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## Physicochemical characterization of different apple varieties using FT-IR spectroscopy and complementary methods

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### Abstract:

This study provides a comprehensive physicochemical characterization of five commercially available apple varieties, focusing on sugar content, by combining Fourier Transform Infrared (FT-IR) spectroscopy with conventional analytical methods. FT-IR spectroscopy offers a rapid, nondestructive, and reliable approach for the quantitative assessment of total sugars, while also enabling identification of molecular components in the fruit pulp. Complementary analyses included measurements of pH, viscosity, surface tension, and sugar concentration expressed in degrees Brix.

### • Introduction

Apples are highly valued fruits due to their nutritional properties and health benefits, including antioxidant activity, cardiovascular support, regulation of blood glucose, and contribution to dietary fiber intake. These beneficial effects are largely attributed to their complex composition, which includes sugars, organic acids, polyphenols, and other bioactive compounds.

### • Experimental

For FT-IR measurements were performed in the absorbance with a spectrophotometer FT-IR-4100 Jasco, using the KBr pellet technique. The spectra were obtained in the wavenumber range  $265\text{ cm}^{-1}$ . Spectral resolution was set at  $4\text{ cm}^{-1}$  and all spectra were acquired over 256 scans. The sample was obtained from 0,003 g of dried fruits of appels and ground.

### • Results and discussions

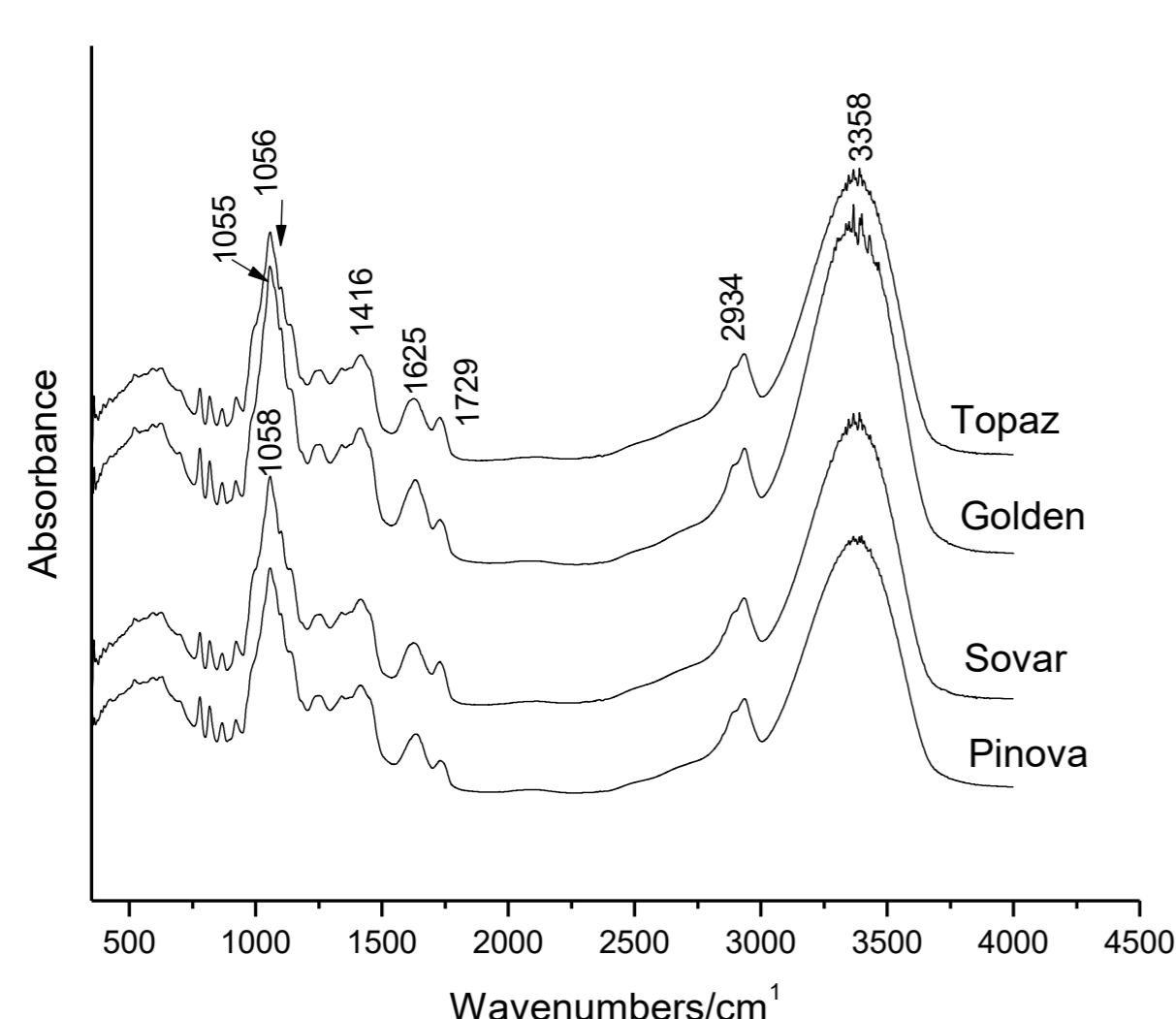
The results demonstrate that the integration of FT-IR spectroscopy with traditional analytical methods provides a powerful tool for evaluating the quality, composition, and nutritional potential of apples. This approach can be applied for routine quality assessment in research and industry, offering rapid and accurate insights into fruit characteristics.

Apple cultivar	Sugar content (°Brix)
Golden	15
Topaz	13
Pinova	16
Şovar	14

Apple cultivar	pH values of juice (interval)
Golden	3.6
Topaz	3.2
Pinova	3.4
Şovar	3.1

Apple cultivar	Viscosity of apple juices (mPa·s at 20°C)
Golden	1,4
Topaz	1,2
Pinova	1,5
Şovar	1,3

Apple cultivar	Values of density (g/cm <sup>3</sup> )
Golden	1.060
Topaz	1.052
Pinova	1.064
Şovar	1.056



### • Conclusions

Comparative analysis revealed significant differences among the apple varieties in both sugar content and other physicochemical parameters. Variations observed in the FT-IR spectra correlated well with the measured pH, viscosity, surface tension, and Brix values, confirming the consistency of the approach.