TITLE: Inhibition of Bacterial Quorum Sensing (QS) by Organic Extracts of Onion Varieties

AUTHORS: QUECAN, B.X.V; RIVERA, M.L.C.; HASSIMOTTO, N.M.A.; PINTO, U.M.

INSTITUTION: UNIVERSIDADE DE SÃO PAULO, SP (AV.PROF.LINEU PRESTES 580, BLOCO 13B, CEP 05508-000, SAO PAULO–SP, BRAZIL)

ABSTRACT:
Expression of some genes is regulated by a communication mechanism called *quorum sensing* (QS) including the expression of virulence factors, biofilm formation and other processes that can influence food quality and safety. Extracts of food sources such as carrots, garlic, radish, vanilla among others and their isolated compounds have shown a great potential to inhibit QS and its controlled phenotypes. This study aimed to evaluate the anti-*quorum sensing* potential of organic extracts obtained from red and white onion varieties against QS microbial models. Phenolic compounds of red and white onions were extracted with organic solvents, then separated by solid-phase chromatography and identified by using HPLC-DAD and LC-*ESI-MS/MS.* The antimicrobial activity of the extracts was evaluated by determining the minimum inhibitory concentration (MIC) using broth microdilution method, testing concentrations ranging from 125 to 15 µg/mL and by performing growth curves under these conditions. The inhibitory effect on the QS system was tested by evaluating phenotypes regulated by the QS system such as violacein production in *Chromobacterium violaceum* ATCC 12472, swarming motility and biofilm formation in *Serratia liquefaciens* MG1 and *Pseudomonas aeruginosa* PA01. Our results showed that Quercetin 3,4'-diglucoside, Quercetin-3-glycoside and Isorhamnetin were the predominant compounds in white and red onion varieties. Additionally, cyanidin-3-glycoside was found in red onion. The MICs for both types of onion were either 125 or above 125 µg/mL. Concentrations below MIC were used for the anti-*quorum sensing* experiments. Violacein production by *C. violaceum* showed a reducing trend with red onion extract at a concentration of 31.2 µg/mL, without inhibition of bacterial growth. *Swarming* motility of *S. liquefaciens* showed a reduction in the concentration of 62.5µg/mL with red onion extract, while for *P. aeruginosa,* inhibition of motility was not observed. Biofilm formation was reduced with red onion extract in all the tested concentrations for both microorganisms while for white onion extracts, inhibition was not observed. The obtained results could boost new applications of onion varieties in the food industry, as future inhibitors of foodborne virulence factors. It is likely that the observed effects are due to the phenolic compounds that were identified here. Future studies will focus on determing the mechanism of inhibition presented by the identified compounds in the extracts.

Keywords: Quorum sensing, antimicrobial activity, onion, anti-quorum sensing effect, organic extracts.

Development Agency: CNPq