Stress-related accumulation of arabidopsides: impact on plant chloroplasts

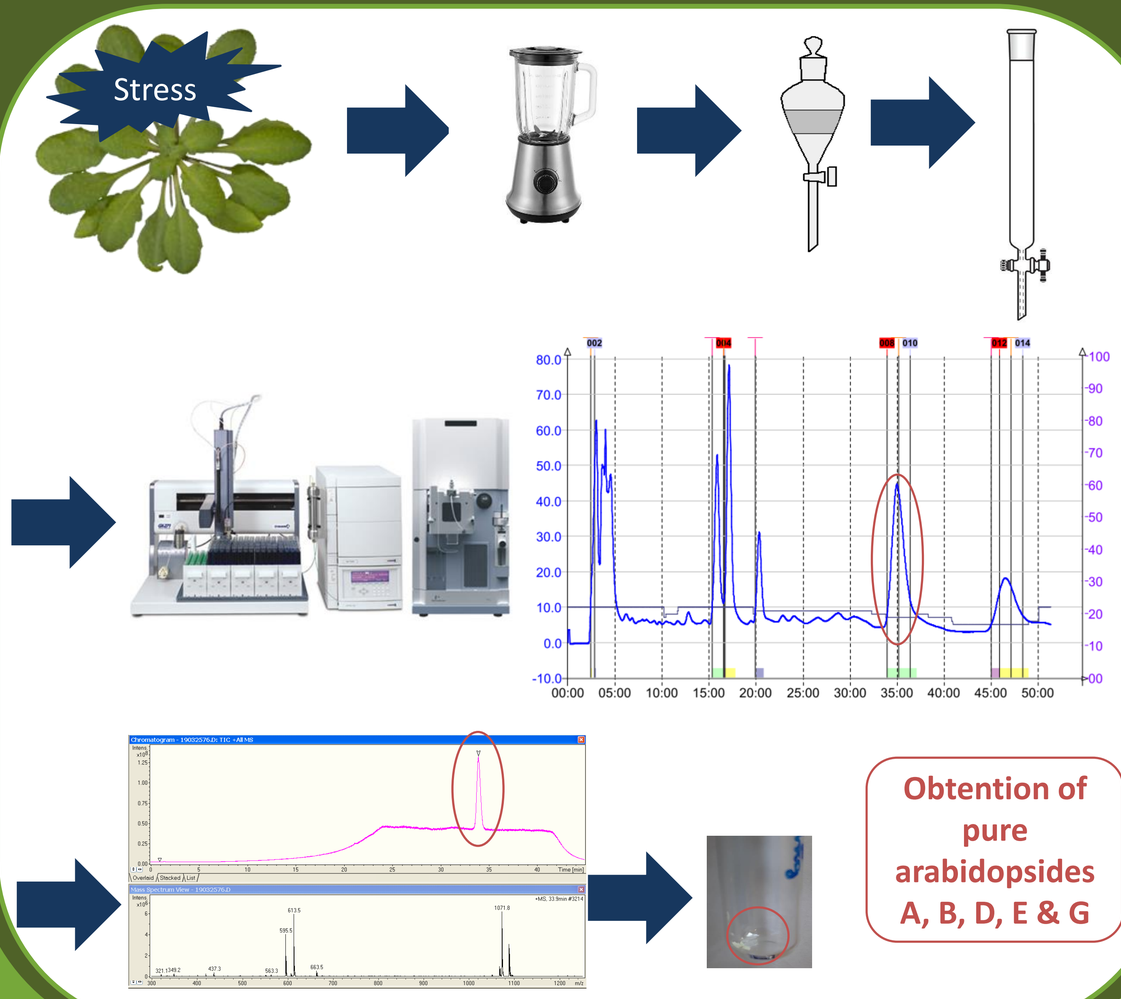
Genva M., Deleu M., Andersson M.X., Lins L., Fauconnier M-L
Gembloux Agro-Bio Tech, University of Liège, Passage des déportés, 2, 5030 Gembloux/Belgium

Context & objectives

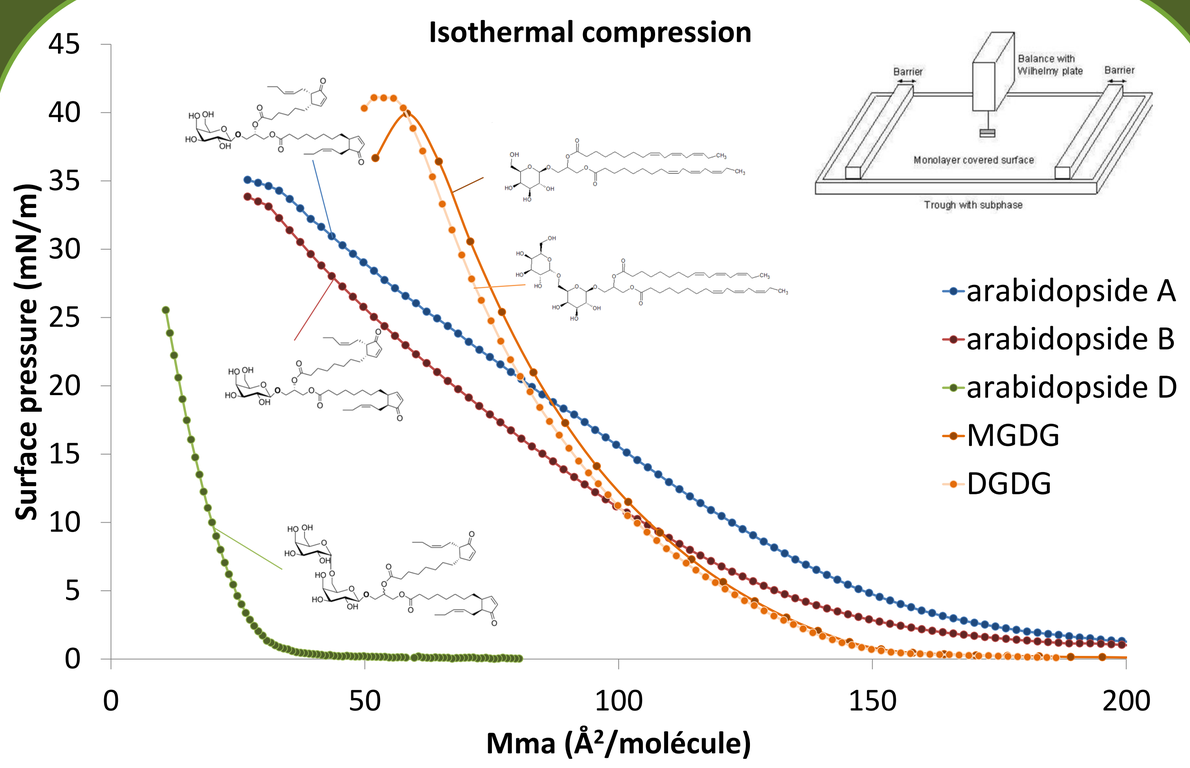
Oxylipins are crucial agents in plant defense mechanisms. While free oxylipins are well studied, roles of esterified oxylipins remain unclear. Esterified oxylipins are structurally diverse metabolites that were found in diverse plant species, suggesting that those may be more ubiquitous that currently thought. Among those, galactolipids containing (dn)OPDA were discovered, firstly in *A. thaliana*, but also in other plants. Those molecules, named arabidopsides, are highly induced under stress conditions, as it accumulates up to 8 percent of plant lipids, but their precise contributions in plant defense mechanisms are still unknown. Arabidopsides are directly formed in plant chloroplast membranes from galactolipids. Accumulation of arabidopsides in such high quantity in chloroplast membranes may modify their properties.

This study aims to understand the impact of arabidopside presence in chloroplast membranes on their properties using biomimetic plant membranes via complementary *in silico* and *in vitro* approaches.

1 Is it possible to extract and purify arabidopsides



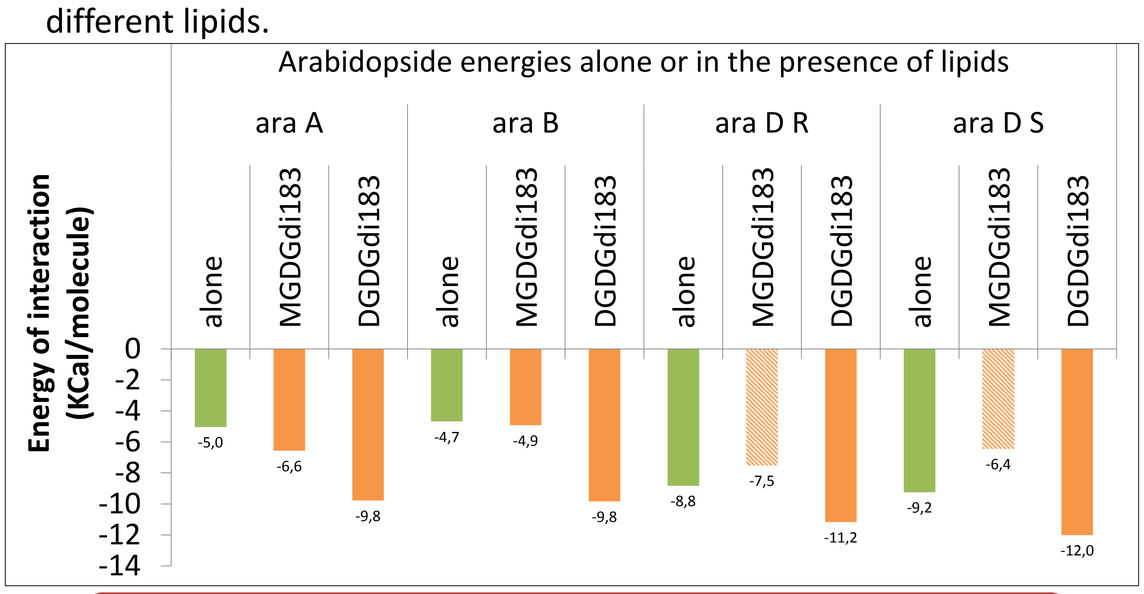
2 Does arabidopsides have different interfacial properties than non-oxidized galactolipids?



Arabidopsides have different behavior in comparison with non-oxidized galactolipids
Arabidopside formation under stress may modify membrane structure and functions

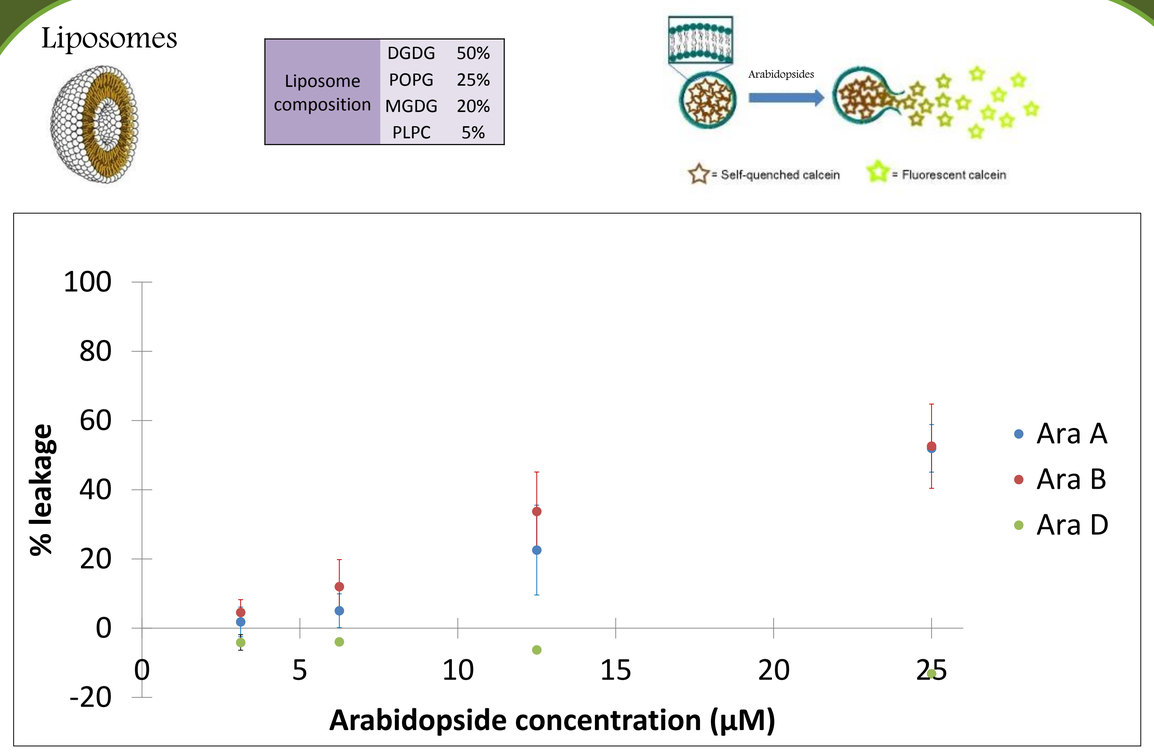
3 Are arabidopsides able to favourably interact with chloroplast lipids?

The docking method **Hypermatrix** is used to surround a biomolecule positioned at an hydrophobic/hydrophilic interface by lipids. It calculates interaction energies and more stable lipid positions are chosen. This method allows to compare molecule interactions with different lipids.



Arabidopsides formed in chloroplast membranes may interact with chloroplast lipids

4 Are arabidopsides able to permeabilize chloroplast membranes?



Arabidopsides A and B are able to permeabilize chloroplast membranes

Conclusions

Arabidopsides formed under stress have different interfacial properties than non-oxidized galactolipids

Arabidopside interaction with chloroplast lipids is favorable

Arabidopsides A and B are able to permeabilize chloroplast membranes

Arabidopside presence in chloroplast membranes under stress may modify chloroplast structure and functions

Literature

Andreou A. & al., *Prog. Lipid. Res*., 2009, **48**(3-4), 148-170
Hisamatsu Y. & al., *Tetrahedron Letters*, 2003, **44**(29), 5553-5556
Nilsson A.K. & al., *FEBS Letters* , 2012, **586**(16), 2483-2487
Böttcher, C. & Weiler, E.W., Planta, 226(3), 629-637
Genva M. & al., Phytochem Rev (2018)

For more informations

m.genva@uliege.be

Acknowledgements

The authors thanks the *Fond National pour la Recherche Scientifique* for their financial support and the *FIELD* project (supported by the Wallonie-Bruxelles federation)