Tropical Journal of Pharmaceutical Research January 2015; 14 (1): 149-152
ISSN: 1596-5996 (print); 1596-9827 (electronic)

Available online at http://www.tjpr.org
http://dx.doi.org/10.4314/tjpr.v14i1.21

Original Research Article

Gas Chromatographic-Mass Spectrometric Analysis of Essential Oil of *Jasminum officinale* L var Grandiflorum Flower

Feng huan Wei*, Fei long Chen and Xiao mei Tan
College of Traditional Chinese Medicine, Southern Medical University, Guangzhou, China, 510515

For correspondence:* ***Email:* *awag7674@smu.edu.cn;* ***Tel:*** *+86 20 61648263;* ***Fax:*** *+86 20 61648244*

Received: 8 September 2014 *Revised accepted: 12 December 2014*

Abstract

Purpose: *To analyze the essential oil composition of the flower of Jasminum officinale L. var. grandifloroum L. (Jasminum grandiflorum) by gas chromatography-mass spectrometry (GC-MS).*
Methods: *The optimum GC-MS conditions used for the analysis were 250 °C inlet temperature, 150 °C MSD detector temperature, and GC oven temperature program as follows: 100 °C initial temperature, increased to 270 °C at 4 °C/min, final temperature 270 °C and held for 7.5 min.*
Results: *Thirty compounds were identified, representing 99.28 % of the oil content. The major volatile components of the flower were 3,7,11,15- tetramethyl-2-hexadecen-1-ol (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 %).*
Conclusion: *The results show that phytol is the major volatile component of Jasminum grandiflorum.*

Keywords: *Jasminum grandiflorum, Essential oil, Gas chromatography-mass spectrometry*

Tropical Journal of Pharmaceutical Research is indexed by Science Citation Index (SciSearch), Scopus, International Pharmaceutical Abstract, Chemical Abstracts, Embase, Index Copernicus, EBSCO, African Index Medicus, JournalSeek, Journal Citation Reports/Science Edition, Directory of Open Access Journals (DOAJ), African Journal Online, Bioline International, Open-J-Gate and Pharmacy Abstracts

INTRODUCTION

Jasminum officinale L. var. grandiflorum (*Jasminum grandiflorum*) is one of the Jasminum plants used as a folk remedy for the treatment of hepatitis, dysmenorrhea, stomatitis, duodenitis and depression in south China [1]. There are few reports about its chemical constituents and pharmacological properties, such as the hydroalcoholic extract from the buds of *Jasminum grandiflorum* showing preferable antiviral efficacy against HBV replication in HepG2 2.2.15 cell line *in vitro* [2].

Six phenolic compounds have been detected from water-methanol extracts of *Jasminum grandiflorum* which showed potentials for the treatment of psychiatric disorders and antioxidant protection [3]. Iridoid-type compounds, secoiridoid glucosides, triterpenes, flavonoids, lignans, etc, have also been isolated from this herb [4-6]. Ole (Oleaceae) obtained from the flowers of *Jasminum grandiflorum* blocked effectively hepatitis B surface antigen secretion in HepG2 2.2.15 cells in a dose-dependent manner (IC_{50} = 23.2 g mL^{-1}) while 80 mg/kg of Ole also reduced viremia in DHBV-infected ducks [7].

Jasminum grandiflorum is aromatic and an excellent source of essential oils. As far as we know, no works on its essential oil analysis has been reported. The objective of this study, therefore, is to evaluate the chemical composition of the flower oil of this plant by GC-MS.

EXPERIMENTAL

Instruments

An Agilent 6890N gas chromatography instrument, combined with an Agilent-5973 mass spectrometer equipped with an electron ionization (EI) and quadrupole analyzer, and Agilent Chem Station data system were used. GC separation was performed on a 30m DB-5 ms fused silica capillary column with an internal diameter of 0.25 mm and a film thickness of 0.25μm (Agilent, USA).

Materials and chemicals

Jasminum grandiflorum (*Jasminum officinale* L. var. grandifloroum L.) samples (batch no. 201301011, from Heshan City, Guangdong Province, China) were purchased from Guangzhou Kangsheng Pharmaceutical Co, Ltd. All samples were identified by Hongwei Zhang (Associate Professor, Department of Medicinal Plants & Pharmacognosy, Southern Medical University, Guangzhou, China) according to pharmacognostic standard documented in Vol 1, 2004 edition, Guangdong Province Chinese Medicine Standards [8]. All samples were kept in a desiccator (silica gel as desiccant) at room temperature in Department of Chinese Medicine Pharmaceutics, College of Traditional Chinese Medicine, Southern Medical University, Guangzhou, China, until used. Ethyl acetate was analytical-reagent grade and purchased from reagent company (Guangzhou, China).

Sample preparation

Jasminum grandiflorum (1 kg) was hydro-distilled for 3 h in a volatile oil extractor to yield 0.39 % of essential oil. The essential oil obtained was stored in a sealed glass tube with a screw cap in a refrigerator at 4 ^{o}C until analyzed.

Analysis of the essential oil

The essential oil of *Jasminum grandiflorum* was subjected to GC-MS analysis system. The carrier gas was helium (99.99 %) with flow rate of 1.0 mL/min. Inlet temperature was 250 ^{o}C and MSD detector temperature was 150 ^{o}C. Scan range 30 - 550 amu and scan rate of 2 scans/s were used. The GC oven temperature program was used as follows: 100 ^{o}C initial temperature, increased to 270 ^{o}C at 4 ^{o}C /min, final temperature 270 ^{o}C and held for 7.5min. The analysis period was 50 min. The oil was dissolved in 1 mL of ethyl acetate and vortex-mixed for 3 min, and finally, 1 μL was injected using a split technique (0.2:1). Identification of oil components was achieved based on their retention index, and by comparison of their mass spectral fragmentation patterns with those reported in the literature and stored in the MS library (D.02.00.275, version 2.0d).

RESULTS

The total ion chromatogram was obtained and showed in Fig 1. Thirty compounds were identified representing approximately 99.28 % of the oil (Table 1). There were significant differences between the main components of the essential oil. The major volatile components were phytol (25.77 %), 3,7,11-trimethyldodeca -1,6,10-trien-3-ol (12.54%) and 3,7,11-trimethyldodeca-6,10-dien-3-ol (12.42%).

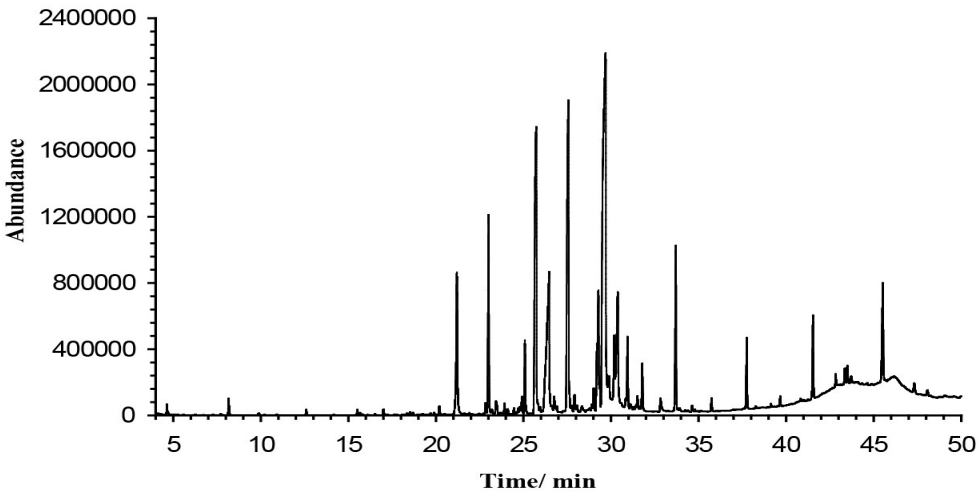

Fig 1: GC-MS total ion chromatogram of essential oil of the flowers of *Jasminum grandiflorum*

Table 1: Composition of the flower essential oil of *Jasminum Grandiflorum*

No.	Retention time	Component	Formula	Mol wt	Content (%)
1	8.160	Benzyl acetate	$C_9H_{10}O_2$	150.17	0.33
2	15.516	Nerolidol	$C_{15}H_{26}O$	222.20	0.11
3	17.004	Cedrol	$C_{15}H_{26}O$	222.20	0.14
4	19.921	Methyl myristate	$C_{15}H_{30}O_2$	242.22	0.75
5	20.199	7-Tetradecene	$C_{14}H_{28}$	196.22	0.20
6	21.195	Benzyl benzoate	$C_{14}H_{12}O_2$	212.80	4.84
7	22.84	Neophytadiene	$C_{20}H_{38}$	278.30	0.23
8	23.021	Perhydrofarnesyl Acetone	$C_{18}H_{36}O$	268.28	4.85
9	23.928	Phytol acetate	$C_{22}H_{42}O_2$	338.32	0.22
10	24.467	Nonadecane	$C_{19}H_{40}$	268.31	0.14
11	24.698	Geranyl linalool	$C_{20}H_{34}O$	290.26	0.12
12	25.090	Methyl palmitate	$C_{17}H_{34}O_2$	270.26	1.57
13	25.736	3,7,11,15- tetramethyl -1-Hexadecen-3-ol	$C_{20}H_{40}O$	296.31	12.42
14	26.465	Hexadecanoic acid	$C_{16}H_{32}O_2$	256.24	9.16
15	27.573	3,7,11-trimethyl-1,6,10-dodecatrien-3-ol	$C_{15}H_{26}O$	222.37	12.54
16	29.014	3,7,11,15-tetramethylhexadecanoic acid methyl ester	$C_{21}H_{42}O_2$	326.32	0.60
17	29.203	9,12,15-octadecatrienoic acid methyl ester	$C_{19}H_{32}O_2$	292.24	1.33
18	29.286	Heneicosane	$C_{21}H_{44}$	296.34	3.12
19	29.695	Phytol	$C_{20}H_{40}O$	296.31	25.77
20	29.897	Octadecanoic acid methyl ester	$C_{19}H_{38}O_2$	298.29	0.56
21	30.389	9,12,15-Octadecatrienoic acid	$C_{18}H_{30}O_2$	278.23	4.82
22	31.515	Docosane	$C_{22}H46$	310.36	0.25
23	33.709	Tricosane	$C_{23}H_{48}$	324.38	4.00
24	35.746	Tetracosane	$C_{24}H_{50}$	338.39	0.58
25	37.757	Pentacosane	$C_{25}H_{52}$	352.41	1.51
26	39.664	Hexacosane	$C_{26}H_{54}$	366.42	2.54
27	41.533	Heptacosane	$C_{27}H_{56}$	380.44	1.86
28	43.358	Octacosane	$C_{28}H_{58}$	394.45	1.26
29	43.501	Squalene	$C_{30}H_{50}$	410.39	0.46
30	45.523	Nonacosane	$C_{29}H_{60}$	408.47	3.00

DISCUSSION

The data show that phytol is the major essential component of *Jasminum grandiflorum*, and this component may have some of the pharmacological effects of *Jasminum grandiflorum* plant itself [1]. It was reported that phytol exhibits anticonvulsant activity by modulating of neurotransmitter systems in piloacarpine-induced seizures and showed antitubercular activity against M. tuberculosis H37Rv strain at 100 mg mL^{-1} (MIC) [9,10]. Acute administration of phytol exerts an anxiolytic-like effect on mice by producing sedative and anxiolytic activities [11]. Phytol also directly activates peroxisome proliferator-activated receptor α (PPARα) and regulated gene expression involved in lipid metabolism in PPARα-expressing HepG2 hepatocytes [12]. Furthermore, trans-phytol inhibits the biosynthesis of estrogen in human ovarian granulose cells by aromatase (CYP19) [13].

CONCLUSION

The results reveal that the essential oil of the flower of *Jasminum grandiflorum* contains thirty compounds in various concentrations, with the major component being phytol.

ACKNOWLEDGEMENT

We express our appreciation to Associate Professor Hongwei Zhang for identifying the samples and Xiaohua Ye for oil extraction. The work was supported by Science and Technology Planning Project of Guangdong Province, China (no. 2011B032200003) and Science and Technology Planning Project of Guangzhou, China (no. 2012Y2-00018-4).

REFERENCES

1. *Nanjing University of Traditional Chinese Medicine. Dictionary of Chinese Materia Medica 2nd ed. Shanghai: Shanghai Science & Technology Press, 2006; p 2476.*
2. *Zhao GQ, Yin ZF, Liu LY, Mao XX, Su ZH. Anti-hepatitis B Virus Activity of 8-epi-Kingiside in Jasminum officinale var. grandiflorum. Chinese Herbal Medicines 2013; 1: 53-57.*
3. *Ferreres F, Gross C, Gil-Izquierdo A, Valentãob P, Andrade PB. Assessing Jasminum grandiflorum L.*

authenticity by HPLC-DAD-ESI/MSn and effects on physiological enzymes and oxidative species. J Pharmaceut Biomed 2014; 88: 157–161.

4. *Tanahashi T, Sakai T, Takenaka Y, Nagakura N, Chen CC. Structure elucidation of two secoiridoid glucosides from Jasminum officinale L. var. grandiflorum (L.) Kobuski. Chem Pharm Bull 1999; 47: 1582–1586.*
5. *Somanadhan B, Smitt UW, George V, Pushpangadan P, Rajasekharan S, Duus J, Nyman U, Olsen CE, Jaroszewski JW. Angiotensin converting enzyme (ACE) inhibitors from Jasminum azoricum and Jasminum grandiflorum. Planta Med 1998; 64: 246–250.*
6. *Sadhu SK, Khan MS, Ohtsuki T, Ishibashi M. Secoiridoid components from Jasminum grandiflorum. Phytochem 2007; 68: 1718–1721.*
7. *Zhao GQ, Yin ZF, Dong JX. Antiviral efficacy against hepatitis B virus replication of oleuropein isolated from Jasminum officinale L. var. grandiflorum. J Ethnopharmacol 2009; 125: 265–268.*
8. *Guangdong Provincial Administration of traditional Chinese Medicine. Guangdong Province Chinese medicine standard Vol. I, Guangzhou: Guangdong Science & Technology Press, Ltd 2004: 182-184.*
9. *Costa JP, Ferreira PB, De Sousa DP, Jordan J, Freitas RM. Anticonvulsant effect of phytol in a pilocarpine model in mice. Neurosci Lett 2012; 523: 115-118.*
10. *Saikia D, Parihar S, Chanda D, Ojha S, Kumar JK, Chanotiya CS, Shanker K, Negi AS. Antitubercular potential of some semisynthetic analogues of phytol. Bioorg Med Chem Lett 2010; 20: 508-512.*
11. *Costa JP, Oliveira GA de, Almeida AA de, Islam MT, Sousa DP de, Freitas RM de. Anxiolytic-like effects of phytol: Possible involvement of GABAergic transmission Brain Res 2014; 1547: 34–42.*
12. *Goto T, Takahashi N, Kato S, Egawa K, Ebisu S, Moriyama T, Fushiki T, Kawada T. Phytol directly activates peroxisome proliferator-activated receptor alpha (PPARalpha) and regulates gene expression involved in lipid metabolism in PPARalpha-expressing HepG2 hepatocytes. Biochem Bioph Res Co 2005; 337: 440-445.*
13. *Guo JJ, Yuan Y, Lu DF, Du BW, Xiong L, Shi JG, Yang LJ, Liu WL, Yuan XH, Zhang GL, Wang F. Two natural products, trans-phytol and (22E)-ergosta-6,9,22-triene-3β,5α,8α-triol, inhibit the biosynthesis of estrogen in human ovarian granulosa cells by aromatase (CYP19). Toxicol Appl Pharm 2014; 279: 23–32.*