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STUDIES REGARDING SOME SECONDARY METABOLITS OF PARSLEY, MINT AND BASIL

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Abstract

Parsley, mint and basil, are herbal products that can be used as food ingredients and medicinal herbs. These plants were rich in minerals, vitamins, chlorophyllian pigmetns and natural antioxidants which may play a major role in inhibiting reactions mediated by reactive oxygen species. The aim of our study was to determine the content of some antioxidant compounds in parsley, mint and basil.

Key words: herbs, total polyphenols, chlorophyllian pigments, vitamin C.

INTRODUCTION

In the last years much attention has been devoted to natural antioxidant and their association with health benefits (Arnous et al., 2001). Antioxidants are used by the food industry to delay the oxidation process (Brand-Williams et al., 2011).

Parsley (*Petroselinum crispum*) leaves constitutes an important source of human food due to rich content of vitamins, mineral salts and essential oils. The leaves contain vitamin C 200 mg%, plus the contents in vitamin A, vitamin B and small amounts of folic acid, apiol (Stan et al., 2003). Parsley is rich in chlorophyll, which has important plastic and antianemia properties.

Mint *(Mentha piperita)*- are famous aromatic and medicinal herb that are used in traditional and folk medicines in the world for the antimicrobial and antioxidant properties (Tsai et al, 2013). Mints contain volatile components, flavonoids, organic acids, quinones, such as for the digestive system, central nervous system, respiratory system (Lopez et al., 2010; Stafford et al, 2005).

Basil *(Ocimum basilicum* L.*)* belonging to the Lamiaceae family, is one of the most popular plants grown extensively in many continents around the world, especially in Asia, Europe and North America. Basil has been planted as a popular culinary and medicinal herb from ancient time until now and the leaves and flowers have been used for the treatment of headaches, coughs, diarrhea, worms and kidney malfunctions, as well as for its carminative, galactagogue, stomachic and antispasmodic properties. (Heath et al, 1981). Basil contains a wide range of phenolic compounds

displaying various antioxidant activities, depending on the basil species and cultivars (Hussain et al., 2008).

Polyphenols are products of the secondary metabolism of plants. These compounds are reported to exhibit anticarcinogenic, anti-inflammatory, anti-atherogenic, antithrombotic, immune modulating and analgesic activities, among others and exert these functions as antioxidants (Gomez-Caravaca, 2006).

Vitamin C – parsley and spinach were an excellent source of vitamin C. Mint also content vitamin C but in a lower level. Consuming foods high in vitamin C, can reduce stress and boost the immune system. Intake of this vitamin can help lower the levels of cortisol, a stress hormone, and blood pressure during high-anxiety situations (http://exploreim.ucla.edu/).

Chlorophyllian pigments - Chlorophyll is the green pigment responsible for the color of leaves. The presence of this pigments in leaves is very important for photosynthesis.

Chlorophyll has great antioxidant capacity and therefore it helps neutralise free radicals and limit oxidative damage within the body, supports the body's detoxification processes and protects against toxins. Increasing the uptake of oxygen in the blood, chlorophyll improves the health of blood cells. (http://www.naturalbodyhealing.com).

The aim of this study is to determine the content of some antioxidant compounds – total polyphenols, vitamin C and chlorophyllian pigments in parsley, mint and basil.

MATERIAL AND METHOD

The experiments were performed in 2013-2014, at the Laboratory of Secondary Metabolits in Food Industry, of Faculty for Environmental Protection, University of Oradea.

For this study 3 samples of parsley, mint and basil from Bihor County, were taken from market.

Total Phenolic content

Plant leaves were dried in an oven at 55°C until the moisture content was constant (8.5%). Samples were ground to a powder from using electrical grinder and passed through mesh. Each powdered sample (10 g) was submitted to extraction using diethyl ether (50ml), for 30 min, under agitation at room temperature (25°C), and then the mixture was filtered through Whatman 1. The residues were extracted again in diethyl ether (50 ml) and filtered. The filtrates were combined and the total volume of the extract was made 100 mL and stored in a freezer at -18°C until used for further analysis (Fahad al-Juhaimi and Kashif Ghafoor, 2011).

The total phenolic compounds (TP) were analyzed using the Folin-Ciocâlteu method with some modification (Ghafoor and Choi, 2009). A 200µl properly diluted sample or a standard solution (galic acid or catechin) of varying concentrations were mixed with 400µl Folin-Ciocâlteu reagent. The solution was diluted to a total volume of 4.6 ml using deionized water then thoroughly mixed. After 10 minutes incubation at room temperature, 1 ml of 20% Na_2CO_3 solution was added then immediately mixed and incubated for 2h. The absorbance was read at 765 nm on a spectrophotometer UV –VIS Mini-1240 Shimadzu.

Vitamin C was extracted using metaphosphoric acid and the extract was titrate with iodine solution starch indicator (Bailey,1974 and Kalluer,1986, cited by Mouhannad AL.-Hachamii, 2010).

The contents of ***chlorophyllian pigments*** (clf a, clf b and carotenoids) of the studied herb leaves were determined using N, N- dimethylformamide (DMF), 99.9%, for the extraction (Moran and Porath, 1980). The use of DMF renders the process simpler and faster, since the pigments can be extracted from intact tissue. The content of the pigment was determined using a UV-VIS mini–1240 Shimadzu spectrophotometer, at 664 nm wave length for chlorophyll a, 647 nm for chlorophyll b and 480 nm for carotenoids. The data obtained from the spectrophotometric determinations, were mathematically processed using the formulas proposed by Moran and Porath 1982.

The results obtained are averages of 3 independent determination for every parameters and were statistically processed with the "t- test"

RESULTS AND DISSCUSIONS

The standard curve realised with galic acid or catechin, were represented in fig. 1 and fig. 2, and the results obtained after performing analyses for health protecting component determination in selected herbs were inserted in table 1.

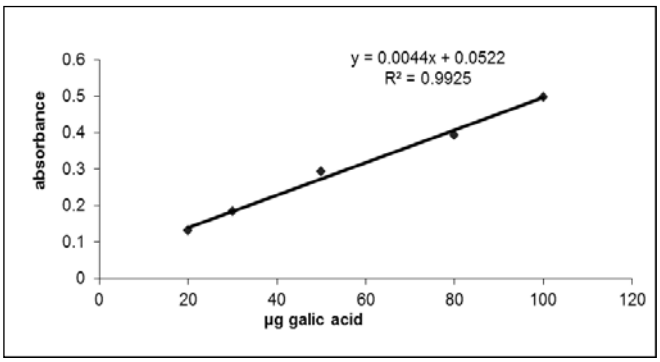

Fig.1. Calibration curve for TP determination using galic acid as standard solution

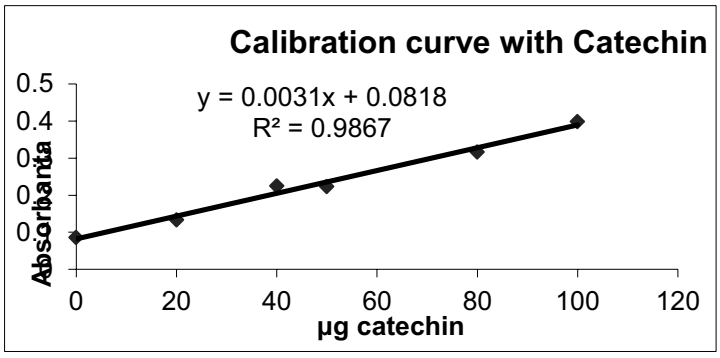

Fig.2. Calibration curve for TP determination using catechin as standard solution

Results of the determination of total phenolic content proved that this compounds has very significantly higher value in case of mint (106.07 mg CAT% and 131.07mgGAE%) in comparison with parsley (54.94mgCAT% and 89.92mgGAE%) and basil (86.38 mg CAT% and 114.99mgGAE%).

Table 1.

Calculated values for antioxidant compounds of some herb products

Type of sample	TP mg GAE/100g	TP mg CAT/100g	Vitamina C mg%
	mean±sd/statistical significance		
Parsley	89.921±0.98/***	54.94±0.42/***	143.4±1.4
Mint	131.074±2.1	106.07±1.6	54.4±0.3/***
Basil	114.990±1.1/***	86.38±1.16/***	28.1±0.2/***

The analysed herbal products are good source of polyphenols. Similar results were obtained by Fahad al-Juhaimi and Kashif Ghafoor, 2011. The highest contents (1.24 mgGAE/100ml) were observed in extract of mint (*Mentha arvensis*) leaves followed by parsley (*Petroselinum crispum*). Chan et al 2012, studying the total polyphenol content in fresh herbs found that peppermint had the highest phenolic content (338 mg GAE%) in comparison with Basil 299mgGAE%. The same trend was observed in our paper.

In case of Vitamin C, very significantly higher values were found for parsley (143.5 mg%), in comparison with mint (54.4mg%) and basil (28.1mg%). Matei and Magearu, 2004; Karklelienė et al.,2014 found for vitamin C content in parsley, values between for 138.5 and 175.53mg%.

Table 2.

Chlorophyllian pigments content of some herb products

Sample	Clf a mg/g leaves	Clf b mg/g leaves	carotenoid mg/g leaves	Total content of assimilatory pigments mg/g leaves
Parsley	0.84±0.03/***	0.47±0.02/***	0.39±0.03/***	1.70±0.1/***
Mint	0.74±0.02/***	0.56± 0.02/***	0.28±0.02/***	1.58±0.1/***
Basil	0.55±0.02	0.25±0.01	0.14±0.01	0.94±0.05

Analyzing the obtained results it was found that chlorophyll a and carotenoids content was highest in parsley and mint samples, and a lowest content was recorded in basil. The chlorophyll b content was highest in mint, followed by parsley and the lowest content was registered in basil.

Cătunescu et al 2012, determined the effect of storage on chlorophyll content of the most important Romanian seasoning herbs. In case of parsley, in first day of storage the content of chlorophyll a and chlorophyll b has similar values than those obtained in the present studies (0.93mg/g fresh leaves for chlorophyll a and 0.38mg/g fresh leaves). Śledź and Witrowa-Rajchert in 2012 studied the influence of microwave drying on chlorophyll content of herbs and found the highest content of chlorophyll a and b in mint leaves, followed by parsley and basil leaves.

CONCLUSIONS

Analyzing the studied parameters we can draw the following conclusions:

Folin-Ciocâlteu method allows expression of polyphenol content to different standards, namely gallic acid or catechin, so there is a greater freedom in choosing experimental conditions. The highest content of total polyphenol was registered in mint, followed by basil and parsley.

Ascorbic acid in the highest amount was found in parsley, followed by mint and basil. The same order was observed in case of chlorophyllian pigments. Chlorophyll has an important role in energy production and carotenoid pigments plyas a role in vitamine A synthesis.

To ensure maximum content in antioxidant compunds for a health protecting effect is advisable to consume the juice derived from fresh leaves.

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