
Relationship between Visible-NIR spectroscopy and sensory analysis of apples

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Sensory profiling and visible/near infrared spectroscopy were used to characterize 20 French apple cultivars. The main objective was to investigate the relationship between Visible/Near Infrared Spectroscopy (NIR), as a rapid and non-destructive method, and sensory attributes, including texture, flavour and aroma. Apples were collected in experimental orchards from Angers (France) region and evaluated by 16 trained assessors, using a fixed vocabulary of 18 descriptors. The individual scores were averaged according to the cultivars, giving a matrix *S* formed by 20 rows (20 cultivars) and 18 columns (descriptors). For NIR measurements, 400 apples (20 fruits for each cultivar) were collected. The visible-NIR spectra (wavelength of the light ranging from 400 to 2100 nanometers) were acquired directly on two opposite faces of the intact fruits using a Visible-NIR spectrometer (NIRSystems 6500, Perstorp Analytical) fitted with an optic probe device (OptiProbe systems, Perstorp Analytical). The digitised spectra, formed by 900 individual absorbencies, were corrected using the standard normal variate correction (Barnes *et al.*, 1989) and averaged according to the cultivars. In this way, it was possible to obtain a matrix *N* of visible/NIR spectral measurements dimensioned 20x900. The correlation coefficients between the columns of *N* (absorbencies at different wavelengths) and those of *S* (sensory descriptors) were studied. The highest correlation coefficients (R= 0.87) were obtained for a texture attribute, *roughness*, at few relevant wavelengths such as 1886 nm (associated with starch) and 2050 nm (proteins) (Osborne *et al.*, 1993). The *sweet* attribute was negatively correlated (R = -0.58) with NIR measurements at 1440 nm (sugar and starch) and 1890 nm (starch), while the *sour* attribute was correlated at the same wavelengths but positively (R= 0.45). Similar observations were done for *crunchiness* and *mealiness*, two very important sensory attributes for apples. The *mealiness mouthfeel* seemed to be correlated to NIR absorbance at 990 nm, (starch; R= -0.53) . These results show the importance of starch in relationship with the texture of apples. With regard to the odour, the most correlated attribute was the *fresh leaves* odour (R= 0.60 at 1084 nm, 1888nm and 2036 nm). This study shows that there is actually some relationship between different visible/NIR wavelengths and sensory attributes for apple. In further work, we will investigate the possible interest of visible/NIR spectroscopy for estimating some sensory attributes as measured by experimented assessors.

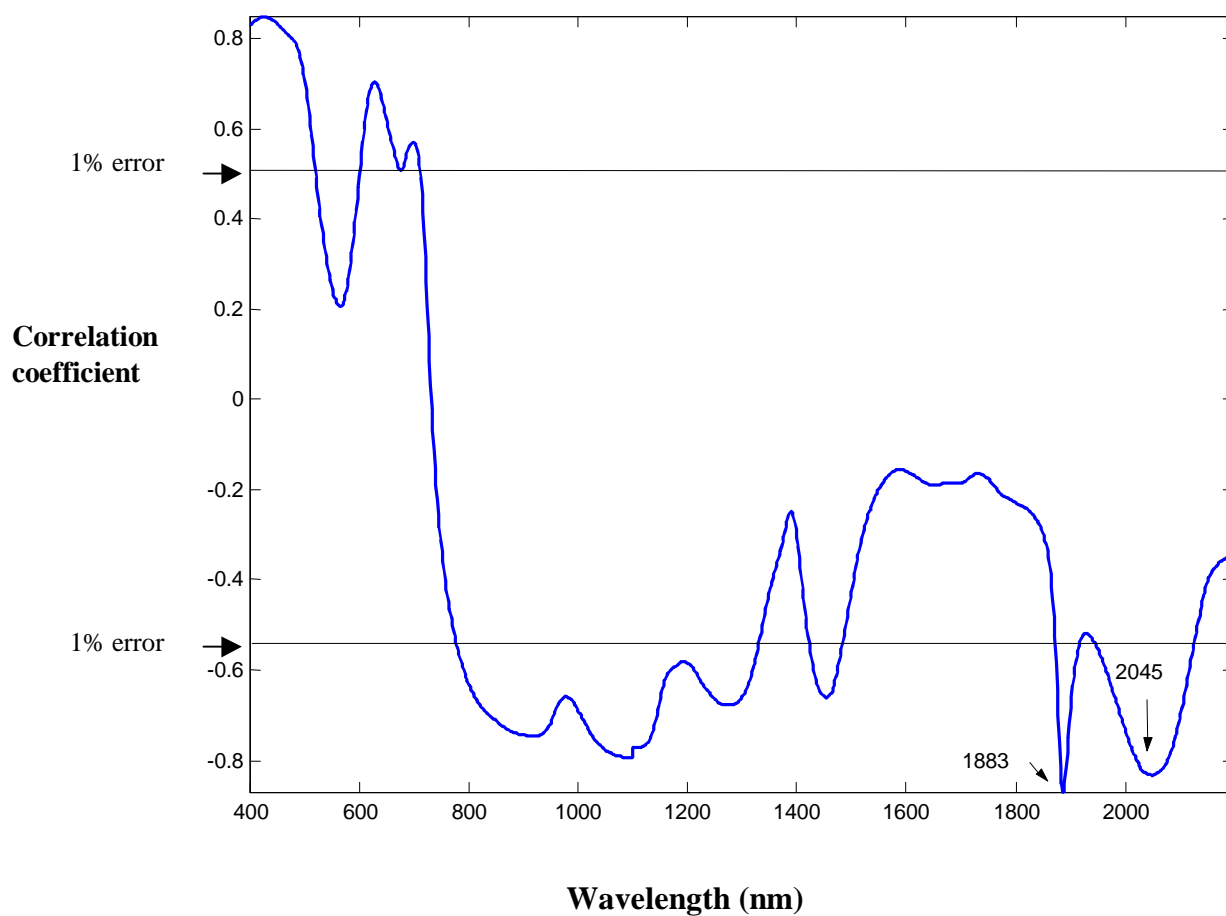


Figure 1: Correlation between NIR spectra and *roughness*

References

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