

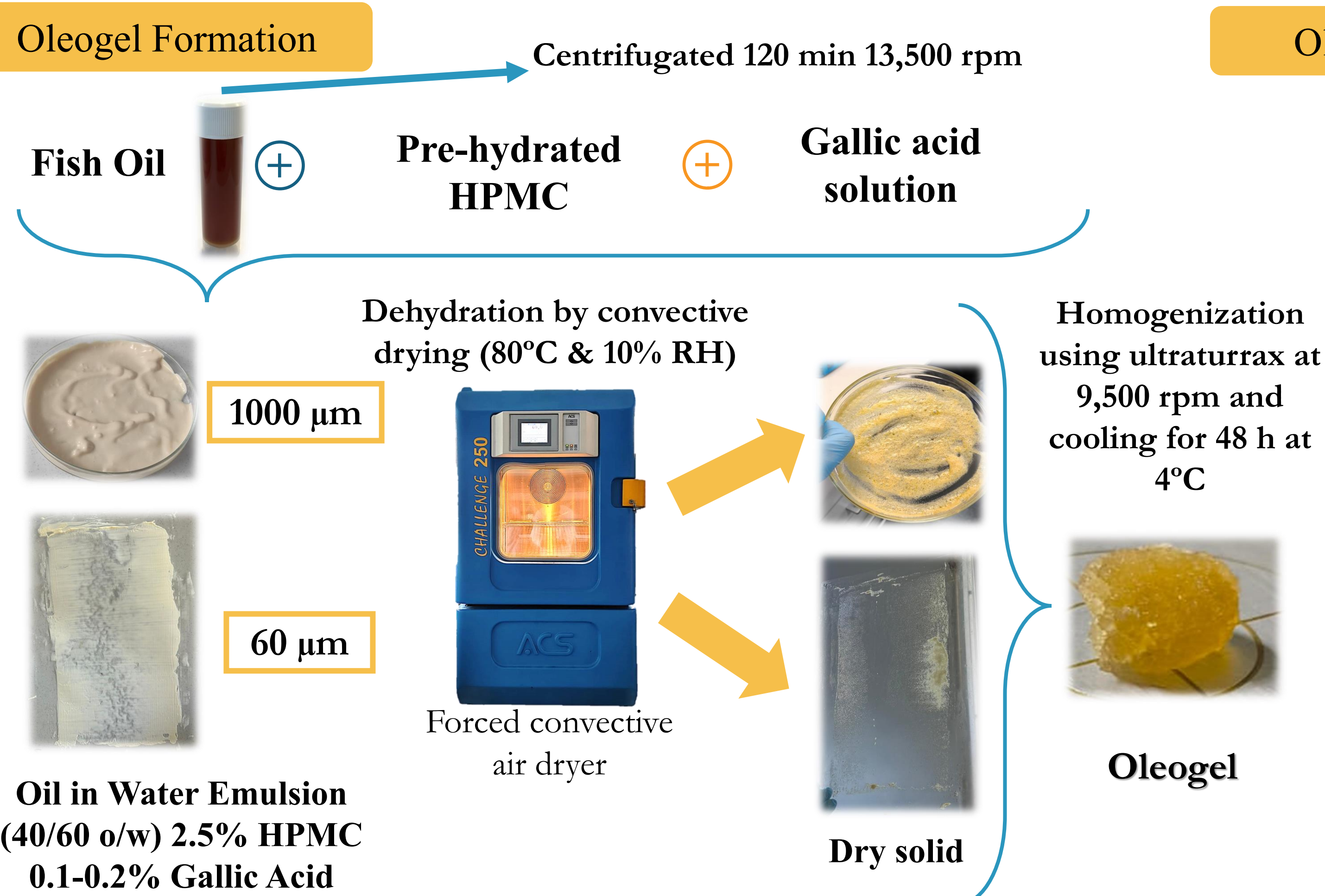
INTRODUCTION

OBJECTIVE

Fishing produces a significant volume of **discards** that have little-to-no market value. The European Commission promotes strategies for reducing fishery biomass waste through its valorization. **Fish oil** extracted from these discards is rich in omega-3 fatty acids, which are associated with cardiovascular benefits. However, its high degree of unsaturation makes it susceptible to oxidation, which poses a major challenge for its stabilization and use. Hydroxypropyl methylcellulose (HPMC)-based oleogels can structure and protect liquid oils from external factors, offering a **nutritionally valuable** alternative to conventional animal solid fats. Fish oil oleogels are a promising strategy to improve oil stability and functionality, enabling applications in food, nutraceutical, and pharmaceutical sectors while promoting waste reduction, value creation, and sustainability.

To produce HPMC-based oleogels using fish oil obtained from discards and evaluate main characteristics: textural properties, oil binding capacity, rheological behaviour, peroxide value, p-anisidine value and TOTOX index.

MATERIALS AND METHODS



RESULTS AND DISCUSSION

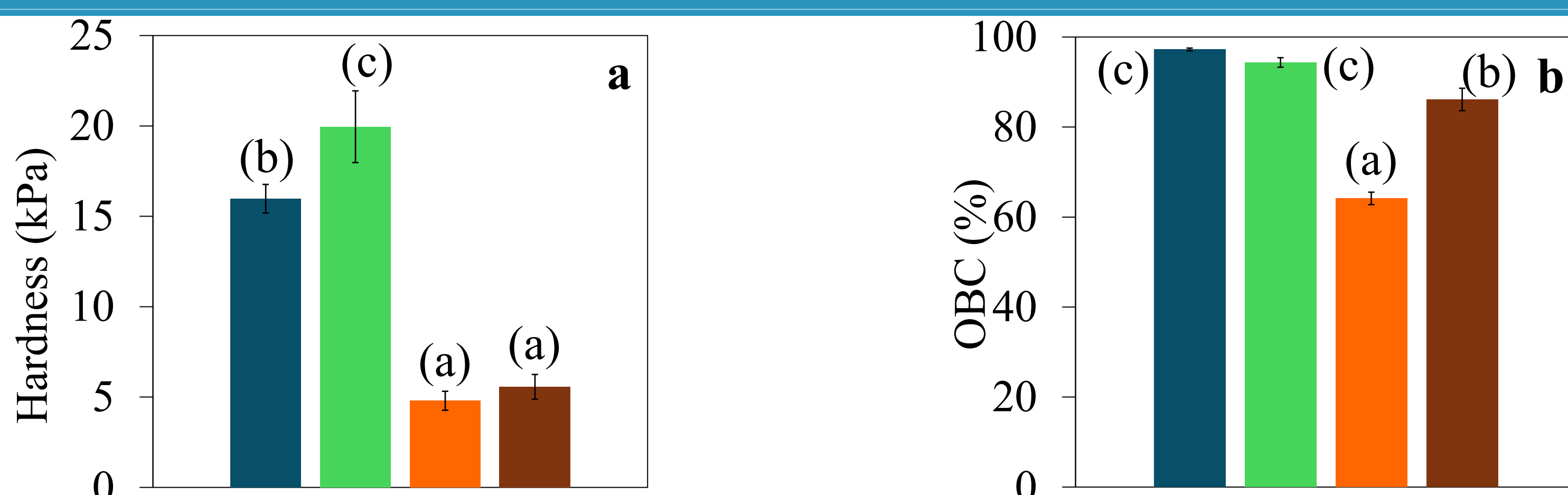
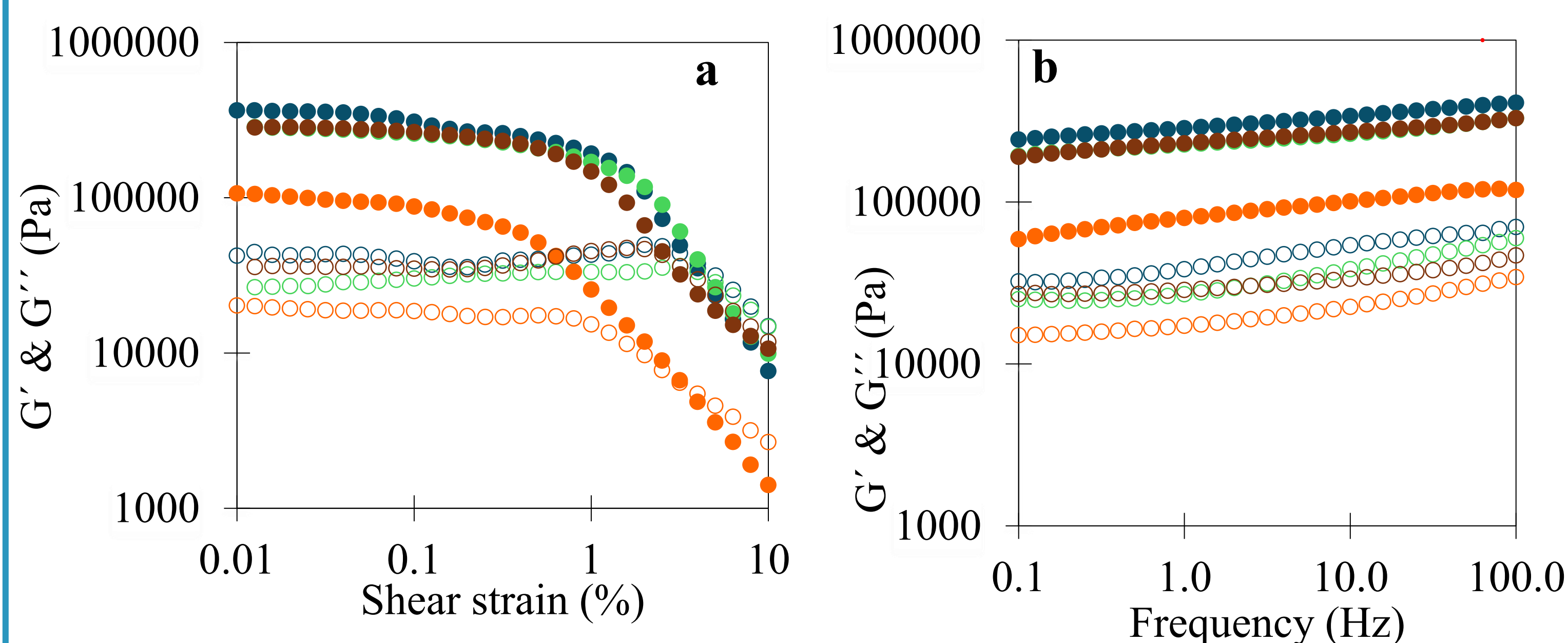
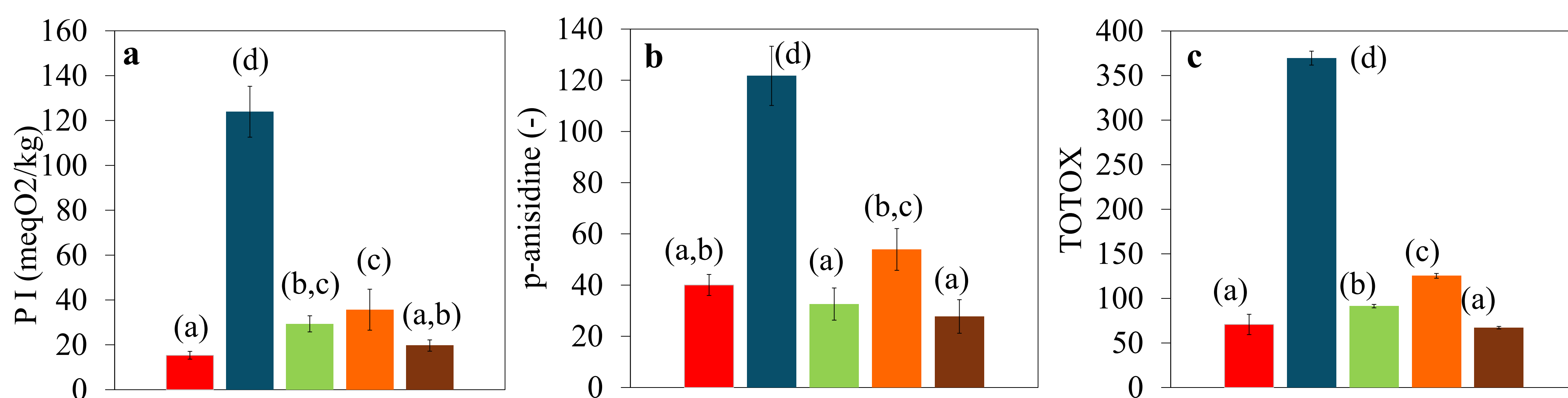


Figure 1. a) Hardness and b) OBC of the studied oleogels. Dark blue is 0.1cm dried oleogel, green is 60μm dried oleogel, orange is 0.2% gallic acid and maroon is 0.1% gallic acid.

Hardness decreased at 1000μm (longer drying time) and lowered to less than a third of the value with gallic acid (**Figure 1a**). **OBC** values (≈97%) were consistent with other reported data (Saavedra *et al*, 2024, Lama *et al*, 2025). Gallic acid significantly reduced the values from 86 to 62%. (**Figure 1b**)



The strain sweep was performed to determine the LVR and a strain of 0.1% was selected for the frequency sweeps (**Figure 2a**). All systems are well structured gels with $G' > G''$. The initial emulsion thickness used in drying showed that in 1000μm thickness both moduli were higher, particularly G'' , having a less solid oleogel. An increase in gallic acid concentration significantly disrupts the HPMC network, resulting in lower G' and G'' values, in agreement with texture results (**Figure 2b**).



The oxidation degree is shown in **Figure 3 (a)** (primary), **b** (secondary) and **c** (total)). A similar tendency was observed between them. Samples dried at 1000μm thickness exhibited high oxidation due to longer drying times. In contrast, the 60μm without antioxidant showed a significant reduction in oxidation. High gallic acid concentration promoted unexpectedly oleogel oxidation, attributed to the low OBC (**Figure 1b**), leaving a larger fraction of oil exposed to air. The system containing 0.1% wt gallic acid was able to preserve the initial oxidation values of the fresh oil.

CONCLUSIONS

In summary, oleogels dried in thin layers exhibit improved textural and rheological properties, while high gallic acid content disrupts the HPMC network and reduces OBC. High thickness and high antioxidant content lead to increased oxidation due to weak oil structuring. The oleogel with 0.1% w/w gallic acid preserves the initial oxidation state of fresh oil, maintaining adequate oil binding and viscoelastic integrity. These oleogels enable the sustainable valorization of fish discards.

REFERENCE

ACKNOWLEDGEMENTS

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