EVALUATION MICROELEMENTS AND VITAMIN C CONTENT OF SOME SPICES

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ABSTRACT
In this paper were studied by comparison microelements (Cu, Zn, Ni, Mn, Pb, Co, Cr) and vitamin C content of some commercial spices: ground black pepper (*Piper nigrum*), sweet paprika, cayenne pepper (*Capsicum annuum)* and powder cinnamon (*Cinnamomum zeylanicum).* For this purpose, the mineral elements mentioned were quantified by Atomic Absorption Spectrophotometry (AAS), for their determination was used the atomic absorption spectrophotometer's contr AA 300, Analytik Jena and the vitamin C content was analyzed by 2,6-diclorindofenol method using as standard ascorbic acid solution, 0.5 mg / ml. This work attempts to contribute to knowledge of the nutritional properties of these plants. These results may be useful for the evaluation of dietary information. Principal component analysis (PCA) was carried out for quantitative mineral concentration and vitamin C content. Among microelements, Cu, Zn and Mn were found in the highest concentration in whole investigated vegetable material.

Keywords: mineral elements, spices, vitamin C,

INTRODUCTION

Capsicum peppers used for paprika are unusually rich in vitamin C, a fact discovered in 1932 by Hungary's 1937 Nobel prize-winner Albert Szent-Györgyi. Much of the vitamin C content is retained in paprika, which contains more vitamin C by weight than does lemon juice. Paprika is also high in other antioxidants, containing about 10% of the level found in açaí berries. Prevalence of nutrients, however, must be balanced against quantities ingested, which are generally negligible for spices.

Spices are common food adjucts that impart flavour, aroma and colour to foods. Several common spices are now understood to exert many beneficial physiological effects (SRINIVASAN, 2005A). Among these, their hypolipidemic and antioxidant properties have far-reaching health implications. Work in our laboratory on the physiological effects of spices has focused on their influence on lipid metabolism, their action as a digestive stimulant, the beneficial influence of hypocholesterolemic spices on cholesterol gallstone disease and diabetic nephropathy, and the beneficial influence of antioxidant spice principles on inflammatory disease (SRINIVASAN, 2005B).

Peppers are an important source of nutrients in the human diet, and an excellent source of vitamins A and C as well as neutral and acidic phenolic compounds, which are important antioxidants for a variety of plant defense responses. Levels of these compounds can vary by genotype and maturity and are influenced by growing conditions and losses after processing (HOWARD, 2000).

After pepper was brought to Spain following the discovery of America, growers have selected many pepper cultivars for the properties and characteristics that were most popular or most profitable agriculturally. The result is a great number of very different cultivars showing a wide range of morphological and organoleptic characteristics, including color, which determine their use. In the last 30 years, an important increase of vegetable production has taken place in Almer´ıa (Spain), due to the generalized use of greenhouses,

providing a better control on nutrient availability by plants. Thus, new pepper varieties are cultured, but the nutritional composition of the same is unreported until now. (GUIL& GUERRERO, 2006).
Cinnamomum verum belongs to the family lauraceae. Cinnamaldehyde, one of the components C. Verum has been found to possess significant antiallergic, antiulcerogenic, antipyretic, anaesthetic and antimutagenic activities. (SULTANA, 2010).
Functioning of living organisms can be done optimally, only in the presence of adequate amounts of macro and microelements. Their presence in insufficient quantities or exceeding certain limits permitted because the body can affect nutrition-disease.
Some modern cultures still consume wild plants as a normal spice and herb source, obtaining fairly good amounts of several nutrients, and it is widely accepted that herbs are significant nutritional sources of minerals. Furthermore, other nutrients, such as carotenoids and phenols, are found in larger quantities in these plants (GUIL, 1997; ÖZCAN, 2004). The nutritional and medicinal properties of these plants may be interlinked through phytochemicals, both nutrient and non-nutrient.
Vitamin C is the most abundant antioxidant in plants, but its functions are entirely unknown. Ascorbic acid is well known for its antioxidant activity, acting as a reducing agent to reverse oxidation in liquids. When there are more free radicals (reactive oxygen species, ROS) in the human body than antioxidants, the condition is called oxidative stress (MC GREGOR., 2006).
Chemometric techniques may reveal useful information from analytical data, including characterization of natural goods. However, caution must be taken to ensure that these techniques are used in an appropriate manner (DEFERNEZ, M., 1997).
Multivariate analysis techniques were applied in collected data and principal component analysis (PCA) was carried out for quantitative mineral concentration, and the total of variation explained was calculated as the sum of extracted Eigen-values. The PCA techniques can be used to determine the variables containing the maximum possible variance and to reduce the information of a multidimensional data set in that it can be displayed in a scatter plot with only three axes. (BOZOKALFA, 2011).

MATERIAL AND METHOD

Material

Dried spices, including: black pepper, hot and sweet pepper and cinnamom powder, were collected from local markets. Chemicals and reagents were purchased from Sigma-Aldrich.

Method

Determination of microelements content

Dried samples were prepared in duplicate, were then calcined at 650˚C for 4 hours. Samples calcined white were treated with 5 ml 0.5 N HNO_3 and brought to dryness on a sand bath. After cooling mineral residues were dissolved in 25 ml 0.5 N HNO_3, filtered and brought to the mark with distilled water. For determination of micro elements were used diluted 1:100 working solution in distilled water for dilute solutions of potassium and calcium and sodium and magnesium if 1:10. The standard solution of 0.1 mg element / mL Pipette 1-5 mL, 5-25 mL respectively in 100 ml flasks. Add 10 ml of phosphate acidity. Monopotassium to ensure roughly equal samples for analysis. Make the mark with distilled water and mix. Standard solutions stored in sealed bottles. Mn, Co, Ni, Cu, Zn, Cr, Pb, by atomic absorption spectroscopy using an atomic absorption spectrometer contrr AA 300. Standard working conditions flame type: C2H2/aerw; flame height: 6 mm; air flow: 568l/h;

acetylene flow: 80l/h for determination of As, 70l/h for Mg, 60l/h for Fe, 50l/h for other minerals.

Titrimetric determination of ascorbic acid (vitamin C) with the redox indicator 2,6-dichloroindophenol

Redox indicator 2,6-dichloroindophenol is a weak oxidizer with mild oxidizing action of ascorbic acid. The method is based on titration of ascorbic acid from plant extracts with redox indicator 2,6-dichloroindophenol until a persistent pink colour for 5 seconds. Were used: 250 mL Erlenmeyer flask, 400 mL Berzelius glasses, 10 mL pipettes, biurette and reagents required have been following: 0.25 M oxalic acid solution, 0.5 mg/mL ascorbic acid solution, indophenol standard solution: dissolve 250 mg of 2,6-dichloroindophenol sodium salt, add 250 mL of distilled water and 210 mg $NaHCO_3$, shake vigorously, and after the dissolution of the indicator, dilute to 1 L with distilled water.

RESULTS

The mineral compositions of condiments are shown in *Table 1*. The results of the analyses were established to give nutrient values per 100 g of used portion of dried weight. Mineral elements were found to vary widely depending on the different spices.

Table 1. Microelements and vitamin C content of some spices (mg/kg)

Crt. No.	Samples	Cu	Zn	Mn	Co	Pb	Ni	Cr	Ascorbic acid mg/100g dry sample
		(mg/kg)							
1	Sweet Pepper	5.01	9.37	9.43	0.10	0.14	8.71	0.30	0.89
2	Hot Pepper	6.99	10.71	9.25	0.11	0.19	0.68	3.89	0.72
3	Black pepper	0.04	0.07	0.32	0.00	0.00	0.01	0.00	0.88
4	Cinnamon	0.00	0.22	0.88	0.01	0.01	0.03	0.00	1.48

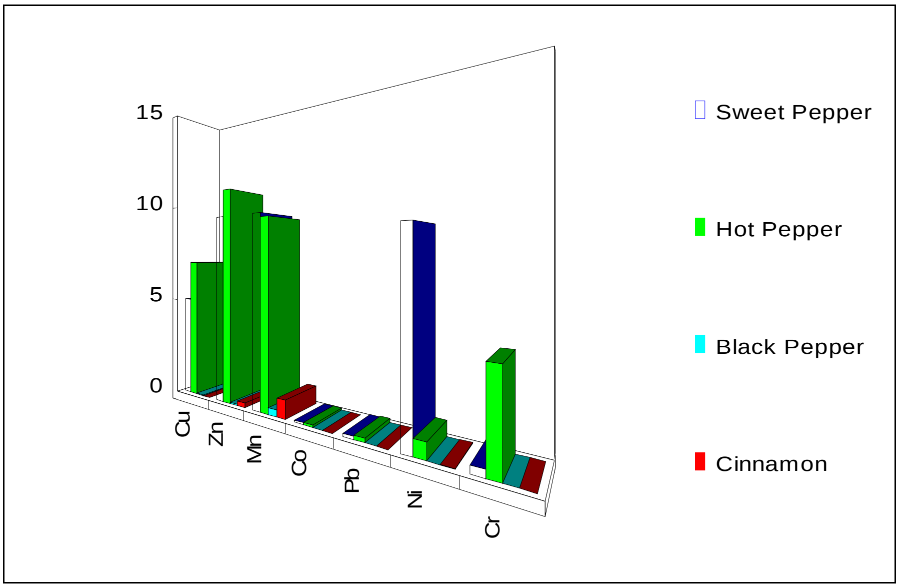

Figure 1. Graphical representation of microelements content

Principal Component Analysis (PCA) used transposed standardized data

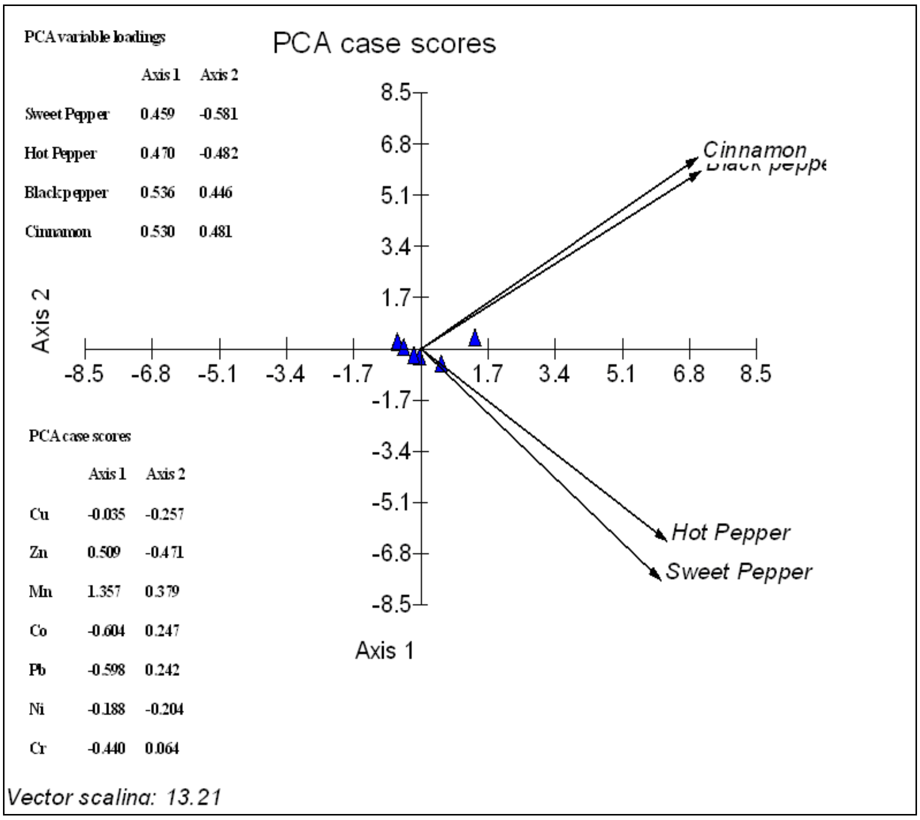

Figure 2. PCA case score representation of microelements content

PCA analysis is showing the representation of the vectors corresponding to the studied samples (black pepper powder, hot and sweet pepper powder and cinnamom powder). In the first quarter we can see the vectors corresponding to Cinnamon and Black Pepper, while in the forth quarter hot and sweet pepper. This ios revealing the fact that the first two samples have similar microelements content, probably also same country of origin. The pepper powder hot and sweet have as country of origin Romania, so it explain the similarity of graphic PCA distribution.

The highest content of vitamin C was found in the cinnamon powder sample (1.48 mg/100g dry sample). Similar values were for sweet pepper powder samples (0.89 mg/100g) and black pepper powder (0.88 mg/100g). Lowest content of vitamin C was the hot pepper powder sample (0.72 mg/100g).

It finds that most were concentrated microelements Zn, Mn and Cu in samples of sweet and hot pepper powder and black pepper and cinnamon powder samples, trace content is

Manganese is well represented in the sweet and hot pepper powder samples (9.25-9.43 mg/kg) and the other samples analyzed, manganese was determined in the range 0.32-0.88 mg/kg.

Chrome content was undetectable when samples of black pepper and cinnamon powder, sweet and hot pepper powder (0.30 mg / kg.) And relative content for hot pepper powder sample.

Nickel is present in very small amounts (0.01-0.68 mg / kg) in all samples analyzed, the highest amount of Ni can be found in sweet pepper powder sample (8.71 mg / kg.).

In the cobalt, it is not in the sample of black pepper and has very low values in other samples subjected to analysis. spectrophotometry.
The values obtained for copper in the range 0.04-6.99 mk / kg, and for zinc in the range of 0.22-10.71 mk / kg.
Lead is considered toxic heavy metal, which is why for Pb maximum limit is 0.5 ppm, and values ranged between 0.01-0.19 mk / kg, was undetectable for the sample of black pepper.

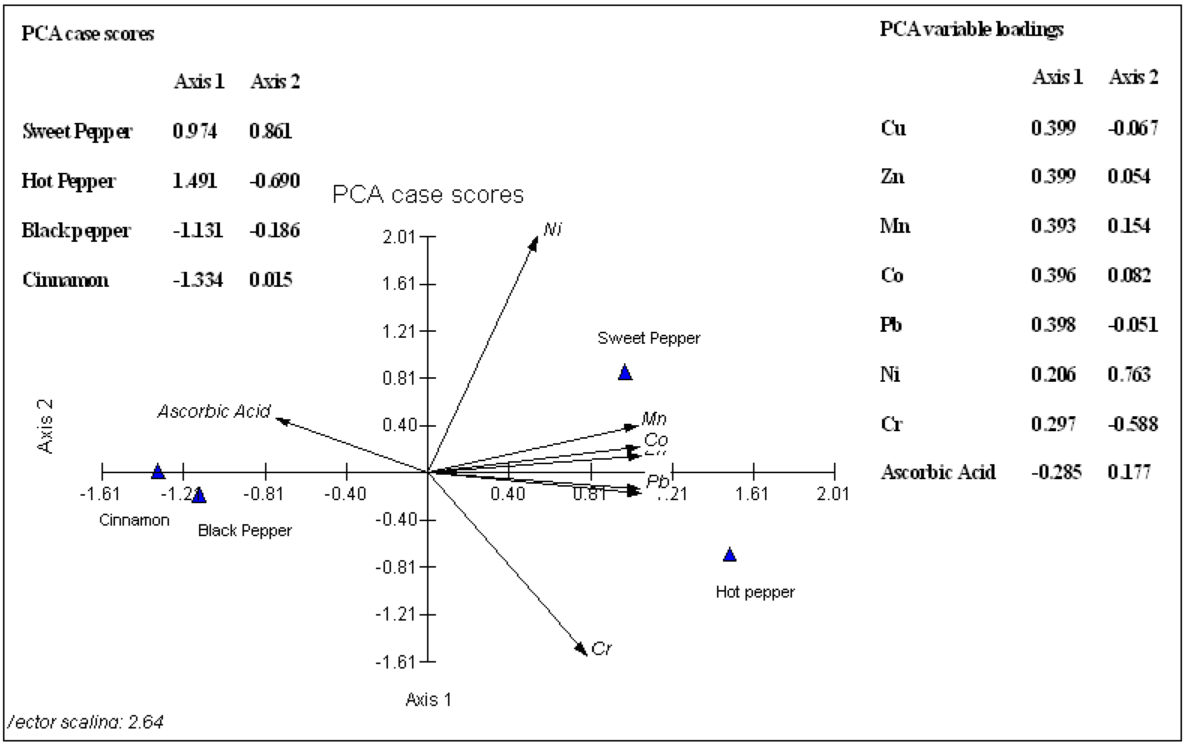

Figure 3. PCA representation of ascorbic acid content associated with microelement content

Figure 3 is presenting the distribution of microelements and ascorbic acid content. Similar to Figure 2 , we can observe the distribution of cinnamon and black pepper , very close to each other, and that is confirming the origin of products even by taking in consideration ascorbic acid content. The distribution of sweet pepper in quarter 1 and hot pepper in quarter 4 is specifying that the ascorbic acids values are different in the 2 Capsicum powders (one sweet and the second hot), but its not infirming the country of origin for both (Romania).

CONCLUSIONS

The highest microelement contents were Cu, Zn and Mn. This work attempts to contribute to knowledge of the nutritional properties of these plants. In addition, knowledge of the mineral contents, as spices is of great interest.
The values obtained for vitamin C content are lower than the literature data, determinations were made on samples dried and stored, not fresh evidence.

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