Application of Head-Space Sensors in the Malaxation Management to Improve in Virgin Olive Oil Quality

Servili Maurizio, Taticchi Agnese, Esposto Sonia, Urbani Stefania, Selvaggini Roberto, Montedoro GianFrancesco.

DSEEA, Division of Food Technology and Biotechnology, University of Perugia, Italy

Sensory and healthy properties of Virgin Olive Oil (VOO) are highly related to its volatile and phenolic composition. The occurrence of these substances in the oil depends from various endogenous oxidoreductase activities of olive fruit that are activated during processing, such as PPO and POD, which promote hydrophylic phenols oxidation during malaxation, and LPO that catalyzes the genesis of C5 and C6 saturated and unsaturated aldehydes, alcohols, and esters responsible for the desirable sensory notes of VOO. The malaxation process parameters, in terms of temperature, length and oxygen concentration, affect the all the mentioned enzymatic activity determining strong modifications in the VOO quality. The technological approach to the control of the enzymatic activities has been attempted through the optimization of the malaxation temperature and the time of exposure of olive pastes to the air contact, using N_2 in order to reduce the oxygen concentration, according to the phenolic and aroma profile of VOO. Recently the CO_2 emission from malaxed pastes has been described as an interesting mean to reduce hydrophilic phenols oxidation.

In this work the monitoring of CO_2 and O_2 concentration modifications during olive paste malaxation in industrial scale has been carried out on several olive cultivars and in different atmosphere composition conditions. The evolution of the volatile compounds has been followed by electronic nose application (MOS) directly in the malaxer chamber. Data acquired during malaxation were successively studied in relation to the composition of the olive pastes and oils obtained in terms of phenolic and volatile concentration, analysed by HPLC and HS-SPME-GC-MS, respectively. During the olive paste's malaxation in oxygen containing atmosphere, the oxygen concentration reduction was always observed; so far, the oxygen availability in the malaxer chamber seemed to influence very slightly the extent of the CO_2 emission from the olive pastes. Furthermore, according to the increase of the oxygen level the phenolic concentration in the VOOs significantly decreased, showing that it affects the PPO and the POD activity; for this reason the oxygen depletion attainable in the sealed malaxing machines, due to the progressive increase of the CO_2, may represent a useful mean to preserve the phenolic compounds from the oxidative degradation.

Results indicate that the monitoring of the chamber atmosphere during malaxation may be a very helpful technological innovation in the improvement of the mechanical extraction process in order to achieve higher quality VOOs.