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Antioxidant capacity evaluation by means of electrolysis at controlled potential

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The characterization of antioxidant (AO) has been studied due to their potential action against oxidative stress and many works are dedicated to establish correlations between AO in food and health maintenance, other focused on the antioxidant status in physiological fluids and the beginning of diseases and others in preventing oxidative degradation of food, such as in the case of wines white.

Reactive oxygen species (ROS) are highly reactive compounds resulting from reduction of molecular oxygen or derivative products of reduction of oxygen. Under normal conditions, oxygen is produced at the level of cells and ROS are harmful to the cells. It is not possible to avoid damages caused by these species that arise from endogenous and exogenous sources. Our antioxidant systems are not perfect and the cells damaged by oxidation accumulate. The cell damage caused by the action of ROS, in accordance with the nature of the targets may be the cause of premature aging to neurodegenerative diseases such as Parkinson and Alzheimer diseases. The oxidative deterioration of the wines is characterized by several changes, including colour, flavour, appearance of off-flavours, and increased acidity. The action of AO in reducing ROS is one of the ways is efficient in eliminating these species.

The need to characterize the protective effect of AO has led to the development of analytical methods to perform the characterization of natural and synthetic AO activity. The methods of evaluation of the antioxidant capacity are classified into two groups according to the nature of the reactions involved: hydrogen atom transfer (eg ORAC and TRAP) and electron transfer (eg TEAC, FRAP and DPPH).

Other methods have been developed with an emphasis on electrochemical methods based on electron transfer, and present several advantages such as analysis speed, sample treatment simplicity and equipment cost. Among the most widely stands out cyclic voltammetry, which is based on voltammogram analysis from peak potential, from peak intensity or from area under the voltammogram and potentiometric titration, which occurs with Cl_2 production.

In the approach presented here, characterization of AO is based on extensive oxidative attack on samples using large electrodes in order to consume the AO simulating the attack by ROS. The reducing power of AO is evaluated based on electron transfer at the anode without the use of synthetic antioxidants. This simulation is carried out based on the potential selection and charge and constitutes an absolute measure of the reducing ability of the AO.

With this method it is possible to control the extent of oxidative attack by the experimental variables that control the degree of conversion: anode area, volume of anodic compartment, mass transfer efficiency and electrolysis time.

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