Juan Manuel Navarrete, J Nucl Med Radiat Ther 2016, 7:6(Suppl)
http://dx.doi.org/10.4172/2155-9619.C1.007

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^{40}K radioactive detection for K quantitative analysis in foodstuff

^{40}K radioactive detection in foodstuff is easily performed by filling Marinelli containers with any food sample in order to detect the γ rays emitted (energy 1461 KeV, 11% decaying nucleus to ^{40}Ar by electron capture, EC), and detected either by one NaI (Tl) scintillation or HPGe semiconductor detector. So, if each one is used during a suitable detection time, for example 12 hours over-night, counts number with reasonable standard deviation are accumulated, and it is possible to compare and obtain better results, when Bq per gram of sample (Bq/gs) is divided by specific activity of elementary K (31.19 Bq/gK) and multiplied by 100, to get the K concentration in the sample as percentage. In this way, to obtain Bq/gs next equation is used: Bq/gs = Cs-Cb/Ws.xDet. Eff.x0.11 (where: Cs=counts per second obtained from sample; Cb=counts per second obtained from background; Ws=foodstuff sample weight in grams; Det. Eff =Detection Efficiency of each detector for 1461 KeV γ rays/100; 0.11=^{40}K branching ratio decaying to ^{40}Ar by EC). Elementary K specific activity is a constant obtained from next equation: Bq/gK=λN= 0.693x6.02x10^{23}x0.0118/1.28x10^{9}x365x24x3600x39.1x100=31.19 Bq/gK (where: λ=^{40}K decay constant; N=^{40}K atoms number per K gram; 0.693=ln 2; 6.02x10^{23}= Avogadro's number; 0.0118/100=^{40}K isotopic abundance; 1.28 x 10^{9}x 365 x 24 x 3600=^{40}K half life in seconds; 39.1=Elementary K atomic weight). And finally: K(%) = Bqx100/gs/Bq/gK= gKx100/gs. So, several vegetables, seeds and grains have been analyzed for K concentration, and this paper presents the higher K concentration in peels, related to grains of cacao and coffee, obtained by this non destructive, easy and precise enough procedure.

Biography

Juan Manuel Navarrete is a Researcher and Professor in the Faculty of Chemistry, Inorganic and Nuclear Chemistry Department, from the National University of Mexico. He obtained the PhD degree from Paris VI University; Pierre et Marie Curie, in 1992. He has published about 120 papers and served as arbitrate-in-reputed-scientific-journals.

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