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LIPOPHILIC COMPONENTS OF SATUREJA AMANI

Annotation. ***Satureja***isan annual herbaceous plant of *LamiaceaeLindle* family. *Satureja* has been known since ancient times. In Greece and in the Roman Empire peopleused it inmedicine andas a spice.

LamiaceaeLindle family consists of 200 sorts and 3500 species and occupies the 13th place by the variety of species and the 3rd place by distribution on the Earth. The wide distribution and availability of biologically active agents creates great opportunities for using the types of this family in world medical practice [1-3].

Previously we have investigated amino-, acid-fatty and vitamin of three types of *Satureja* plant: *S. amani, S. montana* and *S. illiryca* [4].

The aim of this study is the determination of lipophilic constituents of *Satureja* plants growingin Kazakhstan.

The object of our research is the aerial part of genus*Satureja*plant. This plant was prepared during blossoming at the Institute of a Phytointroduction and Botany of the Ministry of science and education of the Republic of Kazakhstan.

The volatile oil constitutes were extracted fromaerial part of a *Saturejaamani*plant by water steamdistillation. They were analyzed by GC-MS method. Eighty three compounds were separated. The major volatile oils of *S. amani*are Hexacosane (16.52%), Tricosane (13.12%), Heneicosane, 11-decyl- (7.94%), gamma.-Sitosterol (5.69%), Dotriacontane, 2-methyl-(3.58%), Hentriacontane (2.90%) Triacontane (E)- (1.73%),Octacosane (1.32%).

Key words: *Saturejaamani the Lamiaceae*; Volatile oils; GC-MS**.**

Materials and Methods

Plant material: *S. amani* was collected in Almaty botanical garden, in July 2014. The oils were isolated bywater-distillation for 4 hrs and then dried over anhydroussodium sulphate.

GC-MS analysis: the aerial part of *S. amani*was analyzed by Electron Impact Ionization(EI) on Perkin-ElemerAutosystemXL–TurboMass (Gas Chromatograph coupled toMass Spectrometer) fused silica capillary column(30m x 2.5mm; 0.25 μm film thickness), coatedwith PE-5 ms was utilized. The gas carrier washelium (99.999%). The column temperature wasprogrammed from 60°C (held for 5min), at 2°C/minto180°C, at 3.5°C /min to 290°C.

The latter temperature was maintained for 40min(the parameters of obtaining were the following: full scan; scan range 40-350 amu). The injector temperature was 310°C. Injection:with a 0.1ul: detector ion source (EI-70eV).Samples were injected by splitting with the split ratio1:60.

Identification of the compounds: Identificationof compounds was done by comparing the NISTand Wiley library data of the peaks and mass spectraof the peaks with those reported in literature.Percentage composition was computed from GCpeak areas on PE-5 ms column without applyingcorrection factors [5-6].

Results and discussion

Volatile oils from the aerial parts of *S. amani*were analyzed by GC-MS. Eighty three compounds were separated. Their relative contents weredetermined by area normalization. Obtained dataare presented

in Table 1. It reports the composition of the volatiles of theaerial parts of *S. amani*.Eighty three componentshave been identified in the volatiles of *S. amani*. The major constituents areHexacosane (16.52%), Tricosane(13.12%), Heneicosane, 11-decyl- (7.94%), gamma.-Sitosterol(5.69%), Dotriacontane, 2-methyl-(3.58%), Hentriacontane (2.90%) Triacontane (E)- (1.73%),Octacosane(1.32%). According to the report,Hexacosane (16.52%), Tricosane (13.12%), Heneicosane, 11-decyl- (7.94%) show antioxidant effects and antiseptic is present in many extracted oils of various plant species, act as an antihypernociception and anti-inflammatory [7]. The major volatile constituent Benzene, 1,3,5-tris(2,2-dimethylpropyl)-2-iodo-4-methyl-(0.67%) showed antimicrobial and antibacterial activates [8, 9]. Delta.-Terpineol, acetate (0.11%) and essential oils containing this terpenoid compound are widely used as a fragrance in cosmetics, as a scent in household products, and as a flavoring additive in food and alcoholic beverages [10]. The hexane extract of *Saturejaamani*which contains mainly hexacosane and heneicosane and extract has exhibit the potent antibacterial activity over a board spectrum against 25 phytopathogenic bacterial strains [11]. The chemical composition:nonadecane, heneicosane, hepatadecane, hexadecanoic acid, octadecanoic acid, and it shows antimicrobial activity against 13 bacteria and 8 fungal strains and it also has cytotoxic effect against two tumoral human cell lines HeLa and MCF-7 [12].The pheromone heneicosane (C21) has been proved to be effective in attracting the female Aedes Egypt to lay eggs in the treated water and the growth of the larva is controlled by insect growth regulator diflubenzuron [13]. The benzene extract contains terpenoids (beta-sitosterol, alpha-amyrin, lupeol, hexacosanoic acid, ceryl alcohol and hexacosane) and bioactivities against selected pathogenic bacteria such as Escherichia coli, Staphylococcus aureus, Aspergillusflavus and Penicilliumchrysogenum [14]. The isolated compound hexacosane was more active against E. coli and hexacosanoic acid had greater activity against A. flavus [15]. Previous report stated that the compounds such as Octadecane and Heptadecane were found in both algae and plant species showing potent antioxidant, anticancer and antimicrobial activity [16-17]. In present study, Octadecane and heptadecane were identified in ethanol, hexane, chloroform and dichloromethane extract of *Saturejaamani*. The methanol and acetone extract of *Saturejaamani* identified the hexadecane, heptadecane, eicosane, octadecane, phenol and pentadecane by GC-MS and these compounds show antibacterial activity against Staphylococcus aureus and Salmonella typhimurium[18]. The ethyl acetate extract shows potent antimicrobial activity against gram positive, gram negative, yeast and fungi and GC-MS analysis of ethyl extract reveals that heptadecane, octadecane, hexadeconic acid, tetracosane [19].Propanamide, 3-bromo-N-(4-bromo-2-chlorophenyl)-has good anti-inflammatory activity in rats [20].

Table 1 – The volatile constituents of aerial parts of *S. amani*.

PeakNo.	Constituents	t_R(min)	MolecularFormula	MW	Content (%)
1	4,7-Methano-1H-indene, octahydro-	6.020	$C_{10}H_{16}$	136	0.10
2	1-(4-Hydroxymethylphenyl)ethanone	6.876	$C_9H_{10}O$	134	0.10
3	Pentasiloxane, dodecamethyl-	10.922	$C_{10}H_{30}O_5Si_5$	370	0.07
4	delta.-Terpineol, acetate	12.570	$C_{12}H_{20}O_2$	196	0.11
5	Cyclopentasiloxane, decamethyl-	14.614	$C_{10}H_{30}O_5Si_5$	370	0.08
6	Neophytadiene	18.093	$C_{20}H_{38}$	278	1.04
7	2-Pentadecanone, 6,10,14-trimethyl-	18.200	$C_{18}H_{36}O$	268	0.19
8	Neophytadiene	18.596	$C_{20}H_{38}$	278	0.33
9	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	18.949	$C_{20}H_{40}O$	296	0.67
10	2-Piperidinone, N-[4-bromo-n-butyl]-	19.720	$C_9H_{16}BrNO$	154	0.13
11	Hexadecanoicacid, methylester	19.795	$C_{17}H_{34}O_2$	270	0.14
12	n-Hexadecanoicacid	20.490	$C_{16}H_{32}O_2$	256	0.17

13	PalmiticAcid, TMS derivative	22.139	$C_{19}H_{40}O_2Si$	328	0.70
14	9,12-Octadecadienoic acid (Z,Z)-, methyl ester	22.963	$C_{19}H_{34}O_2$	294	0.31
15	10-Octadecenoic acid, methylester	23.081	$C_{19}H_{36}O_2$	296	1.53
16	8-Oxabicyclo[5.1.0]octane	23.327	$C_7H_{12}O$	112	0.19
17	2,3,4,4a,8,8a-Hexahydro-pyrano[3,2-b]pyran	23.830	$C_{18}H_{12}O_2$	140	0.37
18	2-Piperidinone, N-[4-bromo-n-butyl]-	24.494	$C_9H_{16}BrNO$	154	0.15
19	Hexanedioic acid, bis(2-methylpropyl) ester	24.718	$C_{14}H_{26}O_4$	258	0.16
20	9,12-Octadecadienoic acid (Z,Z)-, TMS derivative	25.093	$C_{21}H_{40}O_2Si$	352	0.14
21	n-Hexanoic acid, dimethyl(chloromethyl)silyl ester	25.200	$C_{10}H_{21}ClO_2Si$	236	0.46
22	2-Butenedioic acid (E)-, bis(2-ethylhexyl) ester	25.371	$C_{20}H_{36}O_4$	340	0.18
23	Stearicacid, TMS derivative	25.628	$C_{21}H_{44}O_2Si$	356	0.15
24	2-Methyltetracosane	26.527	$C_{25}H_{52}$	352	0.19
25	4,8,12,16-Tetramethylheptadecan-4-olide	27.426	$C_{21}H_{40}O_2$	324	0.31
26	Hexadecane	28.154	$C_{16}H_{34}$	226	0.28
27	(S)(+)-Z-13-Methyl-11-pentadecen-1-ol acetate	28.625	$C_{18}H_{34}O_2$	282	0.27
28	Hentriacontane	29.738	$C_{31}H_{64}$	436	0.92
29	3-Cyclohexylthiolane,S,S-dioxide	29.813	$C_{10}H_{18}O_2S$	202	0.14
30	Octadecylpropylether	30.252	$C_{21}H_{44}O$	312	0.26
31	Bis(2-ethylhexyl) phthalate	30.487	$C_{24}H_{38}O_4$	390	0.70
32	1,3-Dithiane, 2-butyl-2-[2-(1,3-dithian-2-yl)phenyl]-	30.851	$C_{18}H_{26}S_4$	370	0.14
33	Tetratetracontane	31.247	$C_{44}H_{90}$	619	0.40
34	Cyclopentadecanone, 2-hydroxy-	31.740	$C_{15}H_{28}O_2$	240	0.11
35	Tetracosane	32.168	$C_{24}H_{50}$	338	0.61
36	Hexacosylpropylether	32.360	$C_{29}H_{60}O$	424	0.13
37	Heptacosane	32.714	$C_{27}H_{56}$	380	3.40
38	Cyclononasiloxane, octadecamethyl-	32.949	$C_{18}H_{54}O_9Si_9$	667	0.18
39	1-Chloroeicosane	33.602	$C_{20}H_{41}Cl$	316	0.13
40	Hexacosane, 13-dodecyl-	33.752	$C_{38}H_{78}$	535	0.70
41	Octacosane	34.116	$C_{28}H_{58}$	394	1.01
42	Heptadecanal	34.640	$C_{17}H_{34}O$	254	0.17
43	Hexacosane	34.983	$C_{26}H_{54}$	366	1.93
44	Octacosyltrifluoroacetate	35.175	$C_{30}H_{57}F_3O_2$	506	0.41
45	Tricosane	35.518	$C_{23}H_{48}$	324	13.12
46	Octadecanoicacid, ethenylester	35.925	$C_{20}H_{40}O_2$	312	0.11
47	Butyldotriacontylether	36.128	$C_{36}H_{74}O$	522	0.27
48	Heptacosane	36.321	$C_{27}H_{56}$	380	0.45
49	Nonacosane, 3-methyl-	36.471	$C_{30}H_{62}$	422	1.21
50	Cyclononasiloxane, octadecamethyl-	36.727	$C_{18}H_{54}O_9Si_9$	667	0.21
51	Triacontane	36.802	$C_{30}H_{62}$	422	1.73
52	Isolongifolan-8-ol	37.337	$C_{15}H_{26}O$	222	0.23

53	Hentriacontane	37.616	$C_{31}H_{64}$	436	2.90
54	1H-1,2,3,4-Tetrazole-1-propanamide,N-(5-chloro-2-methoxyphenyl)-	37.830	$C_{11}H_{12}ClN_5O_2$	281.5	0.84
55	Hexacosane	38.119	$C_{26}H_{54}$	366	16.52
56	Cyclononasiloxane, octadecamethyl-	38.440	$C_{18}H_{54}O_9Si_9$	667	0.93
57	2,4-Pentanedione, 3,3-di-2-butenyl-	38.643	$C_{13}H_{20}O_2$	208	0.85
58	Octadecane	38.868	$C_{18}H_{38}$	254	0.72
59	Octacosane	39.018	$C_{28}H_{58}$	394	1.32
60	Heneicosane	39.328	$C_{21}H_{44}$	296	1.81
61	Succinic acid, 2,4,6-trichlorophenyl 2-methoxyphenyl ester	39.874	$C_{17}H_{13}Cl_3O_5$	403	0.45
62	Dotriacontane, 2-methyl-	40.088	$C_{33}H_{68}$	464	3.58
63	Octadecane	40.227	$C_{18}H_{38}$	254	0.71
64	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	40.409	$C_{16}H_{48}O_7Si_8$	577	0.50
65	Heneicosane, 11-decyl-	40.559	$C_{31}H_{64}$	436	7.94
66	gamma.-Sitosterol	40.966	$C_{29}H_{50}O$	414	4.11
67	gamma.-Sitosterol	41.052	$C_{29}H_{50}O$	414	5.69
68	gamma.-Sitosterol	41.373	$C_{29}H_{50}O$	414	2.22
69	Tritriacontane, 3-methyl-	41.533	$C_{34}H_{70}$	478	2.10
70	Hexasiloxane, tetradecamethyl-	41.790	$C_{14}H_{42}O_5Si_6$	458	1.73
71	Eicosane	41.897	$C_{20}H_{42}$	282	1.33
72	Eicosane	42.860	$C_{20}H_{42}$	282	1.34
73	Propanamide, 3-bromo-N-(4-bromo-2-chlorophenyl)-	43.353	$C_9H_8Br_2ClNO$	341,5	0.32
74	Eicosane	43.460	$C_{20}H_{42}$	282	0.65
75	Cyclononasiloxane, octadecamethyl-	43.856	$C_{18}H_{54}O_9Si_9$	667	0.86
76	Cyclopropanecarboxamide, 2-cyclopropyl-2-methyl-N-(1-cyclopropylethyl)-	44.530	$C_{13}H_{21}NO$	207	0.71
77	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	44.830	$C_{16}H_{48}O_7Si_8$	577	0.19
78	Cyclononasiloxane, octadecamethyl-	45.333	$C_{18}H_{54}O_9Si_9$	667	0.26
79	Benzene, 1,3,5-tris(2,2-dimethylpropyl)-2-iodo-4-methyl-	45.750	$C_{22}H_{36}INO_2$	473	0.67
80	Cyclononasiloxane, octadecamethyl-	46.446	$C_{18}H_{54}O_9Si_9$	667	0.63
81	N-Methyl-1-adamantaneacetamide	47.516	$C_{13}H_{21}NO$	207	0.17
82	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	49.250	$C_{16}H_{48}O_7Si_8$	577	0.18
83	Hexasiloxane, tetradecamethyl-	49.732	$C_{14}H_{42}O_5Si_6$	458	0.59

Conclusion

The volatile oils constitutes were extracted fromthe aerial part of a *Saturejaaamani*plantby water steamdistillation. They were analyzed by GC-MS method.Eighty three compounds were separated. Their relativecontents were determined by area normalization inwhich 83 volatiles were identified. Active principlesof the Kazakh traditional plant medicine,that are responsible for the activity, were determined.The major volatile constituents are Hexacosane (16.52%), Tricosane (13.12%) and

Heneicosane, 11-decyl- (7.94%). They haveantihypernociception,anti-inflammatory, antimicrobial, antibacterialand analgesic activities respectively.

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SATUREJA AMANI ӨСІМДІГІНІҢ ЛИПОФИЛЬДІ ҚҰРАМДАРЫ

Аннтоция.*Satureja–Lamiaceae Lindle*отбасының біржылдық шөптесін өсімдігі. *Satureja* өсімдігі ерте заманнан бері белгілі. Грекияда және Римдік империяда бұл өсімдікті медицинада және дәмдеуіштер ретінде қолданған.

*Lamiaceae Lindle*отбасысы 200 түрден және 3500 ұқсас түрлері бойынша 13-ші орын, ал Жерге таралуы бойынша 3-ші орын алады. Кең таралуы және биологиялық агенттердің болуы осы типтегі өсімдік отбасы-

сын әлемдік медициналық тәжірибеде пайдалануға тамаша мүмкіндік береді [1-3].

Біз *Satureja* өсімдігінің үш түрінен: *S. amani, S. montana* және*S. illiryca* амин, май қышқылдарын және витаминдерді зерттедік.

Бұл зерттеу жұмысының мақсаты: Қазақстанда өсетін липофильдік құрамды құрайтын *Satureja* өсімдігін анықтау.

Зерттеу жұмысының объектісі ретінде *Satureja* өсімдігі тектес *S.amani*түрінің жерүсті бөлігі алынады. Бұл өсімдік түрі Қазақстан Республикасының Ғылым және білім министрлігінің фитоинтродукция және ботаника институтында гүлдеу кезеңінде жиналған.

*Satureja amani*өсімдігінің жерүсті бөлігінен сулы бу дистилляциясы арқылы липофильдік компоненттер бөлінді. Бұл компоненттер ГХ-МС әдісі бойынша талданды. Нәтижесінде 83 компонент анықталды. *S.amani*өсімдігінің құрамындағы ең басты эфир майлары болыпHexacosane (16.52%), Tricosane (13.12%), Heneicosane, 11-decyl- (7.94%), gamma.-Sitosterol (5.69%), Dotriacontane, 2-methyl-(3.58%), Hentriacontane (2.90%) Triacontane (E)- (1.73%),Octacosane (1.32%) табылады.

Түйін сөздер:*Satureja amani, Lamiaceae,* Эфир майлары, ГХ-МС.

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ЛИПОФИЛЬНЫЕ КОМПОНЕНТЫ SATUREJA AMANI

Аннотация. *Satureja* - однолетнее травянистое растение семьи *LamiaceaeLindle. Satureja* – был известен с древних времен. В Греции и в Римской империи использовали его в медицине и в качестве специи.

Семейство *LamiaceaeLindle* состоит из 200 видов и 3500 разновидностей и занимает 13-е место множеством разновидностей и 3-е место - распределением на Земле. Широкое распределение и наличие биологически действующих агентов создают прекрасные возможности для использования типов этой семьи в мировой медицинской практике [1-3].

Ранее нами были исследованыамино-, жирные кислоты и витамины в трех видов растения *Satureja: S. amani, S. montana* и *S. illiryca* [4].

Целью данного исследования является определение липофильно составляющегорастения *Satureja,* растущего в Казахстане.

Объектом нашего исследования является надземная часть растения рода *Satureja* и ее вид *S.amani*. Данный вид растений был заготовлен в период цветения винституте фитоинтродукции и ботаники при Министерстве науки и образования Республики Казахстан.

Липофильные компоненты были извлечены из надземной части растений*Saturejaamani* водно-паровой дистилляцией. Они были проанализированы методом ГХ-МС. В результате определено восемьдесят три компонента. Основными эфирными маслами в растении *S.amani* являются Hexacosane (16.52%), Tricosane (13.12%), Heneicosane, 11-decyl- (7.94%), gamma.-Sitosterol (5.69%), Dotriacontane, 2-methyl-(3.58%), Hentriacontane (2.90%) Triacontane (E)- (1.73%),Octacosane (1.32%).

Ключевые слова: *Saturejaamani,Lamiaceae*; эфирные масла; ГХ-МС.