

# SEASONAL VARIATION OF OIL AND MENTHOL CONTENT IN *MENTHA ARVENSIS*. LINN

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## ABSTRACT

Essential oil and Menthol content were isolated from leaf samples of *Mentha arvensis* L. collected during March-November from the Medicinal Plants Farm Pakistan Forest Institute, Peshawar. Physico-chemical characteristics of the oil were also determined. October collection gave high yield of oil (2.8%) and menthol content (68.0%) as compared to other periods of the year. next high yield of oil and Menthol content was observed in the month of August.

## INTRODUCTION

Peppermint oil is usually, obtained from

the leaves of *Mentha* spp. such as *Mentha piperita* L., *Mentha piperita* var. *vulgaris* and *Mentha arvensis* L. belonging to the family labiatae. The essential oil occurs in numerous minute glands on the upper and under surfaces of the leaves and is extracted from the cut plant leaves by steam distillation (5).

The plant indigenous to Mitcham (Surry England) has now spread throughout Europe, America, Japan, Russian, India and Pakistan (5, 12, 13). The so called white mint (*Mentha piperita officinalis* L.) is grown in region around Mitcham (Surry England). The oil obtained from this variety enjoys a high reputation; in fact, it is considered the finest of all commercial

peppermint oils (7).

*Mentha viridis*, *M. piperita*, *Mentha incana*, *Mentha sativa*, and *Mentha aquatica* occur in Indian gardens, *Mentha arvensis* L. is native off Western Himalaya (10). In Pakistan *Mentha arvensis* L. and *M. piperita* L. are found in Azad Kashmir, N.W.F.P., Punjab and Baluchistan from 2000-3500 m. These are also now cultivated in the gardens of Pakistan (13).

The dried *Mentha* plant is antispasmodic, carminative, stomachic, refrigerant, stimulant and diuretic. Mint herb is an aromatic and is used in pickles (13). In colic, mint juice with a little black pepper and honey is given (12).

Peppermint oil is one of most popular and widely used essential oils. It is employed for flavouring of pharmaceuticals and oral preparations such as tooth pastes, dental creams, and mouth washes. It is also used as flavouring agent in cough drops, chewing gums, confectionery and alcoholic liqueurs. It is used in medicines for internal use. Because of its pleasant taste, it is an excellent gastric stimulant (5, 12, 13).

Yield of oil from *Mentha arvensis* L. grown in Hokkaido averages 1.3% and from plant grown in Hiroshima is 1.6% (5). Kopp reported the yield of oil from fresh herbs in Roumanian mint varies between 0.2 to 0.24%. The properties of this oil vary within the following limits specific gravity at 18°C, 0.9042 to 0.9113; optical rotations 21° 10' to 27° 9'; refractive index at 20°C, 1.4602 to 1.4618; total menthol content 50.0 to 65.8% (5).

Yield of oil derived from March crop of *Mentha arvensis* L. varies from 0.5 to 1.6% and menthol content varies from 30-40%. The

properties of the oil were as follows: specific gravity at 15°C; 0.8980; refractive index at 20°C, 1.4554 and optical rotation; 31° 2' to 38° 32'. Yield of oil obtained from the leaves of *Mentha piperita* L. was found to be 0.25% on dry leaf weight basis. The properties of the oil are as follows: Specific gravity, 0.9091; and refractive index, 1.4625 (7, 8).

In China yield of oil derived from summer crop varies from 1.3 to 2.0% whereas that of the fall crop averages 2%. The properties of Chinese mint oil vary between the following limits: specific gravity at 15°C, 0.8990 to 0.9091; optical rotation 30° 21' to 37° 32'; total menthol content 70.5 to 87.4% (5). It has also been reported that two years old plant which had been exposed to normal light yielded oil containing 51 to 65% of total menthol and only 2.5 - 5.3% of menthone whereas shaded plants yielded oils containing only 47 to 53% of total menthol and 11.8% of menthone (5).

It has been reported that peppermint (*Mentha* spp.) grow on a wide range of soil, but thrive best in deep rich, well drained soils (4); various types of loamy upland soils are best suited. An optimum of growth and oil yield is obtained on non-acid soil of pH value from 6.0 to 7.5 with pH 5.0 to 8.0 as the wider limit. Light, sandy or loamy soils produce oils of higher menthol and ester contents than heavier soil (10).

The present preliminary study was undertaken to find out the time of harvest of *Mentha arvensis* L. leaves where optimum yield of oil and menthol could be ensured and to study the physico-chemical characteristics of the oil in order to explore the possibility of its commercial utilization in the pharmaceutical industry. It has been planned for future study to determine the effect of age of plant, soil

conditions and fertilizers on the growth, oil and menthol content in *Mentha arvensis* as it has been reported that these factors directly affect the plant growth and oil yield (5).

## MATERIAL AND METHODS

*Mentha arvensis* L. leaves collected from the Medicinal Plant Farm, Pakistan Forest Institute, Peshawar during the months of March-November, were cleaned and dried in shade for a month. These were cut into small pieces. Essential oil was extracted from each sample using steam distillation techniques collecting the distillate in the receiving flask. The oils was separated from the aqueous part of the distillate with the help of a separating funnel using petroleum ether as solvent. The oil thus obtained was purified by redistillation. The oil was then dried over anhydrous sodium sulphate, redissolved in petroleum ether, filtered and the solvent evaporated in an oven at 60°C. The purified oil was stored in suitable containers for further investigations (3, 7).

The physico-chemical characteristics such as specific gravity, refractive index and optical rotation of the oil were determined following the methods given by A.O.A.C., Griffin and Jacobs (1, 6, 9). The results are given in Table 1.

Isolation of menthol was carried out by cooling the oil to a low temperature. For this purpose the essential was first freed from

moisture, filtered and poured into suitable container. The container with oil was then placed into a freezing mixture for 24 hours. The demen-tholized oil was then drawn off through a drain cock at the bottom of the containers, whereas the menthol crystals remaining in the vessel were dissolved in solvent either with warming and recoiled in the freezing mixture as before. it was then left to dry at 60°C temperature for several days in an oven where any adhering solvent or oil was evaporated (5,7).

## RESULT AND DISCUSSION

The yield of essential oil from the leaves of *Mentha arvensis* varied from 1.6 to 2.8%. It was observed from the results that the oil distilled from leaf sample collected in October gave high yield (2.8%) of oil as compared to the oil obtained from the samples collected in other months of the year (Table-1).

The results were in accordance with those reported by Guenther (5) Where the oil and menthol content in the fall crop was higher than the summer crop. The yield of menthol content (68%) isolated from the oil of October crop was also higher as compared to those isolated from the oil distilled from the leaves collected in other months of the year. These results were also in accordance with those reported by Guenther (5). The oil yield (2.8%) determined in the laboratory from the leaves of *Mentha arvensis* L. compared well to oil yield (0.6 to 2.0%) reported by Sobolveskaya (11) for Russian peppermint.

Table 1 Seasonal variation of oil and Menthol content in *Mentha arvensis* L.

Time of collection	Essential oil %	Menthol %	Sp. gravity	Refractive index	Optical rotation	
March	1.6	40.0	0.8980	1.4554	31°	2'
April,	1.6	40.0	0.8980	1.4554	31°	2'
May	1.7	41.0	0.8980	1.4554	31°	3'
June	1.7	41.0	0.8990	1.4553	31°	4'
July	1.8	45.0	0.8980	1.4553	31°	2'
August	2.5	48.0	0.8980	1.4553	31°	2'
September	2.0	46.0	0.8980	1.4554	31°	2'
October	2.8	68.0	0.8990	1.4553	31°	2'
November	1.5	40.0	0.8990	1.4553	31°	2'

It is evident from the above results that the physio-chemical character is of the oil from *Mentha arvensis* L. was not affected by the time of collection of the plant leaves and compared well with those of *Mentha piperita* L. and other *Mentha* spp. reported in literature. This indicates that the oil is of fair standard

## CONCLUSION

It appears from the study that four optimum recovery of oil and menthol for commercial exploitation October is the best month for harvesting the *Mentha* crop. The steam distillation process yielded good recovery of oil. The physio-chemical properties of the oil of *Mentha arvensis* L. compare well with those of oil from other *Mentha* spp.

It was also concluded that this oil could also be used as flavouring pharmaceuticals, tooth pastes, dental creams and confectionery products like those oils from other species;

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