

## Research Article

### Antibacterial Activity of *Ulva Lactuca* Extract against various Bacterial Species

G. Baskar\*, S. Preethi, K. B. Revathy

Department of Biotechnology, St. Joseph's College Of Engineering,  
Chennai - 600119. India.

\*Corresponding author's e-mail: [basg2004@gmail.com](mailto:basg2004@gmail.com)

#### Abstract

Antimicrobial activity for pathogenic microbes is ubiquitous and is the main cause of human health problem issues. In medicine various preventive and curative interventions have been adopted. Development of synthetic and natural drugs is one of the critical ways to treat the human health problems. *Ulva lactuca* is macroalgae grows on rocks and form stable, multi-layered and perennial vegetation. *U. lactuca* has been reported as a potent source of antimicrobial and antitumor agent. Antibacterial activity of extracted product was observed. The zone of inhibition observed after 24 h for *B. subtilis* was 15 mm. The zone of inhibition observed after 24 h for *Klebsiella pneumoniae* was 13 mm. These results confirmed that the extract of *U. lactuca* has good antibacterial property.

**Keywords:** Antimicrobial activity; *Ulva lactuca*; Macroalgae; Zone of inhibition.

#### Introduction

Algae are photosynthetic organisms, utilize energy from sun and release oxygen and synthesize carbohydrates and other metabolites. Macroalgae are important part of marine ecosystems [1]. *Ulva lactuca* has color variations from green to dark green depending on its occurrence i.e., underwater or at beach. It forms irregular, but round ruffled edge shaped translucent soft sheet fronds (leaf blades) from slight yellowish to blackish green. Fronds are attached to rocks with the help of holdfast. It gains 20-30 cm diameter that is quite smaller [2].

Antimicrobial activity for pathogenic microbes is ubiquitous and is the main cause of human health problem issues. In medicine various preventive and curative interventions have been adopted. Development of synthetic and natural drugs is one of the critical ways to treat the human health problems [3]. With the passage of time there is an increasing interest in natural drugs which are thought to have the least side effects. Extract of lemon peels was reported for antimicrobial activity of *S. aureus* and *E. coli* in cotton fabrics [4].

Nanoparticles are reported for their excellent antimicrobial activity. Manganese dioxide nanoparticles were reported for antimicrobial activity of against *E. coli*, *K.*

*pneumonia*, *P. aeruginosa*, *S. aureus*, and *B. subtilis* [5]. Copper and silver nanoparticles synthesized using green Alga *Botryococcus braunii* was reported for good antimicrobial activity on *P. aeruginosa* and *E. coli*, *K. pneumonia* and *S. aureus* [6]. Marine macroalgae (seaweeds) was reported recently as potential alternative to commercial drugs for antimicrobial activity. Antimicrobial activity of marine green algae extract was reported against bacterial pathogens such as *B. subtilis*, *S. aureus*, *B. cereus*, *P. aeruginosa*, and *E. coli* [7]

*U. lactuca* has been evaluated as a potent source of controlling the human pathogenic microorganisms [8]. *U. lactuca* extract was tested against some human pathogenic bacteria namely, *S. paratyphi*, *P. aeruginosa*, *V. cholera*, *S. aureus*, *S. dysenteriae* and *K. pneumonia*. Extract activity against bacteria was tested using inhibition zone method. It was observed that 11.2 mm of inhibition zone for extract against *P. aeruginosa* [9]. Thus the present work was focused on antimicrobial activity of *U. lactuca* extract against selected pathogenic microorganisms.

#### Materials and methods

##### Preparation of nutrient agar plate

Nutrient agar plate was used for checking zone of inhibition of antimicrobial activity of *U.*

*lactuca* extracts. Nutrient agar contains (g/100 ml), 0.5% peptone, 0.3% yeast extract, 1.5% agar, 0.5% sodium chloride dissolved in distilled water and pH was adjusted to 6.8. Then it was sterilized by autoclaving at 121°C for 15 min. Then it was cooled to around 50°C and poured into petri dishes, covered immediately and allowed to solidify. Solidified and cooled petri dishes are stored upside down and refrigerated until used [10].

### Antibacterial activity

In the antibacterial activity studies, five different bacterial species were used. The bacterial species used are *Bacillus subtilis*, *Klebsiella pneumoniae*, *Staphylococcus aureus* and *E. coli*. The well was created in the agar plate, then 10 µl of *U. lactuca* extract was added. Plates were kept in the incubator at 37°C overnight. The antibacterial activity was observed in terms of zone of inhibition. The zone of inhibition was interpreted based on the control plates [10].

### Results and discussions

#### Antibacterial activity

The bacterial species used for antibacterial activity studies are *B. subtilis*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Streptococcus mutans*, *E. coli*. The *U. lactuca* extract was added into the well and the antibacterial activity was observed. The zone of inhibition was interpreted based on the control plates.

#### Antibacterial activity *U. lactuca* extract on *B. subtilis*

The zone of inhibition of *U. lactuca* extract on *B. subtilis* was observed from fig. 1 and 2 and compared with the control plates. Around 15 mm of zone of inhibition was observed on the next day. This shows that *U. lactuca* extract has an antibacterial property against *B. subtilis*.

#### Antibacterial activity *U. lactuca* extract on *K. pneumoniae*

The zone of inhibition of *U. lactuca* extract on *K. pneumoniae* was observed from fig. 3 and fig. 4. Around 13 mm of zone of inhibition was observed on the next day. This shows that *U. lactuca* has an antibacterial property against *K. pneumoniae*.

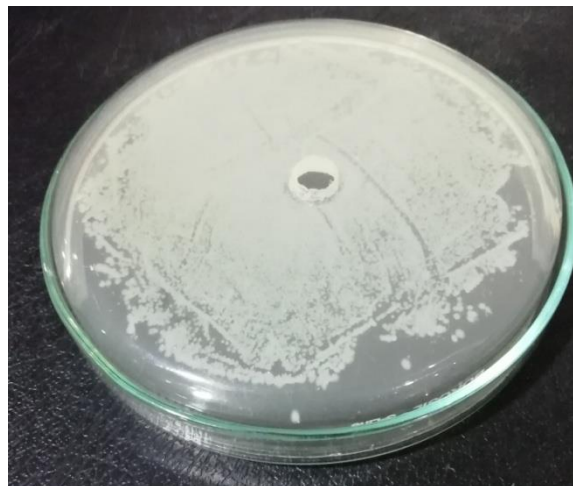


Fig. 1. Control plate for *B. subtilis*

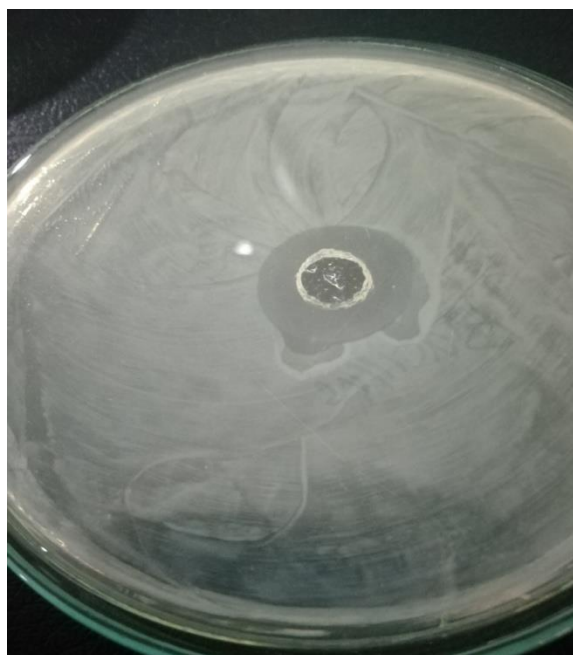


Fig. 2. Zone of inhibition by *U. lactuca* extract on *B. subtilis*

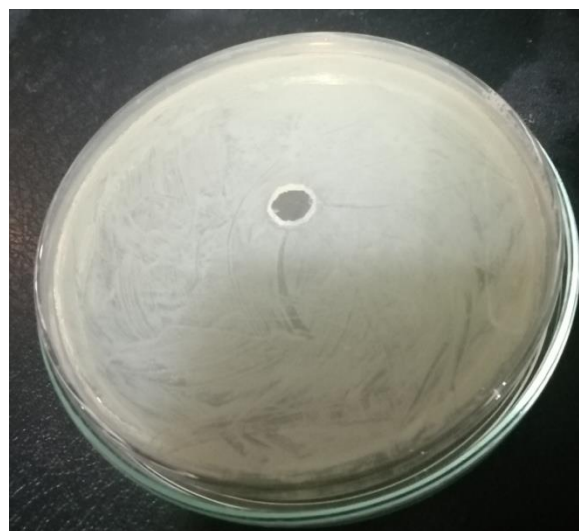


Fig. 3. Control plate for *K. pneumoniae*

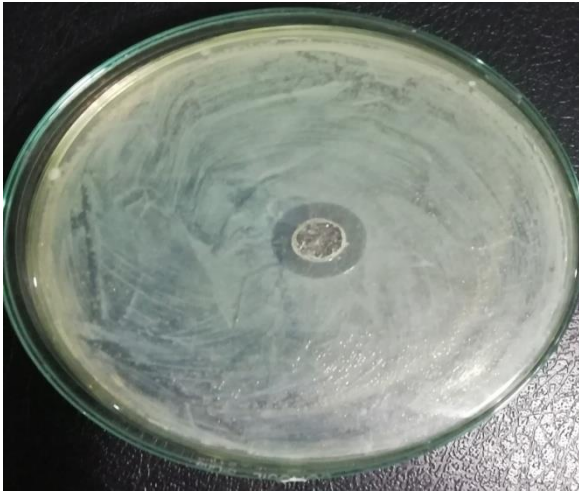


Fig. 4. Zone of inhibition by *U. lactuca* extract on *K. pneumoniae*

**Antibacterial activity *U. lactuca* extract on *S. aureus***

The zone of inhibition of *U. lactuca* extract on *S. aureus* was observed from fig. 5 and fig. 6, around 6 mm zone of inhibition was observed on the next day. This shows that *U. lactuca* extract has an antibacterial property against *S. aureus*.

**Antibacterial activity *U. lactuca* extract on *E. coli***

The zone of inhibition of *U. lactuca* extract on *E. coli* was observed from fig. 7 and fig. 8. Around 10 mm zone of inhibition was observed on the next day. This shows that *U. lactuca* extract has an antibacterial property on *E. coli*.

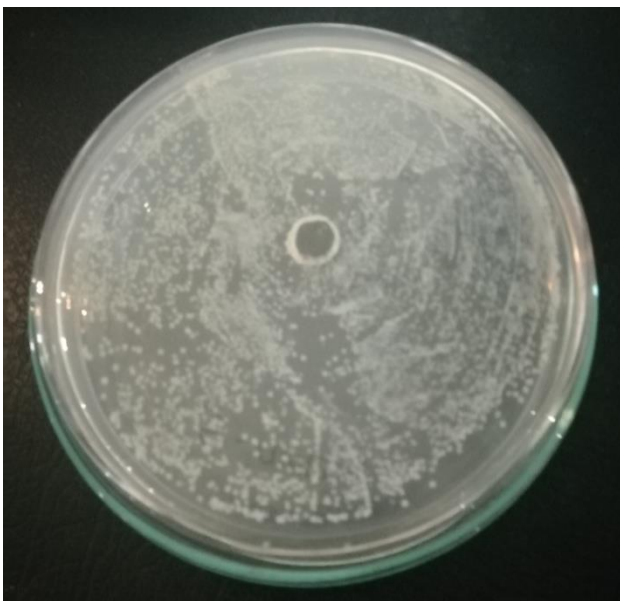


Fig. 5. Control plate for *S. aureus*

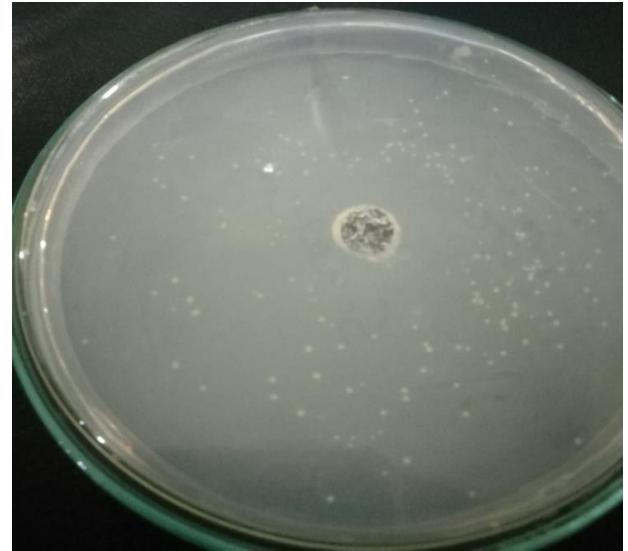


Fig. 6. Zone of inhibition by *U. lactuca* extract on *S. aureus*

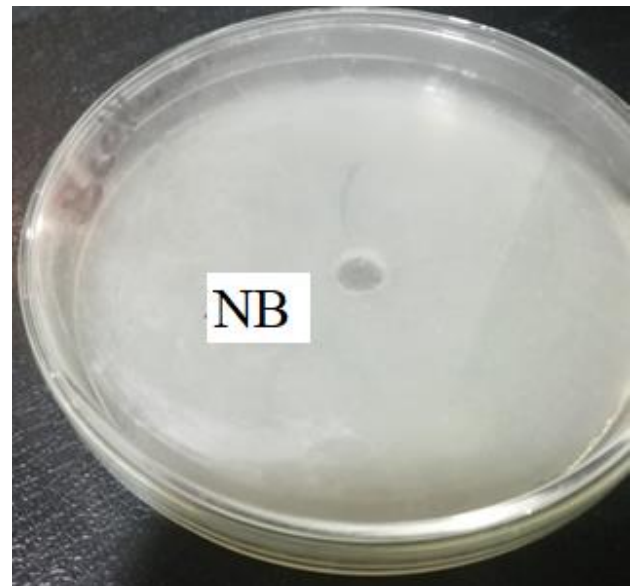


Fig. 7. Control plate for *E. coli*

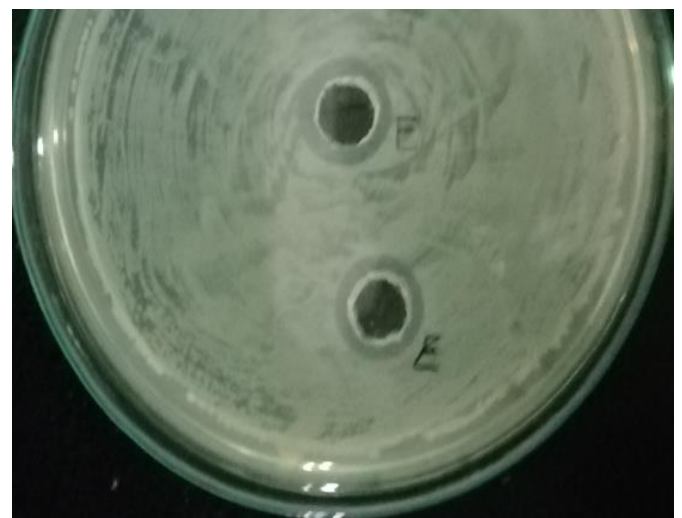


Fig. 8. Zone of inhibition by *U. lactuca* extract on *E. coli*

## Conclusions

The antibacterial activity of *U. lactuca* extract against various bacterial species was studied. The zone of inhibition of 15 mm was observed against *B. subtilis*. The zone of inhibition of 13 mm was observed against *K. pneumoniae*. The zone of inhibition of 6 mm was observed against *S. aureus*. The zone of inhibition of 10 mm was observed on *E. coli*. From the present study it was observed that the *U. lactuca* extract has high antibacterial activity against *B. subtilis* and *K. pneumoniae* than *S. aureus* and *E. coli*.

## Conflict of interest

The authors declare no conflict of interests.

## References

- [1] Alves A, Sousa R, Reis RL. A practical perspective on ulvan extracted from green algae. *Journal of Applied Phycology* 2012;25(2):407-24.
- [2] Sobrino I, Silva L, Bellido JM, Ramos F. Rainfall, river discharges and sea temperature as factors affecting abundance of two coastal benthic cephalopod species in the gulf of Cadiz (SW Spain). *Bull Mar Sci* 2002;71:851-65.
- [3] Devi KP, Suganthy N, Kesika P, Pandian SK. Bioprotective properties of seaweeds: In vitro evaluation of antioxidant activity and antimicrobial activity against food borne bacteria in relation to polyphenolic content. *BMC Complement Altern Med* 2008;8:38.
- [4] Wolela AD, N Govindan N. Ecofriendly antimicrobial finishing of cotton with extract of lemon peels. *International Journal of Modern Science and Technology* 2019;4 (10):252-59.
- [5] Cherian E, Rajan A, Baskar G. Synthesis of manganese dioxide nanoparticles using co-precipitation method and its antimicrobial activity. *International Journal of Modern Science and technology* 2016;1 (1):17-22.
- [6] Arya A, Gupta K, Chundawat TS, Vaya D. Biogenic synthesis of copper and silver nanoparticles using green Alga *Botryococcus braunii* and Its Antimicrobial Activity. *Bioinorganic Chemistry and Applications* 2018;2018:Article ID 7879403.
- [7] Razarinah W, Rizlan Ross EE, Farinna N, Rahim A. Antimicrobial activity of marine green algae extract against microbial pathogens, *Malaysian Journal of Biochemistry and Molecular Biology* 2018;2(2):42-6.
- [8] Smit AJ. Medicinal and pharmaceutical uses of seaweed natural products: A review. *Journal of Applied Phycology* 2004;16(4):245-62.
- [9] Spolaore P, Joannis-Cassan C, Duran E, Isambert A. Commercial applications of microalgae. *Journal of Bioscience and Bioengineering* 2006;101(2):87-96.
- [10] Lartigue L, Sherman T. Field assays for measuring nitrate reductase activity in *Enteromorpha* sp. (*Chlorophyceae*), *Ulva* spp. (*Chlorophyceae*), and *Gelidium* sp. (*Rhodophyceae*). *J Phycol* 2002;38:971-82.

\*\*\*\*\*