The application of infrared spectroscopy in the rapid identification of adulteration in honey

Abstract:

Honey contains nutrients such as glucose, fructose, organic acids, vitamins, and various enzymes. It possesses nourishing, moisturizing, and detoxifying effects, serving as an excellent nutritional supplement, seasoning, and adhesive. It is an essential ingredient in traditional Chinese medicine pills and oral liquids. Due to the high demand for honey, there is often adulteration in the market. With increasing demands for honey quality, traditional detection methods like sensory physical identification and chemical identification are unable to meet the rapid authentication needs for high-quality honey.

Utilizing Fourier transform infrared spectroscopy to analyze and study pure jujube flower honey and adulterated jujube flower honey samples, by comparing the similarities and differences in the infrared spectra of the two types of samples, pure and adulterated honey can be distinguished with significant differences observed. This method does not require complex pre-processing of samples, is simple and fast to operate, provides high accuracy, excellent reproducibility, and holds promising application prospects.

Key words:

Infrared spectroscopy, adulterated honey, qualitative identification

Principle:

At room temperature, applying two different types of honey onto an ATR crystal, scanning their infrared spectra, overlaying the scanned spectra, and observing the peak trends in the range of 1250-900 cm^{-1}. Genuine honey exhibits a single broad and round peak, while adulterated honey displays multiple split peaks with non-identical peak shapes in this specific range.

Experimental Conditions:

Instrument and Accessories:

FTIR-7600S Fourier Transform Infrared Spectrometer;

Single Reflection ATR Accessory (45°, Zinc Selenide crystal);

Test Conditions:

Resolution: 4 cm^{-1}

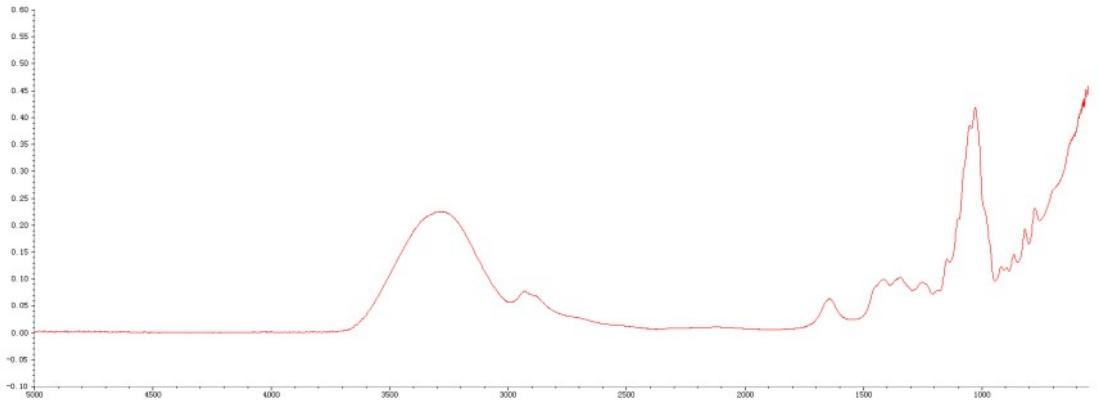
Number of Scans: 64 times

Detector: DTGS

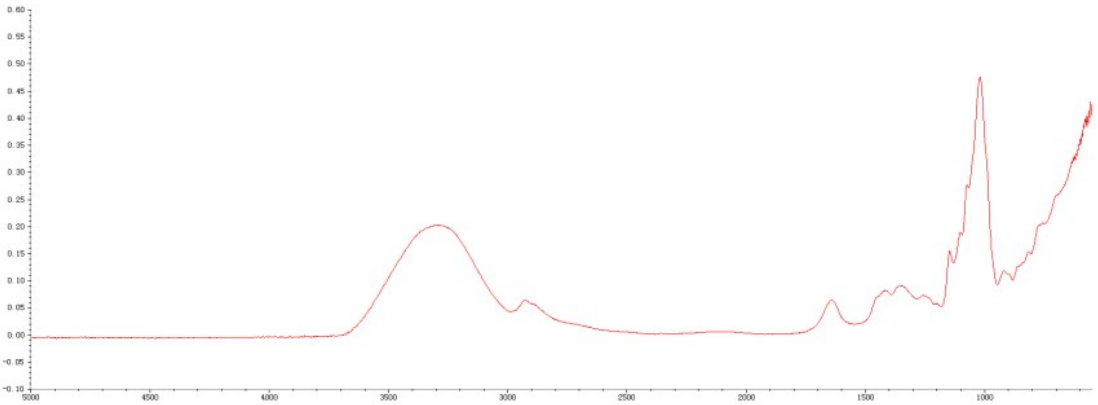
Scanning Range: 5000-550 cm^{-1}

FTIR spectra of two types of honey:

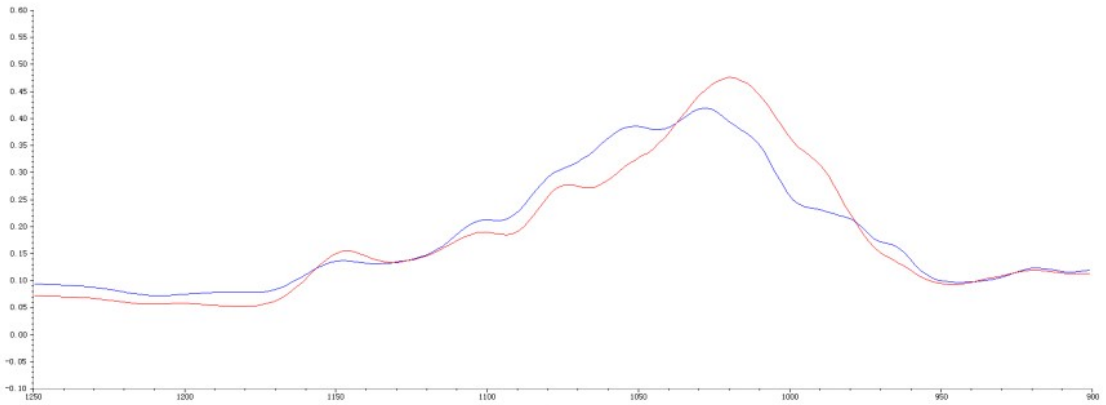
1. A well-known brand jujube flower honey:



2. Adulterated jujube flower honey



3. Overlay of the two spectra: 1250-900 cm^{-1}



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Conclusion:

The use of infrared spectroscopy for the identification of pure jujube flower honey and adulterated jujube flower honey demonstrates significant differences in the infrared spectra between adulterated honey and pure honey in the range of 1250-900 cm^{-1}. This method enables rapid identification between pure and adulterated honey. The utilization of infrared spectroscopy for distinguishing genuine from adulterated honey proves to be straightforward, efficient, highly accurate, and holds significant practical value.

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