

## A review on the phytochemistry and pharmacology of *Hemigraphis colorata*

Shana K.M \*, Vishnupriya V.V, Fahmeeda P.P, Prajna P.P, Reshmi Rajan and E. Tamil Jothi

Department of Pharmacology, Devaki Amma Memorial College of Pharmacy, Chelembra, Malappuram district, Kerala, India.

World Journal of Biology Pharmacy and Health Sciences, 2022, 12(02), 105–109

Publication history: Received on 03 October 2022; revised on 09 November 2022; accepted on 12 November 2022

Article DOI: <https://doi.org/10.30574/wjbphs.2022.12.2.0195>

### Abstract

*Hemigraphis colorata* (Blume) H.G. Hallier (syn: *Hemigraphis alternata*, family: Acanthaceae), is an exotic plant adapted to India and commonly known as Red Ivy. The other names of the plant are Aluminium plant, Red flame Ivy, Waffle plant, Java Ivy cemetery plant, Metal leaf etc. The main traditional use of the plant is in wound healing, hence familiar in name “Murikootti” or Murianpacha. The phytoconstituents present in *Hemigraphis colorata* are saponins, flavonoids, terpenoids, coumarins carbohydrates, carboxylic acids, xanthoproteins, tannins, proteins, alkaloids, steroids and sterols. The main pharmacological activity of *Hemigraphis colorata* are in wound healing, ulcers, inflammation, diabetes mellitus and it is used to promote urination. This review was aimed to collect information about the phytochemical and pharmacological effects of *H. colorata* for future works.

**Keywords:** *Hemigraphis colorata*; Phytochemistry; Pharmacological effects; Wound healing

### 1. Introduction

Plants are source of natural products for various therapeutic processes and they play a major role in the treatment of human disease. The plant *Hemigraphis colorata* (Blume) is a versatile tropical low creeping perennial herb that reaches a height of 15 to 30 cm [1], which is the native of tropical Malaysia [2]. It is a prostrate growing plant with spreading, rooting stems. Its stony leaves are slender and lance shaped with toothed, scalloped or lobed margins. They are grayish green stained with red purple above and darker purple beneath [3]. Literally *Hemigraphis* means ‘half writing’ because the filament of the outer stamen bear brushes [4]. *H. colorata* blooms irregularly throughout the year in the tropics. Flowers are small (1 to 1.5cm diameter), five lobed, bell shaped with imbricate bracts. These are white in colour with faint purple marks within and appear in terminal 2 to 10cm long spikes [5,6]. Seeds are small, flat and white in colour. The leaves are opposite, ovate of cordate, serrate crenate, about 2 to 8 cm long and 4 to 6 cm wide, bearing well defined veins. They are grayish green stained with red purple above and darker purple beneath [7,8].

### 2. Common uses

The plant has various medicinal properties, but of these only few are reported. The leaf juice is applied directly on open wound to stop bleeding [4]. In folk medicine, it is used internally to cure anemia. Traditionally, the leaves are consumed to mend gall stones, excessive menstruation and as a contraceptive [9,10]. In Java, leaves are used to treat bloody dysentery and haemorrhoids. It also used as a diuretic. The whole plant of *H. colorata* is used for diabetes mellitus [11].

\* Corresponding author: SHANA K.M

Department of Pharmacology, Devaki Amma Memorial College of Pharmacy, Chelembra, Malappuram district, Kerala, India.

## 2.1. Plant profile

### 2.1.1. Scientific classification

- Kingdom: Plantae
- Order : Lamiales
- Family : Acanthaceae
- Genus : *Hemigraphis*
- Species : *Colorata*
- Synonym: *Hemigraphis alternata*

## 2.2. Phytochemistry

The phytoconstituents in plants can be used for various medicinal purposes. The phytoconstituents present in *H. colorata* are saponins, flavonoids, terpenoids, coumarins, carbohydrates, carboxylic acids, xanthoproteins, tannins, proteins, alkaloids, steroids and sterol [12]. The phytochemical characteristics of *Hemigraphis colorata* studied using different solvents based on their polarity. The whole plant of *H. colorata* were extracted using solvents such as hexane, chloroform, acetone and ethanol in the increasing order of their polarity. The ethanolic extract showed maximum average extractive yield [13].

## 2.3. Phytochemical analysis

**Table 1** Comparison of various solvent extracts of *Hemigraphis colorata*

Solvents used (150ml)	Colour and consistency	Polarity	Boiling point of solvent	Average yield of extraction(%w/w)
Hexane	Yellowish, sticky	1.88	69	1.3
Chloroform	Dark green	5.6	35	1.4
Acetone	Green	21	56	0.5
Ethanol	Yellowish green	24.3	79	2.4

The plant extracts revealed the presence of phytoconstituents which are known to exhibit medicinal as well as physiological activities [14,15].

**Table 2** Determination of presence of phytoconstituents in different extracts of *Hemigraphis colorata*

Compounds	Hexane	Benzene	Petroleum ether	Chloroform	Ethanol	Methanol	Acetone	aqueous
Alkaloids	-	-	-	+	-	+	-	+
Phenol	-	+	+	+	+	-	+	+
Flavonoids	-	-	+	+	+	-	-	+
Saponins	-	+	+	+	+	-	-	-
Steroids	+	+	+	+	+	+	+	+
Tannins	-	+	+	-	+	+	+	-
Carbohydrate	+	+	-	+	+	+	+	+

(+) – indicates presence of phytoconstituents, (-) - indicates absence of phytoconstituents

### 3. Pharmacological activity

#### 3.1. Anti-oxidant activity

*In vitro* antioxidant potential of leaf of *Hemigraphis colorata* studied by using reducing power and DPPH radical scavenging activity. The phenolic compounds are effective hydrogen donors, which makes them good antioxidants. The reducing power of aqueous and ethanolic extracts of *Hemigraphis colorata* were increased with quantity of samples. With the increase in the concentration of extracts, percentage of radical scavenging activity was found to be significantly increased [13,16].

#### 3.2. Anti-Elastase activity

Elastase are a group of serine proteases that possess the ability to cleave the important connective tissue protein. Elastin is a key component in keeping parts of the body flexible, such as the elasticity in the skin and in the lungs. The aqueous and alcoholic extracts of *Hemigraphis colorata* showed a considerable inhibition towards porcine pancreatic elastase and the inhibitory effect increases significantly with increase in concentration of both extracts. Elastase inhibitors are also used as anti-ageing and anti-wrinkling agent [16].

#### 3.3. Anti-inflammatory activity

*In vitro* anti-inflammatory assay was carried out by HRBC membrane stabilization method. The anti-inflammatory effects of *Hemigraphis colorata* extracts may be due to the presence of flavonoids, tannins, phenols [13].

#### 3.4. Wound healing activity

The wound contraction and epithelialisation were faster in *H. colorata* leaf paste applied mice when compared to control. Wound contraction progressed faster when the leaf paste was applied on the wound compared to untreated wounds. In the *H. colorata* treated wounds, the drug adhered on the wound and prevented the discharges from the wound within a few hrs after the application. The efficacy of the leaf preparation was comparable to that of povidone-iodine ointment [17,18].

#### 3.5. Anti-bacterial activity

*In vitro* antibacterial efficacy of the *Hemigraphis colorata* leaves and stem of crude aqueous, acetone, benzene, chloroform, ethanol and petroleum ether extracts were quantitatively assessed on the basis of zone of inhibition. Ethanolic extracts of *H. colorata* shows anti-bacterial effects against the *K. pneumonia*. Ethanolic extracts of leaves and stem extract of *H. colorata* show the inhibitory activity against the bacteria *S. typhi* due to the presence of active constituents present in the plant. *H. colorata* stem and ethanol extracts of *H. colorata* leaves displayed the inhibition zone against the bacteria *B. cereus*. Petroleum ether extracts of *H. colorata* provides moderate anti-bacterial activity against the pathogen *S. marcescens*. The antibacterial study of ethanolic leaf extract of *Hemigraphis colorata* was determined by agar diffusion method and it shows antibacterial activity against *Escherichia coli* (-) and *Bacillus subtilis* (+). The antibacterial potential increase with increase in concentration of plant extract [19,20].

#### 3.6. Anti-diabetic activity

The hypoglycaemic and anti-diabetic properties of *H. colorata* was identified for the first time using Wistar rats and Swiss albino mice using glucose tolerance test. The n-hexane & ethanol extracts of the whole plant were found to lower the blood glucose levels in glucose fed rats. The presence of steroids & coumarins in the plant extract is responsible for the hypoglycaemic and anti-diabetic effects [11].

#### 3.7. Miscellaneous activity

*Hemigraphis colorata* was recognized as one of the ornamentals which can remove harmful volatile organic compounds to maintain the quality of indoor air, because volatile indoor pollutants from paints, odorants, cleaning agents etc., can cause various ailments to people during exposed to them. Chloramphenicol and Ciproflaxin are antibiotics were used in antibacterial assays of methanolic extract of *Hemigraphis* to treat UTI patients [21,22].

---

### 4. Conclusion

Plants plays a major role in the treatment of human diseases. Medicinal action of the plants is due to the synergic action of several compounds targeting multiple sites associated with physiological processes. *Hemigraphis colorata* belongs to

Acanthaceae family, is one of the potential plants among the tribal healers of south India. The plant contains various phytoconstituents such as flavonoids, phenols, carbohydrates, coumarins, sterols etc. Due to the presence of various phytoconstituents it is used for various treatments such as in wound healing, anemia, gall stone, diuretic, haemorrhoids and diabetic mellitus.

---

## Compliance with ethical standards

### Acknowledgments

Our sincere thanks to Dr. E. Tamil Jothi sir for encouraging and supporting us throughout the work.

### Disclosure of conflict of interest

No conflict of interest.

---

## References

- [1] Devi Priya M. Review on pharmacological activity of *Hemigraphis colorata* (Blume). International Journal of Herbal Medicine. 2013; 1(3): 120-121.
- [2] Irene Skaar, Christopher Adaku, Monica Jordheim, Robert Byamukama, Bernard Kiremire, Qyvind Andersen. Purple anthocyanin colouration on lower (abaxial) leaf surface of *Hemigraphis colorata* (Acanthaceae). 2014; 105:141-146.
- [3] Saravanan J, Shariff WR, Joshi Narasimhachar H, Varatharajan R, Joshi VG, Karigar Asif A. Preliminary Pharmacognostical and Phytochemical Studies of Leaves of *Hemigraphis colorata*. Research Journal of Pharmacognosy and Phytochemistry. 2010; 2(1): 15-17.
- [4] Silja VP, Varma KS, Mohanan KV. Ethnomedicinal plant knowledge of the Mullukuruma tribe of Wayanad district, Kerala. Indian Journal of Traditional Knowledge. 2008; 7: 604- 612.
- [5] Anonymous. The Glossary of Indian Medicinal Plants. Council of Scientific and Industrial Research .1986; 224.
- [6] Anonymous. Dictionary of Indian Medicinal Plants. Central Institute of Medicinal and Aromatic Plants.1992; 416.
- [7] Gamble JS. Flora of the Presidency of Madras. The Authority of the secretary of state of Indian council. 1921; 2: 1344.
- [8] Graf AB. Exotica international. ROEHRS Company Publishers. 1982; 2.
- [9] Bhargavi S, Kumar A, Babu R. Ancient and Modern View of Wound Healing: Therapeutic Treatments. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2011 July; 2(3): 474-479.
- [10] Pawar RS, Toppo FA. Plants that heal wounds - A review. Herba Polonica. 2012; 58:47-65.
- [11] Gayathri V, Lekshmi P, Padmanabhan RN. Antidiabetes and hypoglycaemic properties of *Hemigraphis colorata* in rats. International Journal of Pharmacy and pharmaceutical Sciences. 2012; 4 (2): 224-328.
- [12] Sheu J, Jayakumar T, Chang C, Chen Y, Priya S, Ong E, Chiou H, Elizebeth AR. Pharmacological actions of an ethanolic extracts of the leaves *Hemigraphis colorata* and *Clerodendron phlomidoides*. Journal of Biomedical Technology. 2012; 3:1-3.
- [13] Akhil TT, Punieetha Prabhu. Evaluation of anti-oxidant, anti-inflammatory and cytotoxicity potential of *Hemigraphis colorata*. International Journal of Pharmaceutical Sciences and Research. 2013; 4 (9): 3477-3483.
- [14] Reshma Rajeev K, Sincy Joseph, Neethu EK, Kavya V, Anjali KM, M Suga Bharathi. Preliminary Phytochemical and bio chemical analysis of *Hemigraphis colorata* H.G. Hallier. International Journal of Research in Pharmacy and Pharmaceutical Sciences. 2018; 3(3): 05-09.
- [15] Sandhya S, Sabrinath K, Ishwarya R, Logeshwaran V, Kouslaya N. Review on *Hemigraphis colorata* and its properties. 2019; 4(7): 336-338.
- [16] Asha Gangadharan, Nishath TK, Benny PJ. Evaluation of Phytochemical Analysis, Anti-Elastase activity of *Hemigraphis colorata*. International Journal of Pharmacognosy and Phytochemical Research. 2014; 5(4) :292-298.

- [17] Subramoniam.A, Evans D.A, Rajasekharan.S, Sreekandan nair.G. Effect of *Hemigraphis colorata* (Blume) H. G. Hallier leaf on Wound healing and inflammation in mice. Indian Journal of Pharmacology. 2001; 33:283-285.
- [18] Saravanan J, Josh NH, Joshy VG, Sutar PS, Karigar AA. Wound healing activity of *Hemigraphis colorata* . International Journal Current Research & Review. 2012 ;1: 1-3.
- [19] Anitha, Vimala Thankappan, Antonisamy, Johnson Marimuthu, Jeeva Solaman. Anti-bacterial studies on *Hemigraphis colorata* (Blume) H.G. Hallier and *Elephantopus scaber* L. Asian Pacific Journal of Tropical Medicine. 2012; 5(1):52-57.
- [20] Shameela Nasrin.K, Sincy Joseph. Evaluation of Antibacterial and Antioxidant activity of *Hemigraphis colorata* (Blume) H. G Hallier.YMER. 2022 May; 21(5):1353-1359.
- [21] Salim NA, Tajuddin RM. Effectiveness of local plants on sediment control for sustainable River Management. UMTA .2011;36-42.
- [22] Yang DS, Pennisi SV, Son K, Kays SJ. Screening indoor plants for volatile organic pollutant removal efficiency. Hort Science. 2009 Aug 1; 44(5): 1377-1381.