Polymeric stabilized oleogel-based emulsions aiming at food lipid profile tailoring

Artur J. Martins[1], Ana Guimarães[2], Pablo Fuciños[1], Lorenzo M. Pastrana[1], Pedro Sousa[3], Armando Venâncio[2], Miguel A. Cerqueira[1]

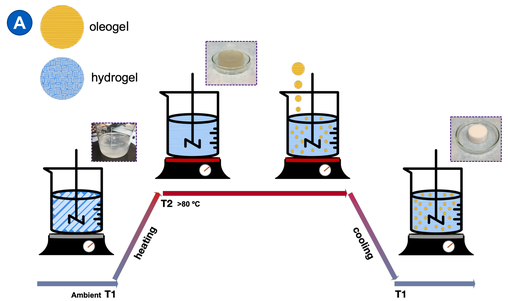
Introduction

Decisive processing and technological requirements like saturated fat reduction and healthier fatty acids delivery are immediate objectives for food industry. In this work, our main focus was the development of gelled O/W emulsions, using oleogels as filling particles, that could act as healthier fat substitutes, namely for meat-based products.

Methods

The procedure to obtain gelled emulsions is seen below **[Figure A]**. Fatty acid profile was determined by the method described by Folch et al.[1] and derivatized with boron trifluoride prior to injection in GC-FID. Glycerol monostearate (5 % in oil medium) was used as the oleogelator.

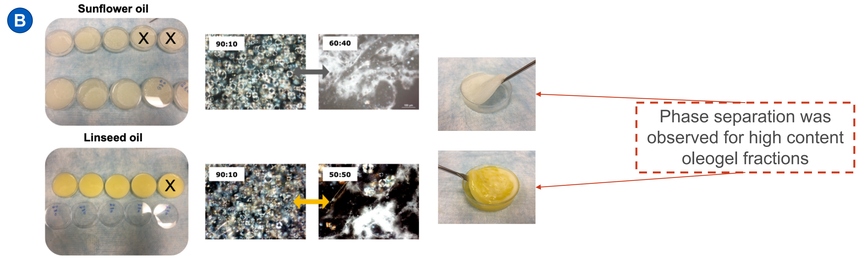
- Stage 1: Oleogel-based emulsions (with nonionic surfactant polysorbate 80) and 3% w/w k-carrageenan were prepared with linseed and sunflower oils. Here characterization regarding microstructure, texture and fatty acid profile is displayed;
- Stage 2: Gelled emulsions targeting industrial use were developed using biopolymer combination of k-carrageenan and locust bean gum (and studied as in the previous step);



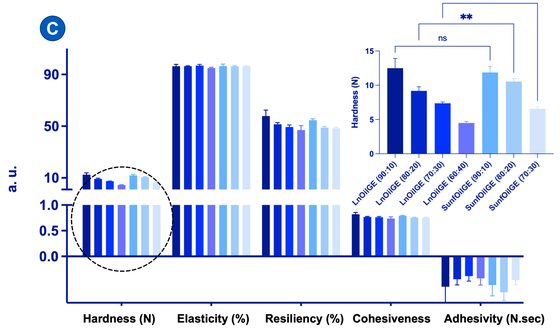
Data Analysis

(Stage 1)

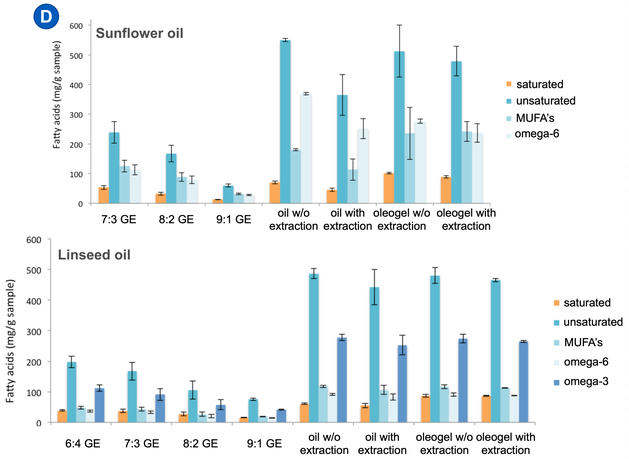
- Suitable oleogel filling particles dispersion. Gelling ability from W:O ratios of 7:3 up to 9:1 (sunflower oil) and from 6:4 to 9:1 (linseed oil). **[Figure B]**



- Hardness values ranged from 4.5 (6:4) to 12.5 N (9:1) for linseed oil-based structures and between 6.5 (7:3) and 11.9 N (9:1) when sunflower oil was used. **[Figure C]**



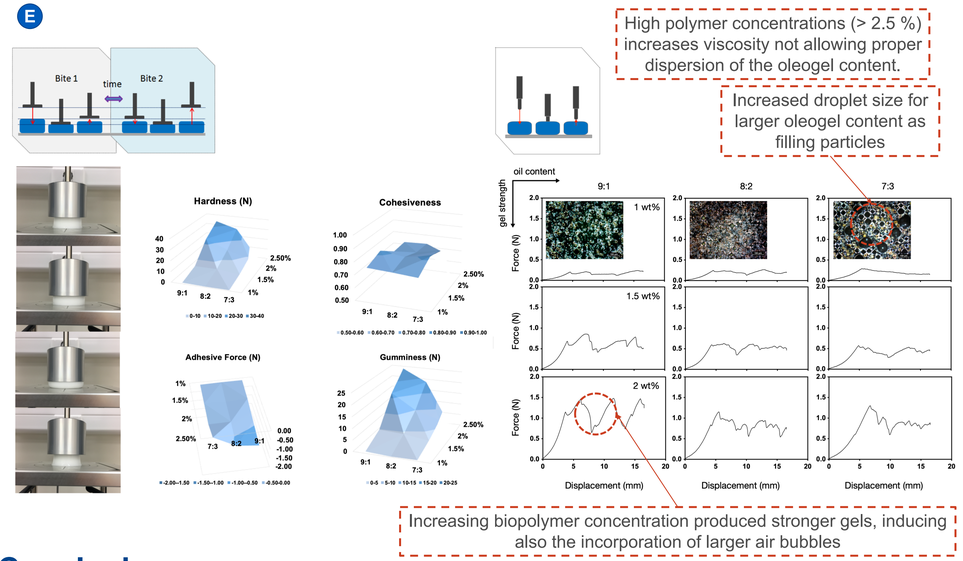
- Fatty acid profile. **[Figure D]**



Oleogels showed (likewise the oils) unsaturated fatty acids (UFA) above 80%, while oleogel-based emulsions exhibited total lipid content analogous to the percentage of oleogel incorporated in oleogel-based emulsions (approx. 40, 30, 20 or 10 %).

(Stage 2)

- κ-carrageenan and locust bean gum combination allowed the incorporation of oleogel fractions up to 30 %. Texture profile analysis (left) and perforation tests (right) informed on the impact of biopolymers concentration and also oleogel fraction incorporation within gelled emulsion properties.



Conclusion

The research revealed that the structural properties of the gelled emulsions were greatly affected by oleogel fraction and hydrogel strength (biopolymer concentration). These biphasic systems, which are characterized by the two gelled phases, (oleogel and the hydrogel) can be proposed for texture tailoring, fat reduction and bioactive delivery in processed foods.

Acknowledgments

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References

1. Folch, J., Lees, M., & Stanley, G. H. (1957). A simple method for the isolation and purification of total lipides from animal tissues. The Journal of Biological Chemistry.

Affiliations

1. International Iberian Nanotechnology Laboratory, Av. Mestre José Veiga s/n, 4715-330 Braga Portugal
2. Centre of Biological Engineering, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal.
3. Porminho Alimentação S.A, Travessa da Lage, 35, 4764 - 901 Vila Nova de Famalicão, Portugal