THE USE OF “OMICS” APPROACHES IN DEORPHANIZING THE KEY AROMA COMPOUNDS RESPONSIBLE FOR AROMA PERCEPTION OF ROASTED HAZELNUTS

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Roasting is the key process converting raw hazelnuts into a semi-manufactured product with a characteristic aroma. In a previous study, the heat-induced aroma generation in Italian hazelnuts of the variety Tonda Romana was studied by means of the molecular sensory science approach revealing that the pairs 2- and 3-methylbutanal (malty), 2-acetyl- and 2-propionyl-1-pyrroline (roasty, popcorn-like), 2,3-pentandione and 2,3-butandione (buttery), 2-furanmethanethiol and 2-thiophenemethanethiol (coffee-like) as well as 5-methyl-(E)-2-hepten-4-one and 3-methyl-4-heptanone (fruity, hazelnut-like) are among the most important aroma-active compounds. However, further sensory experiments indicated that different aromas are obtained by changing the roasting regime as well as the hazelnut variety. Hence, the aim of the present study was to analyze the heat-induced aroma generation by means of targeted and untargeted approaches, and to correlate the data with the overall sensory impact of the respective samples. The targeted analysis of hazelnuts' Sensometabolome comprises the identification and quantitation of key odorants across a larger sample set. The development of a new comprehensive quantitative approach on basis of GCxGC-TOF-MS in combination with stable isotope dilution assays will be presented in detail. Recombination experiments finally verified the effectiveness of the Sensomics approach to understand the generation of hazelnut aroma on a molecular basis. Then, by means of GCxGC-TOF-MS, the heat-induced changes of the total volatile hazelnut metabolome were investigated employing the so-called COMMA approach. This way, marker compounds are located by application of an untargeted comparative analysis, and the data are correlated with the overall aroma as well as with the outcome of the Sensomics approach. The results showed that a combination of both methods is a useful tool in understanding and controlling the aroma generation during hazelnut roasting.

Keywords: Roasting, aroma, hazelnuts, omics approach, GCxGC-TOF-MS