



HAL
open science

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

Jeanne Kergomard, Nathalie Barouh, Gilles Paboeuf, Pierre Villeneuve, Olivier Schafer, Timothy Wooster, V. Vié, Claire Bourlieu-Lacanal

► To cite this version:

Jeanne Kergomard, Nathalie Barouh, Gilles Paboeuf, Pierre Villeneuve, Olivier Schafer, et al.. Stability to oxidation and interfacial behavior at the air-water interface of minimally-processed versus processed walnut oil-bodies. Lipid droplets & Oleosomes - 2nd International Conference, Dec 2021, Strasbourg, France. . hal-03466652

HAL Id: hal-03466652

<https://hal.science/hal-03466652v1>

Submitted on 6 Dec 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

STABILITY TO OXIDATION AND INTERFACIAL BEHAVIOR AT AIR-WATER INTERFACE OF MINIMALLY-PROCESSED VERSUS PROCESSED WALNUT OIL-BODIES



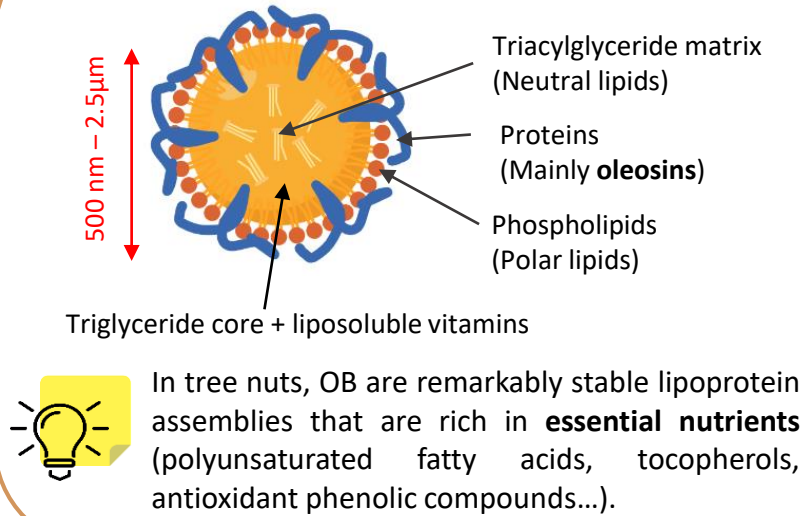
Jeanne Kergomard^{1,2*}, Nathalie Barouh³, Gilles Paboeuf², Pierre Villeneuve³, Olivier Schafer⁴, Tim J. Wooster⁴, Véronique Vié¹ and Claire Bourlieu²

¹IPR Institute of Physics, UMR UR1 CNRS 6251, Rennes 1 University, France ; ²IATE, Univ Montpellier, INRAE, Institut Agro, Montpellier, France ; ³QUALISUD, Univ Montpellier, CIRAD, Institut Agro, IRD, Univ Réunion, Montpellier, France ; ⁴Institute of Materials Science, Nestlé Research, Lausanne, Switzerland

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).

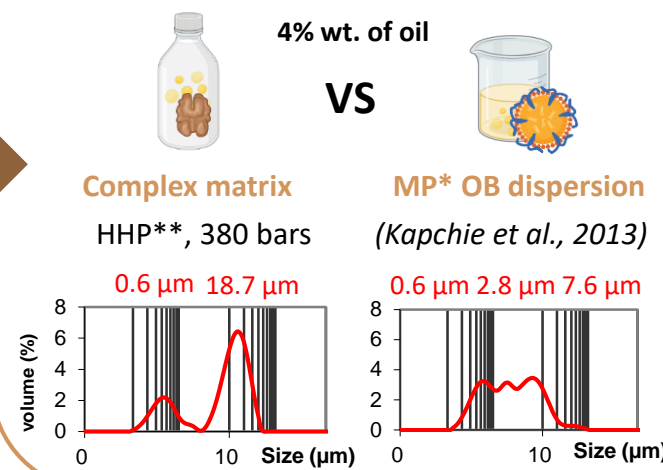
Two questions remain pressing: what is walnut OB's oxidative behavior and what are the consequences of oxidation on its interfacial reactivity?

What are OB?

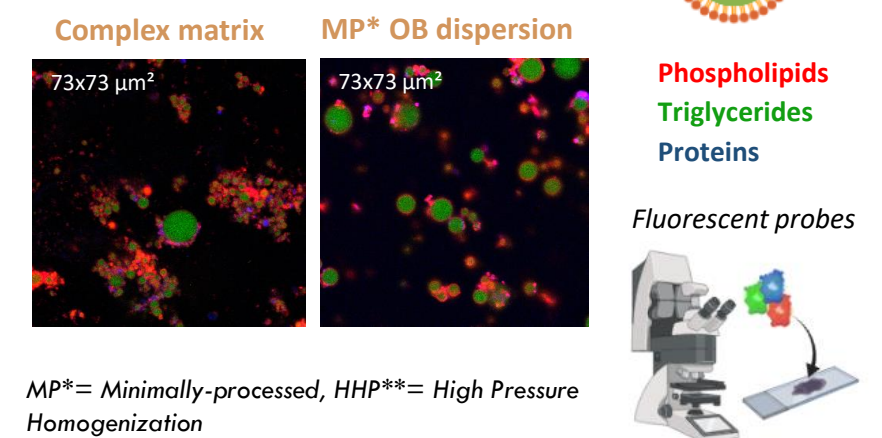


Material and methods

Matrix preparation

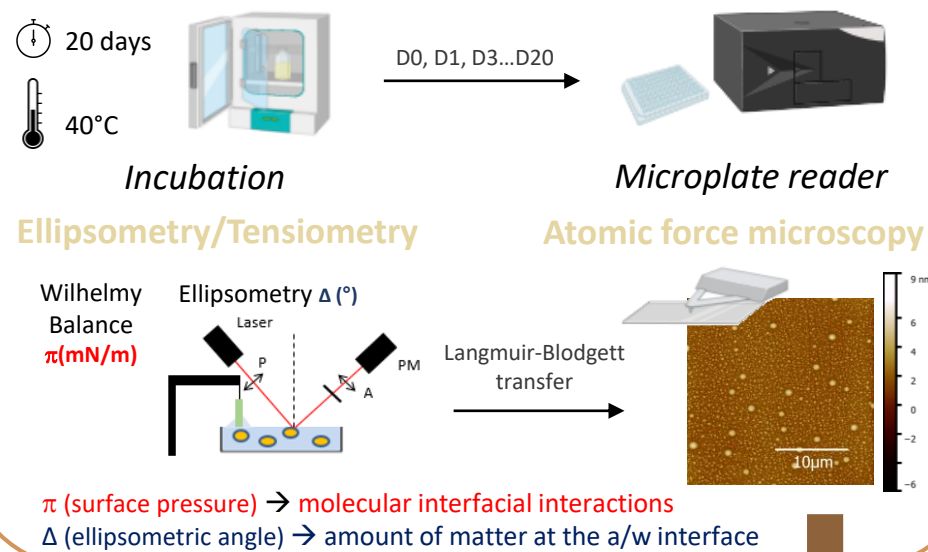


Confocal laser scanning microscopy

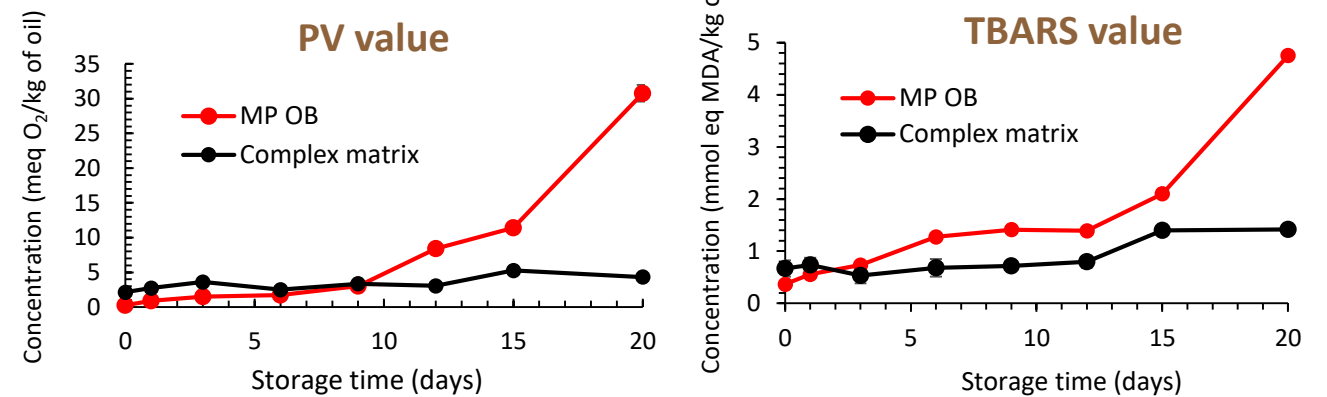


Material and methods

Oxidative challenge test (PV, TBARS)



Results - Oxidative behavior

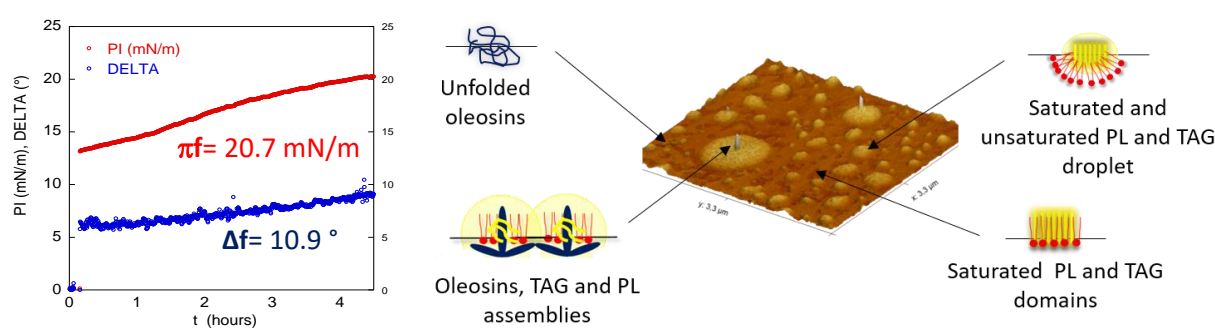


Conclusion: Walnuts OB were **stable to oxidation** on the short term (few days). This phenomenon is related to the “assembly effect” of OB and to their antioxidant content in **vitamins E** (41.0 ± 20.7 % wt.). The stability of the OB dispersion was higher under the complex matrix form due to the “matrix effect”. (Huang et al., 1994)

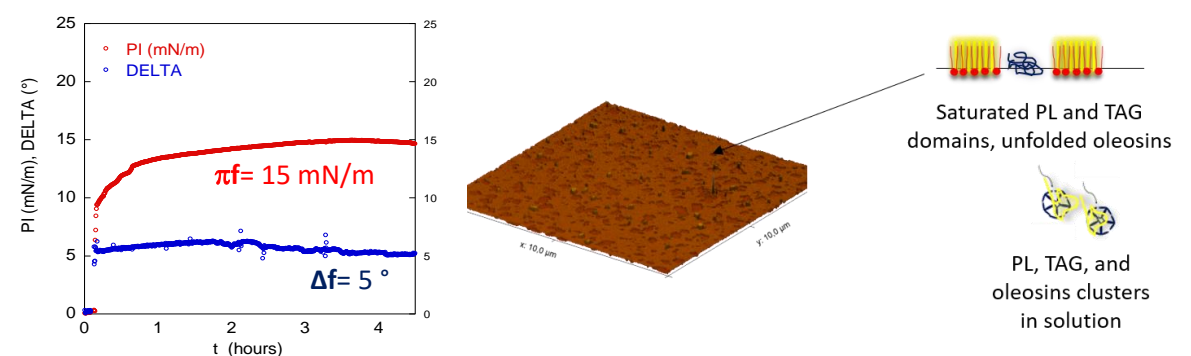
Results - Interfacial behavior

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

Fresh Isolated MP OB



Oxidized Isolated MP OB



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)

Conclusion: Altogether, this study unveiled the **interesting stability of OB** and their **specific interfacial reactivity**, opening the way to the use of these natural lipoproteic assemblies in various food applications. *Nevertheless*, their physico-chemical stability during the design process should be taken into consideration. Indeed, the alteration of the physical structure of OB during processing may affect their chemical stability during storage and hence the quality of the final product expected by the consumer. This finding underlines the need to rethink food processing to preserve natural assemblies and their beneficial properties.

*Corresponding author:
Jeanne.kergomard@univ-rennes1.fr

