



ATR-FTIR chemical screening for adulterants and sugar characterization in honeys

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Introduction

The search for improvements in honey analysis is an important topic due to the relevance that adulterations and variations of sugar composition have in this food.

Attenuated Total Reflectance Fourier Transform InfraRed spectroscopy (ATR-FTIR) is a reliable and fast analytical instrumentation for analysis of liquids, semi-solids and solids, which is currently used in food chemistry for qualitative and quantitative investigations.

Objectives

This work is aimed to build a fast analytical method, using ATR-FTIR and Partial Least Square (PLS) chemometric tool, to quantitative determination of glucose, fructose and sucrose present in honeys.

Materials and methods

21 honey, from two Italian geographical locations, Trentino and Sicily was used.

An analytical model for the calibration was designed by preparing orthogonal standard solutions covering both the expected ranges of variability of Glucose, Fructose and Sucrose in unadulterated honey and those from artificial adulterations.

ATR-FTIR, a fast, reliable and inexpensive instrumentation was used for carrying measure of Glucose, Fructose and Sucrose either for standards, adulterated and non adulterated honey.

After the model was both cross validated and validate with a set of test solutions chosen casually into the calibration scheme, unadulterated honey samples where measured. Was also prepared artificial adulterations of honey by addition of commercial Inverted sugar syrup and glucose syrup in various quantity into the sample honey. Two different additions per type adulterant (4 total) was added and thoroughly mixed.

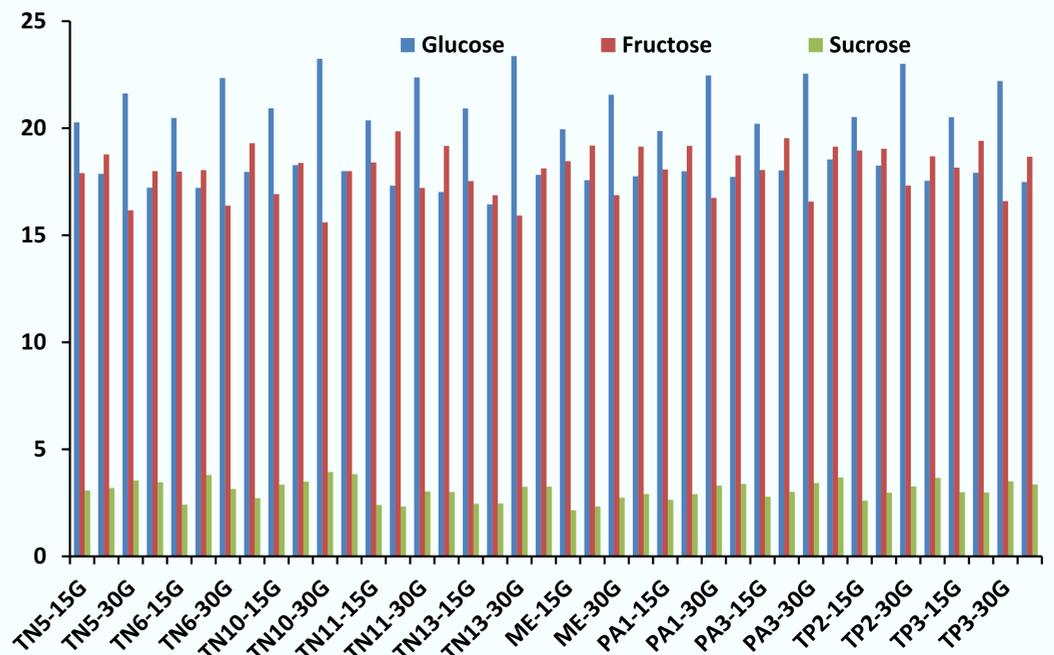


Figure 2: Adulterated honey PLS results

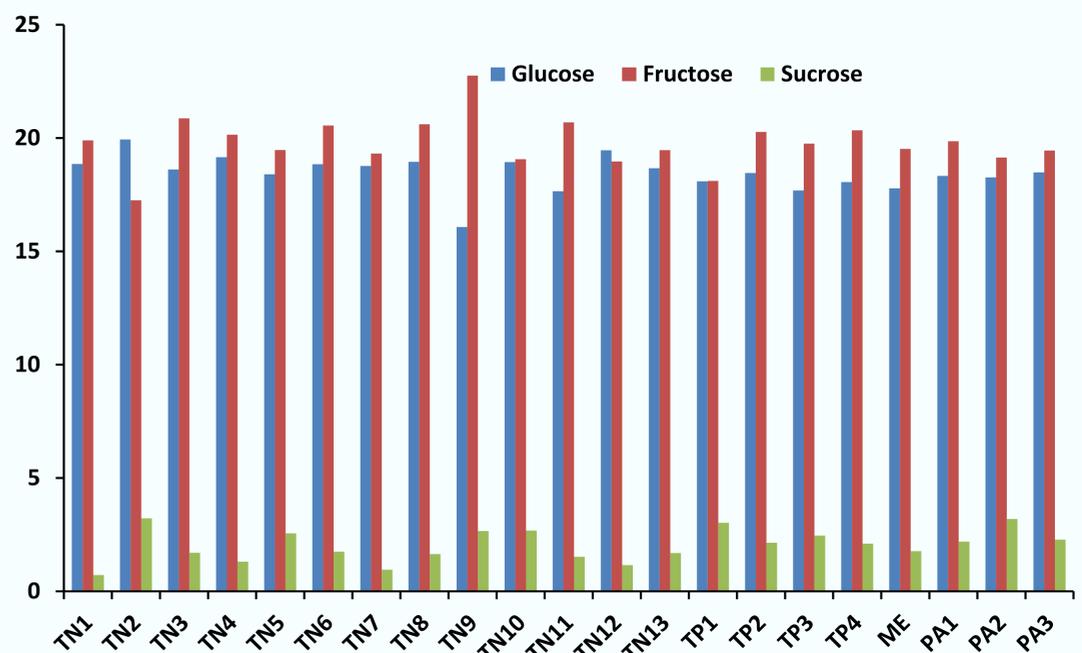


Figure 3: Non adulterated honey PLS results

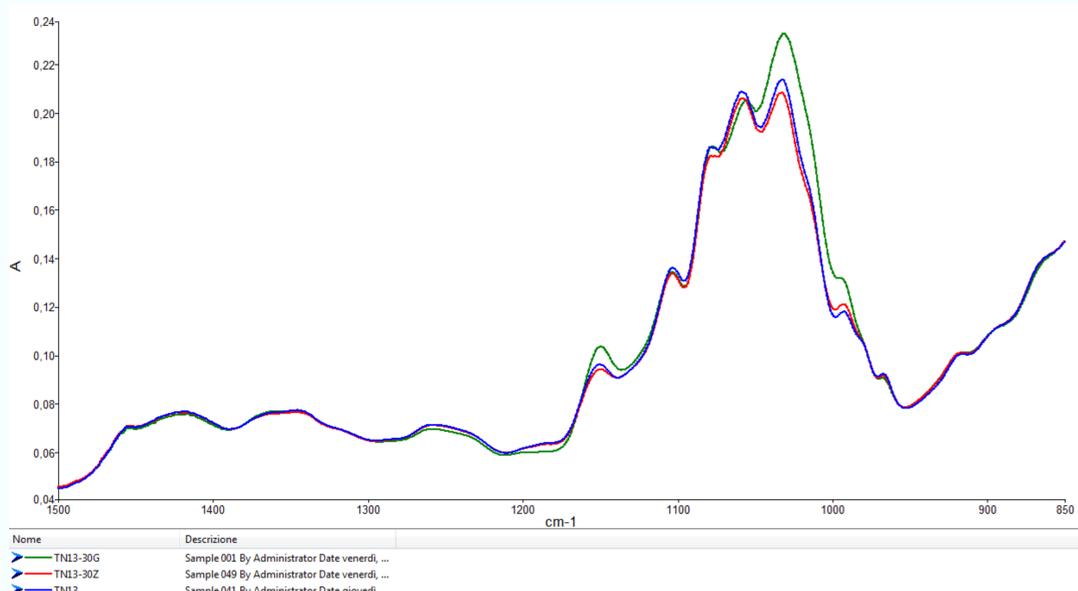


Figure 1: FTIR-ATR spectra of adulterated and non adulterated honey

Results and discussion

In Figure 1 there are reported three superimposed ATR-FTIR spectra of a pure honey sample and the spectra of the same honey with two different adulterant added. It may be seen different peaks varies and this is an indicator that is possible discriminate this kind of adulteration from using this analytical method.

Furthermore as seen confronting Figure 2 and Figure three variability in Glucose, Fructose and Sucrose increase between non adulterated and adulterated samples

Conclusions

From the data we acquired and the preliminary statistical analysis we could infer ATR-FTIR could be used for the screening of adulterants and sugar into honey.

Further instrumental and statistical analysis will be conducted to increase the efficacy of this screening method.