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Effect of drying on the yield and chemical composition of essential oils obtained from *Mentha Longifolia* leaves

Abstract

The present study was carried out to evaluate the influence of the drying mode (under the sun) on the yield and composition of essential oils extracted from leaves (fresh and sun dried) of *Mentha longifolia*. Drying under the sun increased the concentration of essential oils isolated by hydrodistillation in a Clevenger apparatus. Twenty-three components were identified by using gas chromatography (GC) and GC coupled to mass spectrometry (GC–MS). The chemical composition was dominated by the presence of piperitenone oxide, in both essential oils obtained from fresh and sun dried mentha leaves. These results showed that the drying has a significant variation on essential oils yield and affected the qualitative and quantitative constituents of their composition.

Keywords: *mentha longifolia*, drying, clevenger apparatus, hydrodistillation, gas chromatography, mass spectrometry, piperitenone oxide

Volume 8 Issue 2 - 2020

Sunita Singh
Department of Chemistry, Navyug Kanya Mahavidyalaya, University of Lucknow, India

Correspondence: Dr. Sunita Singh, Assistant Professor, Department of Chemistry, Navyug Kanya Mahavidyalaya, University of Lucknow, Lucknow-226004 (U.P), India, Email ocans.singh@gmail.com

Received: May 20, 2020 | **Published:** June 11, 2020

Introduction

More than twenty-five species of the genus *Mentha longifolia* (Lamiaceae) , growing throughout the temperate regions of Asia, Eurasia, Australia and South Africa.[1] They are mainly used in the liquor and confectionary industries, flavoring, perfume production and for medicinal purposes.[2] Mentha have been used as folk remedies for the treatment of nausea, bronchitis, flatulence, anorexia, ulcerative colitis and liver complaints. Mentha has anti-inflammatory, carminative, antiemetic, antispasmodic, analgesic and stimulant properties.[3] The essential oils or/and extracts from some Mentha species possess antimicrobial and antioxidant properties.[4] Water is a one of the significant component of biological materials of plants. Many postharvest operations start with removal of water that is, drying. Aromatic plants and spices are often dried before extraction to reduce moisture content. Dehydration of plants can be performed using different methods. Natural drying (sun drying) and drying in the shade are still most widely used methods because of their lower cost.[5] Many research reports showed the effects of different methods of drying on essential oil content and chemical composition of the essential oil plants.[6] The drying process has increased the yield of essential oil from 94.0 to 98.4% along with increase in percentage of major component, that is, piperitinone oxide from 79.9% to 88.5% which showed that drying method had significantly affects the composition percentage of essential oils.

Materials and methods

The extraction of essential oils from fresh and dried mentha leaves and chemical composition analysis of components by GC-MS were undertaken as described in the previously work reported.[7]

Result and discussion

GC-MS analysis resulted in the identification of a large number of components in the essential oils of fresh and dried leaves of *M. longifolia* (Table 1). Twenty-three components were identified in FMEO and DMEO given in Table 1.[8] representing about 94.0% and 98.4%, respectively, of the total amount. Piperitenone oxide with percentages of 79.9 in FMEO and 88.5 in DMEO is the major component followed by small fractions of piperitenone, terpinen-4-ol, lippiaphenol and caryophyllene oxide. *M. longifolia* essential oil is a good source of piperitenone oxide, cis-piperitone oxide, menthone, pulegone and menthol.[9] The given data is supported by previously work done.[10] The drying process has increased the yield of essential oil from 94.0 to 98.4% along with increase in percentage of major component, that is, piperitinone oxide from 79.9 percentage to 88.5%. There are reports where there is reduction in the total quantities of the essential oils, amounting to 36–45% in sweet basil, 23–33% in marjoram, and 6–17% in oregano during drying at ambient temperature.[11] The sun-dried and oven-dried flowers of Roman chamomile had a markedly lower total content of essential oils compared with shade-dried.[12] There is also work reported where there is increase in the quantities of certain compounds already present in the spice,[13] or the formation of new compounds has in some cases been observed after drying.[14] The available data on the effect of drying on the mint species showed loss of major component during drying[1] which is contradictory to our work. The factors such like the duration, the surrounding condition of drying has important role in affecting the content and yield of volatile components present in essential oils. It is very hard to predict the release or retention of volatile components and it ultimately depends upon the nature of component and which spice has been used. Different chemotypes (genotypes), environmental factors and phenological parameters are mainly responsible for these type of variations found in the chemical composition.[15]

Conclusion

The present study gives an option to explore the effect of drying on the yield and composition of essential oils of *M.longifolia*. The data can be utilized by pharmaceutical and perfumery industries in their post harvesting programs.

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Table 1 GC-MS analysis of fresh mint and dried mint (*Mentha longifolia L.*) leaves essential oils

Compounds	FMEO %FID	DMEO %FID	AI#	AI (lit.)	identification$^{\Phi}$
α-pinene	0.2	tr	928	932	MS, RI, co-GC
β-pinene	0.3	tr	973	974	MS, RI, co-GC
3-octanol	1.1	0.3	985	988	MS, RI, co-CG
p-cymene	0.1	tr	1019	1020	MS, RI, co-GC
Limonene	2.2	0.4	1024	1024	MS, RI, co-GC
1,8-cineole	0.3	tr	1025	1026	MS, RI, co-GC
Linalool	0.3	0.2	1096	1095	MS, RI, co-GC
Borneol	1.3	0.5	1166	1165	MS, RI, co-CG
terpinen-4-ol	0.4	0.1	1172	1174	MS, RI, co-GC
p-cymen-8-ol	0.2	0.6	1179	1179	MS, RI
α-terpineol	0.5	0.3	1188	1186	MS, RI, co-GC
Shisofuran	0.1	0.6	1199	1198	MS, RI
Carvone	0.2	tr	1241	1239	MS, RI, co-CG
Piperitone	0.3	tr	1248	1249	MS, RI, co-CG
cis-piperitone epoxide	0.6	tr	1251	1250	MS, RI
Isopiperitenone	1.1	0.6	1272	---	MS, RI
Piperitenone	2.9	1.5	1338	1340	MS, RI
Piperitenone oxide	79.9	88.5	1369	1366	MS, RI
lippiaphenol (diosphenolene)	1.0	1.8	1401	---	MS, RI
β-caryophyllene	tr	1.0	1415	1417	MS, RI, co-CG
germacrene-D	0.3	0.5	1487	1484	MS, RI
caryophyllene oxide	0.7	0.8	1579	1582	MS, RI
dillapiole	tr	0.4	1615	1620	MS, RI
Total identified %	94.0	98.1			
Monoterpene hydrocarbons	2.8	0.4			
Oxygenated monoterpenes	89.1	94.7			
Total monoterpenoids %	91.9	95.1			
Sesquiterpene hydrocarbons	0.3	1.5			
Oxygenated sesquiterpenes	0.7	0.8			
Total sesquiterpenoids %	1.0	2.3			
Others	1.1	0.7			

DMEO-Dried mint essentil oil; FMEO- Fresh mint essential oil

Trace (tr) <0.05%; #the arithmetic index (AI) was calculated on an HP-5 capillary column using a homologous series of n alkanes C_8-C_{18}; $^{\Phi}$Co-GC: co-injection with an authentic sample

Funding

None.

Acknowledgments

The author is grateful to the Department of Chemistry, Navyug Kanya Mahavidyalaya, University of Lucknow, India for its support.

Conflicts of interest

The author declares that there was no conflict of interest.

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Citation: Singh S. Effect of drying on the yield and chemical composition of essential oils obtained from *Mentha Longifolia* leaves. *MOJ Food Process Technol.* 2020;8(2):67–69. DOI: 10.15406/mojfpt.2020.08.00244

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Citation: Singh S. Effect of drying on the yield and chemical composition of essential oils obtained from *Mentha Longifolia* leaves. *MOJ Food Process Technol.* 2020;8(2):67–69. DOI: 10.15406/mojfpt.2020.08.00244