RAPID AND NON-DESTRUCTIVE SCREENING METHOD FOR PURE MALAYSIAN SWIFTLET'S NEST AND ITS POTENTIAL ADULTERANTS USING HANDHELD FTIR

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INTRODUCTION

Edible bird's nest (EBN) refers to the nest which were produced by several different Swiftlet or Collocalia (Apodidae) species. The EBN is woven from gelatinous strands of its saliva mixed with minor feathers. The Chinese had been consuming these EBN since the Tang (618-907 AD) and Sung (960-1279 AD) dynasties as a symbol of wealth, power, prestige as well as traditional Chinese medicine (Koon & Cranbrook, 2002). The common adulterants present in EBN are karaya gum, red seaweed, Tremella fungus (Marcone, 2005), vermicelli rice, cellophane noodles, jelly or animal skin *(Joe, S., 2012)*.

Handheld Fourier Transform Infrared (FTIR) system can be used equally in the laboratory and at the field. The system is as versatile as it is rugged and features a choice of interchangeable sampling interfaces that make it a highly useful handheld mid-IR spectrometer. The sampling interfaces can be interchange either with diffuse, grazing angle, specular reflection or spherical attenuated total reflectance (ATR) sampling interfaces. In the field or in the lab, the handheld FTIR is used to make valuable measurements on the spot, with no sample preparation (Agilent Technologies). The resulting spectrum represents the molecular absorption and transmission, creating a molecular fingerprint of the sample. Like a fingerprint, no two unique molecular structures produce the same infrared spectrum.

OBJECTIVES

EBN is so expensive that sometimes fake or adulterated EBN is sold on the market. Therefore, purity testing in EBN is very important to prevent the consumers from being cheated as well as to keep genuine quality of Malaysian EBN. Formerly, the empirical methods in determining pure EBN were via visual examination, burning tests, smell sensory testing, and colouring checks. Nowadays, they were determined by the protein and sialic acid contents. Although they are quite reliable, but they are time consuming, require expensive instruments and very experience technician.

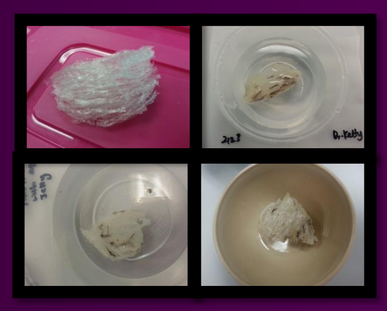
This study was done to explore the FTIR usage in analytical procedure to test the purity of EBN based on the characterization of the FTIR spectrum.

MATERIALS & METHODS

Pure Birdnest

Adulterant

Adulterated Birdnest



Instrumentation

Spectral	• 4000-650 cm^{-1}
No. of Scan	• 64 times
Resolution	• 4 cm^{-1}
Sampling Interface	• diffuse reflectance
Software	• MicroLab • Spekwin32 1.71.6.1

RESULTS

Figure 2: FTIR spectra of Potential Adulterant

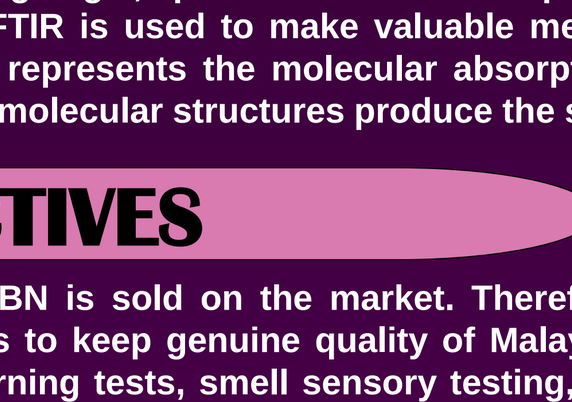


Figure 1: FTIR spectra of Raw Clean and Raw-unclean EBN

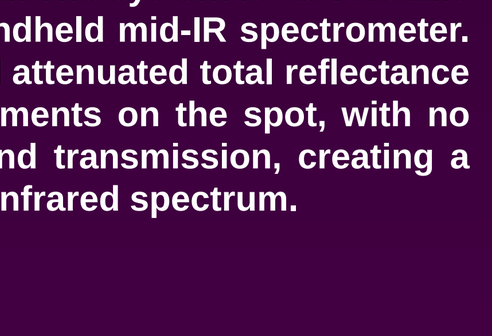
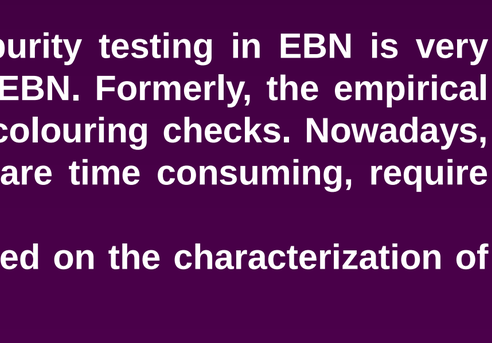


Figure 3: FTIR spectra of Adulterated EBN



- **Raw EBN sample have intense peaks and several are visibly overlapped. The most characteristic infrared bands of both raw clean and unclean EBN were found at about 1640 cm^{-1} to 1425 cm^{-1} representing the secondary protein which is the amide (CO-NH2), monosubstituted amide (CO-NH-R) and disubstituted amide (CO-NR2). Another major band observed was carbohydrate at 1021 cm^{-1}.**
- **Adulterants spectra do not have all the amides I, II and III whilst the carbohydrate peak is higher compared to raw EBN spectra indicates that the carbohydrate concentration is higher.**
- **Adulterated EBN spectra also do not have all three amides.**

DISCUSSION

- **Spectra are interpreted with the aid of 'Structure Correlation Charts', which correlate absorbance bands with bonds, and therefore functional groups, in the molecule.**
- **Pure EBN have different functional group compared with the pure adulterant itself.**
- **Adulterated EBN with the potential adulterant also have different functional group with EBN.**
- **All three amides presented as EBN's fingerprint where these characteristics were not seen in all respective adulterant and adulterated samples.**

CONCLUSION

- **Based on the results, the FTIR-diffuse spectroscopy based technique has proven to be an effective, simple and reproducible means of qualifying native bonds.**
- **Unlike the other common techniques, FTIR-diffuse spectroscopy does not require laborious sample preparation steps and the interpretation of the analysis is rather simple.**

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