VII.I.O57. A metabolomics approach to compare apple cv 'Granny Smith' vs 'Red Delicious' responses to dynamic and static controlled atmosphere storage

Stefano Brizzolara[1], Stefan Stürz[2], Angelo Zanella[2], Pietro Tonutti[1]
[1]Sant'Anna School of Advanced Studies, Piazza Martiri della Libertà 33, 56127 Pisa, Italy
[2]Laimburg Research Centre for Agriculture, Ora Bolzano, Italy

The application of low oxygen levels during the storage of several horticultural products is crucial in order to maintain high quality during the post harvest phase. Since each species and cultivar responds differently to the same imposed stress, a more dynamic control of storage conditions is needed to optimize the use of available technologies. The Bio-markers are driving us to this goal: they are successfully employed to evaluate the level of stress of the fruit; as an example, ethanol is a well known fermentation marker. Apple fruit is commonly stored under low oxygen levels and, among apple, 'Granny Smith' and 'Red Delicious' are differently sensitive to hypoxia stress. These two cultivars represent a good system on which to investigate how apple fruit responds to different oxygen management since Granny Smith is more resistant to the controlled atmosphere storage and it used to produce less ethanol. Two different oxygen managements were tested: ULO (Ultra Low Oxygen, static at 0.9 kPa) and DCA-CF (Dynamic Controlled Atmosphere, between 0.3 and 0.55 kPa). Chlorophyll fluorescence (CF) was used in order to set dynamically the oxygen level. GC-MS techniques were used for the metabolic and aroma profiling of the samples. Several metabolites (e.g. alanine, asparagine, threonine, uridine, GABA, lactate) resulted selectively affected by the different oxygen management, thereby representing possible markers. Among the produced VOCs (Volatile Organic Compounds), aldehydes and terpenoids were generally accumulated at higher levels in 'Granny Smith'. On the other hand alcohols and esters reached higher values in 'Red Delicious' samples: some compounds were detected exclusively for this cultivar at the tested conditions (eg. propyl acetate; propyl propionate; ethyl tiglate; 5-hexene-1-ol, acetate). Butanoic and hexanoic acid ethyl esters appeared to be produced at higher levels under DCA storage. These results are promising in order to identify possible markers for a better management of these advanced storage technologies.

Keywords: *Malus domestica, low oxygen stress, dynamic controlled atmosphere, chlorophyll fluorescence, metabolomics, SPME-GC-MS*