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Impact of Sinapic Acid Ester-Gelatin Films on Quality of Cold-Pressed Rapeseed Oil during Accelerated Storage Test

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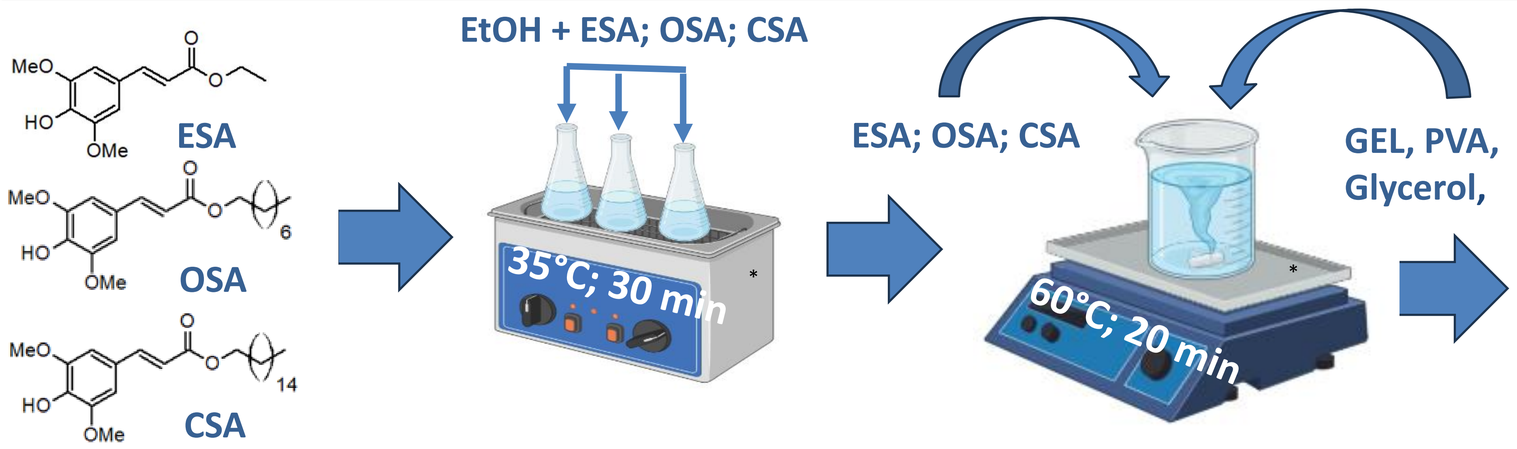
Introduction

Nowadays, cold-pressed rapeseed oil (CPRO) has received increasing attention due to its health-beneficial impact and desired aroma and flavor. Unfortunately, a high level of unsaturated fatty acids and the presence of lipid-accompanying compounds such as metals or free fatty acids render a CPRO more susceptible than refined oil to oxidative deterioration. Therefore, extending the shelf-life of CPRO and monitoring its quality parameters is crucial to access the appropriate quality of CPRO. For this reason, the effect of new gelatin strips with polyvinyl alcohol (GEL-PVA) and sinapic acid esters (ethyl sinapate—ESA; octyl sinapate—OSA, and cetyl sinapate—CSA) on the oxidative stability, antioxidant activity (AA), and total phenolic content (TPC) in CPRO samples was analyzed during accelerated storage. Moreover, synchronous fluorescence (SF) was used to observe the most characteristic qualitative changes in CPRO in the presence of GEL-PVA incorporated with sinapic acid esters during the proposed storage period [1].

Film Preparated



*The drawing were made on biorender.com

Accelerated Storage Test

Parameter of accelerated storage test

- Bottles of oil with immersed polymer film strips were placed in an incubator.
- Temperature in the incubator – 40°C.
- Fluorescent lamp (power of luminous flux = 385 lm, length 380 nm).
- Distance between lamp and incubator shelf – 300 mm.
- Distance between oil bottles – 25 mm.
- Time of test – 14 days.

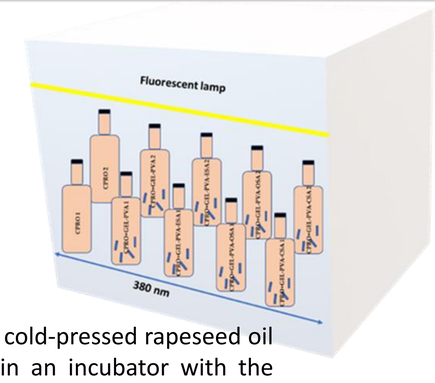


Figure 1. Position of bottles containing cold-pressed rapeseed oil (CPRO) without and with film strips in an incubator with the location of a fluorescent lamp.

Figure 2. Real view of four samples in the incubator.

Results

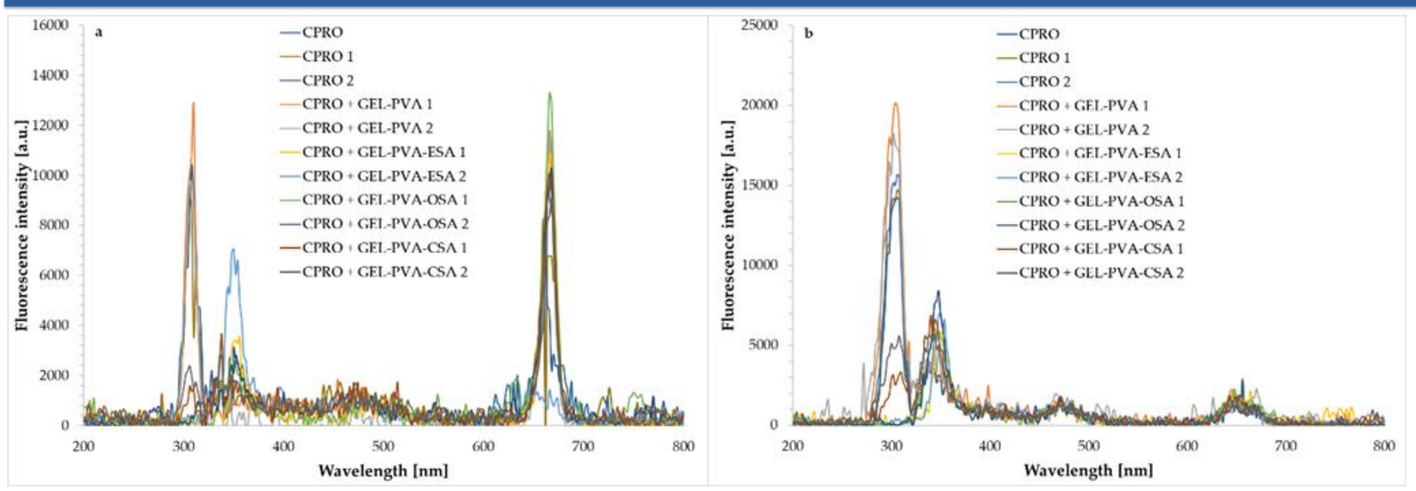


Figure 3. Synchronous fluorescence spectra of cold-pressed rapeseed oils (CPROs) packaged in a dark glass bottles containing film strips without and with sinapic acid esters diluted in n-hexane (c = 10%) and recorded at Δλ = 10 nm (a) and Δλ = 30 nm (b) after storage at accelerated conditions.

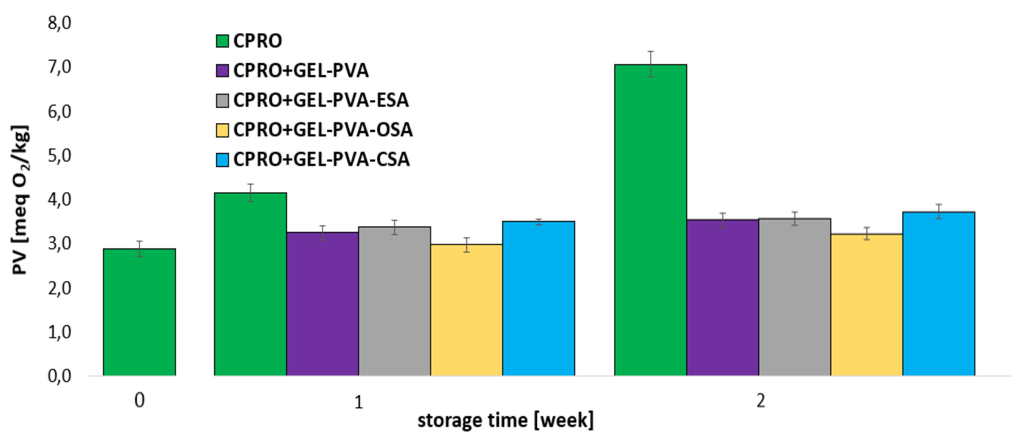


Figure 4.Changes in the peroxide values (PV) of cold-pressed rapeseed oils (CPROs) without and with GEL-PVA film strips loaded with sinapic acid esters during storage for two weeks at accelerated conditions.

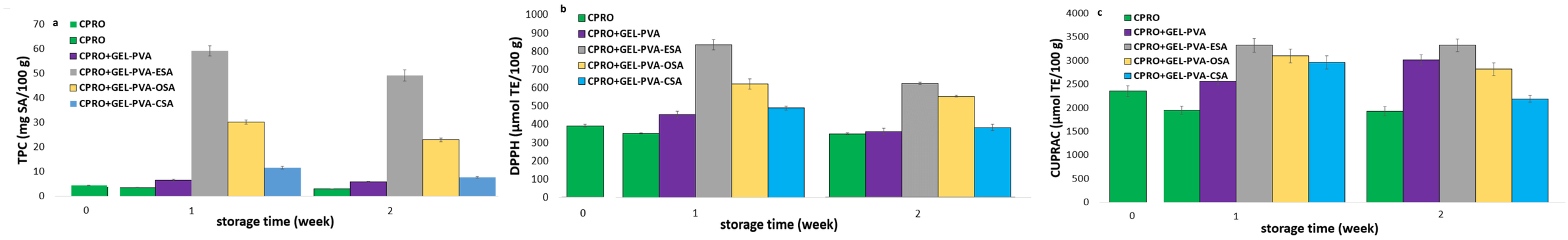


Figure 5. Changes in the antioxidant properties: total phenolic content (TPC), antioxidant capacity determined by 2,2-diphenyl-1-picrylhydrazyl assay (DPPH) (b) and cupric reducing antioxidant capacity (CUPRAC) assay (c) of cold-pressed rapeseed oils (CPROs) without and with GEL-PVA film strips loaded with sinapic acid esters during storage for two weeks at accelerated conditions

Conclusion

The fortified GEL-PVA films incorporated with sinapic acid alkyl esters significantly enhanced the antioxidant potential of CPRO samples stored for two weeks under accelerated conditions. Moreover, oil samples containing film strips loaded with amphiphilic antioxidants were identified as more oxidatively stable than control oil packed in the original dark bottle. This suggests the high antioxidant potential of released sinapic acid esters against primary oxidation products after two weeks of accelerated storage. Based on these findings, the proposed films appear to be promising in extending the shelf life of cold-pressed vegetable oils.

References:
[1] Rabiej-Kozioł, D.; Tymczewska, A.; SzydłowskaCzerniak, A. Changes in Quality of Cold-Pressed Rapeseed Oil with Sinapic Acid Ester-Gelatin Films during Storage. Foods 2022, 11, 3341. https://doi.org/10.3390/ foods11213341