Determination of Antioxidant Capacity of Olive Oils and Rapeseed Oils

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Reactive oxygen species (ROS) such as radicals (OH•, O2•−, ROO•, RO•, NO•) exist in the oxygen metabolism; hence they can react with macromolecules such as DNA, lipids and proteins and cause defects in their functions. Such unbalanced oxidative capacity is named oxidative stress, which has been implicated in the etiology of many diseases such as: heart, central nerve system and cancer. However, present day lifestyles, which include consistent exposure to sunlight, radiation, cigarette smoke and medicinal drugs, as well as pollutants in air, water and food dramatically increase the number of ROS. Therefore, the demand for the efficient inhibitors of oxidation processes has become essential. It is known, that antioxidants in foods including mono- and polyphenols, sterols, tocopherols, vitamins A and C, etc. have a major role in protection against diseases, because these are ROS scavengers. Furthermore, antioxidant compounds in vegetable oils exhibit an antiradical activity and they are important in the prevention and treatment of the mentioned diseases.

In the recent years, different methods have been proposed for evaluation of the antioxidant capacity (AC) of vegetable oils. AC most often were analyzed by spectrophotometric procedures employing: ABTS (2,2’-azinobis(3-ethylbenzothiazoline-6-sulfonate), DPPH (2,2’-diphenyl-1-picrylhydrazyl), FRAP assay (ferric reducing antioxidant power), the competitive β-carotene or crocin bleaching tests, phosphomolybdenum, thiobarbituric acid-reactive substance (TBARS) and the conjugated diene method. Among fluorimetric methods, the ORAC assay has been applied for measuring the antioxidant capacity of vegetable oils. However fluorimetry and other methods require specialized, expensive equipments. Therefore, spectrophotometric techniques should be modified and employed by the industrial laboratory for AC determination of edible oils.

Therefore, we have focused, on spectrophotometric method for the antioxidant capacities (AC) determination of acetic and methanolic extracts of edible oils. The aim of this work was to compare results of AC of vegetable oils obtained by the modified FRAP and ORAC for precision, accuracy and sensitivity. The AC results, total phenolic compounds (TPC) and tocopherols contents were used as descriptors for principal component analysis (PCA) in order to differentiate the analyzed vegetable oils.

The proposed FRAP and ORAC methods are simple, precise and convenient for the determination of antioxidant capacities of vegetable oils. Besides, the ORAC method resulted in determination of AC in the concentration range (0.000391–0.00625 μmol/ml) and FRAP method (0.001 – 0.020 μmol/ml). It is noteworthy that, there is linear and significant correlation between these two different analytical procedures. The properties of the extracting solvents significantly affected the antioxidant capacity of vegetable oils. Moreover, the ORAC and FRAP results for the analyzed oils significantly correlate with total phenolic content. The proposed FRAP and/or ORAC methods were chosen due to preference of the fat industry for a simple procedure of antioxidant capacity determination.