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Antioxidant activity and total phenolic compounds content of some selected vegetables

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Abstract:
The purpose of the study is to evaluate the content of phenolic compounds and the antioxidant activity of some fresh vegetables from the local market. Recently, attention has been paid to plants phenolic compounds in the diet due to their role in maintaining health. The total phenolic content was determined colorimetric and the antioxidant activity was evaluated by DPPH radical scavenging assay. The results show that studied chemical indices vary depending on the analyzed vegetable. The studied vegetables show a high phytochemicals content and significant antioxidant activity and recommend their use as sources of phenolic compounds and natural antioxidants.

Keywords: antioxidant activity, phenolic compounds, vegetables

1. INTRODUCTION

A diet rich in fruits and vegetables has been associated with a decreased risk of certain diseases. This beneficial effect was associated with the presence of biologically active phytochemicals with antioxidant properties that fight against free radicals and oxidative stress [1,2].

Free radicals are formed in a normal aerobic metabolism as a consequence of many redox processes and play central roles in most cell signaling but in excess they can damage various body cells (cell membranes, lipids, proteins, DNA and other cellular structures) causing many degenerative diseases [3]. To maintain the balance between the production and scavenging of free radicals cells develop protective mechanisms which involve several antioxidant enzymatic systems as well as non-enzymatic compounds such as ascorbate, glutathione, thiols and phenolic compounds [4]. The antioxidant self-defense system can be supplemented with natural exogenous antioxidants purchased from food, especially from vegetables and fruits. Among the bioactive compounds from plants, special attention was given to phenolic compounds that possess protective functions in the maintenance of human health and exert powerful antioxidant action [1,5]. Dietary polyphenols including phenolic acids, flavonoids, catechins, tannins, lignans, stilbenes, and anthocyanidins are widely found in vegetables [6]. Because the identification of sources of natural antioxidants represents a priority in human nutrition, this paper sets out to comparatively study the content of phenolic compounds and the antioxidant activity of some fresh vegetables from the local market.

2. MATERIALS AND METHODS

2.1. Materials

The vegetables analyzed in this study are the following: garlic, carrot, potatoes, kale, broccoli, cauliflower, pepper, hot pepper, purchased from the local market.

2.2. Analysis methods

Methanolic extract: For the determination of antioxidant activity and total phenolic content samples were extracted with 80% aqueous methanol (1:20 w:v) by sonicating for 60 min in a sonicate bath Fungilab (Madrid, Spain) equipped with a digital timer and a temperature controller at 24 °C. The resulting slurries were centrifuged at 4000 g for 5 min and the supernatants were analyzed.

The total phenolics content (TPC) was determined colorimetric at 765 nm by using the Folin-Ciocalteu reagent [7]. The total phenolic content was calculated using a standard curve prepared using gallic acid and expressed as μg GAE/g fw.

Antioxidant activity (AO) was determined by DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay, colorimetrically at 517 nm [8]. The results values were compared with those obtained from standard curves of trolox. Antioxidant capacity values were expressed as μM TE/g fw. The spectrophotometric measurements were performed with a Thermo Scientific Evolution 600 UV-Vis spectrophotometer with VISION PRO software. All determinations were performed in triplicate, and all results were calculated as mean.

3. RESULTS AND DISCUSSION

The values obtained for the content of phenolic compounds vary between 340 μg GAE/g (potatoes) and 2123 μg GAE/g (kale) and increase in the order: cauliflower, broccoli, carrot, potatoes, garlic, hot pepper, pepper, kale (figure 1).

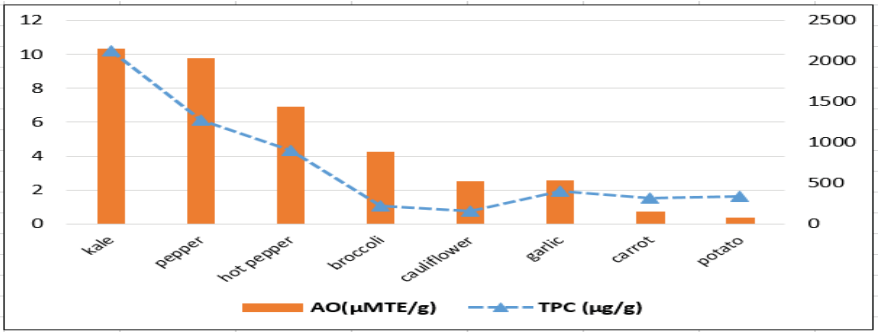

Figure 1. Antioxidant activity (left axis) and total polyphenolic compounds content (right axis) of selected vegetables

The results obtained in this study are close to our results from previous research [8-12].

Antioxidant activity: All the studied vegetables show high values of the antioxidant activity against the DPPH radical (figure 1). The results indicate the highest antioxidant activity for kale (10.32 μM TE/g). The values vary between 0.4 μM TE/g and 10.32 μM TE/g and decrease in the order: kale, pepper, hot pepper, broccoli, garlic, carrot, potatoes.

Positive significant correlations (r=0.88) were observed between the antioxidant activity determined with DPPH and the content of phenolic compounds which indicates that the antioxidant activity is due to the content of phenolic compounds.

4. CONCLUSION

The obtained results confirm that the studied vegetables have high antioxidant activity. The beneficial effects of their consumption in the diet is explained by the content of phenolic compounds with antioxidant properties. Kale stands out, the vegetable newly appreciated by consumers, with the highest values for the analyzed biochemical indices.

REFERENCES

[1] C. Hano and D. Tungmunnithum, *Medicines*, 7 **(2020)** 26.

[2] S. Young and J. V. Woodside, *J. Clin. Pathol.*, 54 **(2001)** 176.

[3] H. Djenidi, S. Khennouf and A. Bouaziz, *Prog. Nutr.*, 22 (1) **(2020)** 224.

[4] S. B. Nimse and D. Pal, *RSC Adv*., 5 **(2015)** 27986.

[5] H. Cory, S. Passarelli, J. Szeto, M. Tamez and J. Mattei, *Front. Nutr.*, 5 **(2018)** 87.

[6] M. Rudrapal, S.J. Khairnar, J. Khan, a.B. Dukhyil, M. A. Ansari, M.N. Alomary, F.M. Alshabrmi, S. Palai, P.K. Deb and R. Devi, *Front. Pharmacol.*, 13 **(2022)** 806470.

[7] M. Dinu, R. Soare, C. Babeanu and M. Velea, *Sci. Papers-Ser. B, Hortic., 63* (1) **(2019)** 371.

[8] R. Soare, M. Dinu, C. Babeanu, M. Popescu and A. Popescu, *J. Agroaliment. Processes Technol.*, 23(4) **(2017)** 217.

[9] R. Soare, M. Dinu, C. Babeanu and M. Soare, *Plant, Soil and Environ.*, 66(6) **(2020)** 281.

[10] R. Soare, M. Dinu, C. Babeanu and M. Popescu, *Bull. Univ. Agric. Sci. Vet. Med. Cluj-Napoca, Hort.*, 74 (2) **(2017)** 191.

[11] C. Babeanu, R. Soare, M. Dinu and O. Păniță, *Sci. Papers-Ser. B, Hortic.*, 64 (1) **(2020**) 339.

[12] M., Dinu, R. Soare, C. Babeanu, M. Botu, *Horticulturae*, *9* (9) **(2023)** 1039.