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Antibacterial Activity on Star Anise (*Illicium verum* Hook) Extracts Against Pathogenic Bacteria

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Structured Abstract

Background: Foodborne illnesses occur when people consume contaminated food or drinks, leading to symptoms like diarrhoea and sometimes death. In Malaysia, acute diarrhoea is a major health issue, with over 13.5 million cases and 230,000 deaths annually. Medical experts are concerned about bacteria becoming resistant to antibiotics. Therefore, there is a need for new antibacterial agents. *Illicium verum* (star anise) is a spice believed to have antibacterial properties and is a potential solution to foodborne illnesses and antibiotic resistance in Malaysia. This study aimed to evaluate the antibacterial properties of *I. verum* ethanolic extracts against bacteria such as Methicillin-resistant *Staphylococcus aureus* (MRSA), *Staphylococcus aureus*, *Escherichia coli*, *Bacillus cereus*, and *Pseudomonas aeruginosa*.

Methods: The methods used included collecting *I. verum* fruit from a local market in Kuala Lumpur, Malaysia, performing ethanolic extraction, preparing media agar, isolating the bacteria on agar plates, microscopic examination, bacterial suspension preparation, well diffusion assay for antibacterial activity screening, determining Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC), conducting bacterial growth reduction assays, and evaluating data via statistical analysis including One-Way ANOVA and Welch tests.

Results: The study showed that *I. verum* ethanolic extracts could inhibit the activity of food pathogens. The inhibition zone ranged from 10 mm to 18 mm, corresponding to extract concentrations from 16.77 mg/mL to 268.30 mg/mL. The extract had a low MIC value against *B. cereus* (4,190 µg/mL) and an equal MIC against MRSA, *S. aureus, E. coli*, and *P. aeruginosa* (8,380 µg/mL). The MBC value was consistent across all bacteria (33,540 µg/mL). The *I. verum* ethanolic extract exhibited bacteriostatic actions against *B. cereus* with an MBC to MIC ratio of 8 and bactericidal actions against the others with a ratio of 4. In bacterial growth reduction assays, Gram-positive bacteria (MRSA, *S. aureus*, and *B. cereus*) showed growth reductions of 15.30%, 34.33%, and 9.24%, respectively, after 24 hours of treatment. Gram-negative bacteria (*E. coli* and *P. aeruginosa*) showed reductions of 2.96% and 13.48%, respectively, under similar conditions.

Conclusion: In conclusion, the findings indicate that *I. verum* ethanolic extracts can inhibit bacterial activity in food pathogens, potentially preventing foodborne illnesses and increasing food safety. These results provide guidance on the effective concentrations of *I. verum* for use in food processing and commercial applications to limit bacterial contamination.

Keywords: *Illicium verum* fruits, *I. verum* ethanolic extracts, food pathogens, foodborne illness, diarrhoea.

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