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Selected Elements content in Paraguayan Wheat

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The two fold purpose of this paper is to determine the composition of selected elements in Paraguayan wheat and flour as well as to analyse the implications of the bromine/bromate content on bakery products.Despite of its importance, there is a lack of information in regard to the normal values of the concentration of minor and trace elements in wheat from Paraguay East Region or Eastern Paraguay (1). According to that, in this work, selected minor and trace elements in eight varieties of wheat from the center and south areas of Eastern Paraguay were analyzed by XRF techniques using an Isotopic Cd Source and a XR Mo tube. The analyzed elements were K, Ca, Ti, Mn Fe Cu Zn Br Rb Sr. The materials were: whole samples, flour, bran and ashes of soft wheat, Triticum Aestivum subspecie Vulgare obtained by successive milling and sieving. Soils in the Center are Rhodic Paleudult from sandstones associated with Mollic Paleudult as well as a small portion of LithicUpdisament. In the south (Itapua) dominate two type of soils: Rhodic Paleudult from basalts and Typric Kandiudox also from basalts and some sandstone. The results (mean values) of whole samples are as follow:
K 1426.7±118.6 ; Ca 213.0±30.0 ; Ti 7.7±0.6 ; Mn 41±3.1 ; Fe 39.1±6.6 ; Cu 5.9±1.0; Zn 33.0±3.0 ; Br 7.5±0.7 ; Rb 4.3±0.4 ; Sr 3.1±0.4.
The first fraction of flour which came from the center of the grain were obtained after the first milling and sieving ; next grinding and sieving yield another fraction; after the third, the fraction was mainly bran. The results were in good agreement with those from whole samples. In addition XRF measurements made on ashes from the grains were also coherent which the above.
Essential microelements like Mn Fe Cu Zn values as well as of the other analytes found here are also into the range of those from several studies made elsewhere (2).
Another element of interest is bromine specially as KBrO3 . The use of this compound as an additive in the bakery dough to improve the whiteness and other characteristics of bread is well known. When using second class flour, this is clearly a deceit (3). Although there are some simple methods to look for the adulterant in the row dough, no simple procedure is available to detect it in the final product. This is overcome using XRF, which is simple and direct, provides the "normal"bromine content of national or regional flour used in the bakery is known: this is the "base line". A significant excess in the product means adulteration.

In this regard, samples of first quality commercial flours from Paraguay (N=25) and from Argentina (N=5) were also analyzed for Br and its content was found to be within the normal values of bromine in Paraguayan wheat and flours. However when analyzing bakery products, bread (N=20) and galletas (N=6) it was found that ˜35% exceed the normal Br values showing bromate malpractice.

From dietary point of view it should be emphasized that KBrO3 is a complete carcinogen and classified as showing clear evidence of carcinogenety (4) ,inducing renal cell tumors as well other toxic effects. Its use as food additive has been banned(3,5). In regard to Br- product of KBrO3 decomposition, after new evidences of its toxicological effects at low dosis, a provisional ADI for bromide ion of 0,4mg/kg bw has been calculated and proposed(6). Therefore it is concluded that the intake due to malpraticed bakery products together with the bromide ion of total diet, easily exceeds the recommended DI. Morover the XRF technique described herein is simple, rapid and reliable.

Primary author: Prof. FACETTI - MASULLI, J F (Universidad Nacional de Asunción - Paraguay)

Co-authors: Mrs DE LORENZI, Adriana (Universidad Nacional de Asunción. Dpt.of Physics); Mrs ROMERO DE GONZALEZ, Virginia (Universidad Nacional de Asución)

Presenter: Prof. FACETTI - MASULLI, J F (Universidad Nacional de Asunción - Paraguay)

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