ENHANCING DOUBLE-LAYER EMULSIONS STABILITY WITH ULTRASOUND TECHNOLOGY: APPLICATION OF CITRUS RESIDUES FOR IMPROVED SUSTAINABILITY

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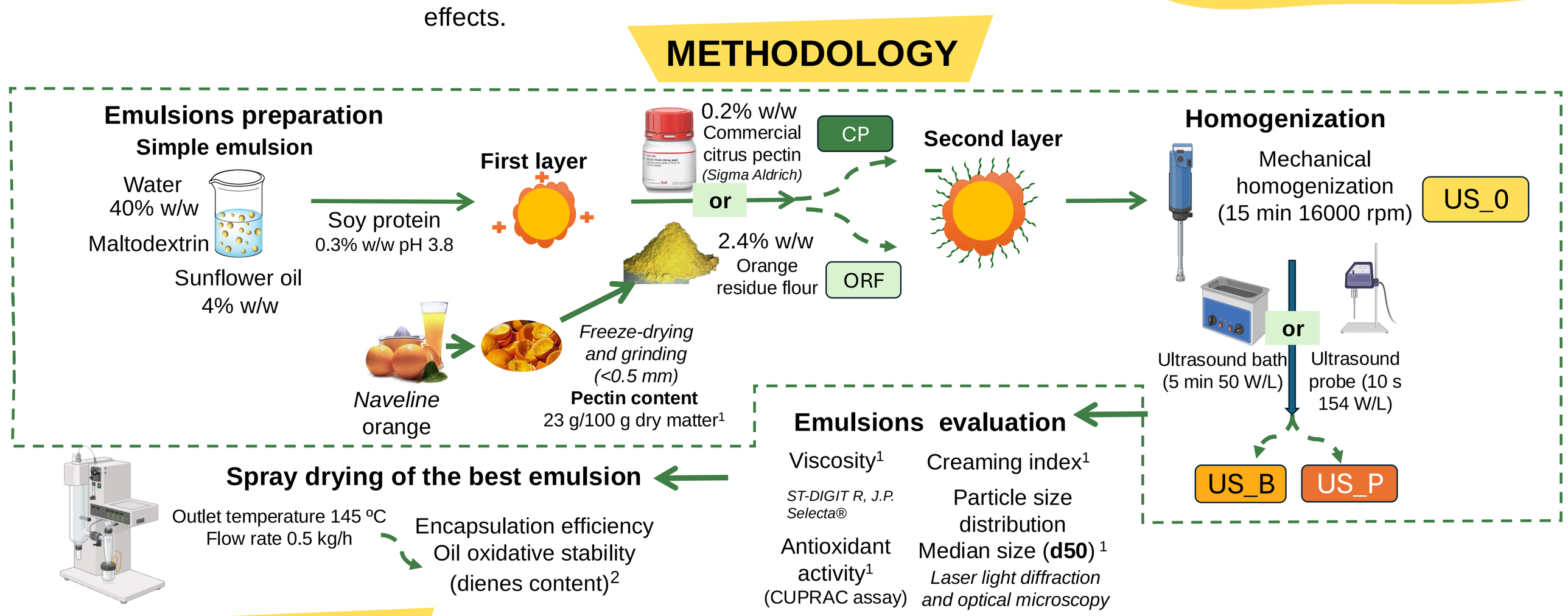
INTRODUCTION

Double-layer emulsions stabilized by using both proteins and polysaccharides, are interesting for the natural origin of their components. Polysaccharides like pectins, sourced from citrus waste are especially valuable. Ultrasound technology (US) is gaining attention for stabilizing emulsions via cavitation effects.

OBJECTIVE: To assess the use of ultrasound technology to enhance the stability of double-layer emulsions produced with citrus residues as a sustainable pectin source.

METHODOLOGY



RESULTS

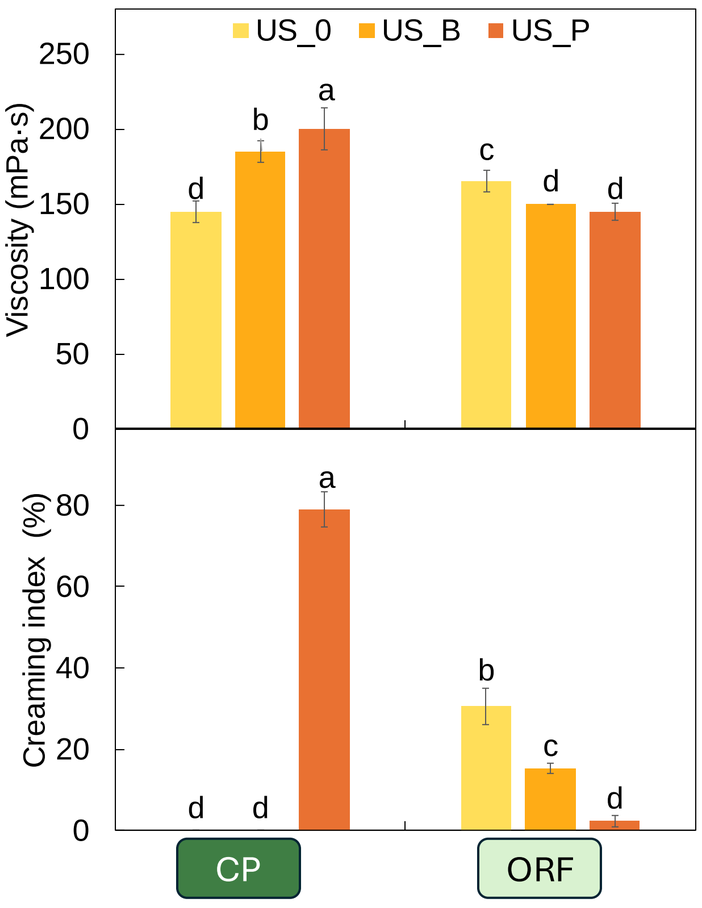


Fig. 1. Viscosity and creaming index of emulsions. Different letters in the same parameter indicate significant differences (p<0.05).

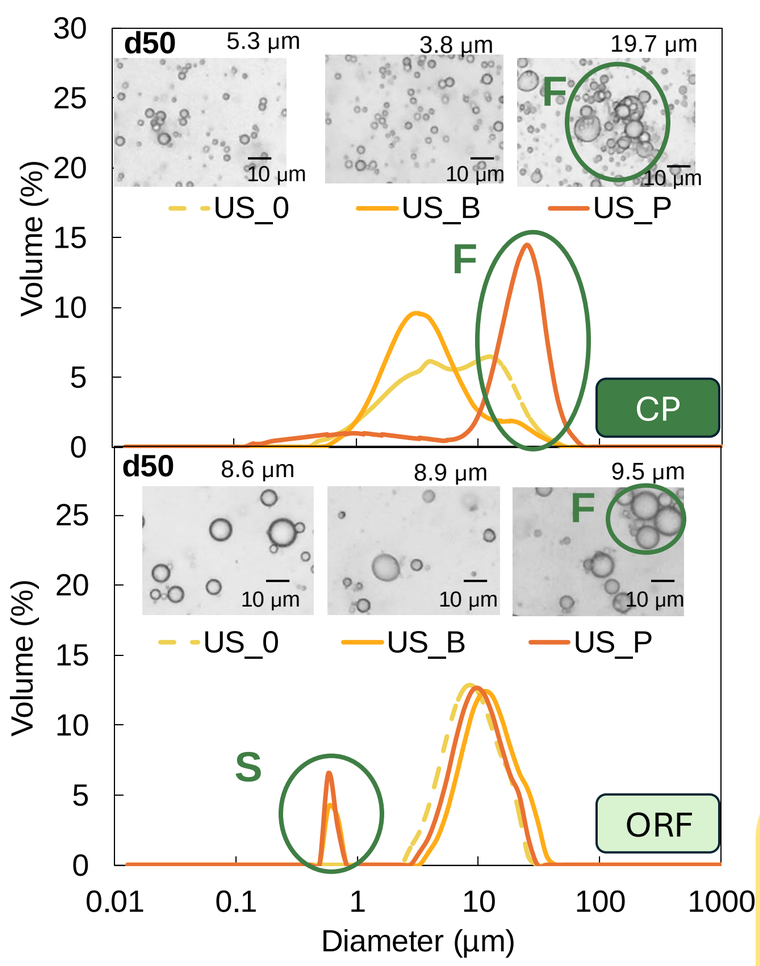


Fig.2. Particle size distribution of emulsions. **F** (flocules) **S** (smaller droplets)

For **CP** emulsions:

- US increased viscosity by up to 38% (US_P) (Fig.1)
- US_B led to 31% smaller droplets (Fig. 3)
- US_P caused creaming (Fig. 1) and flocculation (F, Fig. 2)

For **ORF** emulsions

- US decreased viscosity by ca. 10% and creaming index by up to 93% (US_P) (Fig.1)
- US_P caused flocculation, but some smaller (S) droplets were observed with both US applications (Fig. 3)

ORF emulsions had 10 times higher antioxidant activity (26mg TROLOX/100 g) than **CP** emulsions, with no impact from US application.

The ORF emulsion treated with US_B showed no flocculation, some small droplets, good stability, and high antioxidant activity. After spray drying, no oil oxidation occurred, with an 83% encapsulation efficiency.

CONCLUSIONS

These findings highlight the potential of US to enhance emulsion properties. The effect of US depends on the emulsion composition. Additionally, the use of citrus residues as a natural pectin source offers a sustainable solution for waste valorization in the food industry because of its high pectin content and antioxidant activity.

Acknowledgements

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References

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2 Umaña et al.(2020) Food Chem.