

Anti-quorum sensing and biofilm inhibitory activity of *Mentha piperita* essential oil and its major phytochemical menthol against gram negative bacterial pathogens

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Quorum sensing (QS) plays an important role in virulence, biofilm formation and survival of many pathogenic bacteria including *Pseudomonas aeruginosa*. This signaling pathway is considered as novel and promising target for anti-infective agents. In the present investigation, effect of *Mentha piperita* (peppermint) oil on QS regulated functions was evaluated in *C. violaceum* and *P. aeruginosa* PAO1 strains at their respective sub-MICs. Concentration dependent decrease in violacein production of *C. violaceum* CV12472 was observed in comparison to untreated control. Sub-inhibitory concentrations of the peppermint oil demonstrated statistically significant reduction of las and rhl regulated virulence factors like LasB, total protease, chitinase and pyocyanin production, swimming motility and exopolysaccharide production. Biofilm forming capability of PAO1 was also reduced in a concentration dependent manner at all tested sub-MIC values. Molecular docking was applied to obtain the plausible phytochemicals involved in the inhibition of QS and biofilm formation. Docking studies revealed that menthol has the highest affinity with the residues of LasR active site. The ability of menthol to interfere with quorum sensing (QS) was also assessed and menthol was found to inhibit the production of virulence factors, including violacein, elastase, pyocyanin, and biofilm formation. Further, the preinfected *Caenorhabditis elegans* displayed an enhanced survival when treated with 3% v/v of peppermint oil. The above findings have indicated the promising anti-infective property of peppermint oil which is mainly contributed by its active compound menthol against tested gram negative bacteria.

Keywords: Quorum sensing, biofilm, *Mentha piperita*, molecular docking, and menthol

Biography

Fohad M. Husain is pursuing Ph.D. from Department of Agricultural Microbiology. He is presently working on the quorum sensing and biofilm inhibitory potential of natural products.

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