A Modified QuEChERS Method Using Activated Carbon Fibers as r-DSPE Sorbent for Sample Cleanup: Application to Pesticides Residues Analysis in Food Commodities Using GC-MS/MS

Authors : Anshuman Srivastava, Shiv Singh, Sheelendra Pratap Singh

Abstract : A simple, sensitive and effective gas chromatography tandem mass spectrometry (GC-MS/MS) method was developed for simultaneous analysis of multi pesticide residues (organophosphate, organochlorines, synthetic pyrethroids and herbicides) in food commodities using phenolic resin based activated carbon fibers (ACFs) as reversed-dispersive solid phase extraction (r-DSPE) sorbent in modified QuEChERS (Quick Easy Cheap Effective Rugged Safe) method. The acetonitrile-based QuEChERS technique was used for the extraction of the analytes from food matrices followed by sample cleanup with ACFs instead of traditionally used primary secondary amine (PSA). Different physico-chemical characterization techniques such as Fourier transform infrared spectroscopy, scanning electron microscopy, X-ray diffraction and Brunauer-Emmet-Teller surface area analysis were employed to investigate the engineering and structural properties of ACFs. The recovery of pesticides and herbicides was tested at concentration levels of 0.02 and 0.2 mg/kg in different commodities such as cauliflower, cucumber, banana, apple, wheat and black gram. The recoveries of all twenty-six pesticides and herbicides were found in acceptable limit (70-120%) according to SANCO guideline with relative standard deviation value < 15%. The limit of detection and limit of quantification of the method was in the range of 0.38-3.69 ng/mL and 1.26 -12.19 ng/mL, respectively. In traditional QuEChERS method, PSA used as r-DSPE sorbent plays a vital role in sample clean-up process and demonstrates good recoveries for multiclass pesticides. This study reports that ACFs are better in terms of removal of co-extractives in comparison of PSA without compromising the recoveries of multi pesticides from food matrices. Further, ACF replaces the need of charcoal in addition to the PSA from traditional QuEChERS method which is used to remove pigments. The developed method will be cost effective because the ACFs are significantly cheaper than the PSA. So the proposed modified QuEChERS method is more robust, effective and has better sample cleanup efficiency for multiclass multi pesticide residues analysis in different food matrices such as vegetables, grains and fruits.

Keywords : QuEChERS, activated carbon fibers, primary secondary amine, pesticides, sample preparation, carbon nanomaterials

Conference Title : ICABC 2017 : International Conference on Analytical and Bioanalytical Chemistry **Conference Location :** New York, United States **Conference Dates :** October 05-06, 2017