



## Antimicrobial Activity of *Saussurea costus* Against Bacterial Pathogens Isolated from the Gills of Common Carp (*Cyprinus carpio*) with Gill Disease

Arafat Rajab Ahmed<sup>1</sup>, Eman A. Al-Emara<sup>1</sup>, Abdul Amer Reheim Jassim<sup>1</sup>, Ahmed Yousif AlShammari<sup>2</sup>

<sup>1</sup>Department of the Biological Development of Shatt Al-Arab and the N. Arabian Gulf, Marine Science Center, University of Basrah, Iraq

<sup>2</sup>Environmental Chemistry Department, Marine Science Center, University of Basrah, Iraq

\*Corresponding Author: [arafat.ahmed@uobasrah.edu.iq](mailto:arafat.ahmed@uobasrah.edu.iq)

### ARTICLE INFO

#### Article History:

Received: Dec. 14, 2024

Accepted: May 20, 2025

Online: June 8, 2025

#### Keywords:

Medicinal plant,  
Indian costus,  
Tetracycline,  
Bacterial gill disease,  
Common carp

### ABSTRACT

Bacterial gill disease (BGD) is a major issue in aquaculture, often causing substantial mortality in farmed fish. This study evaluated the antibacterial efficacy of the Indian costus (*Saussurea costus*) root extract against bacterial isolates from the common carp (*Cyprinus carpio*) affected by BGD. Bacterial isolates, including *Aeromonas sobria*, *Sphingomonas paucimobilis* strain K3, and *Sphingomonas paucimobilis* strain E6-5, were tested against ethanolic *S. costus* root extract at varying concentrations (10%, 7.5%, 5%, and 2.5%) along with the antibiotic tetracycline. The results showed promising dose-dependent antibacterial activity, with *A. sobria* being particularly sensitive. The gas chromatography (GC) mass analysis of the ethanolic extract revealed a high diversity of bioactive compounds, especially lactones, phenols, and terpenes with known antibacterial properties. While tetracycline displayed greater potency, the findings suggest that *S. costus* extracts could potentially serve as a natural alternative for managing BGD and reducing the reliance on conventional antibiotics in aquaculture practices. However, before large-scale application, further research is needed to evaluate the efficacy, safety, and cost-effectiveness of utilizing *S. costus* extracts in the aquaculture field. Nonetheless, this study provides valuable preliminary data highlighting the antibacterial potential of *S. costus* against fish pathogens and the potential of exploring natural products from medicinal plants for sustainable disease management in aquaculture.

### INTRODUCTION

The aquaculture sector produced 82.1 million tons of various aquatic animals in 2018, and the common carp (*Cyprinus carpio*) contributed to approximately 4.19 million tons of total production (FAO, 2020). *C. carpio* is the only freshwater fish raised in Iraq and is considered a source of income for the rural community in the country (Ahmed *et al.*, 2020; Ahmed, 2021). Aquaculture production has been plagued by many factors including diseases. High stocking density of fish in aquaculture enterprises increases the rate of disease outbreaks (Irshath *et al.*,