Signals in pathogen and host sensing: free fatty acid and oxylipins

Scala V[1], Pucci N[1], Salustri M[2], Modesti V[1], Lucchesi V[1], L'Aurora A[1], Scortichin M[3], Zaccaria M[4], Momeni B[4], Reverberi M[2], Loreti S[1]

[1] Council for Agricultural Research Economics (CREA), Research Centre for Plant Protection and Certification, Via C.G. Bertero 22, 00156, Roma, Italy
[2] Sapienza University, Dept. of Environmental Biology, P.le Aldo Moro 5, 00185 Roma, Italy
[3] Council for Agricultural research and the Analysis of Agricultural Economics (CREA), Research Centre for Olive, Fruit Trees and Citrus, Via di Fioranello 52, 00134, Roma, Italy
[4] Department of Biology, Boston College, 02467 MA Chestnut Hill, United States

Lipids play important roles at various stages of host–pathogen interactions, determine pathogens virulence, modulate plant defenses and might also function as modulators of several pathways in cell-to-cell communication. Free Fatty Acids (FFA) oxidated by enzymes [e.g., lipoxygenases (LOXs) and dioxygenases (DOXs)] form oxylipins, that have been extensively studied in plant–pathogen interaction. The oxylipins show a structural similarity among plant, fungal and bacterial prompting the hypothesis that they are important in cross-kingdom communication. We presented here the results within European XF-ACTORS and Italian SALAVOLIVI and OLIDIXIIT projects. The studies were carried out with *Xylella fastidiosa* subsp. pauca (Xfp) grown in vitro amending or not different lipids entities to characterize the bacterial lipidome. The results support the hypothesis that FFA and oxylipins change in the different Xfp lifestyle and are crucial to modulate the pathogen lifestyle. Further we analysed the lipidome of *Nicotiana tabacum* and *Olea europaea*, artificially and naturally infected (Olive Quick Decline Syndrome - OQDS) with Xfp, respectively. LC-TOF and LC-MS/MS analysis pinpointed that the FFA and the oxylipins derived by the oleic, linoleic and linolenic acid are differently accumulated in infected plants versus non infected and some lipid entities are hallmarking of infection. Basing on the knowledge of oxylipins as cellular signals in different pathosystems, we can assume that lipids can act as signals for reshaping the lifestyle of the contenders and sometimes determining the fate of the challenge. These studies demonstrate, for the first time in a phytopathogenic bacteria, that the LOX- and DOX-oxylipins can influence the bacterial "status" and are differently accumulated in infected versus non infected plants. More efforts should be conducted to unveil if this lipid entities pave the way to *Xylella* pathogenicity or simply facilitate it. These hallmarks can be employed as markers of OQDS and/or for developing new control strategies.

Keywords: molecular signals, lipids, oxylipins