

Variability of Virgin Olive Oil Volatile Profile in Relation to Fruit Cultivar Combinations

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High-quality virgin olive oil (VOO) is today demanded by consumers not only because of its potential health benefits but also due to its particular organoleptic properties. The most important compounds in the VOO aroma are straight-chain six-carbons (C6) aldehydes, alcohols and the corresponding esters synthesized through the lipoxygenase (LOX) pathway when enzymes and substrates meet as tissues are disrupted during olive oil processing. In a first step of this pathway, LOX produces the 13-hydroperoxide derivatives from linoleic and linolenic acids that are subsequently cleaved heterolytically by hydroperoxide liase (HPL) to C6 aldehydes. C6 aldehydes can then undergo reduction by alcohol dehydrogenases (ADH) to form C6 alcohols that can finally be transformed into esters by means of an alcohol acyltransferase (AAT). Moreover, a collection of compounds of straight-chain five-carbons (C5), generated through a LOX homolytic activity, has been shown also to contribute to the aroma of VOO. The activity load of the different enzymes involved in the LOX pathway differs for each olive cultivar during the oil extraction process and would be responsible for the differences found in the volatile profile of VOO among cultivars. In other words, olive cultivars have different metabolic deficiencies related to the oxidative degradation of polyunsaturated fatty acids through the LOX pathway, and they may affect to both the heterolytic and homolytic LOX pathway branches. These deficiencies are revealed when comparing the profiles of volatile compounds of oils obtained from mixtures of fruits of Picual and Arbequina cultivars, which display quantitatively different volatile compound profiles, with mixtures of oils of each cultivar in the same proportion. Experimental data suggest that processing of fruit combinations of selected cultivars offer interesting possibilities for the targeted modulation of VOO volatile fractions, and consequently their organoleptic quality.