

In vitro stability and oral bioaccessibility of bisphenol A diglycidyl ether from epoxy-based coatings used in food cans

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INTRODUCTION

Canning food and beverages preserves their attributes through their extensive shelf-life. Metal cans are generally **coated**, preventing chemical interactions between the metals and the food (1).
Epoxy-based resins have been the most used class of coatings for aluminium and steel cans for decades (2). Synthesized from **bisphenol A** and epichlorohydrin, may represent a source of contamination over their migration into food (3).

MATERIALS AND METHODS

Sunflower and olive oils

BADGE (10mg/kg)

Leucine

Interaction test

Sterilization by autoclave process
120 minutes
+
10 days, 130°C
Simulating the storage during the extensive shelf life of tuna cans

AIMS

- Simulation of the sterilization treatment and the estimated shelf life of tuna cans through an interaction test.
- Evaluation of *in vitro* bioaccessibility of bisphenol A diglycidyl ether (**BADGE**), a key constituent of epoxy resins.
- Application of the standardized gastrointestinal digestion protocol **INFOGEST**.

INFOGEST protocol

1. Oral phase

5 g sample, amylase
2 min pH 7

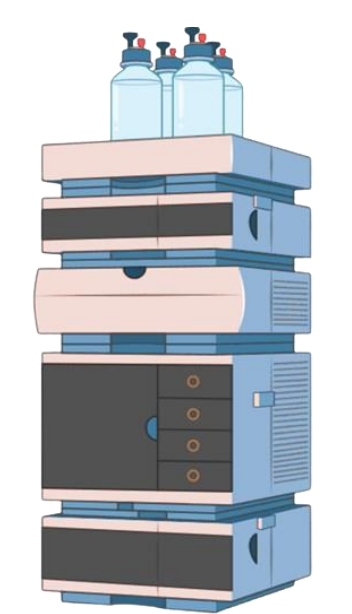
2. Gastric phase

Pepsin, HCl 2 hr pH 2

3. Intestinal phase

Bile, pancreatin, NaOH
2 hr pH 7

HPLC-FLD analysis



RESULTS and DISCUSSION

1- Recovery rates of BADGE after the interaction test

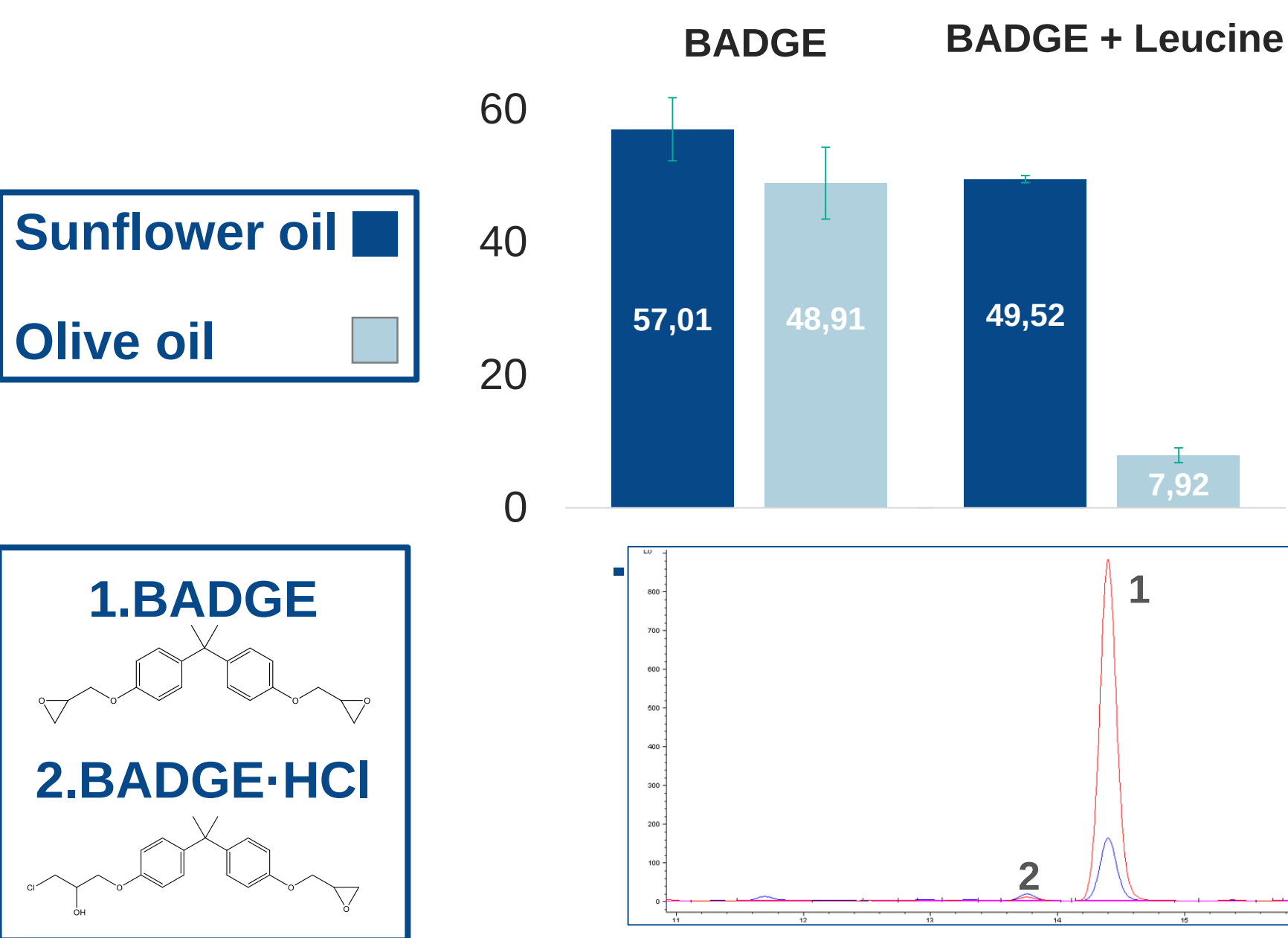


Figure 1. HPLC-FLD chromatogram. Recovery of BADGE after the interaction with leucine in sunflower (red) and olive oil (blue).

2- Recovery rates and bioaccessibility of BADGE after *in vitro* digestion

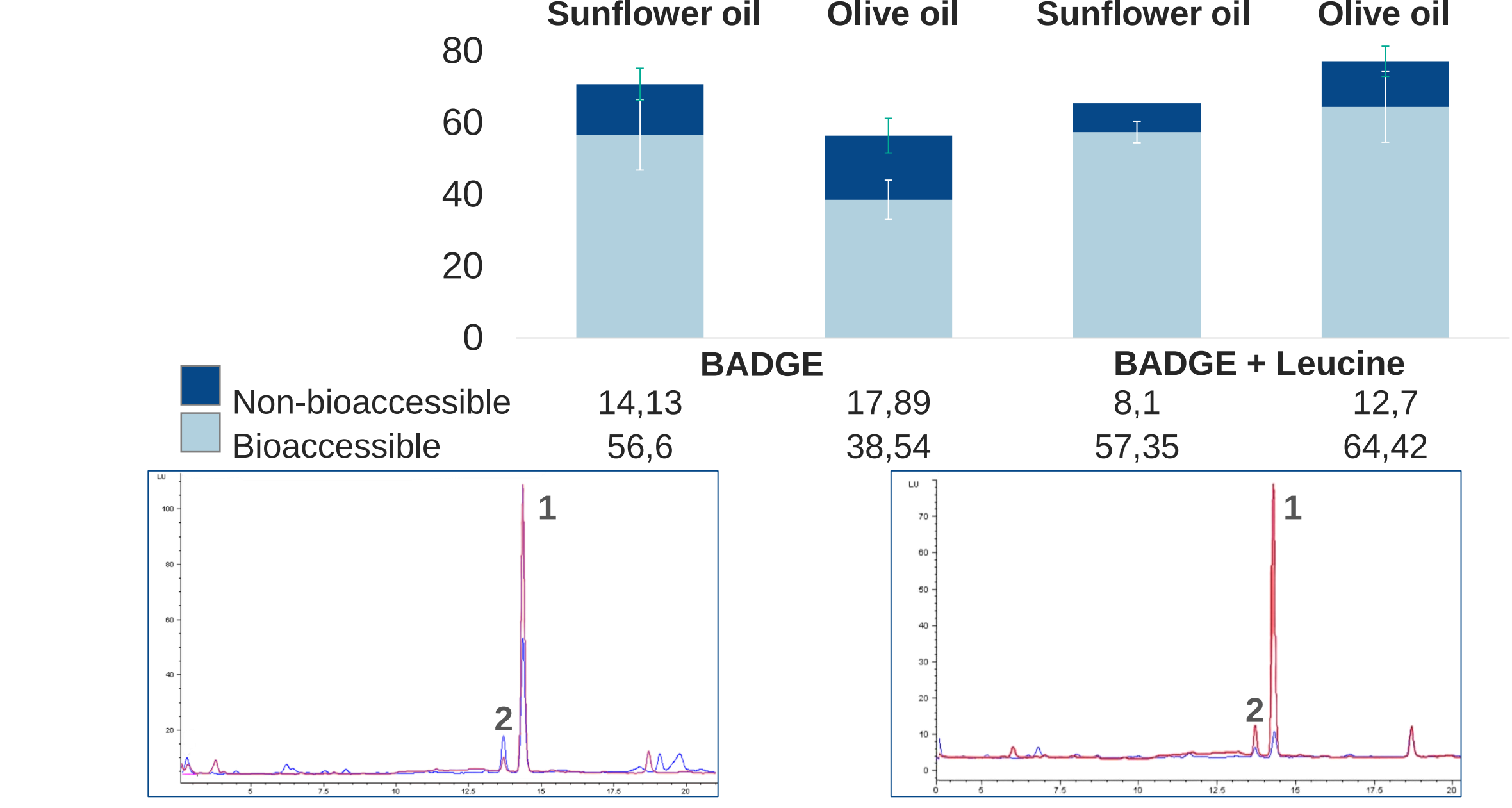


Figure 2. HPLC-FLD chromatogram. Bioaccessible fraction of **BADGE** in sunflower (red) and olive oil (blue).

Figure 3. HPLC-FLD chromatogram. Bioaccessible fraction of **BADGE** after interaction with **leucine** in sunflower (red) and olive oil (blue).

The recovery rates of **BADGE**, after the interaction assay, were comparable for BADGE alone, but the percentage varies from 49.92% in sunflower oil to 8.15% in olive oil after the interaction with **leucine**. The results of the interaction test were considered as the **initial quantity** of contaminant in the cans.

After the *in vitro* digestion protocol, the **bioaccessibility** rates of BADGE obtained were similar for both covering liquids for the contaminant itself (56.6% and 38.54%), but different bioaccessible values were observed after the interaction with the aminoacid: 57.35% in sunflower and 64.42% in olive oil. Considering the absolute values, the consumer would be **less exposed** to BADGE when the covering liquid is **olive oil**.

CONCLUSIONS

Results highlighted that the interaction with the food matrix is crucial when studying the bioaccessibility of chemical substances through diet. In the context of this study, the effect of the presence of leucine combined with olive oil **reduces the exposition** of consumers to BADGE.

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