Modification of a gas chromatography-mass spectrometry method for the determination of acrylamide in fried snacks

Abstract

Acrylamide is a toxic and probably carcinogenic compound and also neurotoxin in humans and animals that is formed naturally in certain foodstuffs, especially those rich in carbohydrate, during heat processing or cooking at high temperatures. This study was carried out to develop and validate the determination of acrylamide in fried snacks using gas chromatography-mass spectrometry (GCMS). The developed method involved the extraction of acrylamide with water followed by a cleanup treatment using Oasis HLB and MCX solid-phase extraction cartridges, bromination using reduced amount of saturated bromine water (from 15 to 2.5 ml due to bromine vapour is harmful and inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, also causes respiratory tract irritation with possible burns), then dehydrobromination by adding sodium thiosulfate solution until the yellow color has disappeared and using triethylamine to convert 2,3-dibromopropionamide to 2-bromopropenamide. This derivative is less polar compared to the acrylamide and is therefore easily soluble in non–polar organic solvents like ethyl acetate and hexane. The limit of detection (LOD) and limit of quantitation (LOD) of the method were 5 and 15 µg kg-1, respectively, and the regression coefficient was 0.9997. The recoveries of acrylamide in banana fritter samples at low, medium and high concentrations of 100, 200 and 4000 µg kg-1, respectively, were in the range of 84 to 109%. The repeatability and reproducibility values of the method ranged to 3-10 and 0.6–6, 0.3–8 for different days and different operators, respectively.

Keyword: Fried snacks; Acrylamide; Gas chromatography-mass spectrometry; Solid-phase extraction; HLB; MCX; Bromination; Modification method; Determination; LOD; LOQ