

Antibacterial Activity of the Essential Oils from *Semenovia tragioides* (Boiss.) Manden.

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Abstract

Introduction:

Plants of the family Apiaceae are widely used in Iranian's folk medicine, but no medicinal use of *Semenovia tragioides*, which is a rare plant, has been reported.

Methods and Results:

The essential oil from aerial parts of *Semenovia tragioides* (Boiss.) Manden. (Umbelliferae) consisting mainly *p*-cymene (18.5 %) Z- β - ocimene (7.7%), cinnamyl isovalerate (7.4%), and γ -terpinene (5.5%) was screened for antibacterial activity against six bacterial strains.

Conclusion:

The essential oil remarkably inhibited the growth of all tested bacteria (two Gram-positive and four Gram-negative). The maximum activity was against *Staphylococcus aureus*.

Keywords: *Semenovia tragioides*, essential oil composition, *p*-cymene, cinnamyl isovalerate, antibacterial activity.

1. Introduction

Semenovia tragioides (syn. *Platytaenia tragioides*; *Zozimia tragioides*) (1) is the herb from Apiaceae. *Semenovia* has 5 endemic species in Iran. This genus was called *Zozimia*, previously.

Plants of the family Apiaceae are widely used in Iranian's folk medicine, but no medicinal use of *Semenovia tragioides*, which is a rare plant, has been reported (2). Previously, some researches were worked on this (3-4) and other species of the genus.

The main components comprising 61.9% of the oil were lavandulyl acetate (25.5%), geranyl acetate (12.5%), *trans*- β -ocimene (8.8%), *p*-cymene (7.7%), and γ -terpinene (7.4%) (4).

In 1978, the essential oil of *Platytaenia lasiocarpa*, from Pakistan, was analyzed by GLC and also isolongifolene (17.9), β -elemene (14.3), and octyl acetate (13.8) were reported as major components (5). Rustaiyan et al. analyzed *Semenovia suffruticosa* oil and identified linalool (11.5%), lavandulyl acetate (11.5%), and (E)- β -ocimene (8.6%) as main components (6). The major constituents of the oil of *Z. absinthifolia* appeared to be germacrene D (20.7 %),

β -caryophyllene (14.6 %), and octyl acetate (12.2 %) (7). Caryophyllene oxide (25.5%) and β -pinene (10.9%) were the main components in the oil of *S. dichotoma* (8). In 2012, Neryl acetate (16.2 %), spathulenol (14.5 %), and citronellol (13.8 %) were reported as the major components in the oil of *S. frigida* (9).

In a continuation of our studies on the composition of oils from plants species to Iran (10-12), we have analyzed the oil of *S. tragioides*.

2. Materials and Methods

Semenovia tragioides (Boiss.) Manden. (Umbelliferae) (1), aerial parts were collected from Anjirak region in the southeast of Iran in June 2001.

The plant was identified by V. A. Mozaffarian, from the Herbarium of Research Institute of Forests and Rangelands (TARI) where voucher specimen were presented.

The dried aerial parts of the plant after grinding were subjected to a Clevenger-type hydrodistillation apparatus for 5 h. and analyzed with GC and GC-MS.

GC: GC analysis was performed using a Packard 439 chromatograph equipped with a CP Sil %CB column (25 m x 0.25 mm i.d., film thickness 0.39 μ m), column temperature 60-220°C at 5°C/min; injection mode, split, split ratio 1:50; volume injected, approximately 0.1 μ L of neat oil; carrier gas, N₂ (0.8 mL/min).

GC/MS: GC/MS Varian 3700 chromatograph with a CP Sil %CB column (25 m x 0.25 mm i.d., film thickness 0.39 μ m), combined with Varian MAT 44S, ionization energy 70 eV. The operation conditions were as above and He was carrier gas.

The identification of the compounds was carried out by comparison of their mass spectra with those of known compounds together with the relative retention indices (13).

Antibacterial activity from essential oil was carried out by agar disc diffusion method. Used microorganisms are listed in Table 1 (cultures obtained from Department of Pathobiology, Faculty of Health, Tehran University of Medical Sciences, Tehran, Iran).

Table 1. Antibacterial activity of the essential oil of *S. tragioides* aerial parts.

Microorganisms	Inhibition zone(mm) ^a		
	Essential oil ^b	GM ^c	AMP ^c
<i>Staphylococcus aureus</i> PTCC 1337 ^d	20.1	-	15
<i>Staphylococcus epidermidis</i> PTCC 1114 ^d	21.7	-	19
<i>Escherichia coli</i> PTCC 1338 ^d	17.6	23	0
<i>Klebsiella pneumoniae</i> PTCC 1037 ^d	14.6	20	0
<i>Pseudomonas aeruginosa</i>	12.5	-	-
<i>Shigella dysenteriae</i>	17.0	-	-
<i>Morganella spp.</i>	18.0	-	-

^a mean value of three independent experiments

^b tested at a concentration of 20 μ l/disc.

^c Gentamycin disc (GM, 10 μ g), Ampicillin disc (AMP, 10 μ g).

^d Presian Type Culture Collection.

3. Results

Micelles Yield of the essential oil was 0.6%. 21 components were identified in the oil. The major

components were *p*-cymene (18.5 %), *Z*- β -ocimene (7.7%), cinnamyl isoavalerate (7.4%), γ -terpinene (5.5%), *E*- β -ocimene (5.2%), and methyl eugenol (4.0%) (Table 2).

Table 2. Composition of the essential oil of *Semenovia tragioides* (Boiss.) Manden.

Compound	K.I.	%	Compound	K.I.	%
α -Thujene	927	Trace	Isoamyl 2-methyl butanoate	1092	1.2
α -Pinene	937	1.8	<i>p</i> -Cymen 8-ol	1170	0.3
Sabinene	968	0.9	Terpinen-4-ol	1175	0.3
β -Pinene	976	1.4	Hexyl isoavalerate	1224	3.0
Propyl valerate	983	0.5	Thymol	1265	2.3
ρ-Cymene	1020	18.5	Methyl eugenol	1372	4.0
Cis- β -Ocimene	1030	7.7	Bornyl propionate	1440	1.0
Trans- β -Ocimene	1038	5.2	Cis-Nerolidol	1549	0.3
γ -Terpinene	1057	5.5	Trans-Nerolidol	1560	0.5
Terpinolene	1087	3.4	Cinnamyl isoavalerate	1666	7.4
Linalool	1090	0.3			

4. Discussion and Conclusion

The essential oil of *S. tragioides* aerial parts showed high activity against all tested bacteria, especially Gram-positive bacteria and also *S. epidermidis* appeared to be the most sensitive bacterium. The observed antibacterial properties show that the oil has a good potential for use in aromatherapy. The main component of our *S. tragioides* oil was *p*-cymene (18.5 %) but in *Platytaenia lasiocarpa* was isolongifolene (17.9), in *Semenovia suffruticosa* were identified linalool (11.5%) and lavandulyl acetate (11.5%), in *Z. absinthifolia* was germacrene D (20.7 %), in *S. dichotoma* was

caryophyllene oxide (25.5%), and in *S. frigida* was neryl acetate (16.2 %). Major components identified in the oil were monoterpenes (mainly ρ -cymene (18.5%)) and esters (such as cinnamyl isoavalerate (7.4%)). ρ -Cymene was reported as major components in some essential oil such as *Bunium persicum* (14), *Satureja mutica* (15), and *Trachyspermum ammi* (16).

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