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Assessment of total polyphenol content and antioxidant capacity of some pepper varieties

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Abstract

This paper aims to analyze the content in total polyphenols (by Folin- Ciocâlteu method), ascorbic acid content (iodometric method) and the antioxidant activity (by CUPRAC assay) of some pepper varieties from the Romanian local market: "Pintea" (red hot pepper), "Yanka F1" (yellow hot pepper), "Impala F1" (green hot pepper), "Punto F1" (red bell pepper), "Valira" (kapia red pepper) and "Vlad" (red fibster). The highest vitamin C content was recorded in kapia red pepper "Valira" (161.23 mg/100g fresh weight), then in red fibster "Vlad" (125.27 mg/100g fresh weight). The highest concentration of total polyphenols was found in sweet pepper varieties (2.17 mg gallic acid/g – for green hot pepper "Impala F1", 1.92 mg gallic acid/g - for yellow hot pepper "Yanka F1" and 1.84 mg gallic acid/g – for red hot pepper "Pintea"). The best antioxidant activity was manifested by green hot pepper "Impala F1" (12.80 mg Trolox/g fresh weight).

Keywords: pepper, fibster, antioxdant activity, polyphenols

1. Introduction

Pepper (*Capsicum annuum* L, *Solanaceae* family) is an annual plant that grows exclusively by seedling. The part used in peppers is the fruit. In Romania the pepper was cultivated from the 19th century, first in the south of the country and then in other areas [6]. There are numerous hybrids of peppers in the culture depending on variety and the technological system practiced [1]. The peppers can be fresh or processed: in different preparations, preserves, sauces, jams, jellies, dehydrated powders [11].

The peppers are appreciated in human nutrition for both their special flavor and the richness of nutrients and important bioactive principles for health. Thus, there are numerous mineral substances (especially calcium, iron, magnesium, potassium), different vitamins (C, complex B, PP, E, K), carotenoids, phenolic compounds, dietary fiber [9]. It has been determined that a daily consumption of 50-100g of pepper can provide 100% or 60% of the daily requirement of vitamin C and vitamin A [8].

The chemical composition depends on the type of peppers, their degree of maturity, the conditions of culture, variety, etc. Hot pepper varieties are rich in capsaicinoids- alkaloids with pharmacological properties [9].

Antioxidant activity of peppers is very high and their consumption, especially fresh, protects the body against the so-called "oxidative stress". Thus, a diet rich in peppers stimulates the immune system, protects the body against some cancers, cardiovascular disease, and macular degeneration [12]. Pepper fruits are also rich in phenolic compounds, but their composition is not yet fully elucidated. Thus, in peppers were identified: *p*-coumaryl, caffeoyl, 3,4-dimethoxycinnamoyl glucoside, 3-*O*-rhamnosylquercetin, 7-*O*-glucosylluteolin, quercetin, luteolin, capsioside A, capsioside B, capsianoside VII and the list continues [4,5,9].

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In this paper we aimed to determine the ascorbic acid content, total polyphenols content (Folin – Ciocâlteu method) and antioxidant activity (CUPRAC assay) for six pepper varieties purchased from Romanian market: "Pintea" (red hot pepper), "Yanka F1" (yellow hot pepper), "Impala F1" (green hot pepper), "Punto F1" (red bell pepper), "Valira" (kapia red pepper) and "Vlad" (red fibster).

2. Materials and Methods

All pepper varieties analyzed: "Pintea" (red hot pepper), "Yanka F1" (yellow hot pepper), "Impala F1" (green hot pepper), "Punto F1" (red bell pepper), "Valira" (kapia red pepper) and "Vlad" (red fibster) were fresh and purchased from the local market.

Total polyphenols and antioxidant activity determination: For ascorbic acid determination in the peppers was used the iodometric method. Folin-Ciocâlteu assay has been used for analysis the total polyphenol concentration of the peppers and CUPRAC method for antioxidant activity evaluation. The same working methods as those used by Dumbrava *et al*. (2016) [3], were used.

3. Results and Discussion

Vitamin C concentration: Figure 1 shows the results of vitamin C concentration of the pepper varieties.

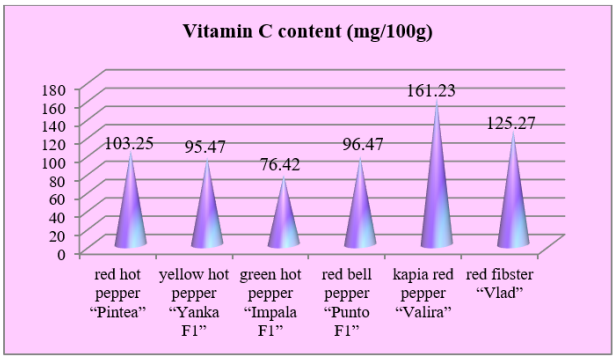

Figure 1. Ascorbic acid content of the pepper varieties

From the analysis of the experimental results, we can see that kapia red pepper "Valira" had the highest concentration of ascorbic acid 161.23 mg/100g fresh weight), followed by red fibster "Vlad" (125.27 mg/100g fresh weight) and red hot pepper "Pintea" (103.25 mg/100g fresh weight). The lowest concentration of vitamin C was recorded in green hot pepper "Impala F1" (76.42 mg/100g fresh weight). Nerdy (2018) obtained concentrations of ascorbic acid for bell peppers between 81.19 mg/100g for green bell pepper and 159.61 mg/100g for yellow bell pepper [10]. For hot pepper varieties, Kumar and Subba Tata (2009) have found values between 72.0 mg/100g and 280 mg/100g [7]. Thus, we can see that our values fall within the limits specified by literature data.

Total polyphenols content: In figure 2 are presented the values of the total polyphenols content (determined by Folin Ciocalteu method), of the six varieties of peppers analyzed.

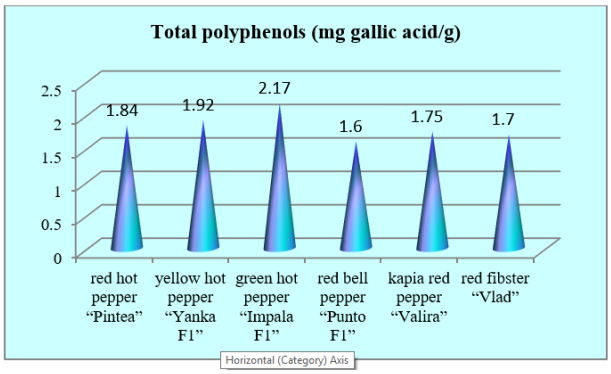

Figure 2. Total polyphenol content of the pepper varieties

It is noted that the highest total polyphenols content was found in green hot pepper "Impala F1" (2.17 mg gallic acid/g), followed by yellow hot pepper "Yanka F1" (1.92 mg gallic acid/g) and red hot pepper "Pintea" (1.84 mg gallic acid/g). The lowest total polyphenol content was found in red bell pepper "Punto F1" (1.60 mg gallic acid/g). Chavez-Mendoza *et al*., (2015) found a concentration of total polyphenols in different pepper varieties of 0.6-0.8 mg gallic acid/g [2]. Therefore, the values determined by us for the analyzed varieties are somewhat higher.

Antioxidant activity: The antioxidant activity of the six pepper varieties analyzed is shown in Figure 3.

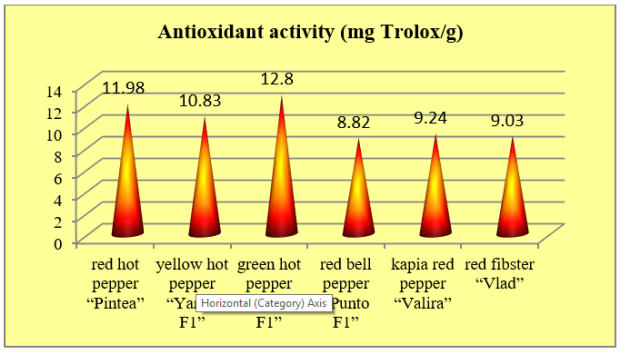

Figure 3. Antioxidant activity of the pepper varieties

From the experimental data we can see that the most powerful antioxidant activity was manifested by the hot pepper varieties. Of these, green hot pepper "Impala F1" had the best antioxidant activity (12.80 mg Trolox/g), followed by red hot pepper "Pintea" (11.98 mg Trolox/g). The weakest antioxidant activity among the six varieties of pepper analyzed, had the red bell pepper "Punto F1" (8.82 mg Trolox/g). Kapia red pepper "Valira" and red fibster "Vlad" had an antioxidant activity with close values (9.24 mg Trolox/g, respectively 9.03 mg Trolox/g).

4. Conclusions

The conclusions that may be drawn from this paper are the following:

- Of the six varieties of peppers analyzed, the highest vitamin C content was found in kapia red pepper "Valira", folowed by the red fibster "Vlad". Green hot pepper "Impala F1" has the lowest concentration of ascorbic acid.
- In terms of total polyphenol content, the green hot pepper "Impala F1" has the highest content, followed by the yellow hot pepper "Yanca F1", and red hot pepper "Pintea". Red bell pepper "Punto F1" had the lowest concentration of total polyphenols.
- The strongest antioxidant activity has been manifested in hot pepper varieties, in accordance with the concentration of total polyphenols, compounds with very strong antioxidant action. Green hot pepper "Impala F1" had the best antioxidant activity, then the red hot pepper "Pintea". Red bell pepper "Punto F1" has the worst antioxidant activity.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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