

Abstract

- This note provides a simplified sample preparation and data acquisition protocol for edible oil analysis using AP/MALDI with high resolution mass spectrometry (HRMS), offering potential applications in quality control and authentication of edible oil products.
- Simple sample preparation makes the workflow suitable for rapid analysis of various edible oil samples.

Introduction

Edible oil production and classification are complex due to diverse raw materials, varying extraction methods, and strict regulatory standards for quality, safety, and nutrition. Our protocol simplifies sample preparation and data acquisition, as demonstrated in a comparative study of various olive oil varieties. Key molecules were targeted for study include: Oleuropein/Oleuropein aglycon (bitterness factor in virgin/extra virgin olive oils), Elenolic acid (freshness indicator in olive oils), and Ligstroside-aglycone (extra virgin olive oil identifier).

Samples prepared by dissolving oils in methanol and combining with CHCA matrix. Replicates of each samples were spotted on a target plate.

Data was acquired with an AP/MALDI ion source hyphenated to HRMS.



AP/MALDI with Thermo HRMS

Data processed with Mozaic software (SpectroSwiss, Switzerland). Classifiers identified and Isotope Simulation performed.

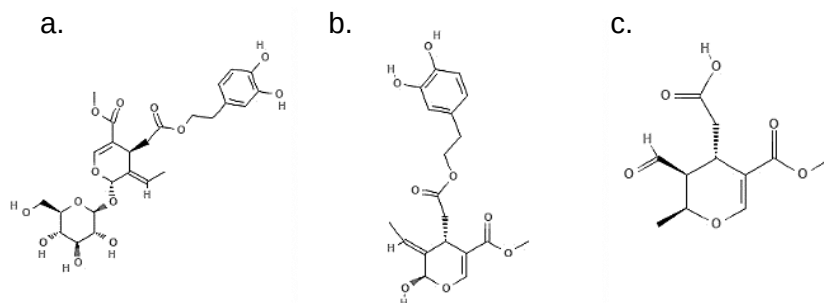


Fig. 1 (a) Oleuropein (b) Oleuropein aglycon (c) Elenolic acid

Results and Discussion

The simplified sample preparation method yielded reproducible spectra with high signal intensity and peaks corresponding to expected molecular species present in olive oil (see Fig. 2). Results of four trials yielded consistent Relative Quantitation, with satisfactory RSD values across the three types of olive oil (see Table 1).

- This method differentiates olive oil varieties based on their signature phytochemical patterns in minutes.
- Authenticity and grading of olive oil is determined by the presence of metabolites such as oleuropein, enlic acid, and ligstroside-aglycon. AP/MALDI HRMS successfully identified relative amounts of these indicator molecules in different oil samples.
- Minimal sample preparation reduces analysis time and increases sample throughput, indicating the applicability of AP/MALDI with HRMS for rapid edible oil analysis and authentication.

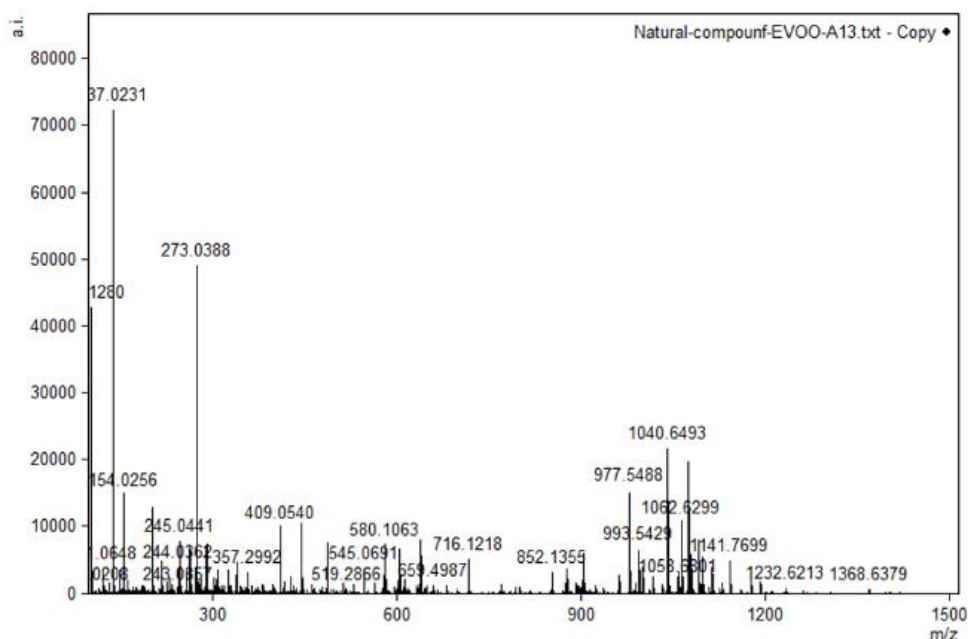


Fig. 2 Representative spectrum of extra virgin olive oil components

Table 1: Relative Quantitation and RSDs of Oleuropein and L

Type of Oil	Oleuropein-aglycone		Ligstroside-aglycone	
	Average (n=4)	RSD (%)	Average (n=4)	RSD (%)
Extra Virgin	3.2	16.2	2.9	16.6
Virgin	3.8	18.0	2.0	18.0
Standard	3.9	14.2	2.2	14.2