**How could the herbicidal effects of selected essential oil compounds be related to their membrane activity ?**

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The European legislation on plant protection products (PPP) is about to undergo important changes in the coming years. The chemical PPP destined to be removed from the European market are responsible for the appearance of resistance phenomena to plants pests. It is therefore necessary to explore new alternatives, one of them being the search for natural herbicides. Essential oils (EO) could provide a welcome alternative due to their proven activity as PPP. Even if these compounds seem to have a bright future as PPP, their activity is mainly approached through empirical observations. EO are also a complex mix of of different molecules that could act individually or in synergy. Particularly, very little is known when it comes to molecular mechanisms of action and the relations between structure and activity of the active compounds. This study aims to investigate the structure/activity relationships of some EO molecules, among which cinnamaldehyde (CIN) from cinnamon and citronellal and citronellol from lemongrass.

Due to their lipophilic properties, EO tend to interact with one or more of the layers found in the outer plant tissues, among which the cell membranes. For cinnalmaldehyde (and other EO compounds), it has been shown that they are able to interact with bacterial phospholipids and induce change in lipid organization (fluidity, packing,..) on model lipid monolayers (Nowotarska et al, 2014). Citronnellol was notably shown to displace cholesterol from its phospholipid complexes (Lange, Y et al, 2009). However, nothing is known about any interaction with lipids specific to plant plasma membrane (PPM). In this study, we analyzed the effects of the above three EO compounds on model PPM by complementary *in vitro* and *in silico* biophysical approaches. We showed that the three compounds have differential effects on plant lipids and different herbicidal properties on plantae. While part of the herbicidal activity could be related to membrane perturbation, some clues remain to be elucidated.

Future studies at a molecular point of view would help to better decipher the herbicidal action involving the membrane, other outer plant tissues such as the cuticule and/or and a potential effect on EO compounds on proteins or genomic DNA, as it was shown for CIN on E. Coli (He, TF et al, 2018).

***References***

Nowotarska et al, Molecules, 2014, 19, 7497

He et al, J. Photochem and Photobiol, 2018, 178, 623

**Mots-clés / Key words:** essential oils, plasma membrane interaction, structure/activity relationships, herbicidal effect