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# COMPUTER VISION IMAGE ANALYSIS (CVIA) AND ARTIFICIAL INTELLIGENCE (AI): A NEW POST-ANALYSIS HYPHENATED TOOL FOR HS-SPME/GCXGC/TOF-MS? AROMA ANALYSIS AND OFF FLAVORS IN WHITE WINE AS CASE STUDY

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Comprehensive multidimensional GCxGC hyphenated with Time Of Flight Mass Detector (HS-SPME/GCxGC/TOF-MS) is a powerful tool to study wine aroma. “White Muscat” grape (*Vitis vinifera* L.) is used to produce “Asti Spumante” and “Moscato d’Asti” white wines (Piedmont, Italian DOCG designation). The characterization of Volatile Organic Compounds (VOC’s) is a fundamental tool to define the quality of the wine. In this work, we first developed an high-sensitive multi-dimensional comprehensive capillary gas chromatographic method for the analysis of Muscat wine, leading us to obtain complex aroma fingerprints. Then we studied the evolution of the VOC’s (HS-SPME sampling) during the ageing of “Asti Spumante” and “Moscato d’Asti” wines. Linalool, nerol and geraniol significantly decreased after one-year in either wines; on the contrary,  $\alpha$ -terpineol, hotrienol, nerol oxide, furanic linalool oxides A/B and rose oxide concentrations significantly increased, confirming an oxidative evolution of the Muscat aroma. Moreover, we identified some off-flavors in “unpleasant” samples, responsible of white wine imperfections. All analyses and identifications were performed considering Kovats retention index.

The application of Computer Vision Image Analysis (CVIA) and Neural Network algorithms on VOC’s bidimensional fingerprints (working on the “raw” matrices of data, directly obtained from the chromatographic software) permitted i) the standardization and the “clean up” of the 2D patterns, in order to compare among them, avoiding the misinterpretation of GC profiles and ii) the automation of the comparison among complex bidimensional fingerprints, permitting the identification of the significant differences between two (or more) samples concerning a specific aroma compound, allowing us to quantify positive and negative variations. Concluding, in this work we optimized some post-analysis hyphenated statistical techniques, either based on the CVIA and on the AI, in order to simplify the interpretation of the comprehensive multidimensional chromatograms of VOC’s in white wine.