JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

GC- MSAnalyses of Three Plant Oils *Jasminum Officinale, Mentha Piperita* and *Prunus Dulcis*

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ABSTRACT:

This present research was aimed to assess the phytochemical components present in the selected three plant volatile oils such as *Jasminum officinale, Mentha piperita* and *Prunus dulcis*by the aid of GC-MS techniques. The spectral data of *Jasminum officinale* showed the presence of 55 phytocompounds, *Mentha piperita* showed the presence of 73 phytocompoundsand *Prunus dulcis* exhibited 42 phytocompounds. Most of the phytocompounds belong to the terpenoid group. Other groups identified in the oils were sterols, phenolics, etc. The analysis of the phytoconstituents of the oil is important for formulation a phytopesticides to control the infestation of insects in field and storage conditions. This investigation is one of the initiative and paved the lead to the thrust area of green chemistry.

Keywords: Phytochemical, Plant volatile, GC-MS, *Mentha piperita, Jasminum officinale.*

INTRODUCTION

The essential oils are secondary metabolites that plants produce to protect themselves against pests and predators, to attract pollinators, as well as to disperse their seeds (Wink, 2018).In different species of plants, the oil is located in different parts of the plant, such as roots, stems, leaves, flowers, fruits, and even seeds can also produce oils (Baser, 2010).Cells, secretory cavities, or glandular hairs accumulate the essential oil (Rehman *et al.,* 2016). Almost all part of a plant canproduce essential oil, extracted and exploited in various industrial ways (1).The essential oils are highly volatile (3), transparent and lipid-soluble liquids (Bilia*et al.,* 2014).They can easily soluble in organic solvents such as benzene, toluene, acetone, ethanol, and methanol with less density than water (Hasan and Mujtaba, 2019).

Essential oils are composedof a mixture of compounds that give the plants a characteristic odour and flavor (Wink, 2018).Most essential oils contain natural monoterpenes and sesquiterpenes, with various functional groupscontributing to antifungal and antibacterial properties (Sridhar *et al*., 2003).There are

different methods of necessaryoil extraction.The extraction method depends on the kind of compounds present in the oil and the location of the oils within the vegetative structure of the plant species (Singh *et al.*, 2008).

Gas chromatography and mass spectrometry areamong the best tools to identify and quantify the constituents of essential oils because of their simplicity, rapidity, accuracy and efficiency (Singariya*et al*., 2015). Consequently, GC-MS has been widely used in chromatographic fingerprinting medicinal plants (Gan and Ye, 2006; Ye, 2009; Yue *et al*., 2013).*Jasminum officinale*, known as the common jasmine or simply jasmine, is a species of flowering plant in the olive family *Oleaceae*.*Jasminum officinale* is one of the first plants that come to mind when one thinks of a sweet fragrance.A single jasmine vine can perfume an entire room or garden.Jasmine oil and components of synthetic blends of jasmine essential oil have properties that offer several health benefits.However, it is a popular home remedy used to treat everything from depression to infections; it's best known as an aphrodisiac.

Mentha piperita is a medicinally important plant that belongs to Lamiaceae (Kiretheker and Basu, 19785). The volatile oil extracted from the aerial parts of this herb is a source of commercial menthol.Peppermint leaves contain a volatile oil composed of free menthol, monoterpene, menthofurane and traces of jasmine, which improve the oil quality remarkably(Dew and Evans, 1984). The essential oil of this species is most popular and widely used.It is employed for flavoring, pharmaceuticals, mouthwashes, cough drops and confectionery.The oil also has antiseptic and local anesthetic properties (Sharma *et al*., 2010).

Prunus dulcis is a species that belongs to the subgenus *Amygdalus* inside the genus *Prunus*,the *Rosaceae* family and the order *Rosales*.*Prunus dulcis*has been known as a source of nutrients in many traditional foods and as a source of important biologically active compounds in traditional medicines.Because of its high unsaturated fatty acids content, almond consumption has been associated with a wide range of health benefits, including reduced levels of coronary heart disease as a result of a reduction in thelow-density lipoprotein cholesterol (Ahrens *et al.*, 2005), hypertension, type 2 diabetes, obesity and reduction in oxidative stress (Chen *et al.,* 2006).Almonds have high nutritional properties and high contents of micronutrients, making them an important dietary source.

Bioactive compounds in essential oils have been found to act as biopesticides locally, but commercial industries do not adequately utilize them. Alternatively, herbal plants that produce essential oils have been used to remedy various problems without knowing their quality or chemical composition (20), though with lesser side effects(Mariyajancyrani*et al.*, 2014). Therefore, it is necessary to analyze the composition of the volatile components of essential oils of different plants to separate individual compounds that may have additional uses in other industries.This study aimed to analyze the chemical composition of *Jasminum officinale, Mentha piperita* and *Prunus dulcis* by GC- MS method.

MATERIALS AND METHODS

Plant collection and solvent extraction

The fully matured, uninfected, diseases-free plant leaves of *Jasminum officinale*, *Mentha piperita* and *Prunus dulcis*were collected from Northwestern Nilgiri Hills (Blue Mountains), Nilgiri District, Tamilnadu, India (11.56230 N, 76.53450 E). The leaves were collected between January and March 2018.The collected plants were allowed to more than 15 days for air and shade, dried at room temperature and ground to a fine powder with the help of an electric blender and sieved through a kitchen strainer.One thousand grams of the fine powder of plants were sequentially extracted through hydro-distilled n a Clevenger apparatus for 6 hours. The distilled oil was stored ina refrigerator under 4^0C and packed in the aseptic amber bottle until use.

GC- MS analysis

The GC-MS was performed by using the Perkin Elmer Clarus 500 Model, and the software used is Turbomassver 5.2.The fused silica column was packed with Elite -5MS(5% Phenyl 95% dimethylpolysiloxane 30mx 250µm).The oven temperature was set up from 50^0C with an increase of 8^0C/min. To 220^0C for 5 minand 7^0C/min. to 280^0C for 15 min. Helium gas (99.999%) was used as the carrier gas at a constant flow rate of 1ml/min. An aliquot of 2µ1of the sample was injected into the column with the injector temperature at 280^0C and a Split ratio of 10:1. The ionizing energy of 70eV was used and the electron ionization is involved. The mass range is 40-600amu. The inlet line temperature was 200^0C and the source temperature was 150^0C. Total GC running time was 50 minutes. The detection employed in the NIST 2005 library.

GC-MS Identification of compounds

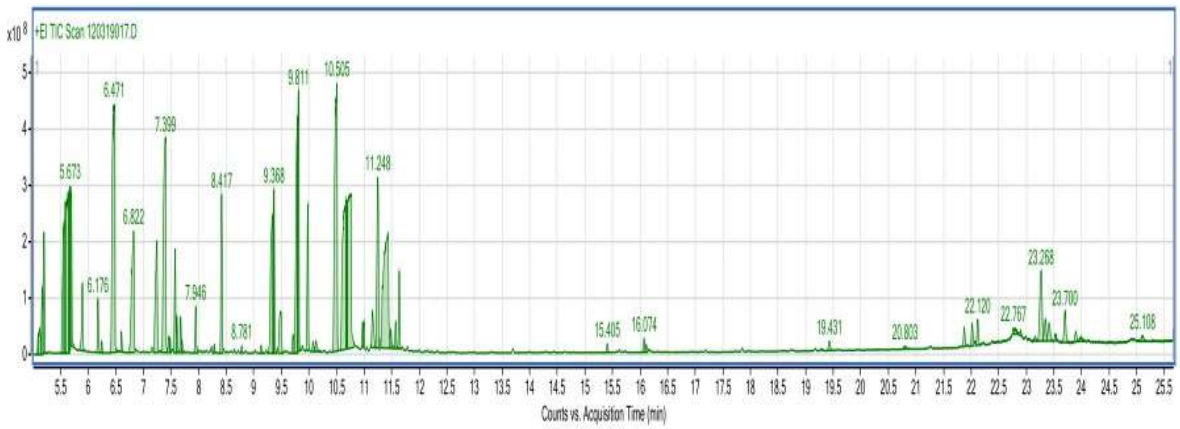
Interpretation of the mass spectrum of GC-MS was conducted using the National Institute Standard and Technique (NIST Version Year 2005), having more patterns. The relative percentage amount of each component was calculated by comparing its average peak area to the total sites. The spectrum of the unknown element was compared with the spectrum of the known part stored in the NIST data library (version 2005). The compound name, molecular weight and molecular formula were determined.

RESULT AND DISCUSSION

The plant oils *Jasminum officinale*, *Mentha piperita* and *Prunus dulcis* were analyzed by GC-MS. The presence of components was confirmed by comparing mass spectra of analyzed components with standard mass spectra of NIST library.In the GC-MS analysis of *Jasminum officinale* plant, oil 55 compounds were identified. The active principles with their peak, retention time, molecular formula, molecular mass and concentration is presented in table 1 and chromatogram of jasmine oil is shown in figure 1.Among the 55 compounds identified major compounds includes Hydroxylamine,o-(phenylmethyl)-11.4046%, Octanol,2- (phenylmethylene) -10.4985%, 5- Tetradecyne-9.5722% and 2-pyrrolidinethione,1-phenyl-6.5898%. *Mentha piperita*plant oil showed 73 compounds and presented in table 2 and figure2. Major compounds include 1-Hexadecen-3-ol,3,5,11,15-tetramethyl- 17.8414%, Cyclohexene,4-methyl-1-(1-methylethenyl) 9.6995%, Cyclopentane carboxylic acid, 2-fluorophenyl ester- 6.1853% and 3-(1-

Methylpropyl)-2-hydroxy-2-cyclopenten-1-one-6.1520%. In the case of *Prunus dulcis* plant oil 42 compounds were identified and shown in table 3 and figure3. The major compounds are Sitosterol-33.7846%, 9-Methyl-z-10-tetradecen-1-ol acetate-8.1529%, Squalene- 7.5509% and 2,4-Decadienal-7.4493%.

Figure 1:Chemical constituents of plant oil *Jasminum officinale* (GC-MS Chromatogram)



GC-MS analysis of plant oils *Jasminum officinale, Mentha piperita* and *Prunus dulcis* revealed the presence of various bioactive compounds. Hydroxylamine, o-(phenylmethyl) is the major compound identified in the *Jasminum officinale* plant oil. In *Mentha piperita* plant oil 1-Hexadecen-3-ol, 3,5,11,15-tetramethyl was the major compound. Sitosterol is the major compound identified in *Prunus dulcis* plant oil. The three plant oils did not reveal a common major compound in them.

Figure2: Chemical constituents of plant oil*Mentha piperita*(GC-MS Chromatogram)

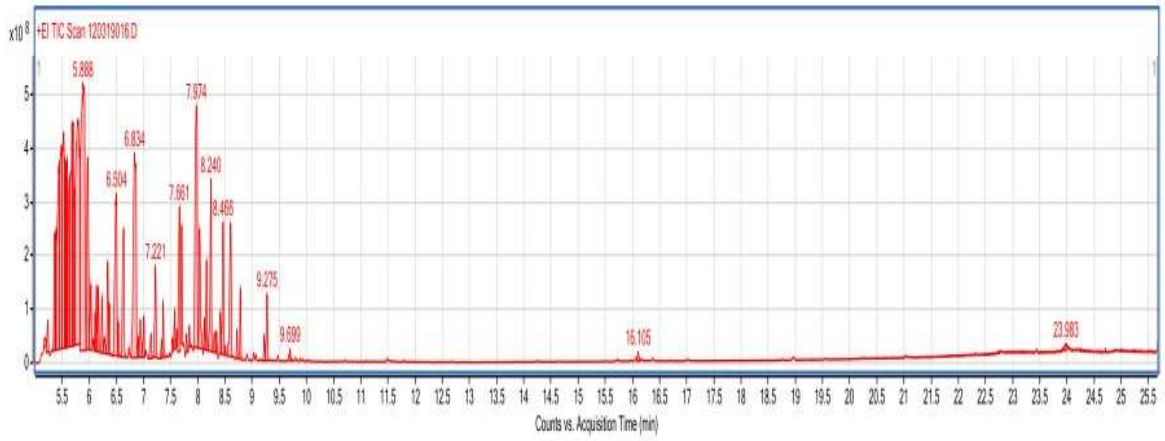
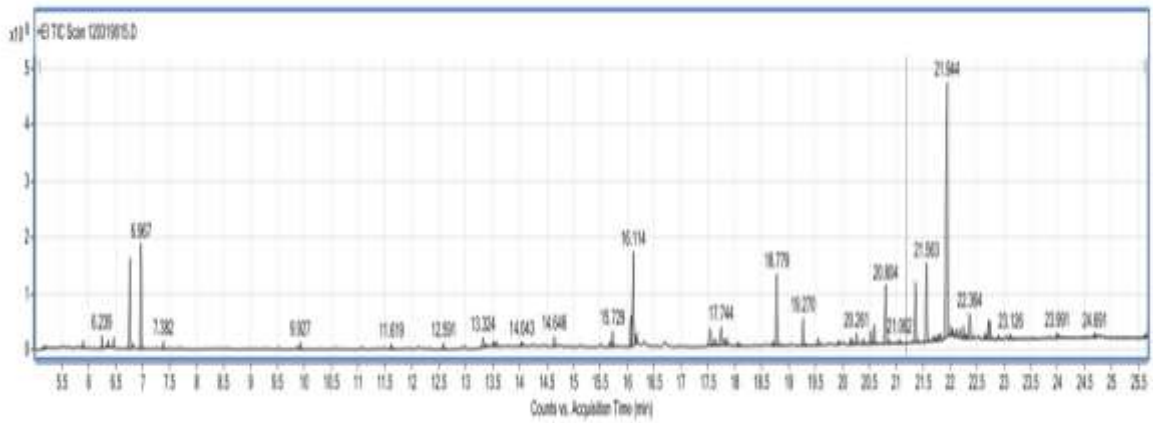


Figure 3: Chemical constituents of plant oil *Prunus dulcis* (GC-MS Chromatogram)



Studies carried out by Feng huanwei*et al.*, (2015) showed that30 compounds were present in the flower of *Jasminum officinale* by GC-MS. The major volatile components of the flower of *Jasminum officinale grandiflorum*were 3,7,11,15- tetramethyl-2-hexadecen- 1-ol 9(Phytol) (25.77%), 3,7,11-trimethyldodeca -1,6,10- trien-3-ol (12.54%) and 3,7,11,15-tetramethyl-1-Hexadecen-3-ol (12.42%).Mokhtar *et al*.,(2018) observed that an obvious inter or intra differences in the chemical composition of the three *Mentha* species. The common components in all species are 35 components, the major of which is P-menthone (33.24%) in *Mentha piperita* leaf. Regarding the unique components it was found that *Mentha piperita* contain 7 unique components the major of which is 2,4-(10)-thujadien (3.88%), while *Mentha spicata* has 18 unique components, the major one is Cymene(24.445%) and finally *Mentha pulegum* has 11 unique components the major one is (+)-Isomenthol (16.64%). Muhammad Nasimullah Qureshi *et al*., (2019) reported that *Prunus dulcis* has been known as a source of nutrients in many traditional foods and important biologically active compounds in traditional medicines. GC-MS analysis of the hexane and chloroform fractions yielded a number of volatile constituents, resulting in the highest amounts of 6-Octadecenoic acid and 1,1,3,3-Tetramethyl cyclopentane 37.52%and 24.54% in hexane and chloroform fractions respectively.

When the results were compared with the literature, the chemical composition and the content of essential oils from *Jasminum officinale, Mentha piperita* and *Prunus dulcis* in the present study showed slight differences, which can be attributed several factors such as the part of plant under analysis, the stage Ofplant development, the time of harvesting or picking, differences in climatic and ecological conditions.

CONCLUSION

GC-MS analysis of plant essential oils (*Jasminum officinale, Mentha piperita* and *Prunus dulcis*) revealed the presence of various compounds. The results reveal that essential oil of *Jasminum officinale* contains 55 compounds, *Mentha piperita* with 73 compounds and *Prunus dulcis* contains 42 compounds. Among the plant oils analyzed *Mentha piperita* shown higher percentages of biological compounds compared to other two plant oils. The chemical composition of the essential oils of *Jasminum officinale, Mentha piperita* and *Prunus dulcis* has a remarkable variation attributable to the species genetic variation and probably the ecological conditions under these plants are grown.

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