



Instituto Politécnico  
de Castelo Branco

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# **Evaluation of the content of minerals and toxic metals and dietary fiber in plant products and their extracts**

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Report presented at the Polytechnic Institute of Castelo Branco to fulfillment the requirements necessary for obtaining the Bachelor's degree in Human Nutrition and Food Quality, performed under the orientation internal of Prof. Maria Carmo Horta, Professor of school agrarian Polytechnic Institute Castelo Branco and under orientation external of Prof. Dr.Zbigniew Krejpcio, Division of Food Hygiene and Toxicology, Department of Human Nutrition and Hygiene, Faculty of Food Science and Nutrition, Poland.

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## Abstract

The objectives of this work were (i) to learn about methods used in quantification of mineral elements such as the Zn, Cu, K, Na, Pb and Cd in food samples, as well as the methodology used in the quantification of the fiber, (ii) know the principal laboratory procedures of the chemical analysis of food and (iii) interpret the results obtained relating them with possible effects on human health. Thus, in the first part of the work presents an approach to fundament and applications of atomic absorption spectrophotometry for the quantification of mineral elements and methodology for the valuation of crude fiber in foods. They are also referred to the main effects of mineral nutrients and fiber in human health. Was verified that the method of atomic absorption presents a good precision of results regarding the concentration of minerals in food samples. However, the levels of lead and cadmium in some samples exhibit a low accuracy, there was a necessity to assess the origin of this variability. The samples Demonstrate contents of mineral elements K, Na, Cu, Zn, Pb and Cd, which Conducted to ingestion within the intervals considered adequate for human health. Relatively to partition between the husk and endosperm of the mineral elements in seed samples was observed that the potassium accumulates in the endosperm, whereas the other elements analyzed minerals (Na, Cu, Zn, Pb and Cb) accumulate mainly in the husk. Also, the fiber shows a similar behavior concentrating mainly on grain husk of *Fagopyrum esculentum* (buckwheat or buckwheat) having high levels of fiber. It was observed that the Cu content of the cocoa has relatively high values and may result in a daily intake which exceeds the values considered suitable for human health.

## Keywords

Cocoa; *Fagopyrum esculentum*; Fiber; Food quality; Mineral elements.

## Resumo

Os objetivos deste trabalho foram (i) aprender sobre os métodos utilizados na quantificação de elementos minerais tais como o Zn, Cu, K, Na, Pb and Cd em amostras de alimentos, bem como a metodologia utilizada na quantificação da fibra, (ii) conhecer os principais procedimentos laboratoriais da análise química de alimentos e (iii) interpretar os resultados obtidos relacionando-os com possíveis efeitos na saúde humana. Deste modo, na primeira parte do trabalho, apresenta-se uma abordagem ao fundamento e aplicações da espectrofotometria de absorção atômica para a quantificação de elementos minerais, bem como a metodologia para a avaliação da fibra bruta em alimentos. São também referidos os principais efeitos dos elementos minerais e da fibra na saúde humana. Verificou-se que a metodologia da absorção atômica apresenta uma boa precisão dos resultados referentes à concentração de elementos minerais em amostras de alimentos. No entanto, os teores de chumbo e de cádmio nalgumas amostras apresentam uma baixa precisão, havendo necessidade de avaliar a origem dessa variabilidade. As amostras analisadas apresentam teores dos elementos minerais K, Na, Cu, Zn, Pb e Cd, que conduzem a uma ingestão dentro dos intervalos considerados adequados para a saúde humana. Relativamente à partição entre a casca e o endosperma dos elementos minerais em amostras de sementes observou-se que o potássio se acumula no endosperma, enquanto que os restantes elementos minerais analisados (Na, Cu, Zn, Pb e Pb) se acumulam principalmente na casca. Também a fibra apresenta um comportamento semelhante concentrando-se principalmente na casca do grão do *Fagopyrum esculentum* (trigo mourisco ou sarraceno) que apresenta valores elevados de fibra. Observou-se que o teor em Cu do cacau apresenta valores relativamente elevados, podendo originar uma ingestão diária que ultrapassa os valores considerados adequados para a saúde humana.

## Palavras-chave

Cacau; Elementos minerais; *Fagopyrum esculentum*; Fibra; Qualidade Alimentar.

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