

TITLE: QUORUM SENSING INHIBITION IN *Pseudomonas aeruginosa* BY CURCUMIN

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ABSTRACT

The expression of many virulence genes in *Pseudomonas aeruginosa* is regulated by quorum sensing (QS) and the inhibition of this mechanism by natural compounds has been widely investigated. The antimicrobial and anti-inflammatory properties of curcumin are reported in the literature, but little is known whether this curcuminoid has an effect on bacterial communication. This study aimed to evaluate the potential of curcumin for quorum sensing inhibition in *P. aeruginosa* PAO1. Initially, we performed a test using two QS reporter strains (*P. aeruginosa lasB-gfp* and *P. aeruginosa rhlA-gfp*) and then we evaluated the expression of QS regulated virulence factors. Expression of *gfp* gives rise to a burst of fluorescence when *lasB* or *rhlA* is induced. This system is very sensitive, and the GFP signal is turned down in the presence of a QS inhibitor. The curcumin sub-inhibitory concentrations were determined by growth curves. Green fluorescent protein (GFP) expression of *P. aeruginosa lasB-gfp* and *rhlA-gfp* was measured at 485 nm for excitation and 535 nm for emission. Pyocyanin levels were quantified in chloroform-extracted cultures at 520 nm. Rhamnolipids were quantified adjusting the pH of the culture supernatant to 2.0 with HCl and measuring the absorbance at 570 nm. Swarming and swimming motilities were examined on M8 medium with 0.5% agar and LB medium with 0.3% agar, respectively. The GFP signal was reduced in the presence of furanone, and curcumin at 50 μ M was capable of inhibiting 41% of GFP expression for *lasB-gfp* and 37% for *rhlA-gfp*. Pyocyanin production decreased 38% with 50 μ M of curcumin and 29% with 25 μ M. In these concentrations of curcumin, the rhamnolipids production, which is involved in bacterial motility, was decreased by 29 and 22%, respectively. Swarming and swimming motilities of *P. aeruginosa* PAO1 were also significantly reduced in the presence of 50 μ M curcumin. For swarming, the halo diameter reduced from 2.5 cm to 1.9 cm, while for swimming the reduction was from 5.0 cm to 1.4 cm. Overall, curcumin showed promising anti-QS activities in *P. aeruginosa* PAO1 and should be analyzed as a QSI for foodborne bacteria, targeting future applications in the food and health areas.

Keywords: motility; phenolic compounds; pyocyanin; rhamnolipids; virulence factor.

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