The comparative efficacy of garlic and other selective natural product extracts as quorum sensing inhibitors (QSI) effective against biofilm producing Pseudomonas aeruginosa

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ABSTRACT

Pseudomonas aeruginosa is an opportunistic pathogen of humans, animals as well as of plants. It is the most common Gram-negative bacterium found in nosocomial infections. Pseudomonas associated biofilms are highly resistant to high doses of antibiotics. Recent discoveries of quorum quenching (QQ) mechanisms use quorum sensing (QS) as a potential antimicrobial target. Interference with QS can be a novel and effective tool to manage recalcitrant pathogenic microbes. Therefore, the aim of the present study was to monitor the biofilm formation in P. aeruginosa and to examine the efficacy of garlic extract as antipathogenic drugs in selective P. aeruginosa strains. To achieve this goal we investigated the effect of garlic extract and other compounds on P. aeruginosa quorum sensing in terms of biofilm formation. For this purpose, local identified strain (Pseudomonas aeruginosa strain BTP1 (KU534099) and Pseudomonas aeruginosa strain WPP1 (KU534100)) of P. aeruginosa was used. Biofilm formation of P. aeruginosa was determined through tube method, congo red medium and microtitration plate method. Then the N-acyl homoserine lactone (N-AHL) autoinducers of P. aeruginosa were detected through biosensors. Garlic (Allium sativum) extract and other selected natural plants extracts like moringa (Moringa oleifera), neem (Azadirachta indica) were tested as quorum sensing inhibitor (QSI) for P. aeruginosa through N-AHL interference assay, pigment inhibition assay, swarming inhibition assay and biofilm inhibition assay. The results outcomes of present study showed that P. aeruginosa infections were found in above-mentioned hospitals with frequency 13.5% (AH), 9% (DHQ) and 7.5% (NH). P. aeruginosa isolates recovered from following sources with a significant rate throat infections (14.7%), wounds (13.3%), hospital instruments (8.6%) and soil (3.3%). Pyocyanin production, swarming and biofilm could be reduced up to 55-60%, 65-75% and 75-85% by ethanolic extracts of garlic, neem and moringa. Through these studies, we explored the potential of these compounds as antipathogenic drugs.