

Antimicrobial Action and Its Underlying Mechanism by Methanolic Seed Extract of *Syzygium cumini* on *Bacillus subtilis*

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Abstract : The development of antibiotic resistance in bacteria is increasing at an alarming rate, and this is considered as one of the most serious threats in the history of medicine, and an alternative solution should be derived so as to tackle this problem. In many countries, people use the medicinal plants for the treatment of various diseases as these are cheaper, easily available and least toxic. *Syzygium cumini* is used for the treatment of various kinds of diseases but their mechanism of action is not reported. The antimicrobial activity of *Syzygium cumini* was tested by the well diffusion assay and zone of inhibition was reported to be 20.06 mm as compared to control with MIC of 0.3 mg/ml. Genomic DNA fragmentation of *Bacillus subtilis* revealed apoptosis and FE-SEM indicate cell wall cracking on several intervals of time. Propidium iodide staining results showed that few bacterial cells were stained in the control and population of stained cells increase after exposing them for various period of time. Flow cytometric kinetic data analysis on the membrane permeabilization in bacterial cell showed the significant contribution of antimicrobial potential of the seed extract on antimicrobial-induced permeabilization. Two components of *Syzygium cumini* methanolic seed extract was found to be quite active against four enzymes like PDB ID- 1W5D, 4OX3, 3MFD and 5E2F which have a very crucial role in membrane synthesis in *Bacillus subtilis* by in silico analysis. Through in silico analysis, lupeol showed highest binding energy for macromolecule 1W5D and 4OX3 whereas stigmasterol showed the highest binding energy for macromolecule 3MFD and 5E2F respectively. It showed that methanolic seed extract of *Syzygium cumini* can be used for the inhibition of foodborne infections caused by *Bacillus subtilis* and also as an alternative of prevalent antibiotics.

Keywords : antibiotics, *Bacillus subtilis*, inhibition, *Syzygium cumini*

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