Classical and Modern review of *Enicostemma litorale* Blume

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Abstract:

Enicostemma littorale is one of the traditional medicines used mainly in Gujarat, Madhya Pradesh, and Rajasthan as a stomachic, tonic, carminative1 and appetizer. E. littorale is also prescribed as a single or in combination in the form of Vati (Pills) for the treatment of type 2 diabetes in Ayurveda. Recent studies based on the anti-diabetic effect of E. littorale suggesting its role to reduce blood glucose and increase serum insulin level. Significant improvement in kidney function, lipid profile, systolic and diastolic blood pressure also reported. Moreover, it possesses multidimensional therapeutic properties viz. antimicrobial activity, antihelminthic activity, antinociceptive effect, antioxidant activity, antiulcer activity, anti-inflammatory activity, antitumour activity, hepatoprotective activity, hepatomodulatory activity, and antihyperlipidaemic activity including the hypoglycemic activity, antihyperinsulinemic activity, and aiabteic neuropathy activity. Present review describes classical and modern literature based on the Enicostemma littorale.

Keywords: Enicostemma littorale, Diabetes, Ayurved

INTRODUCTION

Ethnomedicine is the knowledge based on the curative and palliative effects of certain herbs, animals and minerals. This knowledge is the outcome of trial and error practices of the several generations. Ethnomedicine is contributed to the evolution of different systems of medicine viz. Ayurveda, Siddha, Unani, Naturopathy including modern medicine. It has continuously providing the information about the various effective drugs for the exploration of their therapeutic profile. *Enicostemma littorale* is one of the traditional medicines used mainly in Gujarat, Madhya Pradesh, and Rajasthan as a stomachic, tonic, carminative1 and appetizer. *E. littorale* is also prescribed as a single or in combination in the form of Vati (Pills) for the treatment of type 2 diabetes in Ayurveda. Recent studies based on the anti-diabetic effect of *E. littorale* suggesting its role to reduce blood glucose and increase serum insulin level. Significant improvement in kidney function, lipid profile, systolic and diastolic blood pressure also reported. Moreover, it possesses multidimensional therapeutic properties viz. antimicrobial activity, antihelminthic activity, antinociceptive effect, antioxidant activity, antiulcer activity, anti-inflammatory activity,

antitumour activity, hepatoprotective activity, hepatomodulatory activity, and antihyperlipidaemic activity including the hypoglycemic activity, antihyperinsulinemic activity, and aiabteic neuropathy activity.

Mamajjaka (Enicostemma litorale Blume)

This plant is first time mentioned in Shodhal nighantu (12th century) in lakshamanadivarg. It is a traditional popular herb used in the treatment of diabetes mellitus.[2] This plant is also used in combination with other drugs.[3] Number of polyherbal formulations are available in the market in which mamajjaka is used as an important ingredient like Diasol, Dihar.[4] Mamajjaka ghanavati i.e. pill form of ghana used for treating the type-2 diabetes by reducing blood glucose and increase serum insulin level.

References found in Nighantus about Mamajjaka:[5]

S. No.	Nighantu	Period	Varga
1.	Sodhala Nighantu	12th century AD	Lakshamandi varga
2.	Saligram Nighantu	19th century AD	Parishishta bhaga
3.	Nighantu Adarsh	20thcentuary AD	Kiratadi gavar
4.	Priya Nighantu	20th century AD	Satapushpadi varga

Table 1.1: Mamajjaka in Nighantus

Taxonomic position of *Enicostemma littorale* [6]

Kingdom : Plantae
Subdivision : Angiospermae
Class : Dicotyledonae
Subclass : Gamopetalae
Series : Bicarpellatae
Order : Gentianales
Family : Gentianaceae
Genus : *Enicostemma*
Species : *littorale*

Vernacular name[6]

Sanskrit : Mamajjaka, Naahi, Tikshanpatra
Hindi : Naahi, Chhota Chirayata
Gujarati : Mamejavo
Bengal : Nagajivha
Tamil : Vellarugu or Vallari
English name : White head, Indian Gentian

Ayurvedic properties of mamajjaka[7]

Rasa : Tikta
Guna : Laghu, Ruksha
Virya : Ushna
Vipaka : Katu

Doshakarma : Kaphapittashamak

Description of plant:

Enicostemma littorale Blume (Mamajjaka) is a glabrous perennial herb[8] attaining a height of 5-20 inches, distributed throughout India up to a height of 1500 feet. Drug consist of dried whole plant of E. littorale Blume (Enicostemma hyssopifolium) belonging to the family Gentianaceae.

Figure: 1 Habitat of *Enicostemma littorale* Blume.

Macroscopic characteristics

Stem is cylindrical, glabrous, readily rooting at nodes; no odour; taste-bitter. **Leaves** are sessile, longer than internodes; 5-8× 0.3-1 cm. Midrib depressed on adaxial side. **Flowers** are white in colour arranged in a cluster, numerous in the axils of each pair of leaves. Calyx tube 1-2 mm, unequal lobes 0.7-1.5× 0.4-0.7 mm. Corolla tube 3.5-6mm. **Fruits** are capsule, globes with pale, ridged ovate seeds 0.4-0.5mm in diameter. This plant is used as a folk medicine in the treatment of inflammation, diabetes mellitus and to regulate bowel functions[9] in western and southern India. **Roots** are 2-4mm in dia., taproot dull white, surface slightly rugose.

Figure: 2 Leaves, flowers, and stem of *Enicostemma littorale* Blume.

Microscopic characteristics

Leaf- Presence of prominent bulge abaxially in transverse section of the midrib of the leaf, collenchyma cells, vascular bundle, and parenchyma cells in ground tissues. Epidermis is single layered, papillae on the epidermis, anisocytic stomata. **Stem-**Quadrangular stem and having narrow wings, single layered epidermis, collenchyma and parenchyma are present in winged corners, uniseriate medullary rays, presence of starch grains. **Root-** Transverse section shows single layered epidermis, unicellular trichomes, uniseriate medullary rays. Pith is absent.[10]

Distribution:

E. littorale is widely distributed in South America, Africa, and Asia. It is found in all over the India up to the height 1500 feet, mostly in the coastal region.[11]

Chemical constituents of *Enicostemma littorale*:

Enicostemma littorale has chemical constituents like sterols, satechins, triterpenoids, volatile oil, and alkaloids. Main chemical constituents are betuline, triterpene sapogenin, and swertiamarin. It also contains erythrocentaurin reported to have α-amylase inhibitory activity. Heptacosane, nonacosane, myristic acid, stearic acid and oleic acid are also present in minor quantities.[12] Monoterpene alkaloids like enicoflavine and Gentiocrucine are also present.[13]

Part used **:** Whole plant

Dose **:** 1-3g churna, 50-100ml kwatha.[7]

Ayurvedic pharmacology:[7]

Action on digestive system **:** Deepan, aampachan, yakritutejak, and krimighan.

Action on circulatory system **:** Rakatshodhak and shothhar.

Action on urinary system **:** Parmehaghan.

Action on skin **:** Kushatghan.

Reported pharmacological actions:

S. No.	Pharmacological activity	Part used	Extract	Model	Dose
1.	Anthelmintic activity[14]	Aerial part	Ethanolic extract	-	-
2.	Analgesic and anti-inflammatory activity[15]	Whole plant	Methanolic extract	Freund's adjuvant-induced arthritis	150mg/Kg
3.	Cardio protective and antihypertensive effect[16]	-	Water extract	-	1.5g/100g body wt./day
4.	Antidiabetic activity[17,18]	Whole plant	Water extract	Alloxan-induced diabetic rats.	2g/Kg
		Whole plant	Methanolic extract	Alloxan-induced diabetic rats.	2.5g/Kg/day
5.	Hepatoprotective activity[19]	Aerial part	Water extract	Paracetamol-induced hepatotoxicity in	200mg/Kg

				albino rats	
6.	Antimalarial activity[20]	-	Methanolic extract	-	529.04 µg/ml (swertiamarin)
7.	Antiulcer activity[21]	Aerial part	Methanolic extract	Aspirin-induced gastric ulcer	200mg/Kg
8.	Antiobesity activity[22]	-	Water & ethanolic extract	High fat diet-induced obesity	200,250,400, 500mg/Kg
9.	Antihyperlipidemic activity[23]	-	Methanolic extract	Poloxamer-407-induced hyperlipidaemic model	50mg/Kg (swertiamarin)
10.	Antipyretic activity[24]	Whole plant	Ethanolic extract	-	260-780mg/Kg

Table 1.2: Pharmacological actions of mamajjaka

Conclusion:

Classical and modern literature based on the *Enicostemma Littorale* describing its role in the treatment of the many diseases. It is also reported to have wide array of therapeutic properties including antimicrobial activity, antihelminthic activity, antinociceptive effect, antioxidant activity, antiulcer activity, anti-inflammatory activity, antitumour activity, hepatoprotective activity, hepatomodulatory activity, and antihyperlipidaemic activity including the hypoglycemic activity, antihyperinsulinemic activity. However, there is a need of clinical data and their scientific validation in order to establish it as a medicine.

References

1. Sankaranarayanan S, Bama P, Ramachandran J, Kalaichelvan PT, Deccaraman M, Vijayalakshimi M, et al. et al. Ethnobotanical study of medicinal plants used by traditional users in Villupuram district of Tamil Nadu, India. J Med Plants Res. 2010;4(12):1089–1101.
2. Shukla A. A review of a potential hypoglycemic plant (Enicostemma littorale blume). European journal of biomedical and pharmaceutical sciences 2014. Vol. 2; 1:154-155.
3. Rajamani S, Trumalai T; Pharmacognosy of Enicostemma littorale: A review. Asian pacific journal of tropical biomedicine. 2013; 3(1): 79
4. Srivastava S, Kumar V. Polyherbal formulations based on Indian medicinal plants as antidiabetic phytotherapeutics. Inforesights publishing 2012; 5.
5. Vaibhav A, Singh O P. A concise review on “mamajjaka” (Enicostemma littorale). Asian Journal of science and technology 2016. Vol-07; 07: 3204.
6. Sharma PV. Dravyaguna Vijnana. Vol. 2. Chaukhambha Bharti Academy Varanasi 2012; 704-705.

7. Maroo J, Vihas T. Glucose lowering effect of aqueous extract of Enicostemma littorale Blume in diabetes: a possible mechanism of action. Journal of Ethnopharmacology 2002; 317.
8. Maroo J, Vihas T. Glucose lowering effect of aqueous extract of Enicostemma littorale Blume in diabetes: a possible mechanism of action. Journal of Ethnopharmacology 2002; 317.
9. Sanmugarajah V, Thabrew I. Phyto, physicochemical standardization of medicinal plant Enicostemma littorale, Blume. IOSR Journal of Pharmacy 2013. Vol. 4; 2: 52
10. The Ayurvedic Pharmacopoeia of India. Part-I. Volume- VI.First edition;115.
11. Rathod M C, Dhale D A, Pharmacognostic characterization of Enicostemma littorale Blume. Int. J. Res. Ayurveda Pharma 2013; 4(6): 893.
12. Hassan N, Ahamad J. Rapid preparative isolation of erythrocentaurin from Enicostemma littorale by medium-presssure liquid chromatigraohy, its estimation by high-pressure thin layer chromatography, and its α-amylase inhibitory activity. J. Sep. Sci. 2015; 1-7.
13. Dhanavathy G. Immunohistochemistry, histopathology, and biomarker studies of swertiamarin, a secoiridoid glycoside, prevents and protects streptozotocin-induced B-cell damage in Wistar rat pancreas. Italian Society of Endocrinology 2015; 2.
14. Mishra S, Mishra A. In-vitro anthelmintic activity of Enicostemma littorale Blume. International journal pharmaceutical sciences and research 2011; Vol. 2(5) : 1194-1195.
15. Shabi M M. Uthrapathy S. Analgesic and anti-arthritic effect of Enicostemma littorale Blume. Advances in Bioscience and Biotechnology 2014; 1018-1020.
16. Bhatt N, Chavda M. Cardioprotective and antihypertensive effects of Enicostemma littorale Blume extract in fructose-fed rats. Can. J. Physiol. Pharmacol 2012; 1065-1070.
17. Srinivasan M, Padmanabhan M. Effect of aqueous Enicostemma littorale Blume extract on key carbohydrate metabolic enzymes, lipid peroxides and antioxidants in alloxan-induced diabetic rats. Journal of pharmacy and pharmacology 2005; 57: 497-500.
18. Maroo J, Ghosh A. Antidiabetic Efficacy of Enicostemma littorale methanol extract in alloxan-induced diabetic rats 2003. Pharmaceutical biology. Vol. 41; 5: 388-390.
19. Gite V N, Pokharkar R D. Hepato-protective activity of Enicostemma axillare in paracetamol induced hepato-toxicity in albino rats. International journal of pharmacy & life sciences 2010; 50-53.
20. Soni S, Gupta S. In vitro anti plasmodial activity of Enicostemma littorale. American journal of infectious Diseases 2009; 5(3): 259-260.
21. Roy S P, Niranjan C M. Antiulcer and anti-inflammatory activity of aerial parts Enicostemma littorale Blume. Journal of young pharmacists 2010; 2(4): 369-370.
22. Garg A, Singh R. Antiobesity activity of aqueous and ethanol extracts of Enicostemma littorale in high fat diet induced obese rats. International journal of phytomedicine 2014; 6: 433-440.
23. Vaidya H, Rajani M. Antihyperlipidaemic activity of swertiamarin, a secoiridoid glycoside in poloxamer- 407 - induced hyperlipidaemic rats. The Japanese Society of Pharmacognosy and Springer 2009; 437.

24. Okokon J E, Nwafor P A. Antipyretic and antimicrobial activities of crude lesf of Enicostemma Littorale. Asian Pacific Journal of Tropical disease 2012; 2(6):442-444.