

***In vitro* Antibacterial Activity of *Enicostema littorale* plant extracts**

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The antibacterial activity of aqueous, ethanolic, methanolic, ether, acetone, chloroform and hexane extracts from *Enicostema littorale* plant has been evaluated, *in vitro*, against *Serratia* sp., *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. All extracts of *Enicostema littorale* exhibited highest antibacterial activity against *Serratia* sp and *P. aeruginosa* followed by very less activity against *E. coli* and *S. aureus*. The results indicate that *Enicostema littorale* plant may be a good candidate as antimicrobial agent.

Key words: *Enicostema littorale*, Antibacterial activity, Microorganisms.

Enicostema littorale belongs to the family Gentianaceae. It is commonly known as *Naagjhva*. It occurs throughout India, from Punjab and Gangetic plain to Kanyakumari up to English Indian Gentian. Plant constituents alkaloids are gentianine, erythrocentaurin, enicoflavine and gentiocrucine; flavonoids-apigenin, genkwanin iso-vitaxin, swertisin, saponarin and o-glucoside derivatives of sylwertisin and isoswertisin; glucosides-swertiamarin, a triterpene betulin. Swertisiode exhibited hypotensive activity¹⁻².

The Plant can act as a bitter tonic, carminative, blood purifier, antirheumatic,

anti-inflammatory, antipsychotic, anthelmintic and cardiostimulant. The plant extracts inhibited carrageenan-induced oedema and its anti-inflammatory activity was found comparable to that of hydrocortisone. The plant is used as a substitute for *Swertia chirayita*, and is reported to be effective against malaria. The plant contains ophelic acid, which is also present in chiretta as a hydrolytic product of chiratin. The root extract showed antimalarial activity both *in vitro* and *in vivo*¹. It gives glucose lowering effect in diabetes specifically in non-insulin dependent diabetes^{3,4,5}. In the literature survey it was observed that the plant has potent antioxidant activity an alloxan-induced diabetes rat^{6,7}.

The aim is to discover natural product that could be safe with promising remedies for treatment of infectious diseases caused by microorganisms. This is the first report on antimicrobial activity of *E. littorale* plant.

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MATERIAL AND METHODS

Plant material

The plant material *E. littorale* was obtained from the field of Jalana district (Maharashtra, India). The plant material was air dried and prepared to powder in crushing mixture. Sieving method was used to separate the fine plant powder.

Preparation of extracts

E. littorale whole plant powder (10gm) was taken in 100mL different solvents (ethanol, methanol, acetone, diethyl ether, hexane, chloroform and water) separately and kept for overnight period at room temperature. Next day the mixture was filtered through a cotton filter. It was dried on water bath until the constant weight with dried mass was obtained.

Antibacterial activity

Screening of bacterial activity was carried out by agar well method on *E. coli*, *Serratia* sp., *P. aeruginosa* and *S. aureus*. Dried compound (10 mg mL⁻¹) was dissolved in DMSO solvent, and used 500µg as effective concentration to test its efficacy as antibacterial agent. Antibacterial testing was carried out by Agar well method on nutrient agar medium as described by Zambare *et al.*⁸.

All plates (in duplicate) were incubated at 37°C for 48 h. The zone of inhibition by the extracted compound was measure in mm against DMSO as control.

RESULTS AND DISCUSSION

An extraction of bioactive plant material was done in different volatile and non-volatile

Table 1. Zone inhibition of various plant extract with bacteria

Extracts	Bacteria and zone of inhibition (mm) ± S. D.			
	<i>Serratia</i> sp.	<i>E. coli</i>	<i>P. aeruginosa</i>	<i>S. aureus</i>
1.	0	0	15 ± 1.03	0
2.	15 ± 1.03	12 ± 0.5	25 ± 1.52	0
3.	11 ± 0.5	0	18 ± 1.21	0
4.	17 ± 1.47	0	21 ± 4.93	18 ± 0.98
5.	16 ± 1.41	0	28 ± 0.57	0
6.	13 ± 1.16	0	23 ± 1.52	0
7.	0	0	12 ± 2.4	0

1-aqueous, 2- ethanol, 3-methanol, 4-ether, 5-acetone, 6-chloroform, 7-hexane extracts

solvents. The yields of bioactive compound obtained was 20.024%, 22.58%, 26.59%, 3.44%, 11.59%, 4.33% and 2.60% for aqueous, ethanolic, methanolic, ether, acetone, chloroform and hexane extracts respectively. As this is the second report on antimicrobial activity of plant *E. littorale* but various methodologies are reported on extractions of natural compounds and its antimicrobial activities from various plant sources^{9,10}.

The antibacterial activities of different extract are shown in Table. From Table 1 it was observed that, *Serratia* sp. and *P. aeruginosa* were strongly inhibited by ethanolic, methanolic, ether, acetone, and chloroform extracts. *P. aeruginosa* was also inhibited by aqueous and hexane extracts.

Culture growth of *E. coli* and *S. aureus* was inhibited by ethanolic and ether extracts respectively. Similarly, Patel and Trivedi¹¹ showed antibacterial activity of *E. littorale*. A methanolic extract of *E. littorale* has very good anititumor activity on Dalton's ascitic lymphoma¹².

CONCLUSION

The compound extracted from plant *E. littorale* with different solvents showed promising antibacterial activity against *P. aeruginosa*, *Serratia* sp. followed by *E. coli* and *S. aureus*.

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