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OXIDATIVE AND INTERFACIAL BEHAVIOR OF NATIVE OIL BODIES FROM WALNUT

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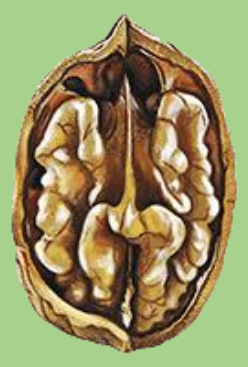
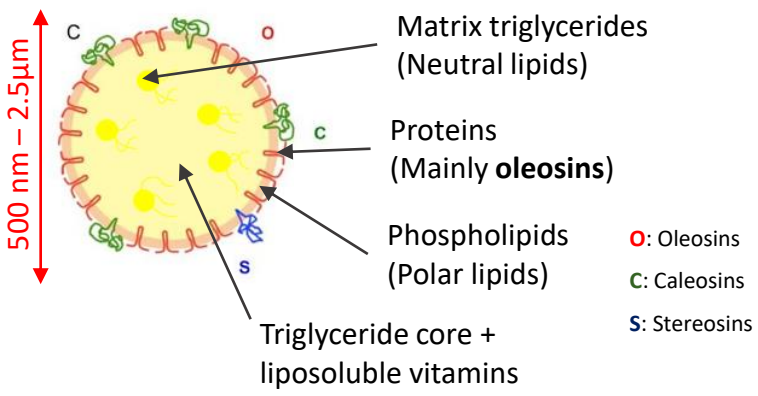


***Walnuts** are among the most widely consumed commercially grown tree nuts in the world. Indeed, their consumption is associated with many health benefits, such as reducing the risk of cardiovascular disease, coronary heart disease and other neurological disorders. These benefits are attributed to their fatty acid profiles, which is rich in polyunsaturated fatty acids (PUFA) [1]. 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?

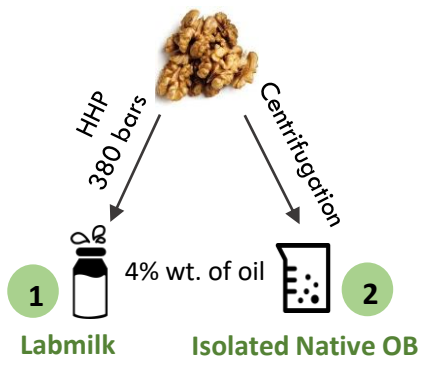
What is OB?



The negative charges of **oleosins** at physiological (neutral) pH trigger objet repulsion and avoid coalescence phenomena in walnut system.

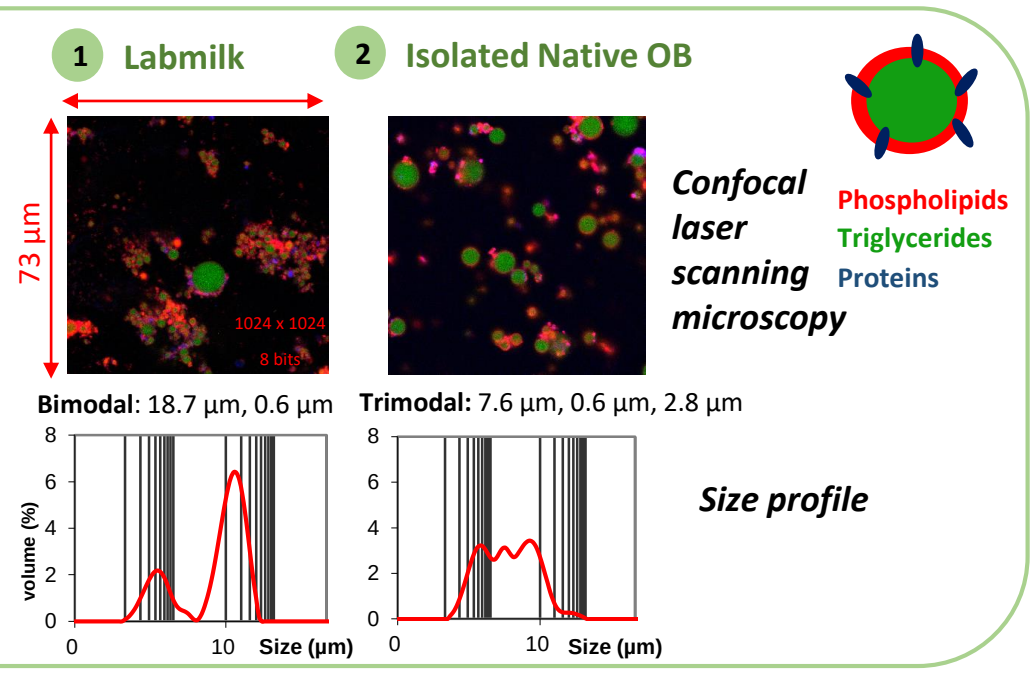
Material and methods

Matrix preparation



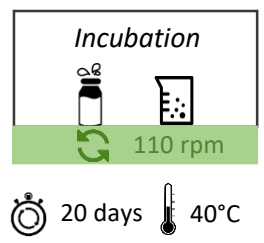
(Kapchie et al., 2013 [2])

HHP= High Pressure Homogenization*

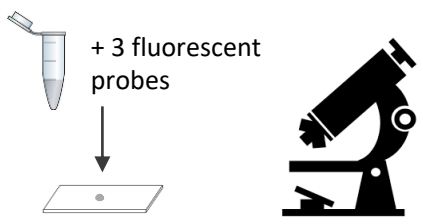


Material and methods - characterization

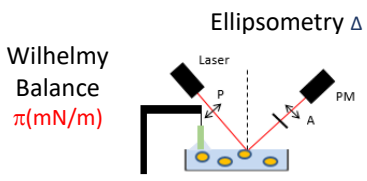
Oxidative challenge test (PV, TBARS)



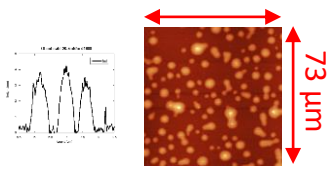
Confocal microscopy



Tensiometry/Ellipsometry

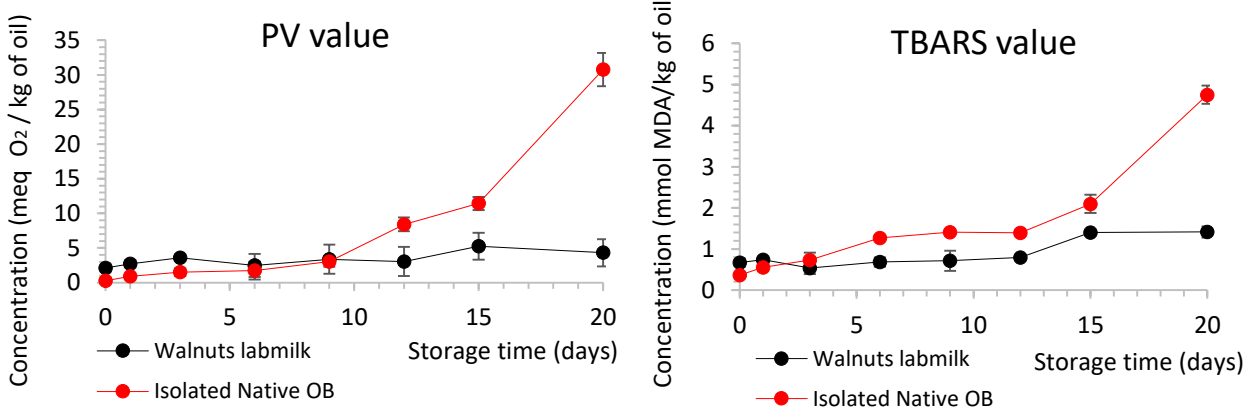


Atomic Force Microscopy



π (surface pressure) is indicative of protein insertion
Δ (ellipsometric angle) is related to the amount of matter at the interface

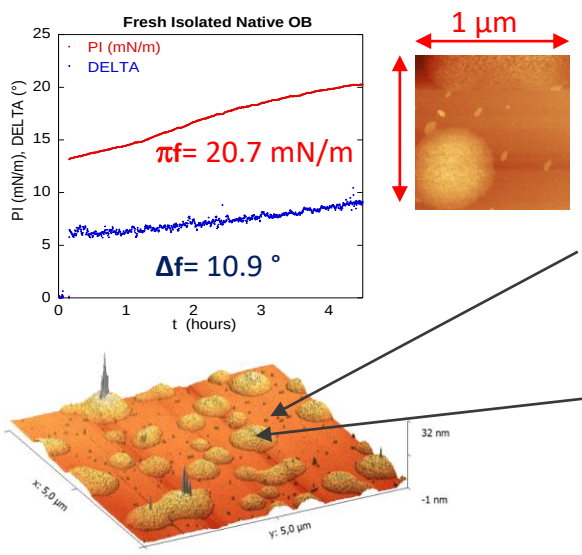
Results - Oxidative behavior



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.) [3].
The stability of lipid dispersion was higher under "milk" form due to a complex "**matrix effect**".

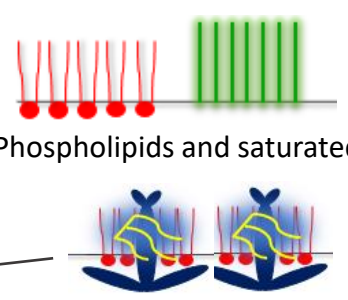
Results - Interfacial behavior

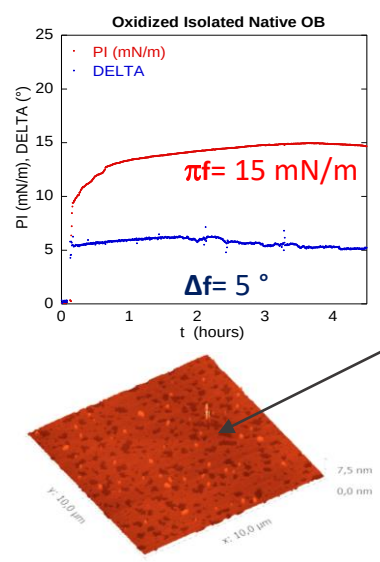
*How does the **structural changes** of oxidized OB affect the behaviour at the interface?*



Fresh Isolated Native OB

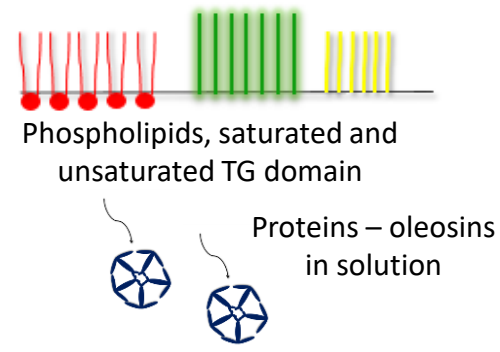
$h_{\text{Small objects}}$= 1-1.5 nm





Oxidized Isolated Native OB

Formation of a thinner monolayer at the interface



(Waschatko et al, 2012, [4])

Conclusion: When OBs are intact, they open at the interface and spread out in domains and assemblies thanks to **good cohesiveness** between the different molecules. **Oxidation phenomenon** modified the **physical integrity** of the OB, decreasing intermolecular forces, which resulted in a **different interfacial organization with a majority of lipids at the interface and solubilization of proteins.**

***CONCLUSION**: Altogether, this study unveiled the **interesting stability of OB** and their **specific interfacial reactivity** opening the way to interesting food applications of these natural lipoproteic assemblies.*

References

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