

Chemical composition of the essential oil of *Satureja calamintha* subsp. *Nepeta* of west Algerian

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Abstract

Satureja calamintha spp. *nepeta* (Lamiaceae) commonly called nabta is used in traditional Algerian medicine and as condiments. The aim of this study was to determine the chemical constituents of nepeta essential oil growing wild in west Algerian. The chemical composition of essential oil analyzed using a Gas Chromatography/ Mass Spectrometry (GC-MS) technique. The yield obtained of essential oil is 1,3%. The essential oil of *Satureja calamintha* spp. *nepeta* characterized by the presence of pulegone (73, 54%) and isomenthone (7, 89%) as major compounds.

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1. Introduction

Essential oils are complex mixture of biologically active substances used since a long time as flavoring agents and constituents of number of commercial products. Currently, their importance is more highlighted due to their increasing demand for food, cosmetics and pharmaceutical industries. Recent scientific literature revealed the antimicrobial, antifungal and antioxidant potential of essential oils. In view of the multiple applications of essential oils, their characterization based on their chemical profiles, is of great importance [1]. Lamiaceae (syn. Labiatae) herb family consists of more than 252 genus and 7000 species. Lamiaceae family is known for the wealth of species with medicinal properties, which have used since early times and many of these species are common in Mediterranean region [1]. The Lamiaceae plants are generally aromatic in all parts including a number of widely used culinary herbs, such genus *Satureja*. *Satureja* species are low shrubs, suffruticose herbs or annuals. Many members of the genus have aromatic and medicinal characteristics. The aerial parts of these species have distinctive tastes and can be used to season stuffing, meat pies, and sausages [2]. These species are widely used as herbal tea and spices in Algeria due to the pleasant aroma. *Satureja calamintha* subsp. *nepeta* (L.) Briq. (Lamiaceae) (syn. *Calamintha nepeta*) , is known in the Algerian language by the vernacular name “Meuta” or “Nebta”. It is a perennial, pubescent, aromatic plant, 40-80 cm high, with green-greyish leaves and white stalked purplish flowers. It grows widely in central Europe and Iran. In Algeria, the genus *Satureja* is present with four subgenus among them the subgenus *calamintha*, which comprises five species and three subspecies [3, 4]. Our purpose is to study chemical composition of *Satureja calamintha* subsp. *nepeta* essential oil obtained through hydro-distillation.

2. Materials and Methods

2.1. Plant material and essential oil extraction

Aerial part of the studied specie (*Satureja calamintha* spp. *nepeta*) was collecting in February 2017 from natural populations in Zmaacha (Bouhanifia region in the western of Algeria). The essential oil was isolated from plant material (100 g) by hydro distillation, for 4 h, using a Clevenger –type apparatus.

2.2. Essential oil analysis

The composition of essential oil of *Satureja calamintha* subsp. *nepeta* (L) Briq were analyzed by GC/MS, using a Hewlett Packard (HP) chromatograph (Agilent Technologies) 5973 coupled to a 6890 plus mass spectrometer, equipped with fused silica capillary column HP-5MS (30m; 0.25mm I.D.; film thickness of 0.25µm). The oven temperature was programmed from 60°C for 8 min, to 280°C at the rate of 2°C/min, isotherm for 10 min. The carrier gas was helium (N 6) with a flow rate of 0.5 ml/min. The mass detector conditions were as follow: Scan TIC (from 30 to 550), Interface temperature: 270°C, Ionization type: electronic impact, Intensity of the filament: 70ev, Type of mass analyzer: Quadrupole, Source temperature: 230°C

3. Results and Discussion

3.1. Yield and chemical composition of essential oil

The oil yield recorded in the present study was 1.3%. Comparable yields are obtained in samples *Satureja calamintha* of different region in Algeria and Morocco [4-6]. The essential oil from the aerial part of *Satureja calamintha* spp. *nepeta*, from Bouhanifia, was obtained by hydro distillation and analyzed by GC/Ms (Figure 1). Essential oil components are listed in table 1 in order of their elution. 31 compounds were identified, representing 90.2 % of the total oil composition. *Satureja calamintha* spp. *nepeta* oil was domined by polygon (73, 54%) (Figure 2). Other major

components were isomenthone (7.89) (Figure 3), cis-peperitone oxide (2.28), limonene (1.37) and trans-isopulegone (1.09).

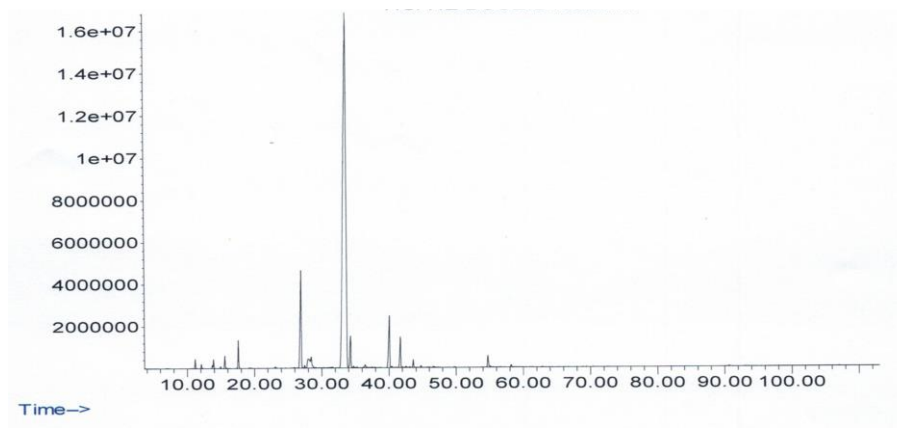


Figure 1: GC-MS Chromatogram of essential oil of *Satureja calamintha spp. nepeta*

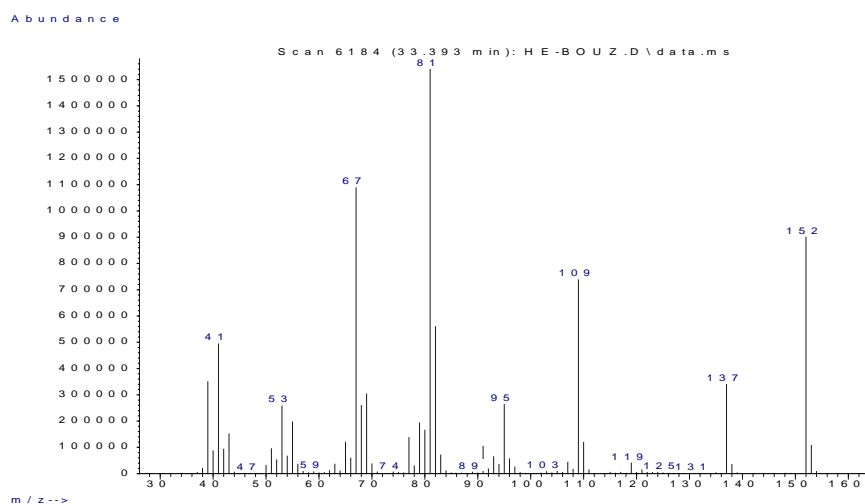


Figure 2: Mass Spectrum of essential oil of *Satureja calamintha spp. nepeta*

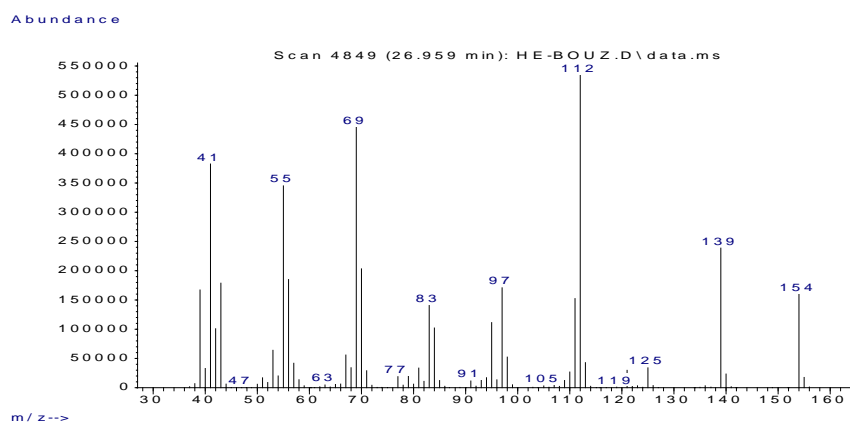


Figure 3: Mass Spectrum of essential oil of *Satureja calamintha spp. nepeta*

TABLE 1. Percentage composition of essential oil of *Satureja calamintha* spp. *nepeta*

Compounds				
1	3-Methylcyclopentanone	6,85	843	0.0099
2	Hex-2-enal	7,05	848	0.0126
3	α -Thujene	10,78	927	0.0174
4	α -Pinene	11,17	933	0.3929
5	Camphene	12,08	947	0.2193
6	Cyclohexanone <3-methyl->	12,43	953	0.0003
7	Sabinene	13,7	972	0.1380
8	β -Pinene	13,89	976	0.4143
9	2-Heptanone, 5-methyl-	14,65	988	0.0109
10	β -Myrcene	14,94	993	0.0874
11	Octan-3-ol	15,58	1002	0.6202
12	Para-Cmene	17,32	1027	0.0230
13	Limonene	17,59	1030	1.3733
14	3-Ethyl-2-hydrxy-2-cyclopenten-1-one	19,23	1053	0.0526
15	Linalool	23,11	1106	0.0938
16	Camphor	25,9	1145	0.0245
17	Isomenthone	26,98	1160	7.8992
18	Menthol	27,97	1173	0.1776
19	Trans-Isopulegone	28,43	1180	1.0948
20	Pulegone	33,78	1255	73.5465
21	Cis-Piperitone oxide	34,33	1263	2.2888
22	Cis-Pulegone Oxide	34,74	1269	0.0928
23	Carvacrol	37,9	1315	0.0172
24	Piperitenone	40,74	1358	0.0021
25	α -Copaene	41,97	1377	0.0379
26	β -Bourbonene	42,56	1386	0.0789
27	Jasmone <(Z)->	43,11	1394	0.3963
28	Caryophyllene <(E)->	44,75	1420	0.1039
29	Aromandendrene	47,3	1461	0.0039
30	Spathulenol	54,72	1585	0.8071
31	isoSpathulenol	58,15	1645	0.1518

The studies realized in different regions of Algeria found that a chemical variability was observed in the essential oils depending on the origin of the samples. The results showed the presence of two chemo types of *C. nepeta*. The sample of Blida (50 km south Algiers), Pulegone, neo-menthol and isomenthone were the main components (39.5- 33- 19.6%) [7]. conversely, the oil of *C. nepeta* from Jijel in Northeastern of Algeria is predominantly composed of menthone (26.46%), piperitone oxide (22.26%) and pulegone (14.04%) [8]. The chemical composition of essential oils extracted from a species is influenced by the climate, geographical area, seasons, soil condition,...Previous studies on the essential oil of many samples of *C. nepeta* from Italy, have shown that it contains contains pulegone (64.4%),

Piperitenone oxide (39.9%) and Piperitenone (2.5%) as major components. That from Portugal showed that isomenthone (35.8–51.3%), 1, 8-cineole (21.1–21.4%) and trans-Isopulegone (7.8–6.0%) were the dominant components [9]. The chemical composition of 40 samples of *Calamintha nepeta* essential oil, in wild growth in Corsica made it possible to determine the existence of three chemo types, Half of the samples were characterized by a menthone / pulegone chemo type, 13 samples presented the pulegone as a component Mentone, while piperitone and piperone oxides were the main components of the last 11 samples [10].

4. Conclusion

A large part of the Algerian territory is characterized by appreciable biological diversity. It is within the framework of a contribution to the valorization of the floristic heritage and the search of the bioactive natural substances, that we are interested in the study of chemical composition of the essential oil of the *Satureja calamintha spp. nepeta*.

The qualitative analysis by CG/SM of essential oil allowed us to identify 31 composites relevant for 90.2 % the total peak areas. The main composites of this oil are pulegone (73, 54%), isomenthone (7.89) and cis-piperitone oxide (2.28).

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