Specification and quality control of different vegetable matrices via polyphenol analyses using HPLC-MS/MS and chemometrics

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Introduction

Plant polyphenols have been increasingly valued in human diets due to their health-promoting and nutraceutical characteristics[1]. Each vegetable species has a distinct polyphenolic profile that could be used for nutritional evaluation[2], as well as in quality control programs. In order to obtain such information, reliable analytical methods for identification and quantification of those compounds, regardless of matrix are highly desirable. Thus, in this work we developed a simple and efficient HPLC-ESI-MS/MS method to quantify specific polyphenols in different plants and their parts.

Results and Discussion

A total of nine compounds were selected being six flavonoids (isoquercitrin, quercetin, naringin, naringenin, hesperidin and rutin), two isoflavonoids (daidzin and daidzein) and one coumarin (umbelliferone) were used as standards. The method was developed by using an Alltech C_{18} column (150 mm x 2.1 mm i.d., 3 µm) in an Agilent 1200 series HPLC coupled to an AB Sciex API 2000 MS/MS working on SRM mode.

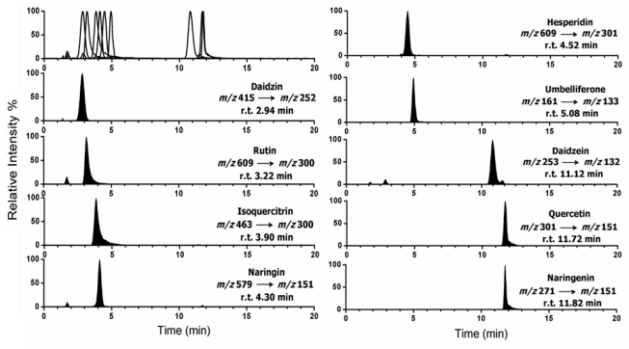

Figure 1. HPLC-ESI-MS/MS analysis of selected polyphenols.

Calibration curves in the range 0.5–50.0 µg.mL^{-} were obtained for all analytes and showed good R^2 (> 0.994) and LOD (≤ 500 ng.mL^{-1}).

The method was successfully applied for detection of analytes in common bean seeds (*Phaseolus vulgaris*), soybean leaves (*Glycine max*), and sour orange (*Citrus aurantium*), sweet orange (*Citrus sinensis*), and Tahiti lime (*Citrus latifolia*) flavedo after methanol extraction.

	Beans (n = 44)	Citrus (n = 9)	Soybean (n = 38)
Quercetin	10,6	< *LOD*	< *LOD*
Isoquercitrin	31,3	< *LOD*	121,5
Rutin	< *LOD*	3,1	1497,7
Hesperidin	< *LOD*	27,2	135,3
Naringin	< *LOD*	1,1	< *LOD*
Daidzin	< *LOD*	< *LOD*	73,4
Daidzein	< *LOD*	< *LOD*	23,0
Umbelliferone	< *LOD*	< *LOD*	< *LOD*
Naringenin	< *LOD*	< *LOD*	< *LOD*

Table 1. Quantitative data for polyphenols in selected matrices. Data are in ug.g^{-1} of dry matrix.

Principal component analysis (PCA) proved to be helpful for the discrimination of each matrix based on their quantitative polyphenol profile.

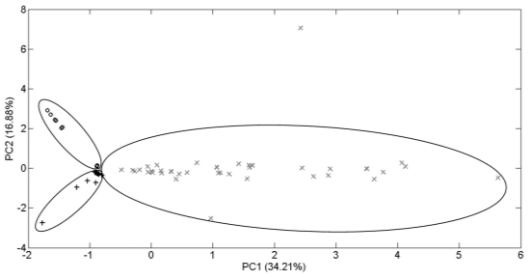

Figure 2. PCA of quantitative values for selected matrices

Conclusions

A fast and reliable LC-MS method was used for quantification of polyphenols in vegetable matrices. The method was tuned for efficient extraction regardless of the matrix used and high sample throughput. PCA proved to be helpful for matrix discrimination based on polyphenol profiles

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