COMPARATIVE RESEARCH REGARDING THE CHEMICAL COMPOSITION OF VOLATILE OILS FROM *Mentha longifolia* (L.) HUDS.

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Abstract. The analysis of the chemical composition of volatile oils obtained from medicinal plants is a concern for many researchers. In this study, we analysed the chemical constituents of four essential oils extracted from aerial organs of the species *Mentha longifolia* (L.) HUDS. The main chemical compounds identified in the volatile oil from the whole plant are: linalool (64.881%), carvone (15.478%), limonene (9.048%) and myrcene (3.586%).

Keywords: volatile oil, *Mentha longifolia* (L.) HUDS., medicinal plant, aerial organs, chemical constituents.

Rezumat. Cercetări comparative privind analiza chimică a uleiurilor volatile de *Mentha longifolia* (L.) HUDS. Analiza compoziţiei chimice a uleiurilor volatile obţinute din plante medicinale, reprezintă o preocupare pentru mulţi cercetători. În prezentul studiu am analizat compuşii chimici din patru uleiuri volatile extrase din organele aeriene ale speciei *Mentha longifolia* (L.) HUDS. Principalii compuşi chimici identificaţi în uleiul volatil al întregii plante sunt: linalool (64,881 %), carvonă (15,478 %), limonen (9,048 %) şi mircen (3,586 %).

Cuvinte cheie: ulei volatil, *Mentha longifolia* (L.) HUDS., plantă medicinală, organe aeriene, compuşi chimici.

INTRODUCTION

One of the most representative genera of the Lamiaceae family is *Mentha*. The *Mentha* genus has a complex taxonomy, which makes species identification difficult because of phenotypic plasticity, genetic variability and due to the fact that most species are able to produce hybrids by crossing (HARLEY, 1972).

Of the genus *Mentha* species, *M. longifolia* (L.) HUDS. has the highest prevalence in Romania, as it can be seen from plains to mountains, on wet and marshy places on waterfronts, along roads, in meadows and water meadows (GUŞULEAC, 1961).

On the surface of air organs it has secretory hairs that produce volatile oils, fact which gives the plant aromatic properties.

The analysis of the chemical composition of volatile oils obtained from medicinal plants is a concern for many researchers. In this study we aimed at analysing the chemical composition of the volatile oils of *M. longifolia*, during flowering phenophase and to correlate these data with those already present in literature.

Recent research on the chemical composition of volatile oil from the species *M. longifolia* were conducted by MKADDEM et al. (2009). They identified in the analysed oil pulegone (54.41%), isomenthone (12.02%), 1,8-cineole (7.41%) and borneol (6.85%) as main compounds. Also, DŽAMIĆ et al. (2010) have analysed the volatile oil extracted from *M. longifolia* identifying as main compounds: trans-and cis-dihydrocarvone (23.64% and 15.68%), piperitone (17.33%), 1,8 - cineole (8.18%) and neoisodihydrocarveol (7.87%).

MATERIAL AND METHODS

The aerial organs of the species *M. longifolia* were collected in July 2010 when the plant was in the flowering phenophase. The plant was taken from the banks of the Bârlad River at Negreşti in Vaslui County. The species was determined by Nicolae Ştefan**,** taxonomist within the Faculty of Biology, "Al. I. Cuza" University in Iaşi.

The volatile oils were extracted with the Clevenger device, in accordance with the European Pharmacopoeia standards the Laboratory of Plant Physiology, Faculty of Biology, "Al. I. Cuza" University of Iaşi. The plant material was crushed, placed in the apparatus ball and distilled for 3 hours.

There were obtained four essential oils: from the aerial parts of the plant, the plant stems, leaves and one from the flowers.

To separate and identify the chemical compounds of the essential oils we used GC_MS (Gas Chromatography coupled with Mass Spectrometry) at the Research Centre for Agri-food products, the Faculty of Horticulture of the University of Agricultural Sciences and Veterinary Medicine of Bucharest.

RESULTS AND DISCUSSIONS

As a result of our investigations on the four essential oils from *M. longifolia* species, it was identified the presence of 34 chemical compounds. Only 10 chemical compounds were present in all four samples, thus giving the aromatic character of these oils. It has also been reported that some compounds are found in one, two or three samples.

The main compounds identified in the four oil samples are: linalool (64.881% -71.902%), carvone (4.016% - 15.478%), limonene (3.259% - 9.048%), β - caryophyllene (1.054% - 4.518%) and germacrene D (1.601% - 4.984%).

Menthol, characteristic to the genus *Mentha* (GALEOTTI et al., 2001), was found in very small quantities and only in the oil obtained from the leaves (0.089%) and whole plant (0.111%).

For oils that were derived from whole plant and plant stems were identified 19 compounds and in oils obtained from plant leaves and flowers were identified 23 compounds. The main chemical compounds identified in the whole plant volatile oil are: linalool (64.881%), carvone (15.478%), limonene (9.048%) and myrcene (3.586%). Linalool is the predominant compound in all the four oil samples that we analysed. The greatest amount of linalool was recorded in the sample containing volatile oil from the plant stems (71.902%), while the smallest amount was reported in the volatile oil from the flowers of the plant (68.829%). Another volatile chemical compound reported in the four samples of essential oil is carvone. The maximum amount of this compound was recorded in the volatile oil sample from the whole plant (15.478%) and minimum quantity of oil was reported in the sample obtained from the stems of the plant (4.016%). Regarding the content of limonene, a compound present in the four different biological samples, it was also found in large quantities. Its evolution is similar to that of linalool, the difference being the reduced quantity of limonene. Thus, the oil extracted from the whole plant has a limonene content of 9.048%, while the oil obtained from the stems of the plant contains only 3.259%. There had been recorded significant amounts of β-caryophyllene (4.518%) and germacrene D (4.984%) in the oil extracted from the leaves of *M. longifolia* species, in the other samples being present in smaller quantities, as shown in Table 1. Also, there can be observed the presence of significant amounts of myrcene in the oil extracted from the whole plant (3.586%) and leaves (2.035%) and the presence of β-myrcene in the oil obtained from the stems (3.001%) and plant flowers (2.398%).

Research studies concerning the chemical composition of *M. longifolia* essential oil were also conducted by MKADDEM et al. (2009). They analysed volatile oils from *M. longifolia* and *M. longifolia* collected in the region of Gabes, Tunisia. The compounds reported in significant amounts in the oil of *M. longifolia* were: pulegone (54.41%), isomenthone (12.02%), 1,8-cineole (7.41%), borneol (6.85%), and piperitenone oxide (3.19%).

Linalool is a monoterpene often found in the volatile oil from medicinal plants and is used for its anti-inflammatory properties (PEANA et al., 2002). Limonene, also a monoterpene, is known for its sedative and expectorant action (WAGNER, 1995) (cf. BOZ IRINA et al., 2010). Germacrene D is a hydrocarbon in sesquiterpenes class, which is often used as a pesticide (http:sun.ars-grin.gov), while carvone has antifungal properties (HARTMANS, 1995).

Table 1. Chemical composition of the volatile oils from *M. longifolia* species.
Tabel 1. Compoziția chimică a uleiurilor volatile provenite de la specia *M. longifolia*.

No.	Compounds	Whole plant (%)	Stems (%)	Leaves (%)	Flower (%)
1	α – Thujen	-	-	0.255	-
2	α – Pinene	0.334	0.220	0.490	0.284
3	Sabinene	0.462	0.354	-	0.325
4	β – Pinene	0.743	0.649	-	0.507
5	Myrcene	3.586	-	2.035	-
6	β – Myrcene	-	3.001	-	2.398
7	3 – Octanol	-	0.519	0.348	0.513
8	Limonene	9.048	3.259	5.148	7.165
9	Eucalyptol	-	1.256	-	-
10	Trans – β – Ocimene	0.912	0.971	0.110	0.086
11	Cis – β – Ocimene	-	-	1.129	0.697
12	Linaool	64.881	71.902	70.719	68.829
13	Menthone	0.089	-	0.111	-
14	α – Terpineol	0.304	-	0.195	0.189
15	Terpinolen	-	-	-	0.068
16	Dihydrocarvone	0.482	-	-	0.163
17	Dihydrocarveol	-	-	0.236	-
18	Carvone	15.478	4.016	6.690	13.737
19	Cis – hexenil-isovalerate	0.201	0.377	0.270	-
20	Hexenil valerate	-	0.207	-	-
21	Hexenil isovalerate	-	-	-	0.178
22	Dihydroedulan	0.110	-	0.250	-
23	Dihydrocarvil acetate	0.146	-	0.347	-
24	β – Burbonen	0.119	0.391	0.156	0.137
25	β – Elemene	-	-	-	0.055
26	Cis – jasmone	-	-	0.118	0.068
27	β – Caryophyllene	1.054	3.106	4.518	1.522
28	α – Caryophyllene	-	0.174	0.167	0.102
29	Epi-biciclosesquifelandren	-	0.265	-	0.036
30	Germacrene D	1.178	2.980	4.984	1.601
31	Germacrene D – 4 – ol	-	-	0.310	-
32	Elixene	0.162	0.481	0.780	0.231
33	α – Farnesene	-	-	0.093	-
34	Δ – Cadinene	0.071	0.226	-	0.062

CONCLUSIONS

Knowledge of the chemical compounds in essential oils obtained from *M. longifolia* is very important. The high content of linalool and limonene (in the whole plants and/or in analysed organs) from this volatile oil can gives anti-inflammatory, sedative and expectorant properties. Due to their properties the plant can be used in obtaining pharmaceutical products.

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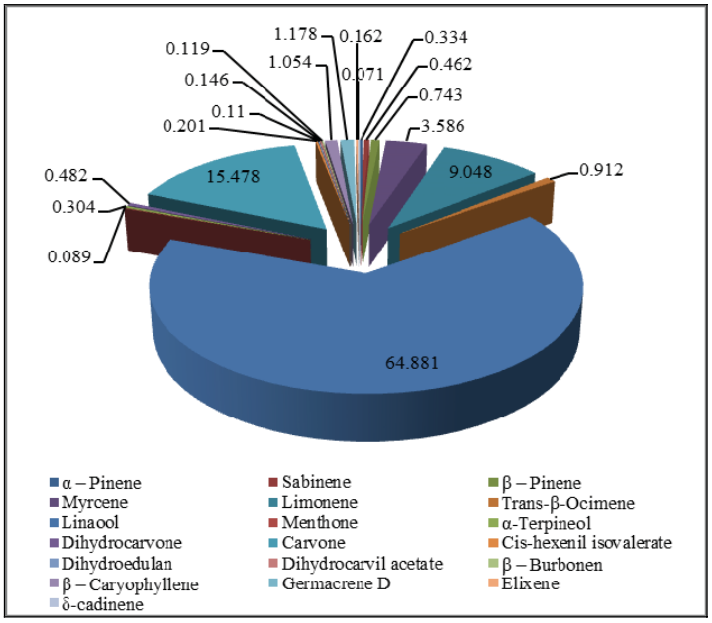

Figure 1. The chemical composition of essential oil of *M. longifolia* (whole plant).
Figura 1. Compoziția chimică a uleiului volatil de *M. longifolia* (planta întreagă).

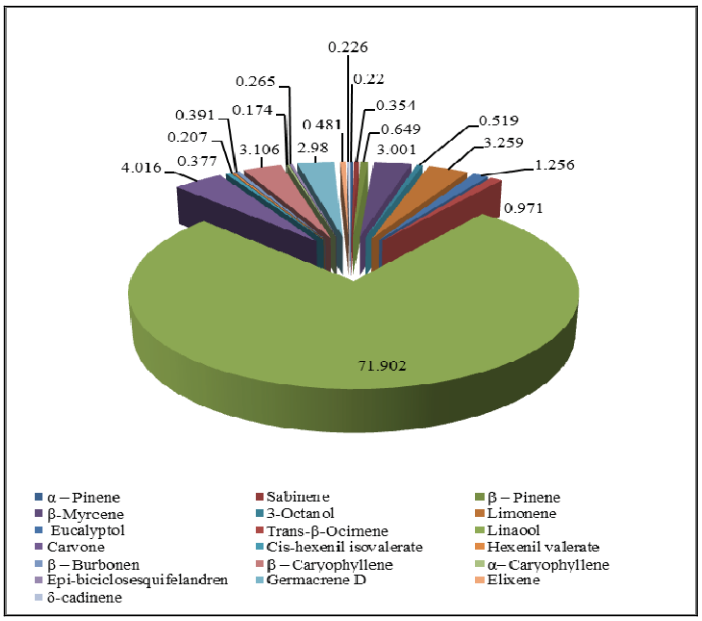

Figure 2. The chemical composition of essential oil of *M. longifolia* (stems).
Figura 2. Compoziția chimică a uleiului volatil de *M. longifolia* (tulpini).

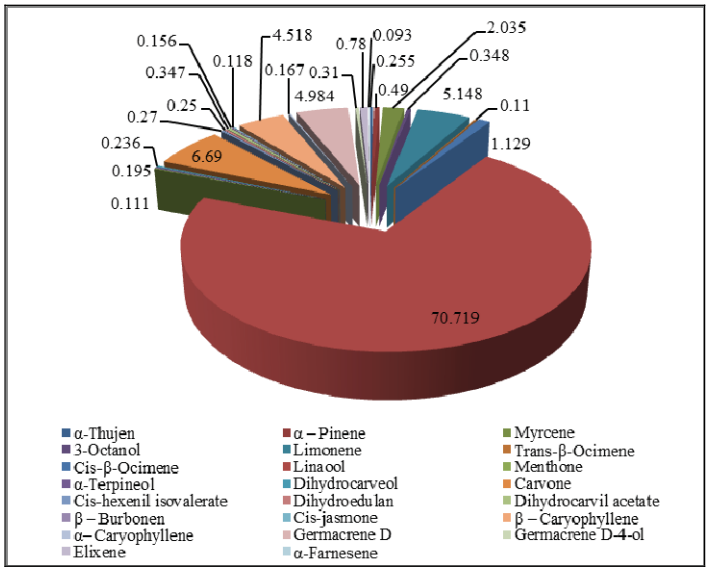

Figure 3. The chemical composition of essential oil of *M. longifolia* (leaves).
Figura 3. Compoziția chimică a uleiului volatil de *M. longifolia* (frunze).

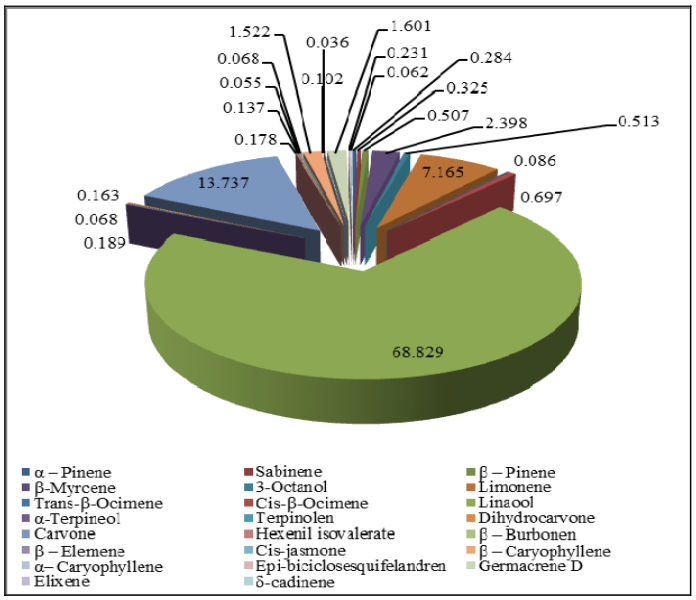

Figure 4. The chemical composition of essential oil of *M. longifolia* (flowers).
Figura 4. Compoziția chimică a uleiului volatil de *M. longifolia* (flori).

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