ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 12| December 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

PHARMACOLOGICAL ACTIVITIES OF ENICOSTIMMA LITTORALE BLUME

Mr. Mahesh G. Sarde [1*], Mr. Sachin S. Dighole [2], Dr. Sunil S. Jaybhaye[3]
Institute of Pharmacy, (NKSPT) Pathrikar Campus, Badnapur, Jalna. 431202
[1]Student of Bachelor in Pharmacy, Dr. Babasaheb Ambedkar Technological University, Raigad, Lonere
[2,3] Department of Pharmacy, Faculty of Pharmacy, Dr. Babasaheb Ambedkar Technological University, Raigad, Lonere

ABSTRACT
Medicinal plant's playing a significant role in curing various diseases from ancient times. Enicostemma littorale blume is chosen for the present study is the rational being the plant is sustainable weed which may be available in quantities of phytochemical analysis, The bitter natural plant which is important indigenous medicine. The leaf and root extract of Enicostemma littorale blume family is Gentianaceae the plant are bitter in taste and it's also various elements founds suitable for diseases majorly laxative, tooth decay, fever obesity, skin disease, wound healing, abdominal lever disorder, blood purification, snake bite, regulation the blood sugar level. E. littorale blume cosmopolitan species found in India. The study aimed to authentically identify & littoral through morphological characterization it also determines bioactive components quantities, this plant report attributes some medicinal properties. Evaluation serves as tool for quality assessment of the drug. The culture of ayurveda is deeply rooted in Indian soil. It as become the lifestyle of people since ancient times. The literature explorer's plentiful medicinal plants being used to cure many diseases. It also called as Nahi, nay in several local languages it prominently found in forest and coastal region of India. The plants also contain minerals like's calcium, iron, potassium and moreover, they possess significant anti-microbial, anti-inflammatory, anti-diabetic, anti-ulcer, anti-oxidant properties.

KEYWORDS: *Anti-Diabetic, Medicinal Plant, Pharmacological Activities .*

1.INTRODUCTION

The global distribution of spaces reflect it is a white range of adaptability to diverse ecosystems commonly called as an Indian whitehead in English and naai (Indian). It is in traditional medicine use in a management as well as treatment to cure of several element in the Indian traditional system of medicine the plant is used for the treating skin diseases fever renal infection also blood purification the plant is well suited in the different element and soil condition.[l] The species has a native distribution includes — Assam, India, South Africa, Tanzania, Shri Lanka. Littoral Blume neutralizes in a various other region in India medicinal herb inhabit the main part as well as remedy for a various disease the deep rotate knowledge about the plant of native community can be used as medicine.

The plants' part like root and leaves are used for the several diseases such as a loss of appetite force delivery care fever weight loss diabetes etc. many modern drugs I derived from the plant. Indeed how much of scientific medicine was derived from the native people herbal lower well into the early 20th century. The world health organization (WHO) established guidelines for the Phyto drug research. According to WHO, billion people or 80% of world populations [2] currently used herbamedicines for aspects of primary healthcare.

Medicines is an important part of all indigenous people's medicine found in ayurvedic homeopathic neuropathic traditional oriental and native American Indian medicine. Serious problem arises during the use of Phytodrug causing a loss of faith in phycytoremedies[3] Double drug are frequently adulterated at a various stage beginning with the collection and ending with the drug as a result adulteration possess in significant challenge to growth and promotion of Phyto drug industries.

Every herbal plant must be label with the set of well defined, clearly, demarcated, and according to all India ethano biological servery conducted by the ministry of environment and forest of the government of the India over the 8000 plants spaces are used by the people of India. The plant is crushed an used locally treated to snake bite [3] It is one of the traditional diabetes meditations mentioned in ashtanga Hridaya and shodhal Samhita. It is used in place of chirayta. Scenery syrup made from the leaves describe in UNANI MEDICINE blood purifier and droopy abdominal ulcer, swelling iches and insect poisoning, the dried and powered plant is given with honey. Administered orally tribangshila, composite drug containing extract of Enicostemma littoral blume.[5]

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 12| December 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188



Image A. Pharmacological Enicostemma of Littorale Blume

Morphology And Geographical Distribution of Enicostemma littorale Blume:	
Plant Habitat and Size	- Erect, perennial herb - 5-30 cm tall - Simple or branched at base
Stem	- Cylindrical - Glabrous (hairless) - Decurrent ridge below each leaf
Leaves	Linear to narrow oblong - Entire (smooth margins) Obtuse at apex (tip) - 3-nerved from base - Glabrous (hairless)
Inflorescence	- Many-flowered auxiliary clusters - Numerous in axils of each pair of leaves
Flowers	- White with green lines - Drying yellowish - Sessile (attached directly to stem) or subsessile (shortstalked)
Geographical Distribution	- Tropical genus - Widely distributed in - South America Africa and Asia
Habitat	Grows in diverse habitats, including: Dry areas - Wetlands Coastal regions Forests Grasslands
Ecological Adaptations	- Adapted to various environmental conditions

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 12| December 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

2.METHOD AND MATERIAL

The fresh, healthy plant's part were collected in wapiti which is away from pollution. The plant material was identified in the flora (wapti) Hingoli district.

In Shree-RD Bhakt college of pharmacy Jalna (India) the herb was preserved. The stem leaf, root was waheed & used for present study.

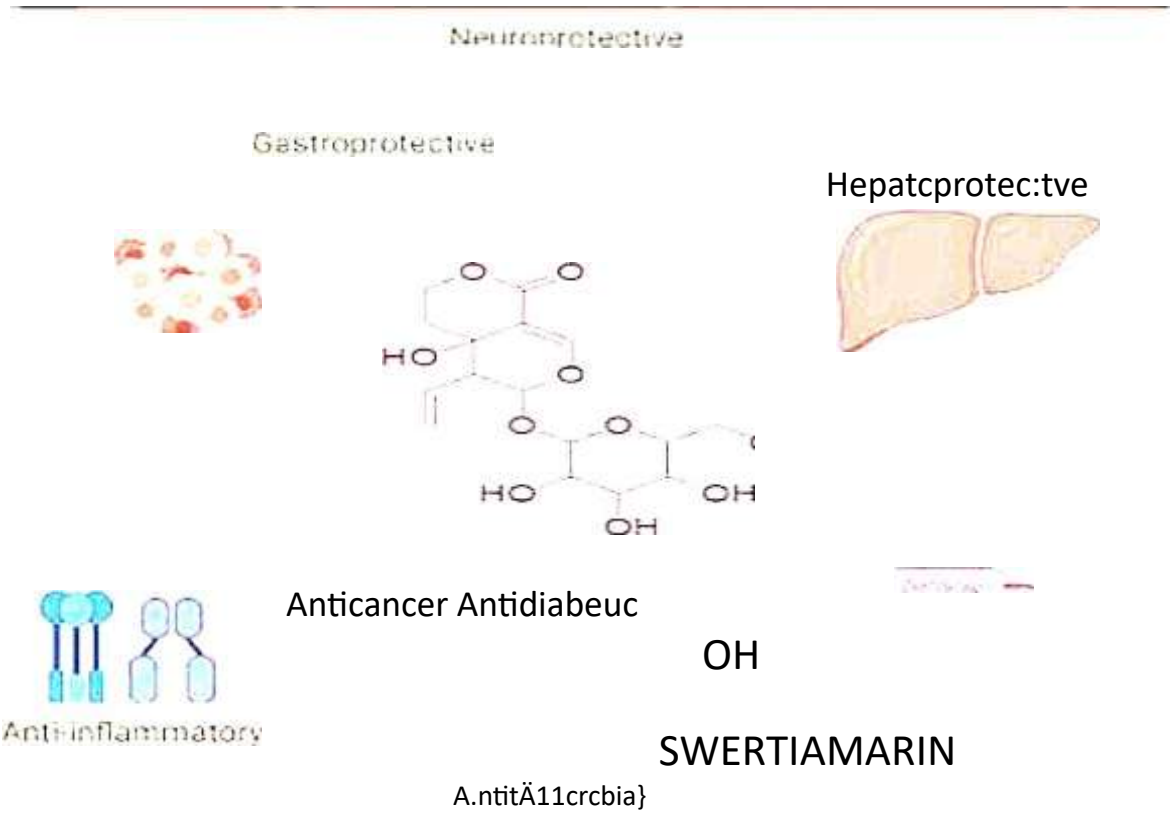
The fresh and preserved materials arial part of plant with leaves & stems were collected then cut in small pieces the health plants were rooted & washed with water. They were separated the roots, stem and leaves dried in sunlight The healthy plant were pulverized into fine powder using by a grinder (mixer). About 10 g powder material was prepared. [6]

Then the powder stored into an air tight container at room temperature. Fresh and preserved materials were used. Sections were stained in safranin (1 %), light green (1%) and mounted in DPX after the customary dehydration. Some hand sections were also examined in glycerine. Microphotographs of leaf, petiole, stem and root sections were taken by using DIGI- EYE High resolution Cameras affixed to microscope Olymphus CH 201. The line and cellular sketches of th figures were drawn using a Camera Lucida. The range of length and diameter of vessel elements was determined by the measurement of 20-25 vessel elements. The fresh, healthy plants were rooted out and washed with water. They were separated as root, stem and leaves and shade dried. The dried plant materials were pulverized into fine powder using a grinder (mixer). About 10 g of powdered material. [7]

Physiochemical values such as the percentage of total ash, acid insoluble ash, acid soluble ash, extractive values as petroleum ether-soluble extractives, etahnol-soluble extractives, methanol-soluble extractive, and watersoluble extractives were calculated according to the methods described in the Indian pharmacopoeial phytochemical studies such as qualitative examination were done on the dried powdered material for this about 5 g of powdered material was extracted in soxhlet extraction apparatus with 250 ml of each of the following.solvents; ethanol, methanol, diethyl ether, and chloroform. [6]
The respected solvents were evaporated (at 40 ^{0}C) with the help of heating mantle. Some of the extracts of each solvent were used for the qualitative phytochemical screening for the identification of the various classes of active chemical constituents, using standard prescribed methods.

The positive tests were noted as present (+++) appreciable amount, (++) moderate amount, (+) trace amount and (-) completely absent.

3.PHARMACOLOGICAL ACTIVITIES



ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 12| December 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188



Image B. Pharmacological Activity of Enicostemma Littoral Blume

PHARMACOLOGICAL ACTIVITY

1. Hepatoprotective Activity
2. Anti - oxidant Activity
3. Anti - neocipative Activity
4. Anti - microbial Activity
5. Anti - Inflammatory Activity
6. Hypoglycaemic Activity
7. Anti - Hypolipidemic Activity

3.1Hepatoprotective Activity

Paracetamol-induced hepatic injury is commonly used as an experimental method for the study of hepatoprotective effects of medicinal plant extracts and drugs. The hepatoprotective activity of E. littorale in rats against paracetamol as hepatotoxin to prove its claims in folklore practice against liver disorders. The extent of hepatic damage is assessed by histological evaluation and the level of various biochemical parameters in circulation. Highly reactive trichloro free radical formation, which attacks polyunsaturated fatty acids of the endoplasmic reticulum, is responsible for the hepatotoxicity of paracetamol. It produces hepatotoxicity by altering liver microsomal membranes in experimental animals. The study was evident that the extract was able to reduce all the elevated biochemical parameters due to the hepatotoxin intoxication[8]. Swertiamarin isolated from E. littorale possesses significant antioxidant and hepatoprotective properties against D-GalN induced hepatotoxicity given at 100 and 200 mg/kg body weight orally for 8 days, which might be due to its in vitro antioxidant activity. [9]Ethanolic extract of E. littorale, exhibited significant hepatomodulation against oxidative stress induced liver injury by CC14 in rats through antioxidant potential and free radical scavenging activities along with reduction of fat metabolism.

DOSAGE

ROOT POWDER(I -2g) with honey (twice in daily) [CAPSULE: 500mg (twice in daily)]

3.2Anti - Oxidant Activity

Antioxidant activity the free radical reactive oxygen species are well known inducers of cellular and tissue pathogenesis leading to several human diseases, such as cancer, inflammatory disorders and diabetes mellitus, as well as aging process. [10] Potent antioxidant activity was observed using many methods for all extracts of Enicostemma littorale. Among the extracts, the petroleum ether, chloroform and ethyl acetate extracts exhibited potent activities. The crude powder form of the aerial part of the Enicostemma littorale showed enzymatic and non-enzymatic antioxidant activity in p- DAB induced hepatocarcinoma in rats.[11] The antioxidant activity of Enicostemma littorale showed a strong free radical scavenging activity and ferric reducing property indicating it to be a good source of natural antioxidants to prevent free radical mediated oxidative damages. [12]

The in vitro antioxidant activity of aqueous, hydro alcoholic, methanolic, chloroform and ethyl acetate extract of leaves of this plant has been evaluated. The possible mechanism involved was investigated by using different model covering nitric oxide and DPPH method. The result indicated efficacy of extracts for antioxidant activity in following sequence: methanol > hydro alcoholic > aqueous > chloroform. [13] The effect of oral administration of an aqueous Enicostemma littoral blume whole plant extract on antioxidant defence in alloxan-induced diabetes in rats.

DOSAGE

ROOT POWDER(I -2g) with honey (twice in daily) [CAPSULE: 500mg (twice in daily)]

3.3Anti - Neociptive Activity

In vivo antinociceptive activity of Swertiamarin isolated from E. littorale was carried out using three
different methods in mice. In the hot plate method, a significant increase in the latency period was observed for the treatment with Swertiamarin at 100 and 200 mg/kg after 30 and 45 min. The percent protection observed after 45min, for the standard paracetamol and swertiamarin at 100 and 200 mg/kg bw treatments. A significant increase in the tail withdrawal reflex was observed for the swertiamarin treatment at both the doses with percent protections of 150 and 200, respectively. In both these methods, swertiamarin produced potent activity than that of standard paracetamol.

DOSAGE

ROOT POWDER(I -2g) with honey (twice in daily) [CAPSULE: 500mg (twice in daily)]

3.4 Anti - Microbial Activity: The in vitro antimicrobial activity of aqueous, hydro alcoholic, methanolic, chloroform and ethyl acetate extract of leaves of this plant has been evaluated. The antimicrobial activity against Bacillus subtilis, Staphylococcus aureus, Escherichia coli, and Candida albicans by well diffusion method. It was observed that chloroform, ethyl acetate and hydrochloric extract showed prominent antimicrobial against all microorganisms.

DOSAGE: ROOT POWDER(I -2g) with honey (twice in daily) [CAPSULE: 500mg (twice in daily)]

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 12| December 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

3.5 Anti - Inflammatory Activity

The alcohol extract at a concentration of 300 and 600 mg kg-I, and its ethyl acetate fractions at 25 and 50 mg kg-I showed a significant dose dependent anti-inflammatory activity in carrageen induced rat hind paw edema as well as formalin induced rat hind paw edema chronic model in rats. The study showed that the alcohol extract of E. littorale and its ethyl acetate fractions, exhibited significant antiinflammatory activity.

DOSAGE: ROOT POWDER(I -2g) with honey (twice in daily) [CAPSULE: 500mg (twice in daily)]

3.6 Hypoglycaemic Activity

The plant extract of E. littorale has the potential to enhance glucose-induced insulin release at 11.1 mM glucose from isolated rat pancreatic islets and was partially able to reverse the effect of diazoxide (0.25 mM). Incubation with Ca2+ chelator and Ca2+ channel blocker (nimodipine) did not affect the glucoseinduced insulin release augmented by the extract.

A single dose of aqueous extract of E. littorale (15 g dry plant equivalent extract per kg) had shown significant increase in the serum insulin levels in alloxan-induced diabetic rats at 8 h. The insulinotropic action of aqueous extract of E. littorale was further investigated using rat pancreatic islets. Above results suggest the glucose lowering effect of aqueous extract of E. littorale. The aqueous extract of the plant prevented the blood glucose level as well as insulin level in rat model. It normalizes dyslipidaemia, provides nephroprotection in diabetic rats and increase in insulin sensitivity. In another study showed diabetic rats were having hyperglycaemic condition. Rats treated with plant extract for 45 days showed reduction in blood glucose levels. The multipotent differentiation property of stem cells opens up new arena for the treatment of the diabetic patients. Many chemical and biochemical compounds make stem cells get differentiate into insulin producing cells. The study highlighted islet neogenic property of the plant.

DOSAGE: ROOT POWDER(I -2g) with honey (twice in daily) [CAPSULE: 500mg (twice in daily)]

3.7 Anti - Hypolipidamic Activity

The aerial part of the E. littorale powder reduced the hypolipidemia at significant level and also reduced the lipid peroxidation and HDL-cholesterol level in serum in p-dimethyloaminoazole benzene induced hepatoma rats (1 mg/kg body weight) The hypolipidemic and antioxidant effect of E. littorale aqueous extract (1.5 g/100g body weight/day, p.o.) in cholesterol fed rats is being reported for the first time by studied that the aqueous extract (1.5 g/100g body weight/day, p.o) of E. littorale was administered to rats along with hypercholesterolaemia diet for 6 weeks for the hypolipidemic and antioxidant effect and they found that the extract showed a decrease in activities often reduced glutathione level are untreated rats. DOSAGE: ROOT POWDER(I -2g) with honey (twice in daily) [CAPSULE: 500mg (twice in daily)]

4. CLINICAL STUDIES

In a toxicity study, on the 3rd day after the oral administration of large doses of the E. littorale aqueous extract in alloxan induced diabetic rats and pigeons, liver and kidney showed early signs of degeneration.

No toxicity has been reported with the standard dose in humans.

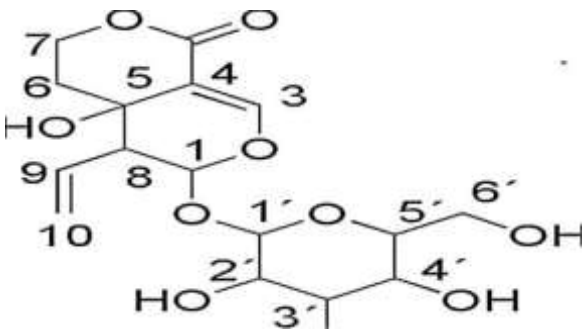
The clinical trial with 84 diabetic patients who ingested 2g of E. littorale per day for 3 months; no adverse side effects were reported.

The E. littorale extract possess significant antioxidant therapy to counteract mitochondrial and post mitochondrial oxidative stress in the development of Gentamicin induced nephrotoxicity. That is suitable for chemoprevention of GM-induced renal damage.

In acute toxicity study of the aqueous extract of E. littorale was nontoxic up to recommended dose 5000mg/kg body weight orally as per OECD guidelines. The extracts did not show any signs of toxicity in streptozotocin induced diabetic albino rats.

Previous in-vitro studies have found that the presence of heavy metals such as arsenic, cadmium, lead and mercury were below the WHO/ FDA permissible limits in whole plant of E. littorale.

4.1 Bioactive Compound



1)Swertiamarin

2)Alkaloid

3)Flavonoids

OH

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 12| December 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

4.2 Pharmacological importance ofActive chemical constituents Properties—

- Alkaloids: It is a pharmacologically active compound and is a chemically heterogeneous group consisting of more than 6000 basic nitrogen organic compounds. This illustrates antimicrobial activity and has been used as a relaxant.
- Flavonoids: It has a large number of natural phenolic compounds that raise the level of blood cholesterol and lower the risk of cancer. Glycosides Itis an organic molecule that decreases dry cough and has a relaxant muscle property
- Phenols: It is an antiseptic, anticancer and antioxidant agent that functions as a secondary metabolite. About steroids It is an organic compound that lowers stress, stimulates the immune system and has antimicrobial activity.
- Saponins: It is a heterogeneous compound used in molluscicides and detergents that has antiheptatonic activity. The Tannins This compound is used to repair the wound and to improve infection resistance
- Terpenoids: It is a molecular product that acts as an anti-inflammatory, antimicrobial compound and inhibits cholesterol synthesis

5. TRADITIONAL USES AND MECHANISM OF ACTIONS:

This plant is bitter in taste and it also reduced fever, diabetics as well as obesity, abdominal disorder, snake bite, regulating blood sugar level.

The plant leaf is crushed and applied locally surface of snake bite area.it is Antioxidant Activities, Enicostemma littoral antioxidant may mitigate oxidative stress induced by venom. This plant has ability to reduce venom mortality inflammation and oxidative stress.

The plant also reduced digestive, anti-inflammatory also swertiamarin protect the gastric mucosa.it is enhances enzyme secretion.it is also anti-diarrheal it regulates bowel moment.

It also useful in abdominal ulcer constipations, fever, skin disease as well as antioxidant activity. It is mucosal protective also it enhances mucus production and glycoprotein synthesis. Stimulate collagen and tissue repair.

Enicostemma littorale blume powder is traditional Ayurvedic remedy used to support various health benefits. The medicinal plants are a major source of biodynamic compounds of therapeutic value and have been known for their health benefits in Ayurveda, Unani and traditional system of medicines.

ENICOSTEMMA LITTORALE BLUME REQUIRED QUALITY CONTROL STANDARDIZATION TO ENSURE ITS SAFETY

6.1 Quality Control

1. Authentication: Verify the plant material's identity through botanical, microscopic, and molecular analysis.
2. Raw material selection: Choose high-quality plant material, free from contaminants and adulterants.
3. Cleaning and drying: Clean and dry the plant material to prevent microbial growth.
4. Extraction and processing: Optimize extraction methods and processing conditions to preserve bioactive compounds.

6.2 Standardization

1. Marker compounds: Identify and quantify specific bioactive compounds (e.gswertiamarin).
2. Phytochemical profiling: Characterize the plant's phytochemical composition using techniques like HPLC, GC-MS, and NMR.
3. Bioassay-guided fractionation: Isolate and purify bioactive fractions using bioassays.
4. Standardization protocols: Establish standardized protocols for extraction, processing, and analysis.

6.3 Parameters for Standardization

1. Swertiamarin content: 2-5%
2. Gentiopicroside content: 1-3%
3. Total flavonoid content: 5-10%
4. Moisture content: 10%
5. Heavy metal content: 1 ppm

6.4 Regulatory Guidelines

1. WHO Guidelines for Herbal Medicines
2. USDA National Organic Program (NOP)
3. European Medicines Agency (EMA) guidelines
4. Indian Pharmacopoeia (IP)

6.5 Ayurvedic Pharmacopoeia ofIndia (API)
Analytical Techniques

1. High-Performance Liquid Chromatography (HPLC)
2. Gas Chromatography-Mass Spectrometry (GC-MS)
3. Nuclear Magnetic Resonance (NMR) spectroscopy
4. Microbiological testing (e.g., plate count, PCR)

Certifications

1. Good Manufacturing Practice (GMP)
2. Good Agricultural Practice (GAP)
3. Organic certification (e.g., USDA Organic)
4. ISO 9001 :2015 (quality management)
5. ISO 22000:2018 (food safety management)

7. PHARMACEUTICAL PRODUCT (TABLET'S OF ENICOSTEMMA LITTORALE BLUME):

a Ayurvedic/Herbal Product Names:

- EnicoTab
- Littoralin
- AyurSwert
- LipiCare
- Enicostem
- BioSwert

b Pharmaceutical Product Names:

- Enicostat
- Swertiax
- Lipidem
- EnicoLife
- Swertian
- Enicostemal

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 11| Issue: 12| December 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

c Product Name Combinations:
EnicostemmalittoraleBlume Extract Tablets
i Swertia-G ii AyurSwert-DS

6. CONCLUSION

Based on these numerous studies related review provides the E. Littorale blume has the number of anti-oxidative phytochemicals, physiochemical properties, chemical constitutions, very low toxicity and is a safe, presence of heavy metals were below the WHO / FDA permissible limits, and therapeutic pharmacological actions such as anti-oxidant, hypolipidemic, hepatoprotective, anti-microbial, anti-inflammatory, etc.

This monograph may provide and confirmed the documentary evidence for multiple medicinal & therapeutic uses and pharmacological effects of the E. Littorale blume. Longitudinal scientific studies should be carried out in human to prove its clinical standards in the management of thmultiple diseases in future.

REFERENCES

1. *Gite VN, Pokharkar RD, Chopade V. V. Takate SB. Hepatoprotective activity of Enicostemma axillare in paracetamol induced hepatotoxicity in albino rats. Int J Phar life Sci 2010; 1(2): 50-53.*
2. *Sharma KA, Kumar R. Mishra A, Gupta R. Problems associated with clinical trials of Ayurvedic medicines. Rev Bras FarmacognBraz J Pharmacogn 2010; 20(2): 276-281.*
3. *Khare CP. Encyclopedia of Indian Medicinal Plants. Springer publication, 2008, 566-567.*
4. *Saranya R, Thirumalai T. Hemalatha M, Balaji R, David E. Phrmacognosy of Enicostemma littorale: A review. Asian Pacific Journal of Tropical Biomedicine.2013; 3(1): 79-84.*
5. *Abirami P, Gomathinayagam M.A Review on Enicostemma littorale. Pharmacology online. 2011; 1:75-83.*
6. *Anonymous, Indian Pharmacopoeia. vol. 2.3rd Ed. Govt. of India, Ministry of Health, Controller of Publications, New Delhi, India; 1966.*
7. *Anonymous, Indian Pharmacopoeia. vol. 2.3rd Ed. Govt. of India, Ministry of Health, Controller of Publications, New Delhi, India; 1985. p. A74 - A75.*
8. *Gite VN, Pokharkar RD, Chopade VV, TakateSB. Hepato – protective activity of Enicostemma axillare in paracetamol induced hepato-toxicity in albino rats. IJPLS 2010; 1: 50-53.*
9. *Jaishree V, Badami S, Bhojraj S. In vitro Antioxidant Activity of Enicostemma axillare. JH Sci 2008; 54: 524-528.*
10. *Aviram M. Review of human studies on oxidative damage and antioxidant protection related to cardiovascular diseases. Free Radical Res 2000; 33: 85-97.*
11. *Gopal R, Udayakumar R. Enzymatic and Non-Enzymatic Antioxidant Activities of Enicostemma littorale in p-DAB Induced Hepatocarcinoma in Rats. Int J Pharmacol 2008; 4: 369-375.*
12. *Sathishkumar R, Lakshmi PTV, Annamalai A. Effect of drying treatment on the content of antioxidants in Enicostemma littorale Blume. Res J Med plant 2009; 3: 93-101.*
13. *Derore SL, Khadabadi SS, Bhagure L, Ghorpade DS. In vitro antimicrobial and antioxidant studies on Enicostemma axillare (Lam.) Raynal. Leaves. NPR 2008; 7: 409-412.*
14. *Arivukkarasu R, Rajasekaran A, Murugesh S. Anti-inflammatory activity of alcoholic extract of Adenemahyssopifolium G.Don in acute and chronic experimental models in albino rats. J ApplBiosci 2009; 19: 1049 -1053.*
15. *Maroo J, Vasu VT, Aalinkeel R, Gupta S. Glucose lowering effect of aqueous extract of Enicostemma littorale Blume in diabetes: a possible mechanism of action. J Ethnopharmacol 2002; 81: 317-320.*
16. *Maroo J, Vasu VT, Gupta S. Dose dependent hypoglycemic effect of aqueous extract of Enicostemma littorale Blume in alloxan induced diabetic rats. Phytomedicine 2003; 10: 196-199.*
17. *Leela prakash G, Mohan Dass S. Antimicrobial activity and phytochemical screening of methanol extract of Enicostemma axillare. Int J Pharm Pharm Sci. 2012; 4(1):342-348.*
18. *Praveena P, Sudarsanam D. In vitro antimicrobial activity studies on Enicostemma littorale (Lam), Raynal Whole plants. Int J Curr Res. 2011;*11(3):12
19. *Jensen SR, Schripsema J. Chemotaxonomy and pharmacology of Gentianaceae. In Gentianaceae:Systematics and Natural History, Struwe, L. & Albert V. Eds. Cambridge, UK: Cambridge University Press 2002.*
20. *Upadhyay UM, Goyal RK. Efficacy of Enicostemma littorale in type 2 diabetic patients. Phytother Res 2004; 18: 233*-235.