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Short Communication

RUTIN CONTENT IN PLANT PRODUCTS

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ABSTRACT

Flavonoids belong to the plant phenolics. The varied biological properties of flavonoids have stimulated an interest in these compounds. The rutin is one of flavonoids which is not sufficiently studied. The increasing interest in powerful biological activity of plant rutin outlined the necessity of determining content in fruits, vegetables and not edible plants. The study comprised 12 food products - 5 fruit and 2 vegetable dry species, 2 dry not edible plants and 3 dry extracts of not edible plants. The results of fruits showed the highest content in aronia (0.34 %). The lowest rutin content was established in white cherry (0.15 %). The results of vegetables showed the greatest value of rutin in red hot chillis pepper (0.22 %). The highest content of rutin was established in not edible plants (Rhus cotinus – 10.53 %). The aim of this study was to analyze rutin content in dry fruits and vegetables, dry not edible and dry extract of not edible plants. Recommend to assess the influence of regular daily consumption of dry fruits and vegetables on naturally occurring antioxidants from plant foods, oxidative stress, cardiovascular risk and gaining in health effect.

Keywords: rutin, fruits, vegetables, dry not edible and dry extract of not edible plants.

INTRODUCTION

Rutin, also called rutoside, quercetin-3-rutinoside and sophorin, is a citrus flavonoid glycoside found in buckwheat [1], the leaves and petioles of *Rheum* species, and the fruit of the Fava D'Anta tree (from Brazil), as well as other sources. Its name comes from the name of Ruta graveolens, a plant, that also contains rutin. Rutin is the glycoside between the flavonol quercetin and the disaccharide rutinose [2].

Rutin is one of the bioactive flavonoid compounds, which are present in substantial amounts in plants. Some related investigations showed that rutin has a broad range of physiological activities [3]. Bao at al. [4] pointed out that an electrochemical inactive supromolecular complex of rutin-DNA was formed by cyclic voltammetry. Solimani [5] indirectly suggested that probably only the benzopyranic-4-one portion of rutin, as well as quercetin, could be located into the biopolymer, whereas the coplanar catecholic portion would more likely be oriented towards the external aqueous medium by linear dichroism technique. As well known, β-cyclodextrin (β-CD) can provide a hydrophobic molecules or groups to form inclusion complexes. It can combine with cations, supplying nutrients from the soil to the cells in plants. In humans, it attaches to the iron ion Fe^{2+}, preventing it from binding to hydrogen peroxide, which would otherwise create a highly-reactive free-radical that may damage cells. It is also an antioxidant, and therefore plays a role in inhibiting some cancers [2[.

The production of flavonoids in plants is enhanced in response to stresses such as fungal or bacterial infection or exposure to UV radiation. Recent interest of the scientific community in flavonoids in foods centers on the varied biological properties of certain flavonoid compounds; these include antioxidative, antimicrobial, and possibly anticancerogenic, and/or cardioprotective effects. Therefore a food composition database for flavonoids in foods is essential to evaluate associations between flavonoids intakes and risk factors for various chronic degenerative diseases [6]. Rutin also strengthens the capillaries, and, therefore, can reduce the symptoms of hemophilia. It also may help to prevent a common unpleasant-looking venous edema of the legs. Rutin, as ferulic acid, can reduce the cytotoxicity of oxidized LDL cholesterol and lower the risk of heart disease [2]. Rutin has a veterinary use in the management of chylothorax in dogs [2]. Based on numerous evidence on the strong biological activity of flavonoid compounds and on the scarcity of data for their content in foods the aim of current study was focused on determination of rutin content in fruits and vegetables in Bulgarian market as well as in some not edible plants and extracts of not edible plants.

EXPERIMENTAL

The study covered 12 food products. Randomized market sampling was applied. The average sample consisted of representative amounts of three individual samples from different manufactories. All samples data are stated in the sampling protocol.

Sample preparation

A sample of 1 to 5 g was extracted with 15 ml HPLC 80 % methanol at room temperature. The filtrated samples were transfered into 50 ml volumetric flask and were diluted to this volume with HPLC 80 % methanol.

Rutin assay

The analyses of rutin content in fruits and vegetables were performed according to the AOAC Official method [7]. This method has been modified using HPLC 80 % methanol. 0.5 g of the sample is dissolved into 50 ml HPLC 80 % methanol. Then 2 ml of the extract thus obtained is transfered into 50 ml volumetric flask. 2 ml dd H_2O and 5 ml ammonium molybdate are added. Then the mixture is diluted to 50 ml with dd H_2O. The standard solution is prepared through dissolving of 0.02 g rutin in 50 ml HPLC 80 % methanol. Then 1 ml of this solution is used following the same procedure as for the sample analysis.

The absorbance of the sample against dd H_2O as a blank sample was determined at 360 nm with an UV-VIS Spectrophotometer CARY Varian (Varian Australian Pry. Ltd). All samples were analyzed in duplicates.

Calculations

Calculations are based on averaging results from analyses of duplicate samples.

The content of rutin (R), %, in the sample is calculated as follows:

$$R(\%) = \frac{A_{sample}\ x\ C\ x\ 50\ \ x\ 100}{A_{standard}\ \ x\ W\ x\ 2},$$

where: A_{sample} - absorbance of the sample at 360 nm, $A_{standard}$ - absorbance of the standard solution at 360 nm, C – concentration of standard solution of rutin, g ml^{-1}, W – weight of the sample, g , 2 – volume of the sample, ml.

RESULTS AND DISCUSSION

Rutin contents in Bulgarian dry products

Table 1 presents the analytical data of rutin content in Bulgarian dry fruits and vegetables. The range of rutin contents in dry fruits and dry vegetables is rela-

Table 1. Content of rutin in dry fruit and vegetable species.

Rutin (%)	Dry fruits					Dry vegetables	
	Apple	Sweet cherry	Morello cherry	White cherry	Aronia	Red pepper	Red hot chillis pepper
	0.17	0.18	0.18	0.15	0.34	0.17	0.22

Table 2. Content of rutin in dry not edible plants.

Rutin (%)	Dry not edible plants	
	Geranium	*Rhus cotinus*
	2.28	10.53

Table 3. Content of rutin in dry extract of not edible plants.

Rutin (%)	Dry extract of not edible plants		
	Green tea	Grape seeds	*Betulae pendula leaves*
	10.18	10.16	5.54

tively close (0.25 % in white cherry, 0.17 % in apple and red dry pepper, 0.18 % in sweet cherry and morello cherry and 0.22 % in red hot chillis pepper). The exception is only the rutin contents in aronia - 0.34 %.

Rutin contents in dry plants

The results for rutin content in dry not edible plants are presented in Table 2. This results show that the rutin contents in this samples is more than 10 times higher compared to that in the dry fruits and vegetables (2.28 % in geranium and 10.53 % in Rhus cotinus).

Rutin contents in dry extract of dry plants

The results for rutin contents in dry extracts in not edible plants are presented in Table 3. The values of the rutin in green tea and grappe seeds is practically equal (10.16 % in grape seeds and 10.16 % in grape seeds). In *Betulae pendula* leaves the rutin conents is two time lower – 5.54 % . The comparison between the results for tannin contents in dry fruits, vegetables and not edible plants and this for the dry extracts from plants show the same order of results but this comparison is not correct because of different methods of analysis.

CONCLUSIONS

In this paper an original data for rutin contents in five Bulgarian dry fruits, two Bulgarian dry vegetables and two dry not edible pants as well as the data for three dry extracts of not edible plants are presented. It is found that in the case of the dry fruits and vegetables the rutin content varies in close ranges (from 0.15 % to 0.18 %) in exception of the red hot chillis pepper - 0.22 % and aronia - 0.34 %. In dry not edible plants the rutin content is ten times higher compared to that in the dry fruits and vegetables. The analyses of rutin content in dry extracts in not edible plants are also carried out. These values are close to those in dry not edible plants but the comparison of these results with another three groups is not correct because of different approaches for analysis.

REFERENCES

1. S. Kreft , M.Knapp., I. Kreft, Extraction of rutin from buckwheat (Fagopyrum esculentum Moench) seeds and determination by capillary electrophoresis, Journal of Agricultural and Food Chemistry, **47**, 11, 1999, 4649-4652.
2. http://en.wikipedia.org/wiki/Rutin.
3. G.-J. Yang, J.-J. Xu, H.-Y. Chen, Z.-Z. Leng, Studies on the interaction between rutin and DNA in the absence and presence of β-cyclodextrin by electrochemical and spectroscopic methods, Chinese Journal of Chemistry, **22**, 2004, 1325-1329.
4. X. Y Bao, J. G. Chen, X. Chen, Y. L. Dang, Chinese Journal of Anal. Lab., **20,** 2, 2001, 1.
5. R. Solimani, Biochim. Biophys. Acta, **281**, 1997, 1336.
6. S. Bhagwat, G. R. Beecher, J. M. Holden, S. Gebhardt, J. Dwyer, J. Peterson A. Eldridge, Development of Database for Flavonoids in Foods, USDA, Agricultural Research Service, 2002.
7. AOAC Official Method, Spectrophotometric Method.