

# Optimization of the DSC method for determining the oxidative stability of virgin olive oil

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## Introduction

The oxidative stability of fats and oils is a crucial parameter that determines its shelf life. Differential scanning calorimetry (DSC) is a fast and reliable technique that uses the exothermic character of the oxidation reaction to determine the induction time (isothermal DSC) or the induction temperature (dynamic DSC). The objective of the study was to optimize the conditions of both DSC methods, isothermal and dynamic, for determination of the oxidative stability of virgin olive oil.

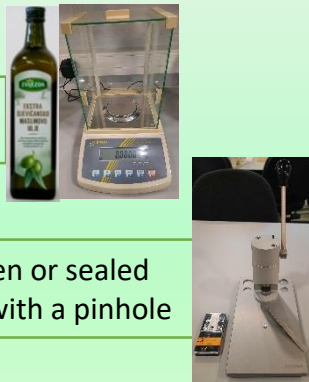
## Materials and methods

Sample size  
4, 8 and 12 mg

Sample preparation  
Open or sealed pan with a pinhole

Temperature  
130, 140 and 150 °C

Heating rate  
5, 10, 15 and 20 °C/min



## Results

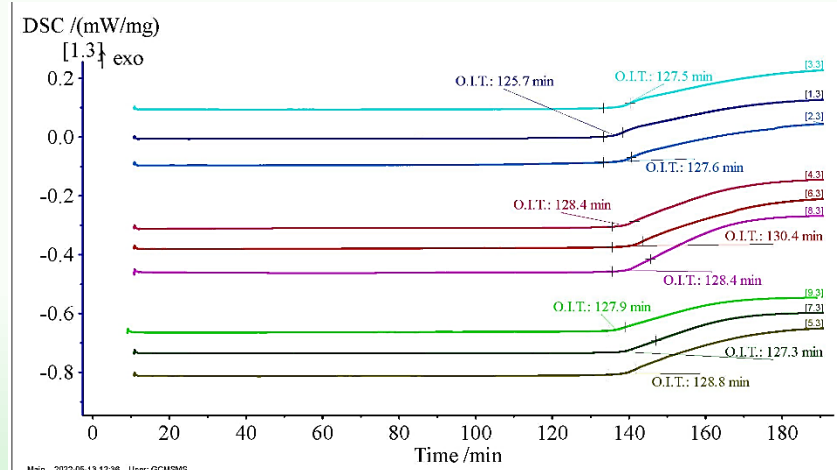


Fig 1 The influence of the mass of virgin olive oil on the induction time (blue lines represent samples with 12 mg, red with 8 mg and green with 4 mg)

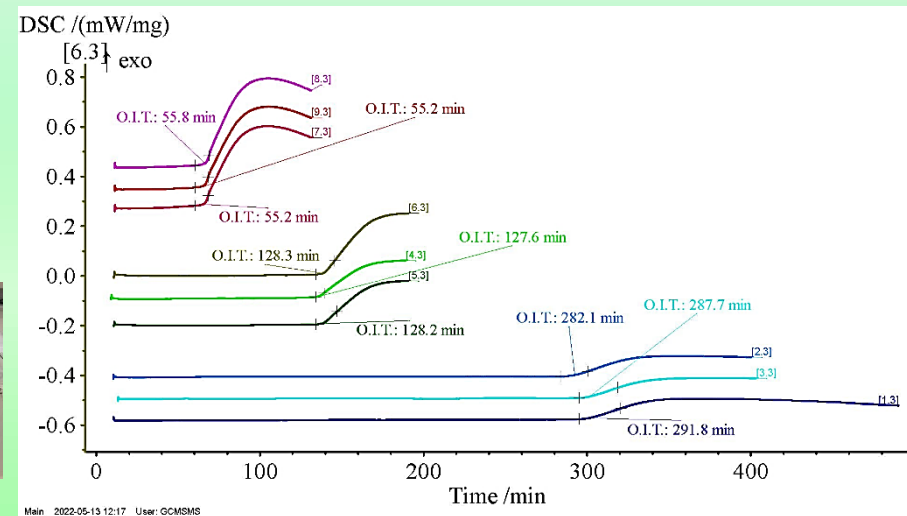


Fig 3 The influence of the oxidation temperature of virgin olive oil on the induction time (red lines are thermograms obtained at 150 °C, green at 140 °C and blue at 130 °C)

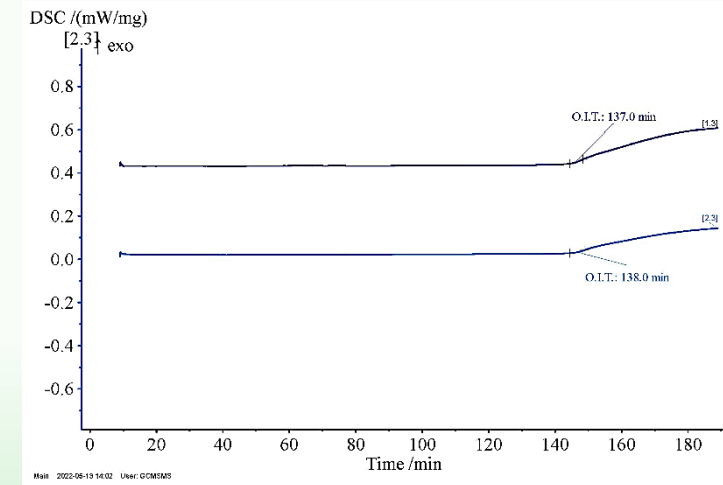


Fig 2 The influence of the lid on oxidation of virgin olive oil (dark blue line shows analysis with perforated lid and light blue without lid)

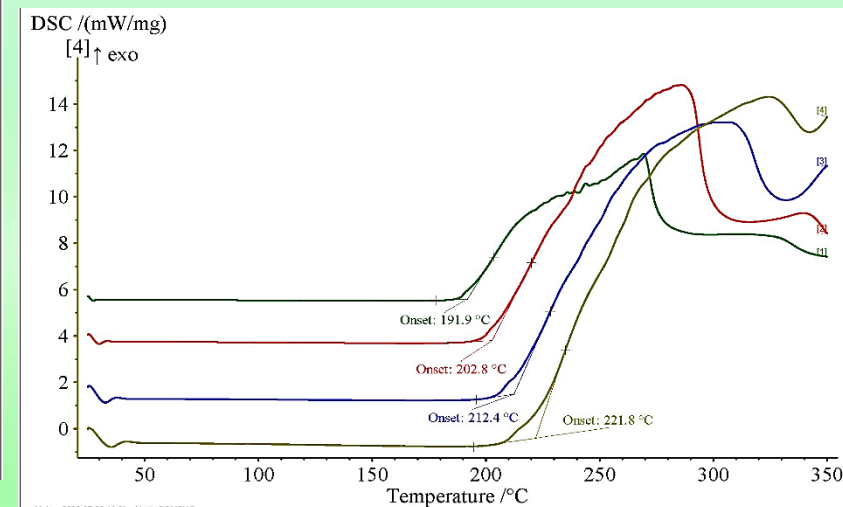


Fig 4 Induction temperature graphs (heating rate of 5 °C/min is marked green, 10 °C/min red, 15 °C/min blue and 20 °C/min brown)

## Conclusions

The results show that the DSC method, both isothermal and non-isothermal, is reliable for determining oxidation stability of olive oil.

1. Sample size did not affect induction time, but a smaller size resulted in better reproducibility. Therefore, 4 mg of oil is optimal.
2. There was no statistical difference between results obtained with an open or sealed aluminum pan. However, it is better to the latter to protect the instrument from possible contamination.
3. For the determination of the induction time a temperature of 140 °C proved to be optimal.
4. For the determination of the induction temperature a heating rate of 15 °C/min proved to be optimal.



## Acknowledgements

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