

## Monoterpenes interaction with a model phospholipid membrane to elucidate their antifungal mechanisms of action

Francesca Sacchi, Francesca Saitta, Marco Signorelli, Francesca Annunziata, Sharmila Gosh, Salvatore Princiotta, Sabrina Dallavalle, Andrea Pinto, Andrea Kunova, Paolo Cortesi, Dimitrios Fessas

University of Milan, Department of Food, Environmental and Nutritional Science, via Mangiagalli, 25, 20133, Milan, Italy

francesca.sacchi@unimi.it

Phytopathogenic fungi affect the quality and the yield of produced crops, causing losses up to the 30% at all stages of crop production. To address the growing urgency in managing fungal diseases, there is the need to find novel compounds able to effectively inhibit plant pathogens, with low impact on human health and environment. In this context, the development of natural and nature-derived agrochemicals is a promising strategy. Several phenolic natural compounds exhibit antimicrobial activity by targeting the microbial cell membrane, as shown also by a previous work concerning the thermodynamic dissection of the antibacterial action of stilbenoids. [1]

Based on the knowledge about cell membrane thermodynamics, [2,3] our study focuses on the investigation of the interaction of terpenes and polyphenols with a model membrane, specifically designed to simulate the lipid bilayer of some pathogenic fungi, like *Alternaria solani*, *Botrytis cinerea* and *Fusarium sambucinum*. Thus, natural compounds are investigated in order to gain further insights into their antifungal activity at a molecular level and possibly elucidate their mechanism of action.

The present work reports the calorimetric study of a model phospholipid membrane prepared as Small Unilamellar Vesicles (SUVs) and constituted as a 30:20:35:15 mixture of DPPC:DOPC:DPPG:DPPS. The interaction of the model membrane with three monoterpenes, namely carvacrol, thymol and cuminaldehyde [4,5], was evaluated through high-sensitivity Differential Scanning Calorimetry (micro-DSC) on SUVs incorporating the selected compounds at physiological pH (pH 7.4). Furthermore, the monoterpenes interaction contribution to the membrane thermodynamic stability was dissected, revealing the influence of both the charge and size of the constituting phospholipid headgroups by using model binary systems.

### Bibliography

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