The lipid fraction of plant plasma membrane has a key role during the immune related defense response by the natural lipopeptide surfactin

In plants, the basal immune response is activated by the perception of conserved molecular motifs typically harbored by microbial phytopathogens and called elicitors. Some non-pathogenic bacteria are also able to reduce plant disease through the stimulation of a primed state in the host plant allowing an accelerated activation of defense responses upon subsequent pathogen attacks. The lipopeptide surfactin secreted by plant-beneficial bacilli has crucial biological functions among which such an ability to stimulate immune-related responses in host tissues. However, the molecular basis of this phenomenon remains poorly understood. In this context, we combined integrative biophysical and biological approaches to investigate the mechanism governing the perception of this biosurfactant at the plant cell surface. First, multiple structural variants were tested for their potential to induce oxidative burst in suspension-cultured tobacco cells. In this way, a correlation between the structure and activity was obtained with good consistency and temporal correlation. Beside structure/activity relationship, a biophysical characterization of the interaction of surfactin with large unilamellar vesicles of different compositions by using isothermal titration calorimetry was also performed with the aim to identify preferential membrane lipids or domains for interaction. Our results indicate that surfactin perception relies on a lipid-driven process at the plasma membrane level. Such a sensor role of the lipid bilayer is quite uncommon considering that plant basal immunity is usually triggered upon recognition of elicitors by high-affinity protein receptors in the plasma membrane.