Contribution of infrared spectroscopy to evaluate the variability of quality traits of the fresh apples and processed purées

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The objective of this work is to use NIRS and MIRS to study the quality of apples in order to evaluate the link between the fresh fruits and their corresponding purées after grinding and cooking. Over two seasons, factors impacting the quality characteristics were modulated: genetic effect by choosing two varieties, agricultural practices with a water stress and a fruit thinning, postharvest conditions with a cold storage at 4°C during 0, 1, 3, 6 and 9 months, and the processing step by applying two cooking recipes and three refining levels. Samples were systematically characterized by both, the classical measurements such as soluble solids content (SSC), titratable acidity (TA), dry matter, individual sugars and organic acids, alcohol insoluble solids (AIS) and the spectral NIRS (800-2500 nm) and MIRS (4000-700 cm^{-1}) data.

NIRS and MIRS to study the apple quality change during growth and maturation:
The NIRS performed on intact apples allowed to discriminate the 6 stages of Golden apples, but MIRS performed on the fruit homogenates allowed to discriminate in addition the thinned condition (50% apples removed) from the non-thinned condition. The water stress was not distinguished in accordance with the classical data.

NIRS and MIRS to study the apple change during cold storage until 9 months and the impact on the corresponding purees after processing:
MIRS performed on purées highlighted a clear change of puree composition and structure with increasing storage time. Whereas the clear separation of the three levels of refining (0.5 mm, 1mm and not refined) at the beginning of storage, the separation was gradually reduced with the time of storage to reach an overlapping of all samples at the end of storage after 9 months. By regarding the macroscopic images of the same samples, at the beginning of storage, purees were composed of large particles and a few separated cells and the refining levels mainly lead to a clear variation of the particle sizes. However, after 9 months of storage, the purees were mainly composed of individual cells and then the purées were not different according to the refining levels.

<u>NIRS and MIRS to evaluate the quality traits of apples and processed purées</u>:
Partial least squares (PLS) regressions were performed to evaluate the predictive ability of the internal quality parameters of apples during growth and ripening and of apples and processed purees after different storage periods. During growth and maturation, a good prediction of SSC, TA and AIS was obtained in NIRS on intact fruits (R^2 respectively of 0.95, 0.8 and 0.9) and in MIRS on homogenates (R^2 respectively of 0.98, 0.98 and 0.93). Similar results were obtained during storage.

NIRS and MIRS appeared to be very some very interesting and convenient tools to pilot the fruit management in orchards and during postharvest.