Usefulness of the ^{1}H Nuclear Magnetic Resonance in the characterization of edible oils and fats and in the study of their degradation processes.

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Edible fats and oils are constituted by triglycerides and by small proportions of minor components. Their characterization requires the determination of the proportions of their acyl groups, as well as of other parameters including Iodine Value, which measures the unsaturation degree of the sample. The common methods used to carry out these determinations involve several modifications of the sample by means of reagents, and subsequent steps to quantify the derived compounds on which the final determination is made; they usually consist of several stages and are time consuming.

Likewise, the oxidation or degradation level of edible oils and fats is usually defined by the value of several parameters associated with the concentration of intermediate primary oxidation compounds such as Peroxide Value, or Diene Conjugated and that of secondary oxidation compounds such as Anisidine Value or Thiobarbituric Acid (TBA) test. The methods described to carry out the determination of these parameters are empirical, and it is not totally clear in some cases what kind of compounds they determine[1]. It is known that hydroperoxides and conjugated dienic systems[2] can also be present among secondary oxidation compounds and that hydroperoxides are not detected[3] in some oil degradation processes; considering all the above mentioned, and taking into account that the determination of these parameters also requires the use of several reagents and is time consuming, the development of new methods to this aim should be considered of great interest.

In this context, the usefulness of ^{1}H NMR, not only to characterize edible oils[4,5] and to determine the percentage of acyl groups and the Iodine Value[6], but also to evaluate their oxidation or degradation level, as well as their oxidative stability, and the evolution of oxidation or degradation processes, has been studied[7]. Several approaches have been developed to determine percentages of acyl groups in vegetable oils and in fish oils; furthermore information on primary and on some secondary oxidation products can be obtained simultaneously. The use of this spectroscopic technique has provided the first ever proof of the formation of 4-hydroxy-(E)-2-alkenals and of 4-hydroperoxy-(E)-2-alkenas together with other oxygenated α,β-unsaturated aldehydes in some degradation process of certain edible oils; the importance of these results is due to these compounds are also formed in tissues and they are being considered responsible for degenerative diseases[8] such as Alzheimer, Parkinson or cancer among others.

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This work has been carried out with financial aid of Ministerio de Educacion y Ciencia (AGL2006-01381) *and of the* Gobierno Vasco (IT-403-07).