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 lipoprotein 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?**

- **Matrix triglycerides** (Neutral lipids)
- **Proteins** (Mainly oleosins)
- **Phospholipids** (Polar lipids)
- Triglyceride core + liposoluble vitamins

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

**Material and methods**

**Matrix preparation**

- Incubation: 20 days, 110 rpm
- Tensiometry/Ellipsometry
- Atomic Force Microscopy

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

- Wilhelmy Balance
- Ellipsometry Δ (°)

- Δ (ellipsometric angle) is related to the amount of matter at the interface

**Results - Oxidative behavior**

- PV value
- TBARS value

**Results - Interfacial behavior**

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

**Conclusions**:

- 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 lipoprotein assemblies.

References

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