

Use of NIR spectroscopy to determine the polyphenol content in peel and flesh of apple cultivars.

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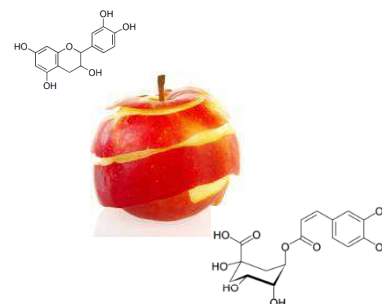
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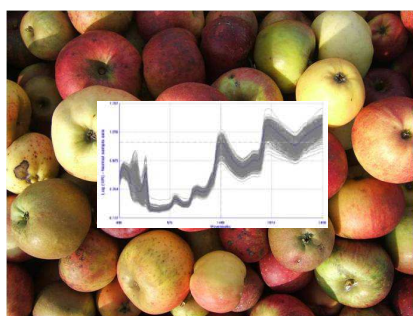
Introduction

Apple, especially its peel, contains many phenolic compounds. The health benefits of these nutrients as antioxidant are widely recognized. Unlike other quality parameters, the use of NIRS to determine polyphenol content has been few studied.

This study was performed in the framework of our activities aiming to promote the Belgian apple genetic resources collection owing to their high content of bioactive compounds. It investigated the use of NIRS to determine the polyphenol content in peel and flesh of apples.



Materials and methods



- A total of **239 fruits** representing **21 apple cultivars** were studied. Old, commercial, and cider cultivars, and new selections coming from our apple breeding program were chosen to cover the broad variability of the CRA-W's collections.
- **Flesh and peel** were analyzed by **NIRS-XDS spectrophotometer** (FOSS, NIRSystems, Inc.) (408-2498 nm) and their polyphenol content was determined using **Folin-Ciocalteu** as a reference method.
- The database was split into a **calibration and validation set** and calibration models based on **PLS regression** were built using WinISI III package.

Results and discussion

- Calibration models showed high coefficients of determination for the polyphenol content in both parts of the fruit (peel and flesh), with slightly higher coefficients for the peel (R^2 cal = 0.91) compared to the flesh (R^2 cal = 0.86).
- For the validation step, as expected, the coefficients of determination were slightly lower than those observed in the calibration (see Table).
- RPD values of the models ranged from 2.9 to 4.2 which allows quantitative prediction.

Total polyphenol content ($\mu\text{g/g FW}$)	Calibration					Validation			
	N	SECV	R^2 cal	RPD	Factors	N	SEP	R^2 val	RPD
Peel	152	625	0.91	2.9	9	70	587	0.88	3.0
Flesh	151	252	0.86	3.7	9	70	217	0.85	4.2

Conclusion

Good models were obtained for the determination of polyphenol content in both peel and flesh of apples measured separately. It confirms the results obtained previously on entire fruits and suggests that NIR spectroscopy may be an interesting tool for a precise evaluation of polyphenol content in apples.

Especially in the framework of breeding programs, NIRS could be used to classify cultivars according to a relative range of polyphenol concentration and make a quick screening of the genotypes based on this criteria.

