

## Antimicrobial and Antioxidant Activity of Rhamnolipids Biosurfactant is Produced by *Pseudomonas aeruginosa*

Nassir Abdullah Alyousif<sup>1,♥</sup>, Wijdan H. Al-tamimi<sup>2</sup>, Yasin Y. Y. Al-luaibi<sup>3</sup>

<sup>1</sup>Department of Ecology, College of Science, University of Basrah. Basrah, Iraq.

<sup>2</sup>Department of Biology, College of Science, University of Basrah. Basrah, Iraq, [wijdan.abdulsahib@uobasrah.edu.iq](mailto:wijdan.abdulsahib@uobasrah.edu.iq), <https://orcid.org/0000-0002-5474-334X>

<sup>3</sup>Department of Biology, College of Science, University of Basrah. Basrah, Iraq, [yasin.yousif@uobasrah.edu.iq](mailto:yasin.yousif@uobasrah.edu.iq), <https://orcid.org/0000-0001-8380-5960>

\*Corresponding author: [nassir.hillo@uobasrah.edu.iq](mailto:nassir.hillo@uobasrah.edu.iq), <https://orcid.org/0000-0001-5316-7195>

Available from. <http://dx.doi.org/10.21931/RB/2023.08.04.25>

### ABSTRACT

Rhamnolipids are the glycolipid biosurfactant produced by different *Pseudomonas* species; they show antimicrobial activity and antioxidant. The findings of antimicrobial activity showed the rhamnolipid biosurfactant had an antimicrobial effect against the microorganisms at different concentrations, such as toward *Bacillus cereus* and *Klebsiella pneumoniae*, while a lower inhibitory effect toward *Staphylococcus aureus* and *Pseudomonas aeruginosa*. The rhamnolipid biosurfactant was shown to have a lower inhibitory effect against fungal strains *Candida albicans* and *Aspergillus niger*. The lower minimum inhibitory concentration (MIC) values of rhamnolipid biosurfactant toward the investigated microorganisms were 2 mg/ml for *E. coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* and 3 mg/ml for *Staphylococcus aureus*, *Enterobacter cloacae*, *Bacillus cereus*, *Proteus mirabilis*, *Candida albicans* and *Aspergillus niger*. Rhamnolipid biosurfactant was tested as an antioxidant agent; the results showed 22.7 %, 47.4 %, 79.8 %, 85 % and 91.4 % of antioxidant activity at concentrations 5, 10, 15, 20 and 25 mg/ml, respectively. Cytotoxicity of the rhamnolipid biosurfactant was also examined at different concentrations against human erythrocytes. Hemolysis of the erythrocytes was observed at concentrations 100, 75, 50, 40 and 35 mg/ml, whereas the results exhibited no hemolysis at concentrations 25 and 15 mg/ml. The study concluded that rhamnolipid biosurfactant showed effective antioxidant activity, no hemolysis at lower concentrations and has a high antimicrobial effect. The rhamnolipid biosurfactant is a suitable and great alternative to be employed as an effective and safe therapeutic agent.

**Keywords:** Antimicrobial; Antioxidant; Cytotoxicity; Rhamnolipid; *Pseudomonas aeruginosa*.

### INTRODUCCIÓN

Antibiotic abuse has led to the developing of multi-drug resistant pathogens to commercially marketed antibiotics. The combatting of resistant infections emergence is required to search for the development of novel antimicrobial drugs having broad spectrum antimicrobial activity<sup>1</sup>. The problem of the increasing resistance by pathogens to some antimicrobial compounds has paid attention to investing in natural compounds with various mechanisms of action as suitable alternatives to existing antibiotics<sup>2</sup>. Several biosurfactant compounds have exhibited antimicrobial activity against different human pathogenic bacteria, making them a suitable substitute for existing antimicrobial agents as potent therapeutic agents<sup>3</sup>.

Rhamnolipids are the glycolipid biosurfactant that is produced by different bacterial species such as *Pseudomonas aeruginosa*, *Pseudomonas plantarii*, *Pseudomonas chlororaphis*, *Pseudomonas putida*,