Abstract

Introduction: Nowadays an occurrence of diseases related to carbohydrate metabolism, such as diabetes mellitus, obesity, metabolic syndrome or cardiovascular diseases, is rising. The medical nutrition which is an integral part of the therapy of these diseases includes a recommendation of fruit intake. Nevertheless, this recommendation does not take into account differences in carbohydrate content and composition in various fruit species. The simple carbohydrate intake by patients with the mentioned diseases can have serious medical consequences and therefore, it would be appropriate to make a selection of suitable and unsuitable fruit species based on their carbohydrate content and composition. With such knowledge it would be possible to create or specify recommendations for fruit intake for the mentioned diseases. The data of carbohydrate content and composition in fruit are publicly available in Czech Food Composition Database, nevertheless, these data should not be used to make recommendations until their validity is checked. An independent chemical analysis is an effective tool for verification of the data validity.

Objectives: The first objective of this thesis was to perform an independent chemical analysis of various fruit species to characterize their simple carbohydrates and assess, whether there is conformity between the data obtained from the database and the data obtained from the real samples. The second objective of this thesis was to interpret the findings obtained from the analysis and suggest their use in clinical practice for creating particular recommendations for fruit intake for diseases related to carbohydrate metabolism.

Methods: The practical part of the thesis was designed as a chemical analysis of 30 fruit species. The analytical method was liquid chromatography with refractive index detection. The individual carbohydrate content, the total carbohydrate content, the fructose-glucose ratio, the edible portion and the average fruit weight were determined. The analysis was performed twice, in July and in March, to assess the inter-seasonal variability of the parameters. The measured data were evaluated using descriptive statistics, while the conformity between the data obtained from the database and from the analysis were assessed by the multivariate analysis of variance (MANOVA). Microsoft Office 2010 Excel and Statistica 12 programs were used to process all the data.

Results: The analysis showed high variability in carbohydrate content and composition in different fruit species, as well as in individual pieces of the same fruit species and also in the same fruit species analysed in different seasons. The least variable parameter was fructose-glucose ratio, which was also the only parameter with no statistically significant difference between the data obtained from the database and from the analysis. It could be thus considered as the only relevant parameter obtainable from the database. Consequently, this parameter was chosen to be the best basis for making the fruit intake recommendations for diseases related to carbohydrate metabolism.

The practical outcomes of the thesis were the fruit intake recommendations for the following diseases: obesity, dyslipidemia, atherosclerosis, metabolic syndrome, fructose malabsorption, irritable bowel syndrome and diabetes mellitus. The recommendations were compiled as a list of suitable and unsuitable fruit species.

Conclusion: The objectives of the bachelor thesis were achieved and its practical outcomes for clinical practice were the fruit intake recommendations for diseases related to carbohydrate metabolism. These recommendations introduce suitable and unsuitable fruit species clearly and simply and could be therefore used to educate the patients suffering from the mentioned diseases or to expand their knowledge.

Keywords: carbohydrate metabolism, chemical analysis, fructose, fructose-glucose ratio, glucose, disease related to carbohydrate metabolism