Evaluation of authenticity by ^{1}H NMR of brazilian commercial coffee blends

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Introduction

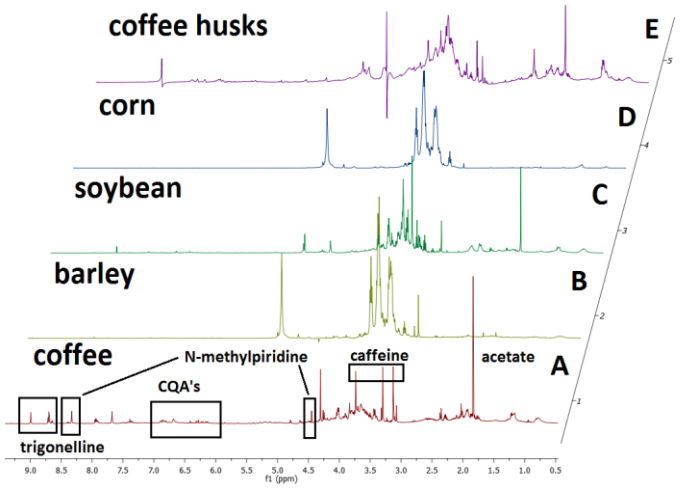
Brazil is the world's largest coffee producer and exporter and, recently, it has become the second largest consuming country of this beverage. Roasted coffees adulteration is relatively frequent and varied. It can involve quality (species, geographical origin and defective seeds) and the addition of other products (sugar, barley, and corn) in the coffee blend. Food authenticity are global problems, become important to establish methodologies capable for safeguarding the interests of producer countries and add value to their products. In this context, the nuclear magnetic resonance spectrometry (NMR) coupled to the multivariate statistics have shown this capability. Therefore, the present work aims to applying a rapid and effective technique using ^{1}H NMR for identification of the main coffee adulterants used in brazilian commercial coffee blends.

Results and Discussion

One set of brazilian commercial arabica blends with good cup quality beans and four types of adulterants (corn, coffee husks, barley and soybean) were used to establish the methodology. Were analyzed 11 samples brazilian coffee from different regions of Brazil (Northeast, South and Southeast). Coffee solutions in deuterated water were used in the analysis. Analysis by ^{1}H Nuclear Magnetic Resonance (^{1}H NMR) were recorded on Heteronuclear Multidimensional NMR, model Avance III 600 MHz (Bruker).

Through the ^{1}H NMR spectra (Figure 1) can be observed that the chemical composition of roasted coffee differs significantly from barley, soybean, corn and coffee husks. Some compounds identified in coffee are signaled in 1A spectrum, among which stand out the majorities (caffeine, trigonelline and CQA's). In the region 0.6 to 3 ppm are also found some lipids, amino acids and aliphatic acid. The adulterants studied, such as soybeans, corn and barley, have in their composition basically carbohydrates. Even after the roasting process this pattern is maintained, and it can be observed in the spectra of Figures 1B, 1C, 1D and 1E (chemical shift region 5-3 ppm).

Figure 1. Fingerprint of roasted coffee (A), barley (B), soybean (C), corn (D), and coffee husks (E) adulterants by ^{1}H NMR spectra



Among the 11 commercial coffee samples evaluated were not identified any adulteration. However, at the moment, the work is in progress and are being evaluated other samples and other different types of adulterants.

Conclusions

The proposed method using the technique ^{1}H NMR showed to be highly comprehensive regarding the identification and quantification of the main types of adulterants in roasted coffee. In Brazil, the regulation of the purity and quality of roasted coffee is conducted by the Brazilian Coffee Industry Association (ABIC- private agency) and the National Health Surveillance Agency (ANVISA - governmental agency), that does not provide a comprehensive methodology. Thus, the study has economic and intellectual impact for the country.

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