Stability to oxidation and interfacial behavior at the air-water interface of minimally-processed versus processed walnut oil-bodies

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**The consumption of walnuts** is associated with many health benefits, attributed to their fatty acid profiles, which is rich in polyunsaturated fatty acids (PUFA). As a result, walnuts are used in several food products, such as walnut-based beverages, where fat is partly dispersed under the form of natural lipoproteic assemblies, which are called oil bodies (OB).

**Two questions remain pressing:** what is walnut OB’s oxidative behavior and what are the consequences of oxidation on its interfacial reactivity?

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### Material and methods

#### Oxidative challenge test (PV, TBARS)

- **Incubation**: 20 days at 40°C
- **Ellipsometry/Tensiometry**: D0, D1, D3...D20

#### Ellipsometry/Tensiometry

- **Wilhelmy balance**
- **Ellipsometry**
- **Langmuir-Blodgett transfer**

#### Atomic force microscopy

**π** (surface pressure) → molecular interfacial interactions

**Δ** (ellipsometric angle) → amount of matter at the a/w interface

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### Results - Oxidative behavior

**PV value**

- **MP OB**
- **Complex matrix**

**TBARS value**

- **MP OB**
- **Complex matrix**

**Conclusion**: Walnuts OB were stable to oxidation on the short term (few days). This phenomenon is related to the “assembly effect” of OB and to their antioxidant content in vitamins **E** (41.0 ± 20.7 % wt.). The stability of the OB dispersion was higher under the complex matrix form due to the “matrix effect”.

(Kergomard et al., 1994)

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### Results - Interfacial behavior

**How does the structural changes of oxidized OB affect the behaviour at the interface?**

**Fresh Isolated MP OB**

- **ϕ** = 20.7 mN/m
- **Δf** = 10.9°

**Oxidized Isolated MP OB**

- **ϕ** = 15 mN/m
- **Δf** = 5°

**Conclusion**: When MP OB adsorb at an air/water interface, the good cohesive ability of their native assembly allows them to keep intact their microstructure. Oxidation phenomenon modified the physical integrity of the OB, decreasing intermolecular forces, which resulted in a different interfacial organization.

(Kergomard et al., 2021)

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