

Antibacterial Properties of *Citrus aurantiifolia* and *Citrus microcarpa* Peel Extracts Against Human Pathogens

Aina Suraya Ismail^a, Wan Razarinah Wan Abdul Razak^{a*}

Structured Abstract

Background: Citrus fruits are among the most significant global fruit crops, known for their high consumption and role in food preservation. However, significant citrus peels generated from citrus fruit production can cause environmental issues. With growing concerns over antibiotic resistance and the need for alternative antimicrobial agents, exploring natural sources like citrus peels has become vitally important. In this research, the antibacterial properties of peel extracts from *C. aurantiifolia* and *C. microcarpa* against selected human pathogens are studied to address the rising issues of antibiotic resistance and promoting sustainable waste utilization. The study aims to evaluate the antibacterial properties of *C. aurantiifolia* and *C. microcarpa* and determine the Minimum Inhibition Concentration (MIC) and Minimum Bactericidal Concentration (MBC).

Methods: Peels of *C. aurantiifolia* and *C. microcarpa* were extracted using ethanol. The antibacterial activity was evaluated using well diffusion methods against *Escherichia coli*, *Staphylococcus aureus*, *Bacillus cereus* and *Pseudomonas aeruginosa*. Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) were determined through 96-well microtiter plate and agar plate dilution methods, respectively.

Results: Both extract exhibited significant antibacterial activity, with clear inhibition zones observed against *S. aureus* and *P. aeruginosa*. However there were no antibacterial activity were observed against *B. cereus* and *E. coli*. Moreover, *C. microcarpa* peel extracts show greater antibacterial efficacy with inhibition zones of 17mm against *S. aureus* at 5000mg/ml compared to *C. aurantiifolia* at 14.3mm. Both extracts demonstrated moderate MIC (625mg/ml) and MBC (1250mg/ml) values for *S. aureus* and *P. aeruginosa*, highlighting differences in bacterial susceptibility. Gram-positive bacteria were more susceptible due to structural differences in their cell walls, enabling better penetration of bioactive compounds found in the extracts.

Conclusion: In conclusion, the study successfully evaluated the antibacterial properties of *C. aurantiifolia* and *C. microcarpa* and determined the MIC and MBC. Utilizing citrus waste in this manner can help combat antibiotic resistance while promoting environmental sustainability by repurposing agro-waste into valuable resources.

Keywords: *Citrus aurantiifolia*, *Citrus microcarpa*, antibacterial activity, antibiotic resistance, sustainability.

*Correspondence: razarina408@uitm.edu.my

^a Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia