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EVALUATION OF THE IN VITRO BIOACCESSIBILITY OF TELLURIUM IN OIL SEEDS (BRAZIL NUT)

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Abstract
Total Te content and its bioaccessible fraction was performed in Brazil nut, due to its chemical similatiry with Selenium and the high content of this element in such seed. From 4 ng g-1 of total Te achieved, 22% and 24% were achieved as bioaccessible, considering gastric and gastrointestinal digestions.

Key words:
Bioaccessibility, Tellurium, Brazil nut.

Introduction

The *Bertholletia excelsa* is a large tree native from the Amazon rainforest, whose fruit contains a seed known as Brazil nut. This seed is of great consumption in Brazil, being a valuable source of calories and proteins, as well as it contains an expressive concentration of Selenium[1]. Due to the elemental similarity of this calcogen to Tellurium, then it is hypothesized its presence of this metalloid in the nuts.
The present work performs the evaluation of the total content of Tellurium in such samples, for evaluating the bioaccessibility of this metalloid in Brazil nuts by ICP-MS. This conception involves all the transformations that occur in the digestion of food, until it becomes accessible by the organism[2]. The total content becomes essential before the *in vitro* simulation from gastrointestinal extraction by the UBM process (Unified Bioaccessibility Method) to obtain a mass balance of Tellurium in the samples with a validated procedure[3].

Results and Discussion

The total quantification of Te in Brazil nuts was determined after the acid decomposition using microwave radiation of 200 mg of the samples (obtained from local market) using 3 mL of HNO_3 (Merck, Darmstadt, Germany) and 2 mL of H_2O_2 30% w/v (Merck, Darmstadt, Germany).
From the optimized conditions (Table 1), the total content of Te in the Brazil nuts was determined from the external calibration method as well as multiple standard additions method. Total Te content in the samples is 4 ng g^{-1}, and the Te quantification method by ICP-MS was validated through the analysis of a certified reference material (SRM 1643e).

Table 1. Microwave decomposition program.

Step	Power (W)	Time (min)
1	330	8
2	590	5
3	720	40

The procedure followed the measurement of inorganic contaminant bioaccessibility according to *in vivo* validated Unified BARGE, which describes the simulation of the human gastro-intestinal tract through 3 different compartments: mouth (5 min), stomach (1 h) and small intestine (4 h). Four digestive fluids were synthesized: saliva, gastric fluid, duodenal fluid and bile. All samples are mixed by endover-end agitation at 37°C (human body temperature)[4]. The results are visualized in Table 2.

Table 2. Tellurium concentrations (average ± standard deviation) determined in the bioaccessible and residual fractions of 300 mg of Brazil nuts after gastric and gastrointestinal simulation using the UBM static method.

Gastric Digestion		
Concentration (µg L^{-1})		Recovery (%)
Bioaccessible	Residue	
0.044 ± 0.004 (22 ± 10 %)	0.158 ± 0.006 (79 ± 6 %)	101 ± 5

Gastrointestinal Digestion		
Concentration (µg L^{-1})		Recovery (%)
Bioaccessible	Residue	
0.048 ± 0.003 (24 ± 7 %)	0.125 ± 0.005 (62 ± 6 %)	86 ± 5

Bracket values correspond to the percentages of bioaccessibility and residues, comparing to the total concentration.

Conclusions

The proposed study allowed a broader understanding of nutritional aspects of Brazil nuts by evaluating their total Te contents, and the quantification of bioaccessible fractions using the *in vitro* bioaccessibility test (UBM). With the methodology employed, the presence of Tellurium was verified in the Brazil nuts, and its bioaccessible concentration found opens the possibility for toxicological studies involving Brazil nuts.

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