ANTIBACTERIAL ACTIVITY OF GERANIOL IN COMBINATION WITH STANDARD ANTIBIOTICS AGAINST HELICOBACTER PYLORI, STAPHYLOCOCCUS AUREUS AND ESCHERICHIA COLI

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Abstract: The emergence of bacterial resistant to conventional antibiotics limits their use in therapeutic treatment. This has led to the search of alternative medications from plant sources. Geraniol, an acyclic monoterpeneid is the main active constituent in the essential oils of rose and palmorosa. Antioxidant, antibacterial, anticancer and antitulcer activity of geraniol was reported by many researchers. The present investigation was designed to study antibacterial activity of geraniol against Staphylococcus aureus ATCC 25923, Escherichia coli ATCC 25922 and Helicobacter pylori ATCC 43504. Further, its combination effect with standard antibiotics ampicillin, amoxicillin and clarithromycin against these bacteria were tested. The minimum inhibitory concentrations (MICs) of geraniol against S. aureus, E. coli and H. pylori were assessed by using the modified broth microdilution and disc diffusion methods. In the other hand, their combinatory effects against targeted bacteria were assessed using checkerboard assay by expressed in term of fractional inhibitory concentration index (FICI). The time killing rate of synergistic drug pairs on bacteria is also evaluated by time kill assay against S. aureus. MIC of geraniol against S. aureus, E. coli and H. pylori was 11200 µg/mL, 5600 µg/mL and 7325 µg/mL, respectively. A significant synergistic effect was observed between geraniol and ampicillin against S. aureus with the FICI ranged from 0.19 to 0.56. The MIC of ampicillin was markedly lowered when combined with geraniol. There were no synergistic effect when geraniol in combination with ampicillin against E. coli as well as the combination between geraniol and clarithromycin towards S. aureus. From the time-kill kinetic study, geraniol itself was found to have a better killing effect than ampicillin in combination with geraniol and followed by ampicillin alone. A marked decline of log CFU/mL was noted between times 2-6 h. MIC of clarithromycin against H. pylori was lowered in combination with geraniol. A partial synergistic effect was observed between clarithromycin and geraniol against H. pylori with the FICI ranged from 0.86 to 1.0. Geraniol exhibited significant antibacterial activity and synergistic activity along with other antibiotics. Partial synergistic activity of geraniol with clarithromycin could be a potential interest for the treatment of H. pylori infection and associated ulcer in humans. Further, its activity against antibiotic resistance strains of S. aureus and H. pylori could be investigated.

Indexterms: Geraniol, Helicobacter pylori ATCC 43504, Staphylococcus aureus ATCC 25923, Escherichia coli ATCC 25922, MIC, FICI