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Predicting apple sensory properties by instrumental measurements:odour, flavour, texture and colour

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The perceivable quality of apple is one of the most important aspects to be considered in breeding, selection and commercialization. The key sensory attributes driving consumer choice are related to appearance and texture because of their correlation with fruit freshness perception. In addition, texture characteristics are also responsible for juice and flavour release during consumption, which also affect onconsumer acceptability. Descriptive sensory analysis is the best approach to provide a comprehensive and objective description of sensory perception, in qualitative and quantitative terms, but it is expensive, time consuming and the number of samples per analysis is limited thus limiting its application in genomic investigation and marker assisted selection.

Our approach, adopted within the apple breeding program conducted at Fondazione Edmund Mach is based on a complete characterisation of commercial varieties and new selections by a trained panel according to a quantitative descriptive method. Furthermore, several physicochemical parameters related to texture, flesh colour, basic composition and volatile compounds are measured on the same fruits in order to study the correlations between sensory characteristics and instrumental determinations and to build and validate predictive models. In the case of texture analysis we complemented the standard mechanical profiles with the recording of the sound emitted during flesh fracturing. Two head space techniques (SPME–GC–MS and PTR-MS) were compared for the quantifiction of volatile compounds.

Good predictive models were obtained for the prediction of acid taste, flesh colour and some texture attributes using both mechanical and acoustic parameters. Furthermore, a clear relationship between several odour attributes and volatile compound concentration was found and PLS diagnostic models allowed the identification of the compounds contributing to the odour sensations.

This study is still running with the aim to generate a complete set of models that, on the basis of rapid instrumental characterization, can provide reliable quantification of a complete sensory profile on large data sets to be used in genomic investigations.

Keywords: Apple, sensory analysis, predictive models, chemometrics