Stable Isotope ratio analysis for geographical discrimination of table olives produced in Poligiros, Greece

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Table olives are highly valued for their nutritional and economic significance, playing a crucial role in the economy of the Mediterranean countries. The geographical discrimination of olives is necessary to ensure product authenticity, as regional environmental factors influence their composition, quality, and traceability. 'Chalkidiki' is a domestic table olive variety which is cultivated mainly in the area of Poligiros (40°22′N, 23°26′E) located in the peninsula of Chalkidiki, Greece, with unique quality characteristics related to the soil-climatic 'context' of the region. These high-quality characteristics and reputation of the produced olives in the above-mentioned area make them vulnerable to adulteration and mislabeling. Thus, the implementation of methods capable of determining the geographical origin of these olives is a critical issue that significantly affects the competitiveness of olive production in this area. Stable isotope analysis which leads to the determination of the "isotopic fingerprint" is a widely used method for the discrimination of agricultural products. In that frame, the aim of this study was to evaluate the characteristic isotopic ratio of stable isotopes of Chalkidiki olives (Olea europaea L., cv. Chalkidiki), which can be used for origin verification. Olive samples were collected from different fields in the Poligiros area during the cultivation period of 2023 and 2024. A detailed sampling methodology based on soil and microclimatic parameters was implemented to ensure the representativeness of the samples collected. Isotope Ratio Mass Spectrometry (IRMS) was used to measure the stable isotope ratios of carbon ($\delta 13C$), nitrogen ($\delta 15N$), and sulfur ($\delta 34S$). The results indicate that isotope ratios of N and S could not be accurately determined due to the very low concentration of these elements in olives. On the other hand, the mean value of the isotopic ratio of C was $\delta 13C$V-PDB = −29.93‰ which is significantly different from the corresponding value of another table olive variety (Olea europaea L., cv. kalamon) cultivated in Kalamata, Greece ($\delta 13C$V-PDB = −28,37‰). These findings provide evidence that IRMS methodology could be used for origin discrimination of table olives based on their isotopic composition.

Biography

A. Ladavos is Professor of General Chemistry. The fields of research expertise/interest of Dr. Ladavos are: geographic origin identification of agricultural products based on stable isotope ratio analysis; synthesis, structure characterization as well as mechanical and barrier properties study of hybrid polymer nanocomposites for food packaging applications. The specific interest in the above-mentioned work fields resulted in participation in many nationally and EU funded research projects. He is the author of 80 peer-reviewed articles which have been cited more than 3500 times, led to an h-index of 35, and he has participated in many national and international conferences.

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