

Determination of Total Phenolics, Flavonoids and Antioxidant Capacity of Methanolic Extracts of Some Brassica Seeds

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Abstract

Cruciferous vegetables are rich in nutrients and bioactive compounds. Seeds are highly nutritious and they are becoming more and more popular in nowadays diets. In the present study various types of radish and mustard seeds were evaluated on the basis of the total phenolic content (TPC), total flavonoid content (TFC) and the antioxidant potential, using simple spectrophotometric methods.

Keywords: *Antioxidant capacity, flavonoids, mustard seeds, polyphenols, radish seeds.*

Introduction. In the last few years the consumption of seeds and sprouts has become increasingly popular among people interested in improving and maintaining their health status by changing dietary habits (Pawel Pasco *et al.* 2009). Natural foods and food-derived antioxidants such as vitamins and phenolic phytochemicals have received growing attention, because they are known to function as chemopreventive agents against oxidative stress-induced damage (R. Rajamurugan *et al.* 2012).

Aims and objectives. The literature contains few reports of antioxidant activity and chemical composition of seeds from the well known (for their disease-fighting substances) *Brassica* vegetables. This paper aims to determine the phytochemical's content and the antioxidant capacity of several varieties of mustard and radish seeds by employing simple spectrophotometric methods.

Materials and methods. The samples consisted in commercially available seeds of white and black mustard (**WM** and **BM**), white and black radish (**WR** and **BR**) and also a red type of Romanian radish – Red of Iernut (**RR**), obtained from the Vegetable Growing Research and Development Station of Iernut.

The methanol extract for the analysis was prepared using the method of Kriengsak Thaipong *et al.* (2006). Briefly three grams of grounded seeds were mixed with 25mL methanol and homogenized. The homogenates were kept at 4°C for 12 h and then centrifuged. The supernatants were recovered and stored at -20 °C until analysis.

Total phenolic content (TPC) was determined by the Folin-Ciocalteu method according to Socaci *et al.* (2013). The absorbance was measured at 750 nm on a Shimadzu UV-1700 PharmaSpec spectrophotometer. A calibration curve was performed using different concentrations of standard gallic acid solutions ($r^2=0.9997$) and the concentration of TPC was expressed as mg GAE / 100 FWfw.

Total flavonoid content was determined by the aluminum chloride spectrophotometric method adapted after Zhu *et al.* (2009). The samples' concentration was determined at 500 nm using a quercetin (0.006–0.800 mg/mL) standard curve ($r^2=0.9944$) and expressed as mg QE / 100g fwFW.

The antioxidant capacity was assessed through the evaluation of free radical scavenging effect on 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical (Kim *et al.*, 2010). Shortly, aliquots of methanolic extracts were mixed with methanolic DPPH solution. After 30

minutes incubation in darkness, the absorbance of each sample was measured at 515nm against a blank of methanol.

Results and Discussion. The comparative amount of the studied phytochemicals and the antioxidant potential of the seeds analyzed in this study are shown in Figure 1. The values for the phenolic contents ranged between 260 and 516 mg GAE/ 100g fw. The total flavonoid contents varied from 388 to 475 mg QE/100 g fw. The maximum amount was always found in the black mustard seeds but the ranking between the samples regarding the phenolic and flavonoid content was slightly different. The minimum amount of polyphenols was registered in white mustard seeds meanwhile the minimum amount of flavonoids was registered in white radish seeds.

The results for the antioxidant activity that were expressed as percentage of decrease in the absorbance value of each sample compared with the absorbance of DPPH reference solution, ranged between 29 and 45% following the same pathway as did the polyphenolic content.

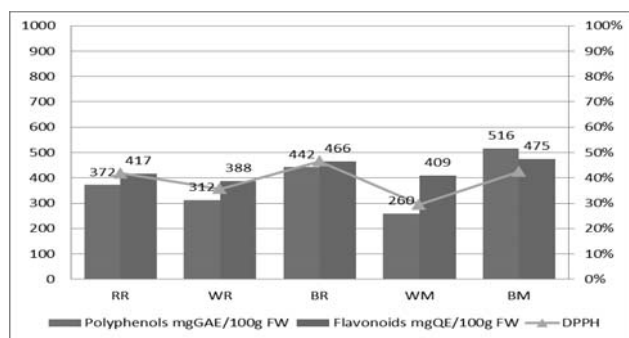


Fig. 1. Antioxidant capacity of selected brassica seeds in respect with total phenolic and total flavonoid content

There are few data available in the literature regarding the phenolic and flavonoid content in radish and mustard seeds and the results are not really consistent. The differences could be attributed to the type of the cultivar, geographical origin of the seeds and the storage conditions but also to the extraction protocols and analytic assays. Compared to data available from other seeds analyzed it can be said that radish and mustard seeds contain a significant amount of polyphenols and flavonoids and possess a notable antioxidant potential.

Conclusions. In the present study, we carried out a record of the relative free radical scavenging activity in some seeds of *Brassica* vegetable, which are frequently used around the world: radish and mustard seeds and we have notice a relationship of

total flavonoid and phenol contents with antioxidant activity. Overall our results are in accordance with Cristina Martinez-Villaluenga *et al.* (2010) supporting their affirmation that raw brassica seeds are an excellent source of antioxidants.

In perspective, the identification of natural and active constituents known having high antioxidant activity in vitro may be valuable in the design of further studies to unravel novel treatment strategies for disorders associated with free radicals induced tissue damage.

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