Spectrophotometric Analysis Of Total Carotenoids In Corn Flours

Svjetlana Luterotti¹ and Kristina Kljak²

¹ Faculty of Pharmacy and Biochemistry, University of Zagreb, Zagreb, Croatia, sluter@pharma.hr
² Faculty of Agronomy, University of Zagreb, Zagreb, Croatia

A new method for determination of total carotenoids (TC) in corn flours, expressed as β-carotene, is reported. The homogenized sample was hydrated overnight with 75% acetone, then first portion of hexane (with 0.0025% BHT) was added and the mixture stirred for 5 min. Afterwards the mixture hexane/acetone/EtOH (2:1:1) was added, first mixed for 5 min and then shaken for 30 min. To enhance the separation of the organic layer, a small portion of water was added, the mixture stirred for 5 min, left to stand for 15 min and the first hexane extract was quantitatively removed. A new portion of the extraction mixture is added to the remaining solid material and the whole procedure repeated as stated above (total four extractions). UV-Vis spectra of combined extracts were recorded and absorbance in the absorption peak was measured. Absorption peaks for corn flour/grit samples lied between 446 and 448 nm.

Beta-carotene 30% FS (suspension of β-carotene in vegetable oil, Roche, Basle, Switzerland) served for all additions of β-carotene. Pre-cooked white corn flour with 0.1 mg TC kg⁻¹ served as a real blank. Results were calculated by the use of absorption coefficient for β-carotene in hexane (2550 dl g⁻¹ cm⁻¹), from calibration in hexane and real blank, and by method of standard additions. Linearity range with $R^2 >0.999$ held up to 3 μg TC ml⁻¹.

Accuracy of the method was confirmed i) against the reference method [1, 2] and ii) against the BCR®-485 mixed vegetables lyophilisate reference material. Neither t- nor F-values for both compared methods differed significantly. Moreover, relative error as a measure of inaccuracy against a reference material was found to be +0.4%. Repeatability of BCR®-485 analyses was 3.5% (n=6). Calibration sensitivity (in ml μg⁻¹) was 0.248±0.0042 (n=37), 0.246±0.0011 (n=2) and 0.241±0.0092 (n=11) for calibration in hexane, in real blank and by standard additions, resp. Moreover, calibration in hexane versus standard additions to the corn flour samples pointed to recovery of 102.2±3.8% and versus calibration in real blank it was 100.0±0.9%. Repeatability RSD lied between 0.0 and 8.9% for corn flours and from 0.2 to 2.3% for corn grits (n=3-4); intermediate precision was as high as 7.2-10.5 (n=24-29) and 1.1-5.9% (n= 17-34), resp. Detection limit and quantitation limit were estimated as 0.6 and 1.9 mg TC kg⁻¹ total carotenoids, resp.

Corn, wheat, soya flours and corn and wheat grits were purchased in the grocery stores. Concentration of total carotenoids (in mg kg⁻¹) was found to be 10.5-18.5 in corn flours, 18.3-21.8 in corn grits, 0.9-9.8 in soya flours, 1.1-1.3 in wheat flours, 1.6 in wheat grits, and 0.7-0.9 in white corn flours.

References