

Determination of qualitative changes in edible oils during the oxidation process using the FTIR method

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INTRODUCTION & AIM

Chemical methods commonly used for routine quality analyses are typically time-consuming and often require the use of toxic solvents and reagents¹. Moreover, in some cases, sophisticated instruments such as gas chromatographs are required. As an alternative approach, it is possible to use simpler methods utilizing spectroscopic techniques, such as FTIR spectroscopy, whose results have been reported to correlate with those obtained using wet chemical methods^{2,3}.

In this study, we used a simple instrumental FTIR method as a fast analytical tool to assess the degree of oxidation and compare the oxidation stability of some edible oils available on the Polish market.

METHOD

MATERIALS

Nigella seed oil	(NSO)
Pumpkin seed oil	(PSO)
Camelina oil	(CO)
Linseed oil	(LO)
Evening primrose seed oil	(EPSO)
Thistle seed oil	(TSO)

EQUIPMENT

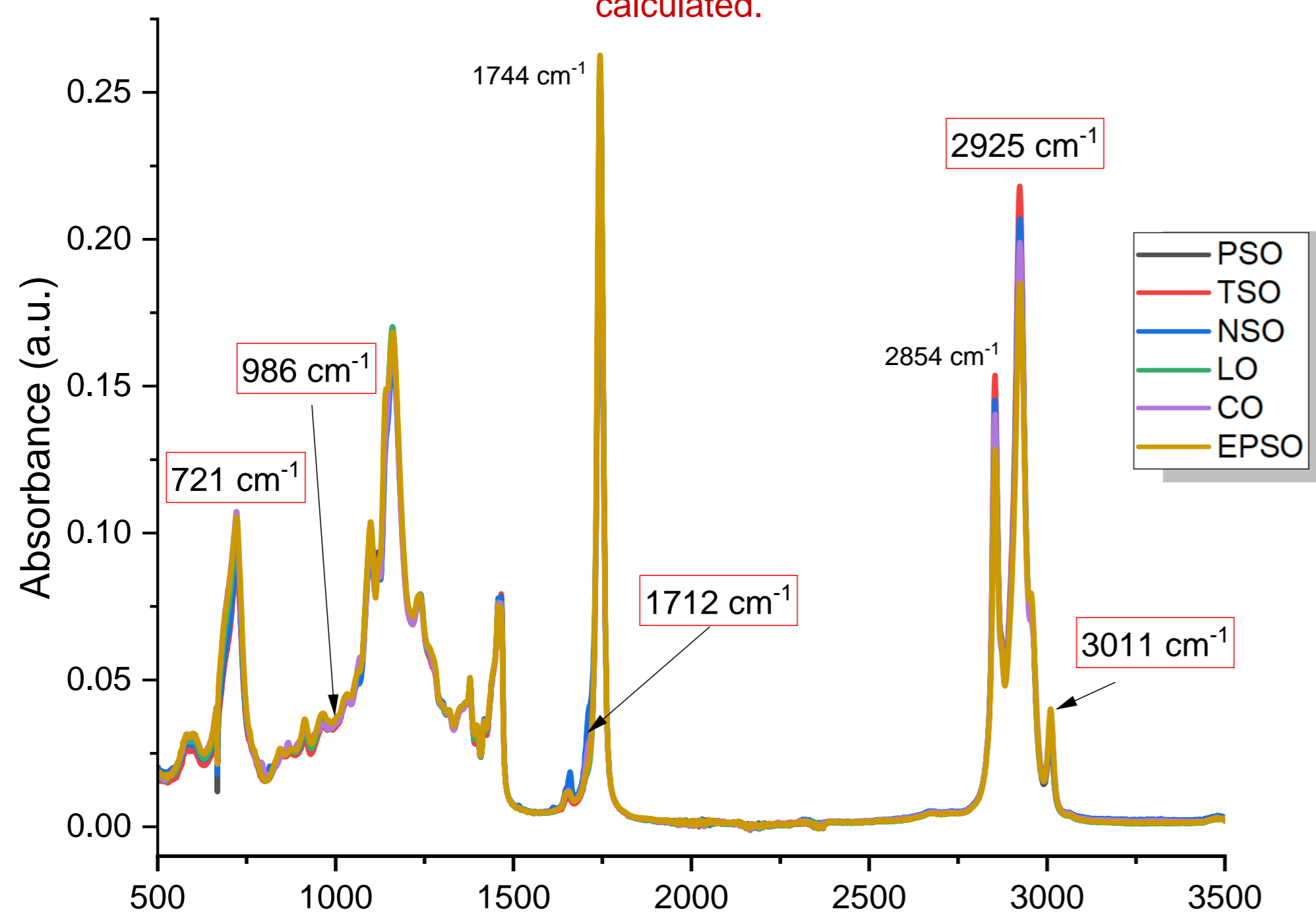
Spectrum Two FTIR-ATR spectrophotometer



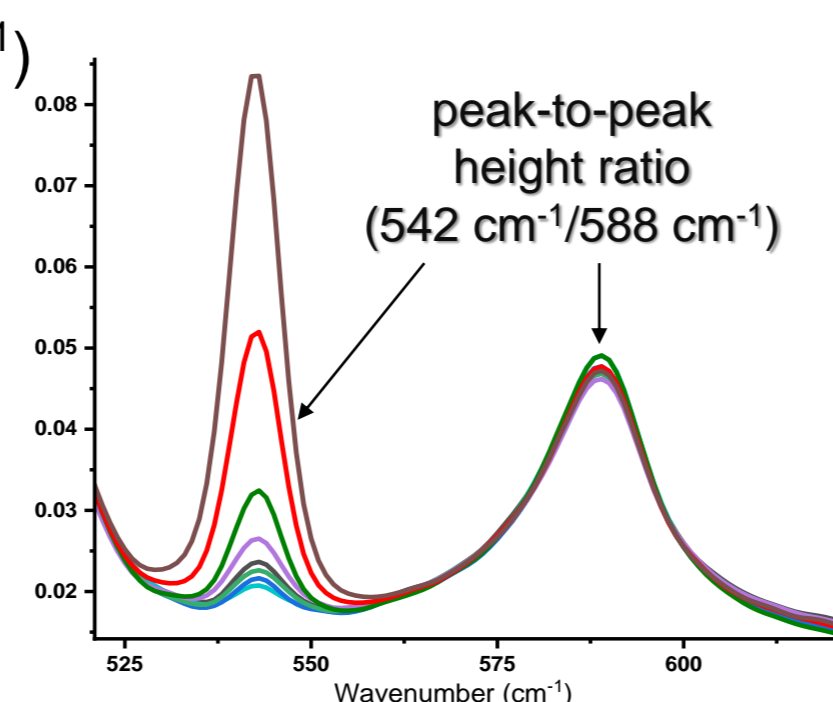
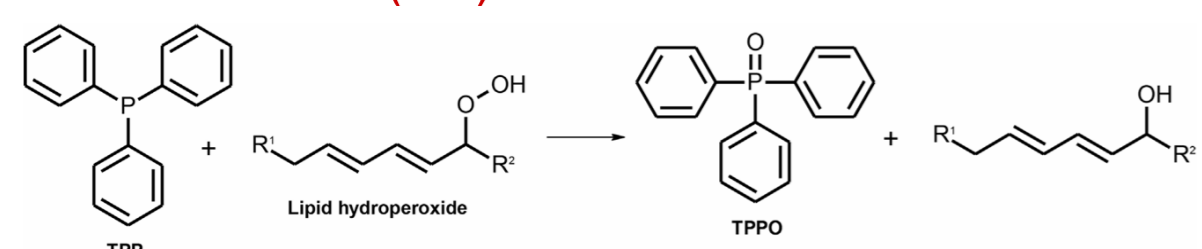
Thermal oxidation

The samples were stored at 60°C in a convection oven in uncover glass dishes for three weeks

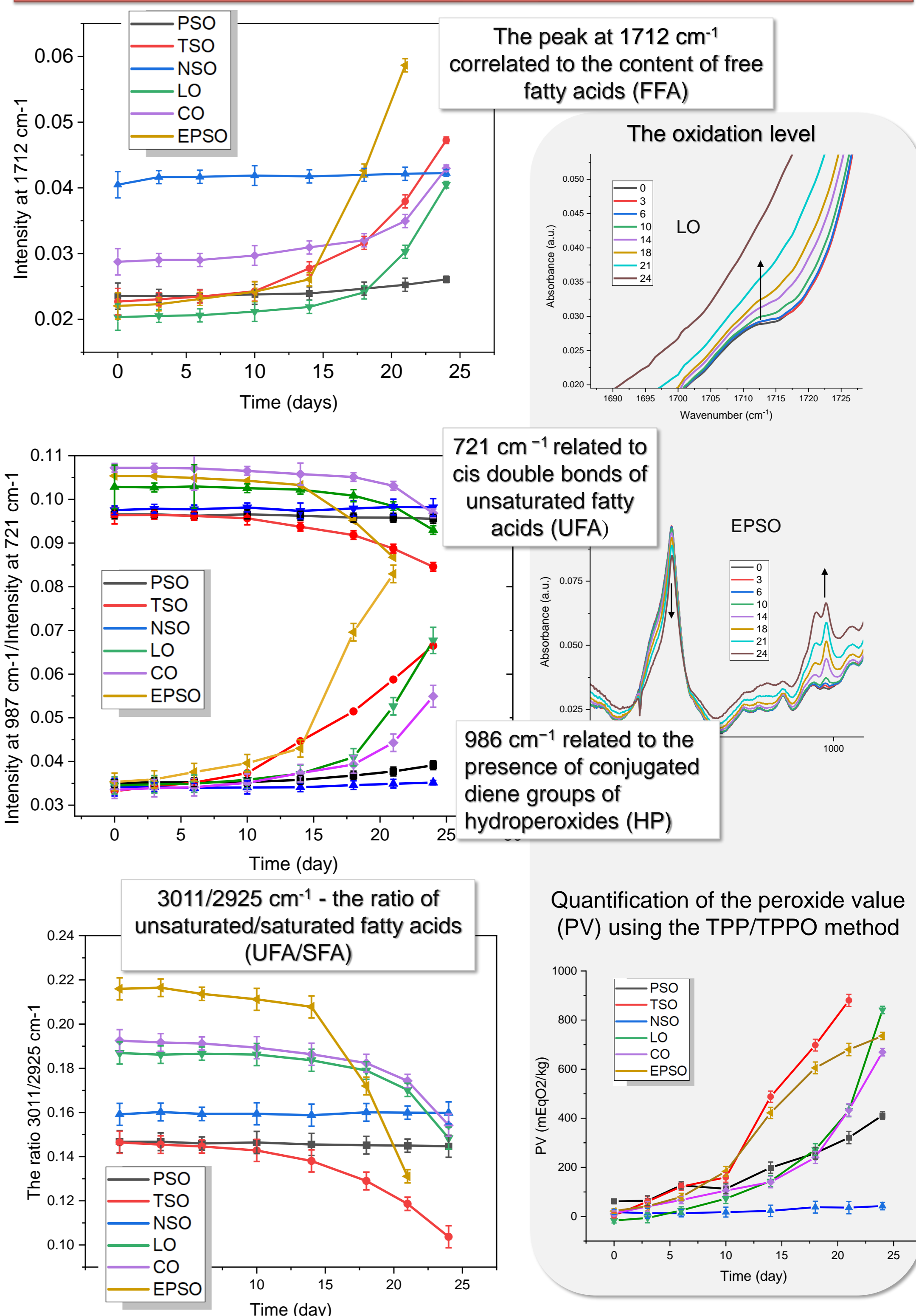
To monitor the oxidation process based on FTIR spectra, the changes in the intensity of characteristic spectral bands were analyzed, and the ratios of some peaks were calculated.



Based on the stoichiometric conversion of triphenylphosphine (TPP) into triphenylphosphine oxide (TPPO) with LOOH and the detection of the characteristic TPPO peak at 542 cm⁻¹ the peroxide value (PV) was calculated.



RESULTS



CONCLUSION

The parameter analysis revealed significant variations among the tested oils. Moreover, all parameters determined from the FTIR spectrum changed during the oxidation process. However, the nature and degree of these changes differed depending on the oil tested.

The findings indicated that the straightforward instrumental FTIR method could serve as a rapid analytical tool for evaluating the level of oxidation and comparing the quality of edible oils.

REFERENCES

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- 2 Deyrieux, C.; Villeneuve, P.; Baréa, B.; Decker, E. A.; Guiller, I.; Michel Salaun, F.; Durand, E. Measurement of Peroxide Values in Oils by Triphenylphosphine/Triphenylphosphine Oxide (TPP/TPPO) Assay Coupled with FTIR-ATR Spectroscopy: Comparison with Iodometric Titration. *Eur. J. Lipid Sci. Technol.* 2018.
- 3 Rajagukguk Y.W., Islam M., Grygier A., Tomaszewska-Gras J.; Thermal and spectroscopic profiles variation of cold-pressed raspberry seed oil studied by DSC, UV/VIS, and FTIR techniques, *Journal of Food Composition and Analysis*, Volume 124,2023,105723,