Effects of α-solanine and α-chaconine on bacterial efflux pump activity and biofilm formation in pectinolytic bacteria

Grupa-Urbańska A, Sołtys-Kalina D, Lebecka R

The Plant Breeding and Acclimatization Institute - National Research Institute

a.grupa@ihar.edu.pl

Abstract:

Pectinolytic bacteria, pathogenic to potato (*Solanum tuberosum* L.), cause significant economic losses in potato production worldwide. These bacteria employ multiple virulence mechanisms , including plant cell wall-degrading enzymes (PCWDEs), quorum sensing (QS), efflux pumps , and biofilm formation, all of which facilitate colonization and persistence in host tissues. As part of its defense strategy, potato synthesize glycoalkaloids (GAs), steroidal secondary metabolites with antimicrobial properties. The predominant GAs in potato tubers, α-solanine and α-chaconine, have been studied for their inhibitory effects on bacterial growth (Sołtys-Kalina *et al.*, 2023). However, their influence on bacterial stress adaptation mechanisms, such as efflux pump activity and biofilm formation, remains poorly understood. Our recent evidence suggests that the ratio of α-solanine to α-chaconine in wild *Solanum* species and diploid hybrids may modulate bacterial virulence, highlighting the need for further investigation of their synergistic effects. This study explores the effects of synthetic α-solanine and α-chaconine both individually and in a ratio reflecting their natural proportion in wild *Solanum* species on the persistence and virulence traits of *Dickeya solani* and *Pectobacterium brasiliense*. We investigate whether these compounds influence bacterial efflux pump activity and biofilm formation, potentially interfering with QS-mediated regulation of virulence. Our findings will provide novel insights into the antimicrobial and regulatory effects of GAs, contributing to a better understanding of plant-derived defense mechanisms and their potential application in sustainable disease management strategies in potato cultivation.

Sołtys-Kalina D, Grupa-Urbańska A, Lebecka R, Tallant M, Kellenberger I, Dupuis B, 2023. Increase of Glycoalkaloid Content in Potato Tubers by Greening as a Method to Reduce the Spread of Pectobacterium and Dickeya spp. in Seed Production Systems. *Microorganisms* 11, 605.