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Bacteriostatic and synergistic antibacterial effects of Piper betle and Petroselinum crispum extracts in combination with conventional antibiotics

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Abstract
The emergence of multidrug-resistant bacteria has prompted the search for novel therapeutic alternatives, including the use of plant-derived compounds. This study investigates the synergistic antibacterial potential of methanolic and hydroalcoholic extracts of Piper betel and Petroselinum crispum leaves in combination with conventional antibiotics against Escherichia coli and Staphylococcus aureus. Phytochemical screening revealed the presence of various bioactive compounds such as flavonoids, alkaloids, tannins, and coumarins. Antibacterial activity was evaluated using agar well diffusion for individual and mixture plant extracts. Both bacteriostatic and bactericidal activities of the extracts were determined, with minimum inhibitory concentration (MIC) by broth microdilution methods. Additionally, minimum bactericidal concentration (MBC) was evaluated, and the maximum bactericidal activity (0.313 mg/mL) was observed for methanolic extract of combined plants against S. aureus. Furthermore, the potential of the plant extracts to modulate the activity of standard antibiotics (gentamycin and ciprofloxacin) was assessed using the fractional inhibitory concentration index (FICI) to classify the interactions as synergistic, indifferent, or antagonistic. The results demonstrated that while the extracts exhibited moderate antibacterial activity individually, they significantly enhanced the efficacy of antibiotics when used in combination, suggesting their potential role as natural antibiotic adjuvants in combating drug-resistant bacteria.
Key words:
Synergism, antibiotic, Petroselinum crispum, Piper betle, fractional inhibitory concentration index

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