Stress-related accumulation of arabidopside: impact on plant chloroplasts

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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 than currently thought. Among those, galactolipids containing (d)OPDA were discovered, firstly in A. thaliana, but also in other plants. Those molecules, named arabidopside, 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. Arabidopside are directly formed in plant chloroplast membranes from galactolipids. Accumulation of arabidopside 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 arabidopside?

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

3. Are arabidopside 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.

4. Are arabidopside able to permeabilize chloroplast membranes?

Conclusions

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

Arabidopside interaction with chloroplast lipids is favorable.

Arabidopside A and B are able to permeabilize chloroplast membranes.

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

Literature

Hisamatsu Y. & al., Tetrahedron Letters, 2003, 44(29), 5553-5556

For more informations

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