

## Evaluation of Chemical Composition and Antibacterial Properties of *Froriepia subpinnata* Essential Oils from Guilan Region: Before and After Flowering

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**Abstract:** Herbal essential oil (EO) as a natural and traditional source are considered to be suitable alternatives for controlling chemical resistant strains due to their antibacterial compounds and also no adverse effects. This study was undertaken to identify the chemical compositions and also to assess the antibacterial effects of *Froriepia subpinnata* (Ledeb.) Baill. (*F. subpinnata*) EOs before and after flowering against *Pseudomonas aeruginosa* (*P. aeruginosa*), for the first time. Based on our findings, 50 and 41 components were identified by gas chromatogram/mass spectrometry (GC-MS) in the before and after flowering EOs of *F. subpinnata*. The major components of *F. subpinnata* EOs before flowering were kuminol (42.05 %), phenol (28 %) and its after flowering prominent compounds were sabinin (25.96 %), timol (22.68 %), cyclohexene (17.21 %). Minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were obtained 6 % and 8 % for before flowering, and, 4 % and 6 % for after flowering. Also in antibiogram method, both EOs at before and after flowering stages exhibited lower inhibitory effect on *P. aeruginosa* in comparison with ciprofloxacin, amikacin and imipenem antibiotics. According to the results, the antimicrobial effect of *F. subpinnata* EOs after flowering was more than before flowering, in both disk diffusion and microdilution methods. Hence as a natural and new antimicrobial agent can be substituted with chemical antibiotics, in the pharmaceutical and food industries.

**Key words:** Antimicrobial, chemical composition, essential oil, *Froriepia subpinnata*, *Pseudomonas aeruginosa*, antibiogram.

### Introduction

The growing resistance of some pathogens including *P. aeruginosa* to synthetic antibiotics produced by the various pharmacological industries is recognized as one of the greatest threats to human health worldwide<sup>1,2</sup>. *P. aeruginosa* is a Gram-negative opportunist pathogen capable of causing nosocomial infections in hospitalized or im-

mune-compromised patients<sup>3,4</sup>. *P. aeruginosa* is a major nosocomial pathogen that can be isolated from different environmental sources, including freshwater, soil, animal, human, and plant due to its high adaptability<sup>4,5</sup>. Due to the high resistance of *P. aeruginosa* to common antibiotics and the relatively high cost and side effects of these drugs, the use of natural compounds with

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