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Research article

ESSENTIAL OIL COMPOSITION OF FOUR VARIETIES OF *MENTHA LONGIFOLIA* L. FROM NORTHERN PARTS OF IRAN

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ABSTRACT: Mentha (Mint) is common named "poneh" belongs to Lamiaceae family and has used in traditional medicine for a long time. M. longifolia is one of the most important species of this genus and consists of seven varieties in Iranica Flora. Many researchers studied about identification and correlation between this species and environmental factors. By attention that environmental factors influence the composition of essential oils, so the aim of this study is to analyze the composition of the oil of Mentha longifolia growing wild in different areas of Northern parts of Iran. Based on our results, monoterpenes and sesquiterpenes are the most chemical compounds in this species. The major components were Carvon (1.1- 26.6%); 1,8-cineol (3.4-11.2%); cis-piperitone oxide(1.59- 34.94%), Pulegone (14.96-31.25%); Menthone (2.8-15.05%) and iso-Menthone (0.96- 43.79%0. M. longifolia var. chlorodictya is reported as the best varity of this species can used in traditional medicine and breeding programs.

Keywords: Chemical component, Iran, Lamiaceae, Mentha

INTRODUCTION

Species (commonly known as mint), belonging to the Lamiaceae family, are widely distributed in Eurasia, Australia and South and North of Africa [1,2]. Various species of Mentha have been used as folk remedies for treatment of bronchitis, flatulence, anorexia, ulcerative colitis and liver complaints, due to their anti-inflammatory, carminative, stimulant and antibacterial activities [1, 3,4,5]. *Mentha longifolia* (L.) Huds. Is one of the species of this genus that grows as wild in various regions of Iran [6,7]. This species is used in Iranian traditional medicines as a stomach pain- relieving agent, antispasmodic, digestive and carminative [8]. Aerial parts of the *M. longifolia* containing essential oils that has medicinal effects [9]. The essential oil content of this medicinal plant, depending on the climatic and geographical factors [10,9]. In Iran, it has six varieties [7]. The objective of this study is to analyze and compare the composition of the oils of five varieties of *M. longifolia* growing wild in different areas of Northern parts of Iran.

MATERIALS AND METHODS

Five varieties of *M. longifolia* were collected during the flowering period from natural habitats of Northern parts of Iran (Table 1). The herbarium specimens were preserved in "IRAN" herbarium.

Table 1- varieties of *M. longifolia* and their localities

Variety	Locality
M. longifolia var. *longifolia*	Tehran: Firoozkoh road, Chapdare, 2134 m, Mazooji
M. longifolia var. *calycantha*	Koh to Damavand, 2166m, Mazooji
M. longifolia var. *aciatica*	Mazandaran: Haraz road to lar, 2270m, Mazooji
M. longifolia var. *chlorodictya*	Gilan: Asalem to Khalkhal, 1963m, Mazooji
M. longifolia var. *chlorodictya*	Gilan: Asalem to Khalkhal, 1963m, Mazooji

After identification of samples using by Iranica Flora, the volatile oils were isolated. From the collected samples, 500 g of each were air dried, crushed into smaller pices and hydrodistilled for 3 h, producing yellow to greenish colored essential oils at a yield of 0.2- 0.5 %. The oils was dried over anhydrous thiosulfate and kept at 4 c in sealed brown vials until required. Analytical gas chromatography was capillary column DB-5 (30 m. 0.25 mmid, 0.25 µm film thickness); Carrier gas, He; Split ratio, 1: 25°, and using a flame ionization detector. The column temperature was programmed at 50°c for 1 min, and then heated to 265°c at a rate of 2.5°c/min, then kept constant at 265°c for 20 min. GC-MS was performed on a thermoquest 2000 with quadruple detector, on capillary column DB-5(GC), carried gas, He; Flow rate, 1.5 ml/min. The column was held at 50°c for 1 min, and programmed up to 265°c for 20 min. Quantitative data were obtained from the electronic integration of the FID peak areas. The components of the oils were identified by comparison of their mass spectra and retention indicates with Wiley library. Also, the percentage of the 14 major essential oil components were used to determine the chemical relationship between varieties by cluster analysis using the SPSS software, version 11.5.

RESULTS

A total of 51 compounds were identified (Table 2). The highest and lowest essential oil content of *M.longifolia* was found to be 1.5% v/w in *M. longifolia* var. longifolia, M. longifolia var. calycantha and 1%v/w in three other varieties, respectively. The major components were Carvon (1.1- 26.6%); 1,8-cineol (3.4- 11.2%); cis-piperitone oxide(1.59- 34.94%), Pulegone (14.96-31.25%); Menthone (2.8-15.05%) and iso- Menthone (0.96- 43.79%0. Although qualitatively similar but oils showed notable quantitative differences. For example, Carvon was abundant in *M. longifolia* var. *longifolia* and had the lowest concentration in *M.longifolia* var. chlorodictya. This component had not found in *longifolia*var. *aciatica*. Similarly, Piperitone oxide had the highest concentration in *M. longifolia* var. *aciatica* but lowest in *M. longifolia* var. *chlorodictya*. Pulegone was abundant in *M. longifolia* var. *aciatica* and the lowest in *M. longifolia* var. *chlorodictya*. The highest and lowest Menthone content were found to be 15.05 in M. longifolia var. longifolia and 2.8 in *M*. l*ongifolia* var. *chlorodictya*. Based on our results, the most components in *M. longifolia* var. *longifolia* were 1.8-cineol (10.58%); Menthone (11.46%); Pulegone (14.96%); Carvone (26.06%) and Cis-piperitone (15.25%). The most components identified in *M. longifolia* var. *aciatica* were Pulegone (31.25%0; Thymol (13.78%); and Pulegone (17.5%0 and Pipeitone oxide (10.35%) in *M. longifolia*var. *calycantha*. Also, the major compounds identified in *M. longifolia* var. *chlorodictya* were Menthone (10.5%); Iso-Menthone (43.79%) and Pulegone (21.39%) (Table 3).

Table 2- Chemical composition (%) of the essential oils of four varities of *M. longifolia*

Component	var. *longifolia*	var. *aciatica*	var. *calycantha*	var. *chlorodyctia*	var. *chlorodictya*
α-pinene	O.84	1.42	1.35	1.01	1.19
comphene	0.05	0.06	0.06		0.08
sabinene	0.32	0.24	0.92	0,33	0.18
β- pinene	1.42	2.23	2.18	1.61	1.56
- -Myrceneβ	0.16	0.32	0.48		
α-Terpinene	0.32		0.21		
ρ-cymene	0.12	0.30	0.15		0.13
Limonene	1.55	0.98	0.40	0.51	0.22
1,8- cineol	10.58	11.2	8.03	8.80	3.47
γ-Terpinene	0.138	4.00			0.19
Menthone	11.46	15.05	6.32	10.50	2.8
Iso- Menthone	1.15	1.7	0.96	43.79	1.44
Borneol	0.25	0.35	0.2		
Menthol	1.3	2.4	0.77	1.7	2.91
Cis- Isopulegone	0.73	1.59	1.36	0.20	1.24
Trans- Isopulegone	1.25	2.17	1.46	0.35	2.71
α-Terpinole	0.44	0.62	0.36		

Cis- Dihydricarvone	2.8				
Pulegone	14.96	31.25	7.50	21.34	
Carvone	26.06		1.50	1.10	3.25
Cis-Piperitone oxide	15.25		33.54	1.99	34.94
Piperitone oxide	3.99		13.89		10.35
Trans- caryophyllene	1.64	2.07	2.11	2.11	3.63
Germacrene D	0.13	0.41	0.15	0.14	0.50
Bicyclogermacrene	0.15		0.42		
Spathulenol	0.25	1.18	0.29	0.14	0.62
Caryophyllene oxide	1.00	0.98	1.2	0.89	1.35
α-Thujene		0.86			
3- octanol		0.05	0.23	0.18	0.26
(E)-β-ocimene		0.12	0.85		0.44
Linalool		0.12			
Camphor		0.22	0.26	0.21	0.14
Terpinene-4- o1		0.45	0.32	0.96	
Myrtenal		0.14	0.39		
Thymol		13.78		0.57	1.34
Trans-pinacarveol			0.1	0.17	0.19
Cis- cadin-4-en-7-o1					0.32
Piperitenone					0.86
Total	97.95	96.74	98.53	98.52	95.32

Table 3- Comparison the most important contents between four varieties of *M. longifolia*

Component	var. *longifolia*	var. *aciatica*	var. *calycantha*	var. *chlorodyctia*	var. *chlorodictya*
α-pinene	O.84	1.42	1.35	1.01	1.19
sabinene	0.32	0.24	0.92	0,33	0.18
β- pinene	1.42	2.23	2.18	1.61	1.56
Limonene	1.55	0.98	0.40	0.51	0.22
1,8- cineol	10.58	11.2	8.03	8.80	3.47
Menthone	11.46	15.05	6.32	10.50	2.8
Iso- Menthone	1.15	1.7	0.96	43.79	1.44
Borneol	0.25	0.35	0.2		
Menthol	1.3	2.4	0.77	1.7	2.91
Pulegone	14.96	31.25	7.50	21.34	
Carvone	26.06		1.50	1.10	3.25
Piperitone oxide	3.99		13.89		10.35
Germacrene D	0.13	0.41	0.15	0.14	0.50
Spathulenol	0.25	1.18	0.29	0.14	0.62
Caryophyllene oxide	1.00	0.98	1.2	0.89	1.35

DISCUSSION

The essential oil composition of *M. longifolia* were studied from other geographical locations, extensively and have produced a number of chemotypes [1,9, 3, 11,12,13]. Differences in the results can be explained by differences in the environmental conditions regions under study which affect on essential oil content of *M. longifolia* leaves [9]. Based on our results, genetic variation, growth stages, parts of plant utilized and maturity variation are important factors that determine the composition and yield of the essential oil obtained. These results correlated with Hussain et al, 2010 and Anwar et al., 2009 [14,15]. Based on results in Table 2, monoterpenes and sesquiterpenes are the most chemical compounds in this species. For example, Thymol, Cis-piperitone and 1,8-cineol are the most oxygenated monoterpenes, Sabenen and Limonene are monoterpene hydrocarbons; trans-caryophyllene and Germacreene D are the most sesquiterpenehydroides. Also, Caryophyllene oxide is the main chemical composition from oxygenated sesquieterpene. This study showed that Piperitone oxide is the main component in this species but did not found in *M. longifolia* var. *aciatica*. This result shows that changing the climate and height affect on kind of the essential oils content. Cluster analysis based on 14 major essential oil components showed two main clades (Fig. 1). *M. longifolia var. chlorodictya* made a separate clade with the highest distance from other specimens. The other main clade consists of two subclades: *M.longifolia* var. aciatica made a one group and three other specimens placed in one subclade. There are very similarities between two varieties of *M. longifolia* from Tehran and Gilan provinces. It showed that environmental factors such as soil, nutrition and weather play a large role in chemical similarities of these two specimens. Based on our results, many chemotypes were introduced in this research and *M. longifolia* var. *chlorodictya* is reported as the best variety of this species.

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