

³¹P NMR Spectroscopy in the Quality Control and Authentication of Extra Virgin Olive Oil

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In the past decade, high-resolution nuclear magnetic resonance spectroscopy (NMR) for proton and carbon-13 nuclei has been applied effectively in the analysis of olive oil. Amongst other advantages offered by NMR spectroscopy over conventional analytical methods is its ability to identify several constituents of olive oil in a single experiment. This presentation reports an alternative NMR method that supplements ¹H and ¹³C NMR techniques, especially in cases where strong signal overlap and dynamic range problems in ¹H NMR spectra and/or long relaxation times of the insensitive ¹³C nuclei render the analysis of olive oil a difficult task. This method is based on the derivatization of the labile hydrogens of functional groups, such as hydroxyl and carboxyl groups, of olive oil constituents with the tagging reagent 2-chloro-4,4,5,5-tetramethyldioxaphospholane and the use of the ³¹P chemical shifts to identify the labile centres. The phosphorous reagent reacts rapidly (within 15 min), and quantitatively under mild conditions within the NMR tube. The interest of the present study is focused on basic aspects underlying this methodology. Applications of this methodology to extra virgin olive oil quality control and authentication will be presented.

1. P. Fronimaki, A. Spyros, S. Christophoridou, P. Dais *J. Agric. Food Chem.* 2002, 50, 2207-2213.
2. S. Christophoridou, P. Dais *J. Agric. Food Chem.* 2006, 54, 656-664.