The Biobrio ISSN : 2393-9508 e-ISSN: 2582-4902
An International Quarterly Journal of Life Sciences
Website: www.thebiobrio.in SJIF 2024:8.259
12(1&2): 1327-1329, 2025

# Antimicrobial activity of blue-green algae, *Oscillatoria limnosa* collected from chours of Saharsa district

**Rupak Kumari***
Department of Botany, R.M. College, Saharsa, Bihar, India

*Received : 02nd June, 2025 ; Accepted : 29th June, 2025*
*DOI:- https://doi.org/10.5281/zenodo.17022675*

## ABSTRACT

To access the antimicrobial activity of *Oscillatoria limnosa*, its extract were prepared in water, ethyl acetate and hexane and tested against three pathogenic bacteria: *E. coli, Klebsiella pneumonae* and *Staphylococcus aureus* by disc diffusion method. Maximum inhibition was recorded in ethyl acetate extract followed by hexane extract. Further *Staphylococcus* showed maximum inhibition in all extracts and *E. coli* showed minimum inhibition.

**Key Words -** Extract, *E. coli, Klebsiella pneumonae*, *Staphylococcus*, antimicrobial activity.

***Corresponding author :** rupak852201@gmail.com

## INTRODUCTION

Blue-Green Algae (Cyanobacteria), commonly referred to as Cyanobacteria, are a group of gram-negative, photosynthetic prokaryotes. Unlike eukaryotic algae, they lack a true nucleus and membrane-bound organelles but possess chlorophyll a and accessory pigments, which enable them to perform oxygenic photosynthesis. Cyanobacteria represent one of the oldest life forms on Earth and are widely distributed across the globe. They are found in diverse aquatic ecosystems, including freshwater, brackish, and marine habitats, and also thrive in terrestrial environments such as soil surfaces, moist rocks, and symbiotic associations with plants, lichens, and fungi.

One of the remarkable features of cyanobacteria is their ability to synthesize a broad spectrum of secondary metabolites (Kaushik *et al.*, 2009). These bioactive compounds exhibit diverse biological activities, such as antibacterial, antifungal, antiviral, antitumor, and anti-inflammatory effects (Kailash *et al.*, 2010). Certain cyanobacterial metabolites have been explored for pharmaceutical and nutraceutical applications. For instance, *Spirulina* (a filamentous cyanobacterium) is rich in proteins, vitamins, and pigments, and is commercially exploited as a dietary supplement and therapeutic agent, particularly in combating malnutrition. However, several cyanobacteria also produce toxins, collectively known as cyanotoxins, which pose significant risks to animal and human health as well as to water quality. Cyanotoxins are structurally diverse, and based on their chemical nature and mode of action, they are broadly classified into three major groups (Carmichael, 1992):

**Neurotoxins –** These are alkaloid compounds that disrupt the normal functioning of the neuromuscular system by blocking ion channels or interfering with neurotransmission. Exposure often results in paralysis and can cause rapid death in animals.

**Hepatotoxins –** These are cyclic peptides that primarily target the liver. By inhibiting protein phosphatases, they lead to massive liver damage and hemorrhaging, which may be fatal.

**Lipopolysaccharides (LPS) –** These are components of the cyanobacterial cell wall. While

generally less potent than neurotoxins and hepatotoxins, LPS can cause skin irritation, gastrointestinal disturbances, and allergic reactions in animals and humans.

The ecological and biomedical significance of cyanobacteria has attracted increasing attention in recent decades. Beyond their harmful effects, their metabolites are being investigated as potential sources of novel antimicrobial agents in the face of rising antibiotic resistance.

In the present study, the antimicrobial activity of *Oscillatoria limnosa,* a filamentous species of cyanobacteria, was evaluated against three clinically important pathogenic bacteria: *Escherichia coli, Klebsiella pneumoniae,* and *Staphylococcus aureus*. These bacterial strains are known for causing severe infections in humans and are often associated with multidrug resistance. The investigation aims to assess whether *O. limnosa* possesses significant inhibitory effects against these pathogens, thereby exploring its potential as a natural source of bioactive compounds for therapeutic use.

## MATERIAL & METHODS

### Collection, culture and maintenance of *Oscillatoria limnosa*:

*Oscillatoria limnosa* was collected from local chour of Saharsa district. Collected samples were brought to laboratory in polythene bags and washed thoroughly. Washed material was inoculated in BG-11 medium and incubated at 28°C temperature, 4000 lux light intensity. From this culture, axenic culture was prepared by subculturing few trichomes in BG-11 medium. Culture was identified on the basis of morphology as described by Desikachari T.V.-1959.

### Preparation of extract:

28 days old axenic culture was harvested and centrifuged at 5000 rpm. Pellets were collected and extracted in water, ethyl acetate and hexane. One gram dried pellet was dissolved in 20 ml of each solvent.

### Test organisms:

*E. coli, Klebsiella pneumonae* and *Staphyllococcus aureus* were obtained from local pathological labs and cultured in Nutrient medium.

### Antimicrobial Assay:

Antimicrobial assay was prepared by agar disc diffusion method. All pathogens were separately inoculated by lawn culture method in nutrient medium in different culture plates. Filter paper disc were prepared from extract by dipping 6mm filter paper disc in extract. Filter paper disc were dried in air and placed at the center of each plate containing culture of pathogens. Culture were incubated at 37°C for 24 hours. Inhibition zone was measured using Calipers.

## RESULT

Antimicrobial activity of *Oscillatoria limnosa* was tested against three pathogenic bacteria: *E. coli, Klebsiella* and *Staphylococcus*. Extract of *Oscillatoria limnosa* was prepared in three solvents-water, ethyl acetate and hexane. Maximum inhibition zone was recorded in Ethyl acetate extract against all pathogens. The inhibition zone against *Staphylococcus* was recorded as 13.6 mm in ethyl acetate extract, 12.5 mm in hexane extract and 9.7 mm in aqueous extract. Inhibition zone against *Klebsiella* was recorded as 12.5 mm, 11.6 mm and 8.9 mm in ethyl acetate extract, hexane extract and aqueous extract respectively. *E. coli* showed minimum inhibition in all extracts in comparison to *Klebsiella* and *Staphylococcus*. The inhibition zone for *E. coli* in aqueous, ethyl acetate and hexane extracts were recorded as 8.3 mm, 11.6 mm and 10.7 mm respectively. The result is shown in Table 1.

**Table 1- Inhibition zone.**

| Extract | Inhibition zone in mm | | |
|---|---|---|---|
| | *E. coli* | *Klebsiella* | *Staphyllococcus* |
| Water | 8.3 | 8.9 | 9.7 |
| Ethyl acetate | 11.6 | 12.5 | 13.6 |
| Hexane | 10.7 | 11.6 | 12.5 |

## CONCLUSION

The antimicrobial activity of *Oscillatoria limnosa* extracts was tested against three pathogenic Bacteria: *E. coli, Klebsiella pneumonae* and *Staphyllococcus aureus*. Extract were prepared in water, ethyl acetate and hexane. Maximum inhibition zone was recorded in ethyl acetate extract for all pathogens and minimum in aqueous extract. In all extracts maximum inhibition was recorded for *Staphylococcus pneumonae* and minimum for *E. coli*.

## REFERENCES

Browitzka M.A. and Browitzka L.J. 1988: Micro-algal Biotechnology. Cambridge University Press, Cambridge, pp.: 456-458.

Carmichael W.W. 1992: Cyanobacteria secondary metabolites the cyanotoxins. *J. Appl. Bacteriol*. 72: 760-766.

Desikachary T.V. 1959: Cyanophyta. Indian council of agriculture Research, New Delhi.

Kailash N., Bhardwaj S.C., and Bahuguna Y.M. 2010: Screening of Thermophilic cyanobacteria isolated from Tapoban Geothermal field, Uttarakhand Himalaya for the Production of Antibacterial Compounds. *Asian J. Exp. Biol. Sci.*, 1: 787-791.

Kaushik P., Ghauhan A., Chauhan G. and Goyal P. 2009: Antibacterial Potential and UV-HPLC Analysis of Laboratory Grown Culture of *Anabaena variabilis*. *Inter. J. Food Safe.*, 11: 11-18.

Mule M., Caire G., De Cano M. and Haperin D. 1991: Bioactive compound from *Nostoc muscorum (cyanobacterium*). *Cytobios*. 66: 169-172.

National Committee for Clinical Laboratory Standards (NCCLS) 1997: Performance standards for antimicrobial disk susceptibility test (6th ed.). Approved Standard. M100-A6. Wayne, Pensylvania, USA.

Prescott G.W. 1962: Algae of the Western Great Lake Areas. W.M.C. Brown Company Publisher, Dubuqe. Iowa.

Sakthivel K. and Kathiresan K. 2012: Antimicrobial activities of marine cyanobacteria isolated from mangrove environment of south east coast of India. *J. Nat. Prod.*. 5: 147-156.

***