Application of Infrared and Raman spectroscopy for date palm (Phoenix dactylifera) analysis

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Introduction: Today, there are over 100 known date varieties. Among them, Deglet Nour, Medjool, Hayani, Barhi and Zahidi are the most common in the market. This fruit contains more than 70% of carbohydrates, mainly sugars. The range of sugar concentration varies from one variety to another.

Objectives: Determination and discrimination of different date palm varieties using fast and non-destructive spectroscopic methods (FTIR and Raman)

Infrared Spectroscopy

Lyophilized and ground dates

5 samples were analyzed by FTIR

The infrared spectrum was collected using Attenuated Total Reflectance (ATR)

Raman Spectroscopy

Lyophilized and ground dates

7 varieties were analyzed using a Bruker RFS100/S FT Raman spectrometer

Raman spectra for each variety has its own behavior, specially between 1000-1200 cm⁻¹ and 800-1000 cm⁻¹.

Overall analysis of the Raman spectra was performed using PCA.

Samples are classified into three different groups showing similar spectra regions

Conclusions

Raman spectroscopy is a very promising approach for the characterization of different varieties of dates, since:
1. Its high simplicity
2. Its high sample throughput
3. It does not require any sample pre-treatment
4. It is a non-destructive method