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GC-MS Analysis of phytocomponents in the methanolic Extract of *Mentha arvensis* (Corn Mint)

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Abstract

Mentha arvensis, locally called "Corn Mint or Menthol Mint" belongs to the family *Lamiaceae*. "Corn Mint" is a medicinal herb traditionally used in treatment of digestive, jaundice, diarrhea, Asthma, bronchitis and skin diseases. The present study was carried out to identify the phytocomponents present in the methanolic extract of the leaves of *Mentha arvensis* by GC-MS analysis to ascertain it's usage by the local community as 'a plant possessing medicinal properties'. From the GC-MS results four compounds were identified as major constituents, they are Carvone, 6-Methylsalicylaldehyde, 2-(2-Hydroxy-2-Phenylethyl)-3, 5, 6-Trimethyl pyrazine and Phytol.

Keywords: GC-MS, *Mentha arvensis*, Methanolic components, Phytocomponents

Contents

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1. Introduction

Mentha arvensis L. (Lamiaceae), commonly known as corn mint, Japanese mint or menthol mint was introduced into India in 1952 from Japan. *Mentha arvensis L*. is commercially cultivated in tropical and subtropical climates. This plant is widely distributed throughout India and leaves of the plant are extensively used in traditional system of medicine for various ailments like jaundice, digestive, diarrhea, carminative, expectorant, cardio tonic, diuretic, dentifrice, hepatalgia, inflammation of liver, peptic ulcer, bronchitis and skin diseases. The plant consist essential oils of monoterpenes like menthol, menthone, carvone and pulegone major constituents. It is used in food products for its mint flavour and in oral products (e.g. mouth fresheners and tooth pastes) for its physiological cooling effect. Thus it is also used as fragrance component in cosmetics and perfumes, soaps, detergents and industrial fragrances. The plant has been shown to possess sedative–hypnotic, anti–inflammatory [1] antioxidant, hepatoprotective [2] antibacterial [3] antifertility [4] and anti-Candida activities [5] and also radio protective activity against gamma

radiation [6]. The locals use the powder of aerial parts mixed with dilute curd to cure indigestion, cough, sore throat and constipation [7] and the leaves are used to treat Asthma and Diarrhea [8]. The present communication deals with the GC-MS analysis of phytocomponents in the methanolic extract of the leaves of *Mentha arvensis*.

2. Materials and Methods

Collection of the plant material

The leaves of *Mentha arvensis* were collected from GKVK University of Agricultural Sciences Bangalore, India.

Preparation of the extract

Plant material (leaves, 20 Gms) was extracted with 250 mL of methanol at 60^{o}C for 8hrs in Soxhlet extractor. The methanolic extracts were filtered through Whatmann No. 1 filter paper. The filtrate was evaporated to dryness at 80^{o}C and stored until further analysis.

Preparation of stock solution

The extracts were reconstituted in methanol. Methanolic extracts (1 µl) were injected for GC-MS analysis.

Gas Chromatography-Mass Spectrometry

The methanolic extract of the leaves of *Mentha arvensis* was subjected to GC-MS analysis on a GC- MS Clarus 500 Perkin Elmer system comprising a AOC- 20i autosampler and gas chromatograph interfaced to a mass spectrometer (GC-MS) instrument employing the following conditions: Restek Rtx^{R} – 5, (30 meter X 0.25 mm) (5% diphenyl / 95% dimethyl polysiloxane), running in electron impact mode at 70 eV; helium (99. 999%) was used as carrier gas at a constant flow of 1ml/min and an injection volume of 1.0 µl was employed(split ratio of 10:1); injector temperature 280 ^{0}C. The oven temperature was programmed from 40°C (isothermal for 5 min.), with an increase of 6 ^{0}C / min to 280 ^{0}C, then ending with a isothermal for 15min at 280°C. Mass spectra were taken at 70 eV; a 0.5 seconds of scan interval and fragments from 40 to 550 Da. Total GC running time was 60 minutes.

Identification of Compounds

Interpretation on mass spectrum GC-MS was conducted using the database of National Institute of Standard and technology (NIST). The spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST library.

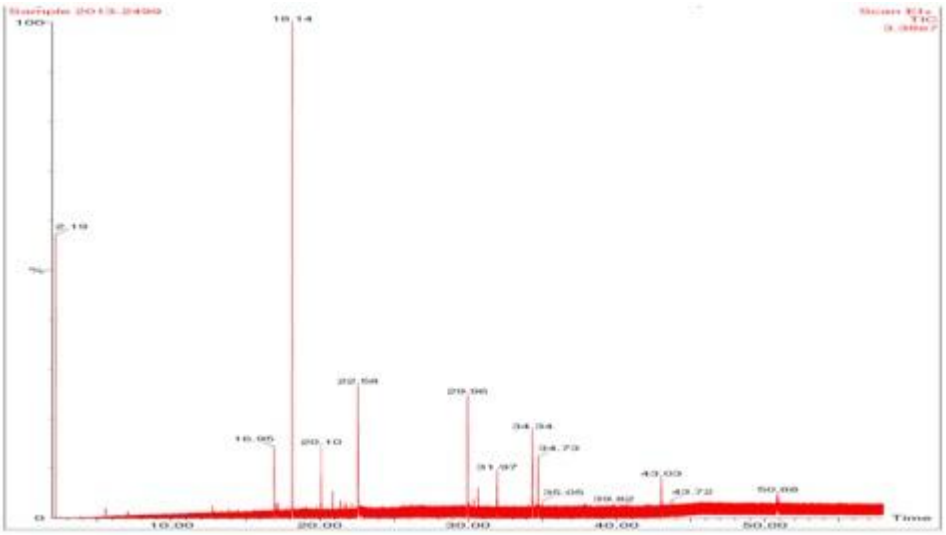

Figure 1. GC- MS chromatogram of the methanolic extract of the leaves of *Mentha arvensis*

3. Results and Discussion

GC-MS analysis

GC-MS chromatogram of the leaves of methanolic extract of *Mentha arvensis* showed four major peaks (Figure-1) and have been identified after comparison of the mass spectra with NIST library (Table-1), indicating the presence of four phytocomponents and its medicinal properties. From the results, it was observed that 2-Cyclohexen-1-One, 2-Methyl-5-(1-Methylethenyl); (synonym: Carvone), Benzaldehyde, 2-Hydroxy-6-Methyl- (synonym:6-Methylsalicylaldehyde), 2-(2-Hydroxy-2-Phenylethyl)-3,5,6-Trimethylpyrazine, 3,7,11,15-Tetramethyl-2-Hexadecen-1-Ol (synonym: Phytol) were the major components in the extract. The phytochemicals that contribute to the medicinal properties of the plant leaves is listed in Table 1. Carvone is considered to have insecticidal properties [9].6-Methylsalicylaldehyde has the property of Antibacterial activity and this compound also reported as biological intermediate from several adult mite species that plays a role in alarm pheromone and sexual behavior

mediator [10]. Phytol is reported to have antinociceptive, antioxidant [11] antiallergic and anti-inflammatory activities [12]. Recent studies have revealed that phytol is an excellent immunostimulant; it is superior to a number of commercial adjuvants in terms of long-term memory induction and activation of both innate and acquired immunity [13]. Phytol has also shown antimicrobial activity against *Mycobacterium tuberculosis* [14], [15] and *Staphylococcus aureus* [16].

Table 1. Chemical constituents and its Activity of some of the phytocomponents identified in the methanolic extracts of the Leaves of *Mentha arvensis* by GC-MS.

Retention Time	Name of the Compounds	Molecular Formula	Molecular Weight	Activity**
18.14	2-Cyclohexen-1-One,2-Methyl-5-(1-Methylethenyl)	$C_{10}H_{14}O$	150.21	Carminative Flavor , Fungistat, Insecticide, Insectifuge , Nematicide, Perfumery, Sedative, Candidistat, Cancer-Preventive
22.58	Benzaldehyde, 2-Hydroxy-6-Methyl-	$C_8H_8O_2$	136.142	Antibacterial Anticancer Antimutagenic Antitumor Immunostimulant
22.58	2-(2-hydroxy-2-phenylethyl)-3,5,6-trimethylpyrazine	$C_{15}H_{18}N_2O$	242.31	Not reported
34.34	3,7,11,15-Tetramethyl-2-hexadecen-1-Ol	$C_{20}H_{40}O$	296	Cancer-Preventive, Antimicrobial, anti-inflammatory, anti-diuretic, Antioxidant

****Source: Dr. Duke's phytochemical and ethnobotanical database (online database)**

4. Conclusion

The presence of many important phytocomponents in *Mentha arvensis* lends credence to its use by the local community as a plant with 'medicinal properties' and also holds promise for the production of novel pharmaceuticals as well as a nutraceutical. It would be beneficial to further isolate the compounds and determine their specific activity and also to understand the synergistic effect of compounds for therapeutic roles.

5. Acknowledgement

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