic compound like gallate, ferulate and chlorogenate are also found in Hemigrapshis plants.



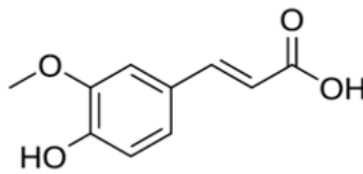
**Figure 1:- Beta Carotene**

Source-<https://en.wikipedia.org/wiki/%CE%92-Carotene>



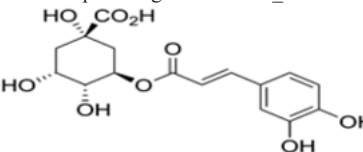
**Figure 2:- Gallate**

Source-[https://en.wikipedia.org/wiki/Propyl\\_gallate](https://en.wikipedia.org/wiki/Propyl_gallate)



**Figure 3:- Ferulate**

Source-[https://en.wikipedia.org/wiki/Ferulic\\_acid](https://en.wikipedia.org/wiki/Ferulic_acid)



**Figure 4:- Chlorogenic Acid**

Source-[https://en.wikipedia.org/wiki/Chlorogenic\\_acid](https://en.wikipedia.org/wiki/Chlorogenic_acid)

### Miscellaneous Activity

Apart from pharmacological properties Hemigrapshis can also be applicable for another purpose. It prevent the mild steel corrosion in 1M HCl was investigated using mass loss measurements, ultraviolet-visible(UV) spectroscopy, Fourier transform infrared spectroscopy and other techniques at the temperature ranges 303K – 323K[22] and also nanoparticles of Hemigrapshis having a important role in the bioremediation of waste water (27,28). The leaves extract also can be used as a natural dye.

### CONCLUSION

In this review we may say that Hemigrapshis colorata has therapeutic properties that can reduce the oxidative stress. It has antibacterial, anti-diabetic, wound healing, anticancer, anthelmintic, anti-oxidative, anti-inflammatory, anti-diarrhoeal properties. So that we can use this medicinal herb as a regular basis for our own health. As a result this herb considered as a super herb.

### REFERENCES

- d'Angelo, M., Castelli, V., Tupone, M. G., Catanesi, M., Antonosante, A., Dominguez-Benot, R., Ippoliti, R., Cimini, A. M., & Benedetti, E. (2019). Lifestyle and Food Habits Impact on Chronic Diseases: Roles of PPARs. *International Journal of Molecular Sciences*, 20(21), 5422. <https://doi.org/10.3390/ijms20215422>
- Wasullah, M., Piyush Yadav, P., Yadav, S., Chandan (2023). Review article on the role of herbal medicine in health care. *International Journal of Pharmaceutical Research and Applications*, 8(3), 636-640
- Alabri, T. H. A., Al Musalami, A. H. S., Hossain, M. A., Welu, A. M., & Al-Riyami, Q. (2014). Comparative study of phytochemical screening, antioxidant and antimicrobial capacities of fresh and dry leaves crude plant extracts of *Datura metel* L. *Journal of King Saud University-Science*, 26(3), 237-243.
- Rahman, S.M.M., Atikullah, M., Islam, M.N. et al. (2019). Anti-inflammatory, antinociceptive and anti-diarrhoeal activities of methanol and ethyl acetate extract of *Hemigrapshis alternata* leaves in mice. *Clinical Phytoscience*, 5(16) <https://doi.org/10.1186/s40816-019-0110-6>
- Gowthaman, S., Ilango, D., Brindha, R., Bharathi, S., Paulraj, W. P., Aju, N.T., & Yadukrishnan T. (2024). A Comprehensive Review of Hemigrapshis Alternata. *International Journal of Pharmaceutical Research and Applications*, 09(05), 576–587. <https://doi.org/10.35629/4494-0905576587>
- Daniel, T.F. and D. Rodríguez. 2016. New distribution records for Acanthaceae in El Salvador with a list of native and naturalized species noting occurrences by department. *Phytoneuron*, 31, 1–8.
- Meyer, J. Y., Lavergne, C., 2004. Beautés fatales: Acanthaceae species as invasive alien plants on tropical Indo-Pacific islands. *Diversity and Distributions*, 10(5/6) 333-347.
- Acevedo, Pedro & Strong, Mark. (2012). *Catalogue of Seed Plants of the West Indies*. Smithsonian Contributions to Botany. 98. 1-1192. [10.5479/si.0081024X.98.1](https://doi.org/10.5479/si.0081024X.98.1)
- PIER. 2016. *Pacific Islands Ecosystems at Risk*. Honolulu, USA: HEAR, University of Hawaii. <http://www.hear.org/pier/index.html>
- Sreekumar, D., Bhasker, S., Devi, R., Mohankumar, C., (2021). Wound healing potency of *Hemigrapshis alternata* (Burm.f) T. Anderson leaf extract (HALE) with molecular evidence. *Indian Journal of Experimental Biology*, 59, 236-245.
- Devasahayam A. B., R., Palolathil, A., Kumar, S.T.A. et al. (2024). Role of *Hemigrapshis alternata* in wound healing: metabolomic profiling and molecular insights into mechanisms. *Scientific Reports* 14, 3872. <https://doi.org/10.1038/s41598-024-54352-x>
- Rojas, S.J., *Hemigrapshis alternata* (red ivy), (2022), CABI Compendium, 121880. doi:10.1079/cabicompendium.121880.
- Gamble, J. S. (1915). *Flora of the Presidency of Madras*. West, Newman and Adlard. <https://doi.org/10.5962/bhl.title.21628>
- Silja, V.P., Thero, S., K.V., Mohanan. (2008). Ethnomedicinal plant knowledge of the Mullu kuruma tribe of Wayanad district, Kerala. *Indian Journal of Traditional Knowledge*. 7. 604-612.
- Gayathri, V., Lekshmi, P., Padmanabhan, R.N., (2012). Anti-diabetes and hypoglycaemic properties of *Hemigrapshis colorata* in rats. *International Journal of Pharmacy and Pharmaceutical Sciences*. 4. 324-328.
- Yeni, Y., Rachmania, R., Mochamad, D. (2021). Affinity of Compounds in *Hemigrapshis alternata* (Burm.f) T. Ander Leaves to Cyclooxygenase 1 (COX-1): In Silico Approach. [10.2991/ahsr.k.210115.107](https://doi.org/10.2991/ahsr.k.210115.107).
- Appian, S., Evans, D., Rajasekharan, S., Nair, G. (2001). Effect of *Hemigrapshis colorata* (Blume) H. G. Hallier leaf on wound healing and inflammation in mice. *Indian Journal of Pharmacology*. 33.
- Annapoorna, M., Sudheesh Kumar, P. T., Lakshman, L. R., Lakshmanan, V. K., Nair, S. V., & Jayakumar, R. (2013). Biochemical properties of *Hemigrapshis alternata* incorporated chitosan hydrogel scaffold. *Carbohydrate polymers*, 92(2), 1561–1565.
- Gayathri V, Lekshmi P, Padmanabhan RN. Antidiabetes and hypoglycaemic properties of *Hemigrapshis colorata* in rats. *International Journal of Pharmacy and pharmaceutical Sciences*. 2012; 4 (2): 224-328.
- Subramoniam A, Evans D.A, Rajasekharan S, Sreekandan nair G. Effect of *Hemigrapshis colorata* (Blume) H. G. Hallier leaf on Wound healing and inflammation in mice. *Indian Journal of Pharmacology*. 2001; 33:283-285.
- Saravanan, J., Nh, J., & Joshi, Vijaya & Ps, Sutar & Karigar, Asif. (2010). Wound Healing Activity of *Hemigrapshis Colorata*. *International Journal of Contemporary Research and Review*. 1. 1-3.
- Akhil T.T., Punieetha P. (2013). Evaluation of anti-oxidant, anti-inflammatory and cytotoxicity potential of *Hemigrapshis colorata*. *International Journal of Pharmaceutical Sciences and Research*. 4 (9), 3477-3483.
- Deepak RP, Renjima V, Murugan K. Antioxidant Potential of *Hemigrapshis colorata* (Blume) HG Hallier and *Rhinacanthus nasutus* (Linn). *Kurz.-A Search*. In *Proceedings of the 2007 Kerala Science Congress* (03-04), Kannur, Kerala 2007 (pp. 1-4).
- Mathew J, Joy J., Vazhacharickal, P., Sajeshkumar N.K. (2016). Phytochemical analysis and in vitro hemostatic activity of *Mimosa pudica*, *Hemigrapshis colorata* and *Chromolaena odorata* Leaf Extracts. *CIBTech J. Pharm. Sci.* 5,16-34.
- Bangera S., Alva V.D.P., Sannaiah P.N. (2023). *Hemigrapshis colorata* (HC) Leaves Extract as Effectual Green Inhibitor for Mild Steel Corrosion in 1M HCl. *Biointerface Research in Applied Chemistry*. 13 (2). <https://doi.org/10.33263/BRIAC132.200>
- Priya M.D., (2013). Review on pharmacological activity of *Hemigrapshis colorata* (Blume) HG Hallier. *International Journal of Herbal Medicine* 1 (3). 120-121.
- Meenakshi, M., Nishanthini, K. (2022) Bioremediation of Polluted Waters Using Nanoparticles. *Journal of University of Shanghai for Science and Technology*. 24 (1)
- Amit, S.S., Satish, A.B. (2018). Review of Ethnobotanical, Phytochemical And Pharmacological Profile Of Cardio-Spermum *Halicacabum* Linn. *International Journal of Pharmaceutics and Drug Analysis*. 6(3). 371-376, <https://www.ijpa.org/index.php/journal/article/view/384>.