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DETERMINATION OF QUANTITATIVE COMPOSITION OF POLIPHENOLIC COMPOUNDS OCCUR IN ANATOMICALLY DIFFERENT PARTS OF *Levisticum officinale* Koch

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ABSTRACT

Lovage garden (*Levisticum officinale* Koch.) is many years' - herbaceous plant numbered to raw materials curative and spice. To biologically active compounds stepping out both; in root and organ above-ground belong: essential oils, carbohydrates, glairs, phenolic acids and among them: caffeic and chlorogenic acids, coumaric acids: umbelliferone, and furanocoumarins: psoralene and bergaptene, and besides β -sitosterol and organic acids.

Object our investigations former different anatomical parts: roots, stems, leaves and also fruits lovage garden. After harvests materials were dried to dry masses. In these materials were determined content of moisture and sum free phenolic acids with two methods: Folin-Ciocaltu' and Arnov in count on coffeic acid. Besides in investigated materials were marked content of tannin. Content of sum phenolic acids appointed Arnov method was shaped on level from 0.12% for roots to 1.32% for fruits, while with Folin-Ciocaltu' method from 0.16% (roots) to 1.41% (fruits). Second group of phenolic compounds were tannins of which greatest content show stems (7.4%) instead lowest fruits (1.8%). Using method HPLC were marked composition and content of following phenolic acids: coffeic, chlorogenic, p-coumaric and m-coumaric.

Key words: *Levisticum officinale* Koch., lovage, roots, stems, leaves, poliphenolic compounds, determined methods, HPLC

INTRODUCTION

Poliphenolic compounds are important group of secondary metabolites and showing proprieties antioxidants. This group embraces beyond 8000 well-known compounds and divided is on ten different classes [3]. How it is known [2] oxidation stress appearing not controlled height reactive of forms of oxygen (RFT). RTF can be reason of many civilization diseases such as: arteriosclerosis whether some kinds of new-coined words [13]. Plant materials in this vegetables and fruits containing natural antioxidants can liquidate results of activity RFT. To this groups of relationships stepping out in vegetables and fruits belong phenolic acids, flavonoids, tannins and other biologically active compounds [2, 3].

Poliphenolic compounds numbered to natural matter antinutritional (NSN) stepping out universally in world of plants and being with inseparable components of food [12]. The content of some natural matter antinutritional shows [table 1](#).

Table 1. Content of natural matter antinutritional substances in foods of origin vegetable [12]

Food	Natural matter antinutritional substances		
	Carotenoids (µg/g)	Poliphenolic compounds (mg/g)	Phosphates inozytolu (mg/g)
Corns cereals wheat, barley, rye, buckwheat	-	0.7-1.6	4.3-12.8
Leguminous seeds pea, bean, lentils	0.35-3.00	1.1-6.3	8.0-14.3
Oleiferous seeds soya, bean, rape, flax	0.12-0.50	1.5-18.4	14.8-21.2
Garden-truck cross-shaped cabbage, cauliflower, broccoli	2.15-5.57	0.7-3.2	0.10-0.80
Other vegetables potatoes, onion, celery, beets, carrot, lettuce	11.5-154.5	0.9-2.4	0.5-0.8
Tomatoes	18.45-60.75	0.6	0.6
Citrus – Fruits lemon, grapefruity	3.33-21.17	0.5-0.6 (juices)	0.1-0.2
Other fruits	0.15-0.20	0.60-7.10	0.1

Lovage garden (*Levisticum officinale* Koch.) is many years' – herbaceous plant numbered to raw materials curative and spice. Underground organ lovage garden (*Levistici Radix*) assembled autumn are medical materials [7]. Instead spice raw materials can be both underground parts (root) and above-ground ie. herb and leaves [4]. To biologically active compounds stepping out both; in root and organ above-ground belong: essential oils, carbohydrates, glairs, phenolic acids and among them: caffeic and chlorogenic acids, coumaric acids: umbelliferone, and furanocoumarins: psoralene and bergaptene, and besides β -sitosterol and organic acids [4, 8, 9].

MATERIALS AND METHODS

Object our investigations former different anatomical parts: roots, stems, leaves and also fruits lovage garden (*Levisticum officinale* Koch.). After harvests materials were dried to dry masses. In these materials were determined content of moisture [5] and sum free phenolic acids with two methods: Folin-Ciocaltu' [14] and Arnov [7] in count on coffeic acid. Besides in investigated materials were marked content of tannin with pharmacopoeias method [6]. Isolation and cleaning of free phenolic acids group from investigated raw materials to marks chromatographic were executed peaceably with earlier described procedure [11]. Qualitative and quantitative analysis of phenolic acids stepping out in investigated extracts were determined with method HPLC [1, 10, 13]. In this of aim were used HPLC Merck firms type La-Chrom with loop dosing 20 µl, with diode crystal set DAD (Diode Array Detector L-7455) and with pump (L-7100). Analysis were made on steel - column LiChrospher RP-18 (about dimensions 250×4 mm) with full stationary phase about diameter of grain $dp = 5 \mu m$. Analysis of samples were made in room temperature. Phase moving determined solution: methanol + water (25:75 v/v) with addition 1% v/v of acetic acid. Speed of flow carried out 0.8 ml/min. Qualitative compositions were marked by comparison of retention times (tR) and their UV spectrum standards of phenolic acids, with analogous given obtained in advance of chromatographic analysis, with method HPLC for investigated extracts [1, 14].

RESULTS

Data numerical relating estimations of content of moisture, tannins and sums of free phenolic acids shows [table 2](#). To quantitative marks were used two methods of marking sums free phenolic acids, one at use of Arnov's reagent, second while at use of Folin-Ciocaltu' reagent. As results from given placed in [table 2](#), a little higher contents of free phenolic acids were received using method at use of Folin-Ciocaltu' reagent. From introduced by us of investigations results, that content of moisture in examined raw materials was shaped from 6.0% for leaf tin plates to 9.4% for fruits.

Table 2. Percentage of water content, tannins and total free phenolic acids determined by means of Folin-Ciocaltu's and Arnov's methods in raw material (in anatomically different parts of lovage)

Part of railway track	Water content (%)	Tanins (%)	Total free phenolic acids (%)	
			Methods	
			Folin-Ciocaltu s	Arnov s
Roots	7.0	6.6	0.16	0.12
Herbs	8.6	5.3	1.03	0.88
Stalks	9.3	7.4	0.39	0.30
Blades	6.0	2.7	1.23	1.11
Fruits	9.4	1.8	1.41	1.32

Content of sum phenolic acids appointed Arnov method was shaped on level from 0.12% for roots to 1.32% for fruits, while with Folin-Ciocaltu' method from 0.16% for roots to 1.41% for fruits. Second group of phenolic compounds were tannins of which greatest content show stems (7.4%) instead lowest fruits (1.8%).

Using method HPLC [1,14] were marked composition and content of following phenolic acids: coffeic, chlorogenic, p-coumaric and m-coumaric ([tab. 3](#)).

Table 3. Content of total free phenolic acids determined by means of HPLC method (in anatomically different parts of lovage)

Phenolic acids	Retention time t_R (min.)	Total free phenolic acids (mg/100g dry mas)				
		Part of railway track				
		Roots	Herbs	Stalks	Blades	Fruits
chlorogenic	9.16	0.123	1.362	0.645	2.012	2.123
caffaic	12.98	0.264	2.121	0.148	2.657	3.067
p-coumaric	24.37	0.044	0.063	0.032	0.110	0.758
m-coumaric	33.51	0.052	0.098	0.048	0.123	0.214

Table 4. Retention time of standards of phenolic acids correlation coefficients with standards (in anatomically different parts of lovage)

Phenolic acids	Retention time t_R (min.)	Corelation cooficents (%)				
		Part of plant				
		Roots	Herbs	Stalks	Blades	Fruits
chlorogenic	9.16	0.999	0.998	1.000	0.999	0.999
caffaic	12.98	0.996	0.999	0.998	0.999	1.000
p-coumaric	24.37	0.996	0.999	0.997	0.996	0.996
m-coumaric	33.51	0.999	0.996	0.995	0.991	0.997

Coefficients of correlation of spectrums identified with method DAD phenolic acids stepping out in investigated materials were shaped as follows: chlorogenic acid from 0.998 in herb to 1.000 in stems, for coffeic acid from 0.998 in stems to 1.000 in fruits, for acid p-coumaric from 0.996 in fruits to 0.999 in herb, for acid m-coumaric from 0.991 in leaf to 0.999 in roots ([tab. 4](#)).

DISCUSSION

In precincts each groups of phenolic compounds exists large differentiation in respect of; numbers and of location of phenol groups (OH) creations of methoxy groups (OCH₃) and of joining of the rests glycosydes. Proprieties, activity biological and metabolism of phenolic compounds depend from numbers, of kind and places of position chemical groups in particle [15]. Of principle influence on proprieties anthioxidation has also character hydrofobic-lipophilic, which within of poliphenolic compounds from right their different structure is very diverse. Phenolic and poliphenolic compounds can increase activity other antioxidants e.g. of solvable vitamins in rabbles and lowparts of solvable matter in water. Data these prove, that presence these of relationships in diet has very important meaning. Confirm this investigations epitemiologically, showing on inverse dependence among consumption of phenolic compounds and with morbidity on new-coined words and diseases of hearts [12]. As one introduced in table 1 rich source these of matter are vegetables, fruits, seeds different plants, some cereals and also red wine, tea especially green, coffe, juices fruit – and of many spices [10].

As results from table 2 content of sum phenolic acids is shaped on level from 1.32 to 1.41% in fruits, from 0.12 to 0.16% in roots. Instead second fraction of phenolic compounds this is of tannins steps out in considerably higher contents and carries out she for roots 6.6% while for fruits 1.8%.

Analysis HPLC did not confirm presence of acids: galic and elagic can be suggest that stepping out tans in investigated raw materials belong to tannins nonhydrolyzed that is to say i.e. catechinowych.

CONCLUSIONS

1. Content of sum of phenolic acids in investigated raw materials was shaped as follows: roots (0.12-0.16%), herb (0.88-1.03%), stems (0.30-0.39%), leaf (1.11-1.23%), fruits (1.32-1.41%). Instead content tannins carried out: roots (6.6%), herb (5.3%), stems (7.4%), leaf (2.7%), fruits (1.8%).
2. Using with method HPLC were identified and were qualified content following free phenolic acids: chlorogenic, caffeic, p-coumaric and m-coumaric.
3. Absence of acids: chlorogenic and elagic in composition free phenolic acids can suggest that stepping out tans in investigated raw materials belong to tannins katechinowych.

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