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The possibilities of the application of some species of sage (*Salvia* L.) as auxiliaries in the treatment of some diseases

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Abstract: The chemical composition of four essential oils of four species of sage (*Salvia officinalis* L., *Salvia pratensis* L., *Salvia glutinosa* L. and *Salvia aethiopis* L.) are examined by GC-FID and GC-MS analysis. The presence of some components in the essential oil (mono- and sesquiterpene) determines the pharmacological effects and therapeutical application of a plant species. *Salvia officinalis* L. gives the highest yield of oil (1.1 %), while the lowest is in *Salvia pratensis* L. (0.1 %). The investigations included the determination of the antimicrobic activities of the essential oils by the diffusion method and the oil of *Salvia pratensis* L. proved to have the highest activity.

Keywords: diseases, therapy, auxiliaries, *Salvia* L., antimicrobial activity, essential oils, extracts.

INTRODUCTION

Garden-sage (*S. officinalis*) as a highly appreciated medicinal herb has long been used in popular medicine. There are more than 900 species of *Salvia* (Lamiceae),[1] 14 of them can be found in Serbia.[2] More than 60 kinds of diseases that might be treated by this plant are mentioned in the literature. Preparations of garden-sage are used for the treatment of stomatitis, periodontosis, gingivitis, parodontal abscesses, gingival bleeding.[3] Investigations have proved that the aqueous and ethanolic extracts of garden-sage have highly inhibitory activities against the periodontopathogenic bacterium *Porphymonas gingivalis* that acts collagenolytically and cytotoxically to the gingival fibroblasts.[4] Salvin from the acetone extract of the dried flowers is effective against *Staphylococcus aureus*.[5] Due to its content of phenolic acid, garden-sage exhibits

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antibacterial effects and is used in the treatment of sore throat, laryngitis, tonsillitis and throat ulceration, while the presence of thujone exhibits antiseptic effects in infections caused by staphylococcus.[6] Linalyl acetate and terpineol have the greatest power of bacterial inhibition,[7] while alpha-bisabolol, farnesol, anethole and carvacrol have proved antifungal action.[8] Besides the above mentioned effects, the antimicrobic effects of the essential oil of garden-sage to some other microorganisms has also been proved.[9] Monoterpene isoborneol exhibits viricidal activities against the herpes simplex virus 1,[10] while safficinolide and sageone (diterpenes) also exhibit antiviral activity.[11] Its application against fever,[12] asthma, and blood circulation,[13] release of excessive mucus from the respiratory system is well known.[14] The essential oil of garden-sage has stimulative effects on the digestive system and is applied in the treatment of intestinal disturbances and dyspersia.[6] In the form of tea it is effective in diarrhoea and flatulence, kidney disturbances and in lungs and stomach haemorrhagia,[5] it stimulates the functioning of bile and the bile paths peristalsis[15] and is effective in different nerve disturbances,[13,15,16] as well as in memory and concentration improvement.[13,17] The extract of garden-sage exerts antimutagen effects[18] and can be applied for pains in joints, dislocation, typhoid fever,[14] perspiration reduction,[19] ulcerations and in the treatment of skin abrasion, germs, sea-sickness, venereal diseases, intestine worms, rheumatism.[13] *S. officinalis* shows antiinflammatory[20] and antioxidative activity.[21] Diterpene aethiopinone derived from *S. aethiopis* is responsible for its antiinflammatory, analgetic and antipyretic effects.[22]

Investigations of the biological activities of the mono- and sesquiterpenes have proved so far the following effects: anesthetic, antihistaminic, antirheumatic, diuretic, expectorant, insecticidal, purgative (monoterpenes); analgetic, antiarhythmic, antiepileptic, spasmolitic, toxical (sesquiterpenes); anthelmintic, antibiotical, antiinflammatory, antitumorous, hypotensive, irritative and sedative (mono- and sesquiterpenes).[23]

The chemical composition of the essential oil of *S. officinalis* has been the subject of many publications.[9,24–27] The content of some components varies according to the locality. Thus, 1,8-cineole was the most abundant in the oil of sage from the USA (18.0 %), camphor in the oil from Romania (26.5 %), caryophyllene in the oil from the USA (10.0 %), alpha-thujone in the oil from Italy (45.8 %), beta-thujone in the oil from Romania (23.1 %).[24]

Compared to *S. officinalis*, the oils of the other species have been less investigated. The oil of *S. pratensis* contains 53.1 % of monoterpenes (sabinene 21.0 %, borneol 7.1 % and 1,8-cineole 6.2 %).[28] With reference to the sesquiterpenes, there is γ-muurolene (8.7 %) and β-caryophyllene (8.1 %). In the oil from umbel there is 53.5 % sesquiterpenes β-caryophyllene 23.9 % and β-farnesene 10.6 %) from the other locality.[29]

There are linalool, fenolens and aldehydes,[30] as well as β-caryophyllene oxide (26.5 %) and 1,2-epoxyhumulene (9.6 %).[31]

In the oil of *S. aethiopis*, sesquiterpenes prevail (β-caryophyllene 27.5 %, germacrene D 10.9 %, caryophyllene oxide 6.4 %, α-humulene 5.3 % and β-cubebene 4.2 %).[26]

The extracts of the mentioned species are less investigated than their essential oils.[32–35] The prevailing components in the extracts of *S. officinalis* were: α-thujone (48.4 %) and camphor (14.2 %),[33] 1,8-cineole (54.4 %),[34] α-thujone (15.7–59.3 %), 1,8-cineole (10.9–43.1 %) and β-thujone (4.9–25.8 %).[35]

The chemical composition and antimicrobic effects of the essential oils of *S. officinalis* L., *S. pratensis* L., *S. glutinosa* L. and *S. aethopis* L. were investigated in this study to determine their possible medical application.

EXPERIMENTAL

Plant material: The chosen herbal species originate from various localities in the southeast of Serbia: the *S. officinalis* originates from the locality of Sićevačka Klisura gorge (the surroundings of Niš, Gradište village), *S. pratensis* from Rtanj Mt. (the surroundings of Sokobanja, Rtanj village), *S. glutinosa* from Strešer Mt. (the surrounding of Surdulica, Vučedelce village) and *S. aethiopis* from the surroundings of Pirot (Blato village). The plants, collected in the second half of May (*S. officinalis* and *S. pratensis*), at the beginning of August (*S. glutinosa*) and at the beginning of June (*S. aethiopis*) in 2001, were identified by Prof. Dr. Novica Randjelović (Faculty of Technology, University of Niš). Herbaria samples are kept in General herbarium of the Balkan Peninsula (BEO) Natural History Museum in Belgrade (Serbia and Montenegro), under the following numbers: BEO 32147 (*S. officinalis*), BEO 32148 (*S. pratensis*), BEO 32149 (*S. glutinosa*) and BEO 32150 (*S. aethiopis*). The plant material was dried for fifteen days in a dark and airy place. The essential oils were obtained by distillation of the dry ground herb (6 mm sieve) with water.[36]

Antimicrobial action: The antimicrobial action of the oils was investigated by the diffusion method with the following microorganisms: *Escherichia coli ATCC 25922*, *Salmonella enteritidis ATCC 13076*, *Pseudomonas aeruginosa ATCC 9027*, *Bacillus subtilis ATCC 6633*, *Staphylococcus aureus ATCC 6538*, *Sarcina lutea ATCC 9341*, *Candida albicans ATCC 10231*, *Saccharomyces cerevisiae ATCC 9763*, obtained from Oxoid, as well as *Aspergillus niger* from the collection of micro-organisms of the Department for Microbiological Control of "Zdravlje" Pharmaceutical and Chemical Industry, Leskovac.

The following nutritive media were used: Antibiotica-Agar Nr. 1 (Merck, Darmstadt, Germany) for bacteria, Tripton soya agar - TSA (Institute Torlak, Belgrade, Serbia and Montenegro) for *C. albicans* and *A. niger*, Sabouraud dextrose agar - SDA (Torlak) for *S. cerevisiae* and a Medium for the total bacterial count (Torlak), for the determination of the total number of microorganisms.

A microorganism suspension (0.1 mL), formed during 24 h culture on oblique agar with 10 mL 0.9 % NaCl, was introduced into 10 mL of the nutritive medium. A Petri dish (86 mm internal diameter) was filled with this system. The essential oils (10 μL) were applied by micropipette onto sterile cellulose discs, diameter 6 mm (Biolife Italiana sr1-Milano, Italy). Following a 2 h prediffusion at +4 ºC, the incubation was carried out for 24 h at 37 ºC for bacteria and 48 h at 26 ºC for fungi. The initial number of microorganisms in the suspension was determined after thermostating the medium for the total bacterial count during 24 h at 37 ºC mixed with 1 mL of diluted suspension 10^{-4}.

Identification procedure: The oil was analyzed on an analytical GC-FID and GC-MS, and most of the constituents were identified by comparison of their mass spectra to those from Wiley MS library and retention indices.[37,38]

GC-FID: A Hewlett Packard 5890 II Gas Chromatograph, equipped with a 25 m × 0.32 mm fused silica capillary column, with a 0.53 μm film thickness of HP-5 and FID was used. The operating conditions were: column temperature program 40º – 280 ºC at 4 ºC/min, an injector temperature of 250 ºC and a detector temperature of 280 ºC. The carrier gas was He (1 mL/min).

GC-MS: Analyses were performed on a Hewlett Packard, model G 1800 C, equipped with a fused silica 30 m × 0.25 mm, HP-5 capillary column, with a film thickness 0.25 μm; the carrier gas was He (1 mL/min) with the same column temperature program as for the analytical GC. Electrons at 70 eV performed the ionization. Solutions of the essential oils (0.5 %, 1 μL) were injected in the split mode (1:30).

RESULTS AND DISCUSSION

According to the yield of oil, *S. officinalis* prevails (1.1 %), then *S. aethiopis* (0.3 %) and *S. glutinosa* (0.2 %), while *S. pratensis* contains the lowest amount of oil (0.1 %). It is obvious that the yields of the oils depend upon climatic factor, so they vary from year to year. At the same time, there are some changes in chemical composition (presence or absence of some component, or the content varies).[9,27,39] The results of GC-FID and GC-MS analyses of the investigated oils are shown in Table I.

TABLE I. Percentage compositions of the oils from the herbs of *Salvia officinalis*, *Salvia pratensis*, *Salvia glutinosa* and *Salvia aethiopis*

Constituents		*S. officinalis*		*S. pratensis*		*S. glutinosa*		*S. aethiopis*	
	RI	RIexp.	%	RIexp.	%	RIexp.	%	RIexp.	%
(*Z*)-Salvene[m]	856	848	0.7						
Tricyclene[m]	927	917	0.1						
α-Thujene[m]	930	922	0.2	928	0.2				
α-Pinene[m]	939	928	3.9						
Camphene[m]	954	942	2.0						
Sabinene[m]	975	968	0.2						
1-Octen-3-ol	979			978	1.0	975	0.2		
β-Pinene[m]	979	970	7.6						
6-Methyl-5-hepten-2-one	986					984	0.1		
Myrcene[m]	991	988	0.6	988	0.4				
3-Octanol	991					992	0.5		
α-Terpinene[m]	1017	1012	0.3	1013	0.4				
p-Cymene[m]	1026	1020	0.3	1020	8.5			1021	0.5
Limonene[m]	1029	1024	0.8	1024	0.2				
β-Phellandrene[m]	1030					1022	tr.		
1,8-Cineole[m]	1031	1027	16.2	1027	0.8				
(*Z*)-β-Ocimene[m]	1037	1035	0.3			1033	1.2		
(*E*)-β-Ocimene[m]	1050	1045	0.5			1044	0.4		
γ-Terpinene[m]	1060	1055	0.1	1055	3.1			1056	0.2
Terpinolene[m]	1089	1084	0.2						
Linalool[m]	1097	1098	0.4	1098	1.9	1097	1.5	1099	0.1
n-Nonanal	1101					1101	0.5	1104	0.1
cis-Thujone[m]	1102	1102	21.5	1103	0.4				
trans-Thujone[m]	1114	1113	2.7						
Camphor[m]	1146	1140	4.0	1141	0.5				
Borneol[m]	1169	1162	3.2	1162	1.4				

TABLE I. Continued

Constituents		*S. officinalis*		*S. pratensis*		*S. glutinosa*		*S. aethiopis*	
	RI	RIexp.	%	RIexp.	%	RIexp.	%	RIexp.	%
Terpinen-4-ol[m]	1177	1174	0.4	1174	0.7				
γ-Terpineol[m]	1189	1188	0.2	1188	0.3	1188	0.1		
Thymol methyl ether[m]	1235			1232	0.4				
Carvone[m]	1243	1241	0.5	1242	0.8				
Linalyl acetate[m]	1257	1256	tr.						
(*E*)-Anethole[m]	1285	1282	0.8	1282	0.2			1283	0.1
Bornyl acetate[m]	1289	1283	tr.						
Thymol[m]	1290			1292	29.9			1292	1.3
Carvacrol[m]	1299			1300	1.8	1291	0.5	1292	0.1
δ-Elemene[s]	1338							1335	0.3
α-Cubebene[s]	1351	1346	0.2					1347	tr.
α-Ylangene[s]	1375	1367	0.2						
α-Copaene[s]	1377	1372	0.6			1372	0.8	1374	12.9
(*E*)-β-Damascenone[s]	1385			1381	0.2				
β-Bourbonene[s]	1388	1381	0.2			1381	6.2	1382	tr.
β-Cubebene[s]	1388							1388	4.8
β-Elemene[s]	1391					1388	0.5		
α-Gurjunene[s]	1410					1405	tr.	1407	0.2
(*E*)-Caryophyllene[s]	1419	1415	5.0	1416	28.1	1415	16.1	1417	11.7
β-Gurjunene[s]	1434	1425	0.3			1425	1.3	1430	0.5
γ-Elemene[s]	1437					1432	0.4		
Aromadendrene[s]	1439							1436	0.4
β-Humulene[s]	1439							1441	0.3
(*Z*)- β-Farnesene[s]	1443					1440	0.7		
α-Humulene[s]	1455	1450	11.2	1449	1.9	1450	9.7	1451	2.7
(*E*)-β-Farnesene[s]	1457			1454	1.7				
allo-Aromadendrene[s]	1460	1457	0.1			1456	0.8	1458	0.5
γ-Muurolene[s]	1480	1473	1.3	1473	0.4	1473	0.6	1474	0.8
Germacrene D[s]	1485			1477	0.8	1477	8.0	1479	18.2
Valencene[s]	1496			1491	0.8				
Bicyclogermacrene[s]	1500					1493	0.3	1495	31.3
α-Muurolene[s]	1500	1496	0.7			1496	2.4	1500	0.2
(*E*,*E*)-α-Farnesene[s]	1506					1505	0.8		
γ-Cadinene[s]	1514	1510	0.5	1510	0.5	1510	tr.		

TABLE I. Continued

Constituents		*S. officinalis*		*S. pratensis*		*S. glutinosa*		*S. aethiopis*	
	RI	RIexp.	%	RIexp.	%	RIexp.	%	RIexp.	%
δ-Cadinene[s]	1523	1519	1.5	1520	0.8	1520	1.7	1521	3.9
trans-Cadina-1;4-diene[s]	1535	1528	0.2						
(*Z*)-Nerolidol[s]	1533					1534	0.4		
α-Calacorene[s]	1546	1539	0.1			1539	0.3	1540	0.1
Germacrene B[s]	1561					1552	2.5		
(*E*)-Nerolidol[s]	1563					1560	1.0		
Spathulenol[s]	1578					1573	2.9	1574	4.2
Caryophyllene oxide[s]	1583	1577	0.3	1578	4.2	1578	17.3	1579	1.1
Viridiflorol[s]	1593	1586	6.0	1586	0.5			1587	0.4
Humulene epoxide II[s]	1608	1603	1.1	1603	0.3	1604	8.6		
epi-α-Cadinol[s]	1640			1635	0.3	1637	2.5		
T-muurolol[s]	1642							1638	1.0
α-Muurolol[s]	1646					1641	2.0	1643	0.6
Germacrone[s]	1694					1690	0.2		
(*Z*,*Z*)-Farnesol[s]	1718	1709	0.3						
n-Octadecane	1800			1850	1.9				
Isophytol[d]	1948			2108	1.2				
Manool[d]	2057	2048	2.2						
No. of recorded components			46		44		45		39
No. of identified components			44		34		34		28
% of identified constituents			99.7		96.1		92.7		98.4
Tentatively identified compounds			2		0		3		2
No. of identified monoterpenoids			25		18		5		6
% of identified monoterpenoids			67.7		51.9		3.7		2.3
No. of identified sesquiterpenoids			18		13		25		21
% of identified sesquiterpenoids			29.6		40.5		88.0		96.1
No. of identified diterpenoids			1		1		0		0
% of identified diterpenoids			2.2		1.2		0		0

RI – retention index by Kovats; RIexp. – retention index experimentally determined (medium values); tr. – traces; m – monoterpenoids; s – sesquiterpenoids; d – diterpenes

The investigated oil of *S. officinalis* contains all the characteristic components.[40] Monoterpenes form 67.7 % of the total mass. The total participation of the characteristic monoterpenic components is 51.5 %: α-pinene (3.9 %), camphene (2.0 %), limonene (0.8), 1,8-cineole (16.2 %), linalool (0.4), *cis*-thujone (21.5 %), *trans*-thujone (2.7 %), camphor (4.0 %) and bornyl acetate (tr.). The mass percent of sesquiterpenes is 29.6. α-Humulene, a characteristic component, constitutes 11.2 %. Besides the mentioned 10 components, a large amount of β-pinene (7.6 %), viridiflorol (6.0 %), (*E*)-caryophyllene (5.0 %), borneol (3.2 %) and diterpene manool (2.2 %) were found. The chemical composition of the oil of *S. officinalis* from the Sićevačka Klisura gorge is similar to the oil originating from the herb of plants from some other localities. It can be noticed that some components are present in the oil of this species, but from another locality (menthene, neomenthol, menthol, piperitone, thymol, menthyl acetate, valencene, spathulenol), while they are absent from the oil of sage originating from the Sićevačka Klisura gorge (γ-muurolene, humulene epoxide II *etc*.).[24,25]

The mostly represented components in the oil of *S. pratensis* are: thymol (29.9 %) (*E*)-caryophyllene (28.1 %), *p*-cymene (8.5 %) and caryophyllene oxide (4.2 %). The identified monoterpenes, sesquiterpenes and diterpenes contribute 51.9 %, 40.5 % and 1.2 % to the total mass respectively. There are some similarities in the chemical composition of the oil of this species from different localities ((*E*)-caryophyllene and β-farnesene). A larger content of (*E*)-caryophyllene was found in the oil from *S. pratensis* from Rtanj Mt. (28.1 %), while the content in the oil from the herb from Vojvodina was 23.9 %.[29] Considering β-farnesene, the case is reversed (1.7 % Rtanj Mt., 10.6 % Vojvodina). In comparison to the oils from the other localities (southern Italy),[28] there are some similarities in the presence of limonene, 1,8-cineole and (*E*)-caryophyllene.

The oil of *S. glutinosa* is rich in the following components: caryophyllene oxide (17.3 %), (*E*)-caryophyllene (16.1 %), α-humulene (9.7 %), humulene epoxide II (8.6 %), germacrene D (8.0 %) and β-bourbonene (6.2 %). The percentage of the identified monoterpenes is 3.7 % and sesquiterpenes 88.0 %. The chemical composition of the oil of this species is similar to other results.[30,31] Linalool, caryophyllene oxide and humulene epoxide II were identified.

Components with the greatest participation in the oil of *S. aethiopis* are: bicyclogermacrene (31.3 %), germacrene D (18.2 %), α-copaene (12.9 %), (*E*)-caryophyllene (11.7 %), β-cubebene (4.8 %), spathulenol (4.2 %) and δ-cadinene (3.9 %). Only 2.3 % of the total mass are monoterpenes and 96.1 % are sesquiterpenes. Diterpenes were not evidenced. In the oil of this species from another locality[26] (Niš, Serbia) there was 27.5 % of (*E*)-caryophyllene, which is more compared to the oil isolated from species originating from the surroundings of Pirot, but there is less germacrene D (10.9 %) in comparison to the same locality.

Linalool, (*E*)-caryophyllene, α-humulene, δ-cadinene and caryophyllene oxide were present in all the investigated essential oils. The oils of *S. officinalis* and *S.*

pratensis are rich in monoterpenes (67.7 and 51.9 %, respectively), but they contain the lowest amount of sesquiterpenes (29.6 and 40.5 %, respectively). The oils of other species are poor in monoterpenes, but rich in sesquiterpenes. The percentage of identified sesquiterpenes is the largest in the oil of *S. aethiopis* (96.1 %) and *S. glutinosa* (88.0 %).

TABLE II. The diameters of the inhibition areas (mm) caused by the effect of the essential oils

Microorganisms	CFU/0.1 mL of suspension	*Salvia officinalis*	*Salvia pratensis*	*Salvia glutinosa*	*Salvia aethiopis*
Escherichia coli ATCC 25922	25×10^7	10.2	14.8	9.2	9.1
Salmonella enteritidis ATCC 13076	15×10^7	0	10.4	0	0
Pseudomonas aeruginosa ATCC 9027	20×10^7	0	0	0	0
Bacillus subtilis ATCC 6633	75×10^6	9.6	14.8	9.4	0
Staphylococcus aureus ATCC 6538	10×10^7	10.8	14.6	8.2	0
Sarcina lutea ATCC 9341	90×10^6	0	10.8	0	0
Candida albicans ATCC 10231	10×10^6	7.5	19.0	0	0
Saccharomyces cerevisiae ATCC 9763	15×10^6	7.1	12.6	0	0
Aspergillus niger	21×10^6	7.5	18.0	7.4	7.0

Inhibition zone diameter in millimetres around of the disk (diameter = 6 mm); CFU – Number of Colony Forming Units

Based on the results of the GC-FID and GC-MS analyses of the essential oils, *i.e.*, the relations between the mono- and sesquterpenes, the application of the investigated species in medicine is possible. Diuretic, antirheumatic, antihistaminic, expectoral and other effects are to be expected due to the fact that *S. officinalis* and *S. pratensis* are rich in monoterpenes. The other species are very rich in sesquiterpenes, especially *S. aethiopis*. Due to their high concentrations, the plants might be used for preparations with antiepileptic, antiarhythmic, analgesic and spasmolytic effects.

S. lutea and *S. cerevisiae* are not pathogenic for humans.[41] Of the other investigated bacteria almost all of them cause alimentary toxoinfections. Some of them, but seldom, cause meningitis and endocarditis (*E. coli, S. enteritidis*, *P. aeruginosa*, *S. aureus*). Also, they provoke urinary infections (*E. coli*, *P. aeruginosa*), respiratory infections, pneumonia, lung abscess (*S. enteritidis*, *P. aeruginosa*, *S. aureus*), gastrointestinal infections, enteritis and colitis (*E. coli*, *S. enteritidis*, *P. aeruginosa*, *S. aureus*), osteomyelitis (*S. enteritidis*, *S. aureus*), skin and wound infections, illness of the intermedius ear, change on the cornea of the eye (*P. aeruginosa*, *S. aureus*) and stubborn intrahospital infections (*P. aeruginosa*). *C. albicans* provokes skin and mucous membrane infections, but it is also able to provoke generalized changes in the body. *A. niger* causes aspergilosis which is mostly expressed by changes on the lungs and brain.

The results of the effects of the essential oils on the microbic bateria are given in Table II. *S. enteritidis*, *P. aeruginosa* and *S. lutea* bacteria showed resistance to the oil of *S. officinalis*. The least resistant were *S. aureus* and *B. subtilis*. The activity to *S. cerevisiae* is lower than to *C. albicans* and *A. niger*. The obtained results are compatible with previous ones.[9] The oil of *S. pratensis* has the greatest influence on the microorganisms (on *A. niger* the most, then follow *B. subtilis*, *E. coli* and *S. aureus*). The oil of *S. glutinosa* has an effect on *B. subtilis*, *E. coli*, *S. aureus* and *A. niger*. The microbic baterium is generally resistant to the oil of *S. aethiopis*, except for *E. coli* and *A. niger*. Based on the investigated analysis, there is a possibility for application of some species of sage and their essential oils in the treatment of some diseases.

CONCLUSIONS

The application of the investigated species of sage and their essential oils in the treatment of some diseases is possible, which is based on the results of GC-FID and GC-MS analyses of essential oils. *S. officinalis* and *S. pratensis* are rich in monoterpenes, but the other two species are very rich in sesquiterpenes, especially *S. aethiopis*. There are possibilities for application in the treatment of some diseases, such as: alimentary toxoinfection, urinary, gastrointestinal and respiratory infection, osteomyelitis, stubborn intrahospital infection, *etc.*. The diuretic, antirheumatic, antihistaminic, expectoral, antiepileptic, antiarhythmic, analgesic, spasmolytic and other effects might be expected.

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ИЗВОД

МОГУЋНОСТ ПРИМЕНЕ НЕКИХ ВРСТА ЖАЛФИЈА (*Salvia* L.) КАО ПОМОЋНИХ ЛЕКОВИТИХ СРЕДСТАВА У ТЕРАПИЈИ ПОЈЕДИНИХ ОБОЉЕЊА

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У овом раду је испитан хемијски састав етарских уља четири врсте жалфија (*Salvia officinalis* L., *Salvia pratensis* L., *Salvia glutinosa* L. и *Salvia aethiopis* L.). Присуство појединих компонената у етарском уљу, односно однос моно- и сесквитерпена, одређује фармаколошко деловање и терапијску примену биљних врста. По приносу уља истиче се *S. officinalis* L. (1,1 %), док *S. pratensis* L. има најмање уља (0,1 %). Испитивања су обухватила и одређивање антимикробне активности етарских уља дифузионом методом, при чему је највећу активност показало уље врсте *S. pratensis* L. На основу резултата GC-FID и GC-MS анализе етарских уља, односно односа моно- и сесквитерпена, могућа је примена испитиваних врста у медицини.

Како *S. officinalis* и *S. pratensis* обилују монотерпенима, могуће је очекивати диуретичко, антиреуматичко, антихистаминско, експекторантно и друга деловања. Друге две врсте су веома богате сесквитерпенима, а посебно *S. aethiopis*. Због њиховог великог садржаја могућа је употреба за препарате са антиепилептичким, антиаритмичким, аналгетичким, спазмолитичким деловањем.

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