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A NEW APPROACH BASED ON OFF-LINE COUPLING OF HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY WITH GAS CHROMATOGRAPHY - MASS SPECTROMETRY TO DETERMINE ACRYLAMIDE IN COFFEE BREW

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Acrylamide (2-propenamide) was labeled in 1994 as most likely carcinogenic to humans by the International Agency for Research on Cancer (1). EFSA is monitoring, since 2007, the levels of acrylamide in different food commodities, being fried potato products, baked goods, and coffee the most important sources of dietary acrylamide exposure. It is known that coffee contribution is about 39% to the total acrylamide exposure (2). Most methods reported in the literature to determine acrylamide, in order to establish the exposure of consumers to this compound, are mainly based on LC-MS/MS and by GC-MS. However, although all these methods are well performing for determination of acrylamide in cereal products and potato, some of them experienced problems with matrices as coffee (3).

In order to isolate acrylamide from other coffee components, several extraction procedures have been proposed as the extraction with water (or also exceptionally with methanol) followed by an Solid Phase Extraction step with different cartridges. This procedure has been equally employed before LC (3) and GC analysis. However, coelutions with other matrix components are not always totally eliminated.

To overcome the interference problems arise when intending to determine acrylamide in coffee brew. Here we propose the employment a new method based on off-line coupling LC with GC-MS, which is based on the use of LC as a preseparation technique replacing the above-mentioned conventional extraction procedures. This approach consists essentially of three steps: the direct introduction, with no previous treatment, of coffee brew into the liquid chromatograph, the subsequent collection of the LC fraction containing acrylamide, its concentration under nitrogen and the final introduction of the collected fraction into GC coupled with MS for its chromatographic analysis and mass spectrometric detection. The composition of the LC mobile phase and the flow rate were studied to select those conditions that allowed separation of acrylamide without coeluting compounds. The off-line LC-GC-MS method developed was applied to the detection of acrylamide in five different coffee brew samples, three powders, and two instant. Under the conditions selected recoveries close to 100% were achieved while LODs and LOQs equal to 5 and 10 µg/L for acrylamide in brewed coffee were obtained.

(1) International Agency for Research on Cancer (IARC), Some industrial chemicals, in IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, Lyon, France 1994, Vol. 60, pp. 389–441.

(2) Svensson, K., Abramsson, L., Becker, W., Glynn, A., Hellen " as, K. E., Lind, Y., Rosen, J., Food Chem. Toxicol. 2003, 41, 1581–1586.

(3) Roach, J. A. G., Andrzejewski, D., Gay, M. L., Nortrup, D., Musser, S. M., J. Agric. Food Chem. 2003, 51, 7547– 7554.

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