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Synergistic Antibacterial Activity of Methanolic Extract of *Cinnamomum zeylanicum* Bark and *Curcuma longa* Rhizome

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Background: The combination of plant extracts has shown significant potential in enhancing antimicrobial efficacy through synergistic interactions. Such combinations may offer improved therapeutic outcomes, multitarget actions, reduced toxicity, lower dosage requirements, decreased resistance development, and wider activity against many pathogens. *Cinnamomum zeylanicum* (Sri Lankan cinnamon) and *Curcuma longa* (turmeric) are rich in phytochemicals and are renowned for their antibacterial properties. However, the type of pharmacodynamic interaction between the methanolic extracts from the bark of *C. zeylanicum* and the rhizome of *C. longa* grown in Sri Lanka, has not yet been investigated.

Objective: To evaluate the synergistic antibacterial activity of methanolic extracts of Sri Lankan *C. zeylanicum* bark and *C. longa* rhizome

Methods: Minimum inhibitory concentrations (MICs) of methanolic extracts were evaluated using the broth microdilution method, using Muller Hinton broth in a 96 well plate across the concentrations ranging from 100 mg/mL to 0.195 mg/mL with each concentration in triplicates. The synergistic antibacterial activity was determined using the checkerboard microdilution method and quantified by calculating the fractional inhibitory concentration index (FICi) against clinical isolates of *Staphylococcus aureus* and *Escherichia coli.*

Results: The MIC of *C. zeylanicum* extract for both *S. aureus* and *E. coli* was 3.125 mg/mL. For *C. longa,* the MIC was 25 mg/mL against *S. aureus* and 50 mg/mL against *E. coli.* Synergistic and additive effects were observed with FICi ranging from 0.25 to 0.625. The MICs at which synergistic effects observed were at 0.781 and 0.097 mg/mL of *C. zeylanicum* for both bacteria; for *C. longa,* the MICs were 25 and 12.5 mg/mL for *E. coli* and 12.5 and 6.25 mg/mL for *S. aureus*. Further, additive effects were observed at 0.195, 0.390 and 1.562 mg/mL of *C. zeylanicum* for both bacteria; for *C. longa,* the MICs were 25 and 6.25 mg/mL for *E. coli* and 12.5 and 3.125 mg/mL for *S. aureus*.

Conclusions: The combination of methanolic extracts of *C. zeylanicum* bark and *C. longa* rhizome demonstrated both synergistic and additive antibacterial effects against both *S. aureus* and *E. coli.*

Keywords: *Cinnamomum zeylanicum, Curcuma longa, Escherichia coli, Staphylococcus aureus, Synergistic effect*