Deciphering the Distinct Biocontrol Activity of Fengycin and Surfactin, Two *Bacillus* Lipopeptides, through Their Differential Impact on Lipid Membranes

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Lipopeptides produced by beneficial bacilli are interesting candidates as biocontrol agents to reduce the use of chemical pesticides. These molecules present dual properties, i.e, some of them can have a direct antagonism against plant pathogens while others are able to elicit plant immunity. Their biological activities rely on their interaction with plasma membrane lipids but their exact mode of action remains to be elucidated. In this study we conducted a comparative analysis of two bacilli lipopeptides, namely surfactin (SRF) and fengycin (FGC) in terms of biocontrol activity. We examined both their antagonistic property against *Botrytis cinerea* and their capacity to elicit early immune responses in *Arabidopsis thaliana*. In parallel, we investigated their effects on membranes using biomimetic liposomes. FGC exhibits a direct antagonistic activity and a very slight plant immune-eliciting activity while SRF only demonstrates an ability to stimulate plant immunity. Our analysis of membrane permeability, lipid packing, and liposome size revealed that FGC interacts with lipids through a solubilizing/permeabilizing mechanism while SRF interacts by disturbing the lipid packing within the membrane. By correlating the findings from both studies, we can suggest that the direct antagonistic activity of CLPs is linked to their capacity to disrupt lipid membrane (through pore formation or solubilization) while the stimulation of plant immunity is more likely the result of their ability to alter the mechanical properties of the membrane. Hence both aspects, membrane disruption and membrane disturbance, play a pivotal role in determining the effectiveness of lipopeptide or other membrane-active molecules as biocontrol agents.