

Authenticity and Nutritional Value in Olive Oil: New Technologies and Prospects**Authors:** Nikolaos S. Thomaidis**Affiliation:** Laboratory of Analytical Chemistry, Department of Chemistry, University of Athens, Panepistimiopolis Zografou 157 71 Athens, Greece
ntho@chem.uoa.gr

Extra virgin olive oil holds a prominent position in the global market, recognized as a key component of the Mediterranean diet, with significant beneficial properties deriving from its consumption. In this context, particular emphasis has been placed on the study of its bioactive components and the strengthening of health claims, as is typical in the case of polyphenols. At the same time, due to its high value, extra virgin olive oil is often adulterated with other vegetable oils of lower commercial and nutritional value, or olive oils of lower quality. The Analytical Chemistry Laboratory of the National University of Athens (NUA) is conducting a multi-year study on olive oil, both in terms of chemical characterization and highlighting its nutritional value, as well as in the field of authenticating it. Utilizing high-resolution mass spectrometry (HRMS) workflows in combination with advanced chemometric models, it is possible to thoroughly characterize olive oil, identifying new bioactive compounds that make the product unique. More than 900 samples have been analyzed by the laboratory, from different cultivars and geographical origins, primarily from Greece. The olive oils have been fully characterized in terms of their chemical profile, and the data have been integrated into digital databases, contributing substantially to the mapping and highlighting of products of national priority, with Greek olive oil as the dominant one. In addition, the laboratory has developed a method for checking the authenticity of extra virgin olive oil, utilizing the innovative Direct Analysis in Real Time (DART) technique. This methodology makes it possible to detect adulteration of up to 1%, simultaneously checking 10 different oils that may have been used as an adulterant, such as common vegetable oils (corn oil, sunflower oil, rapeseed oil, soybean oil, sesame oil, cottonseed oil, linseed oil), as well as lower quality olive oils (pomace oil, refined and blended olive oil). The application of this methodology ensures the documentation of authenticity, a crucial element for maintaining and enhancing the commercial value of extra virgin olive oil, especially in the international competitive environment. Finally, the development of the above methodologies is not limited to research investigation, but is already available as services to interested parties, with the aim of practically supporting the agri-food sector and highlighting the value of Greek extra virgin olive oil.

Keywords: Extra virgin olive oil; authenticity; chemical analysis; Direct Analysis in Real Time (DART).