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Chemical analysis of some *Ocimum basilicum* medicinal teas

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Abstract

Objectives. Ocimum basilicum *is one of the widespread medicinal plants, widely used due to its multiple therapeutic properties (antimicrobial, antiviral, hypoglycemic, antispasmodic, anti-inflammatory, carminative, stomachic, antioxidant, analgesic, etc.), as well as its specific aromatic character. The aim of this study was to comparatively investigate the chemical composition (flavonoids, caffeic acid derivatives, tannins, essential oil) of the aerial parts of some Romanian medicinal teas of* Ocimum basilicum.

Materials and methods. *The content of flavonoids, phenolic acids and tannins in three samples of* O. basilicum *tea were determined spectrophotometrically. Identification of important phenolic compounds (rutin, isoquercitrin chlorogenic acid and caffeic acid) was performed by thin layer chromatography (TLC). The essential oils were obtained by hydrodistillation method.*

Outcomes and conclusions. *Following the quantitative determinations performed, it can be seen that the basil samples are rich in active principles, and their use for the treatment of some diseases can be justified.*

Keywords: *Ocimum basilicum,* tea, flavonoids, acid caffeic derivatives, tannins, essential oils

INTRODUCTION

Ocimum basilicum L.(basil, *Lamiaceae* family) is an aromatic medicinal plant and is a rich source of bioactive principles [1-5]. Basil is a plant cultivated in many areas of Romania and is frequently used for medicinal purposes and to specific flavor. The aerial parts (*Basilici herba*) contain essential oil (with linalool, methyl chavicol, 1,8-cineole, eugenol, methyleugenol or methyl cinnamate), polyphenols (flavonoids, caffeic acid derivatives, etc.), triterpene acids, phytosterols, with antimicrobial, diuretic, antioxidant, digestive stimulant properties. Traditionally, sweet basil has been used as a medicinal plant in the treatment of headaches, coughs, warts, worms, and kidney malfunctions. The essential oil has antimicrobial, antifungal, insect-repelling, antioxidant activities [6-8].

The purpose of this research was the chemical analysis of some vegetal raw materials from three medicinal teas of *O. basilicum* from the Romanian market, in order to evaluate the quality of commercial products.

MATERIALS AND METHODS

Plant material and preparation of extracts

The plant materials were three medicinal basil teas (B1, B2, B3) purchased on the Romanian pharmaceutical market, from three commercial companies, which were ground to a fine powder. The

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plant materials were extracted at 60° C using 70% ethanol, on water bath (30 minutes). The ethanolic extracts obtained were filtered and made up to volume (50 ml) in volumetric flasks [9,10].

Determination of flavonoidic contents

The flavonoids contents were determined using AlCl3 reagent, by a spectrophotometric test. 10 ml of each ethanolic extract were diluted with methanol. To 5 ml of solution was added 5 ml of sodium acetate (100 g/l) and 3 ml of aluminum chloride (25 g/l). The absorbance of the solutions was measured at 430 nm. Rutin was used as a standard for the preparation of a calibration curve (R2 = 0.999). The results were expressed as a percentage (g of rutin equivalents (RE)/100 g of dry plant material) [10-12].

Determination of caffeic acid derivatives contents

The caffeic acid derivatives contents were determined using a spectrophotometric method with Arnow reagent in basic medium (NaOH), method described in the *Cynarae folium* monograph [12]. 5 ml of extract ethanolic were diluted with 50 ml ethanol in a volumetric flask (solution A). To 1 ml of solution A were added: 1 ml sodium hydroxide (1N), 1 ml Arnow regent, 1 ml HCl (1M) and 10 ml water. Absorbance was measured at 500 nm. The phenolic acids contents were expressed as caffeic acid equivalent (g CAE/100 g dry plant material), using an equation derived from the from the calibration curve of caffeic acid (R2 = 0.994) [9-12].

Determination of tannin contents

Quantitative analysis of tannins was performed according to an indirect photocolorimetric technique, after a prior color reaction of polyphenols with phosphorulfamic acid, in basic medium [9,12]. First, the absorbance of the total polyphenolic (A1) was determined at 715 nm. In the second step, after the adsorption of the tannins on the skin powder, the absorbance of the polyphenols (A2) was measured. The pyrogalol was used as the standard solution. The concentration of the tannins was calculated using the relation: C(%) = [62,5·m1·A1-A2)]/A3·m2 (A1 = absorbance of the total polyphenol solution; A2 = absorbance of the solution of unabsorbed polyphenols on the skin powder; A3 = absorbance of the pyrogalol solution (0.31); m1 = mass of pirogalol (0.05 g); m2 = mass of the sample used in work (Table 1) [9].

Determination of essential oil contents

The *O. basilicum* essential oil (*Basilici aetheroleum*) was obtained by hydrodistillation with the Clevenger apparatus, according to the method described in FR X [12]. The results were expressed in ml/100 g dry material product (Table 1) [9,12].

Thin-layer chromatography (TLC)

The preliminary TLC identification of some polyphenolic compounds from *Ocimum basilicum* extracts (Table 2, Figure 5) was performed using a silica gel chromatographic system as the stationary phase and a mobile phase: ethyl acetate: acetic acid: formic acid: water (100: 11: 11: 26) [9].

RESULTS AND DISCUSSION

The results obtained from the quantitative determinations performed on the three basil teas are presented in Table 1.

TABLE 1. Polyphenolic and essential oils contents in some O. basilicum ***extracts***

Samples	Flavonoids (%)	Caffeic acid derivatives (%)	Tannins (%)	Essential oil (ml/100g)
B1	**1.61**	**2.28**	**2.33**	**0.80**
B2	1.39	2.02	2.25	0.60
B3	0.60	1.19	2.07	0.13

Flavonoidic contents

The total flavonoid contents of the three *O. basilicum* tea ethanolic extracts were spectrophotometrically analyzed using the aluminum chloride colorimetric method, and the results were presented in Figure 1.

The highest amount of flavonoids was found in the B1 extract (1.61%) and B2 (1.33%), B3 having the lowest amount of flavonoids below 1%.

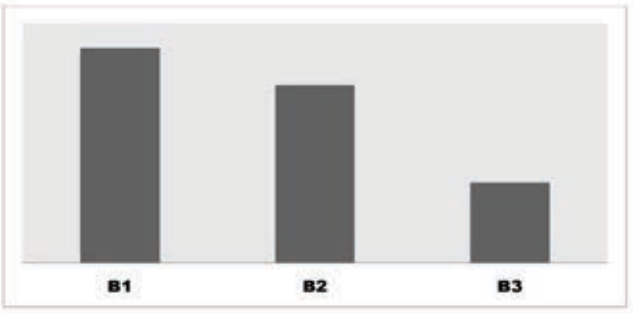

FIGURE 1. Flavonoid content in the O. basilicum ***extracts***

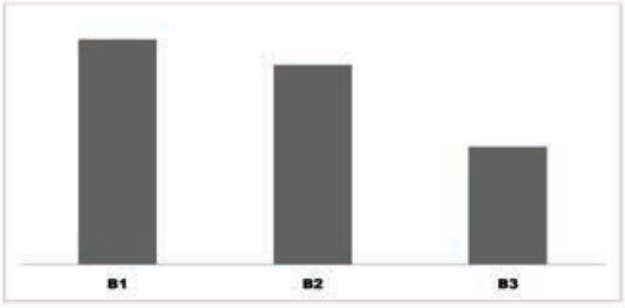

FIGURE 2. Caffeic acid derivative content in the O. basilicum ***extracts***

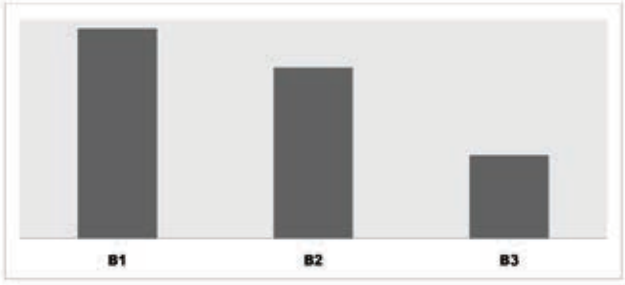

FIGURE 3. Tannins content in the O. basilicum ***extracts***

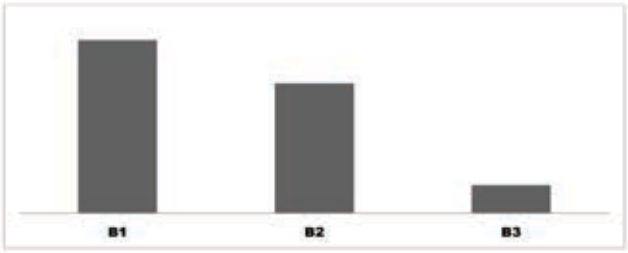

FIGURE 4. Essential oil content in O. basilicum

Caffeic acid derivatives contents

The amount of caffeic acid derivatives from the three ethanolic extracts of *O. basilicum* teas determined by spectrophotometry were shown in Figure 2. All samples of basil teas showed significant amounts of caffeic acids, *Ocimum basilicum* being a rich source of natural antioxidant polyphenols.

Tannin contents

The tannin contents of the three basil extracts were spectrophotometrically determined, and the results were shown in Figure 3. All samples of basil teas showed small amounts of tannins, between 2.07 and 2.33%. The smallest amount of tannins was identified in the B3 extract (2.07%).

Essential oil contents

Following the determinations performed, it can be seen that sample B1 is the richest in essential oil (0.80 ml/100 g), and the poorest being sample B3 (0.13 ml/100 g). In all samples of basil, small quantities, below 1%, were measured, the vegetable products being poor in essential oil (Figure 4).

Thin-layer chromatography

TLC identification of polyphenolic compounds in the *O. basilicum* ethanolic extracts were performed using the chromatographic system with silica gel as stationary phase and the corresponding mobile phase: ethyl acetate:acetic acid: formic acid: water (100:11:11:26). The spots of standards were easy to detect and compare with samples spots. Rf values were: rutin - 0.42 (yellow-orange spot), chlorogenic acid - 0.51 (blue spot), caffeic acid - 0.96 (blue spot), and isoquercitrine - 0.64 (orange spot) for corresponding mobile phase mentioned earlier. The results are presented in Figure 5 and Table 2. In our samples, along with flavonoids (rutin and isoquercitrin), phenylpropanic acids such as caffeic acid and chlorogenic acid were also detected.

TABLE 2. TLC results

Sample B1	Sample B2	Sample B3	Standards
Rf1 = 0.42 yellow-orange	Rf1= 0.42 yellow-orange	Rf1= 0.42 yellow-orange	rutin (Rf = 0.42, yellow-orange)
Rf2 = 0.51 blue	Rf2 = 0.51 blue	Rf2 = 0.51 blue	chlorogenic acid (Rf = 0.51, blue)
Rf3 = 0.64 orange	Rf3 = 0.64 orange	Rf3 = 0.64 orange	isoquercitrine (Rf = 0.64, orange)
Rf5 = 0.91 blue	Rf5 = 0.91 blue	Rf5 = 0.91 blue	caffeic acid (Rf = 0.91, blue)

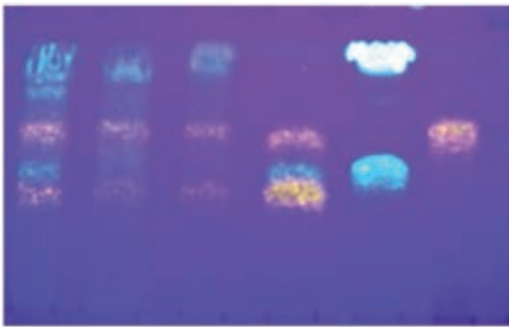

FIGURE 5. TLC plates viewed after staining with NEU/PEG reagent, under 365 nm

CONCLUSIONS

The most important active ingredients analyzed in three Ocimum basilicum medicinal teas were essential oil and polyphenolic compounds: flavonoids, phenylpropane derivatives and tannins.

Following the quantitative determinations performed by spectrophotometric and gravimetric methods, it can be seen that the three samples do not show significant differences in chemical composition. Thus, the vegetal materials correspond both from a qualitative and quantitative point of view, being able to be capitalized as phytotherapeutic remedies, but also as valuable spices.

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