Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env.Pharmacol. Life Sci., Vol 4 [4] March 2015: 153-155
©2014 Academy for Environment and Life Sciences, India
Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804

ORIGINAL ARTICLE

Essential Oil Constituents of *Nigella sativa*

Ali Reza Ladan Moghadam
Department of Gardening, Garmsar Branch, Islamic Azad University, Garmsar, Iran
E-mail: aladanmoghadam@gmail.com

ABSTRACT
The chemical composition of the essential oil obtained from Nigella sativa (Ranunculaceae) was analyzed by GC/MS and the components identified were: p-cymene (32.05%) followed by α-thujene (6%), α-pinene (1.11%), camphene (11%), sabinene (1%), β-pinene (7%), β-myrcene (0.21%), α-phellandrene (0.45%), limonene (0.13), γ-terpinene (5.12%), terpinolene (0.23%), camphor (1%), carvone (0.32%), thymoquinone (20.32%), thymol (10.12%), carvacrol (1%), longicyclene (0.9) and borneol (0.43).
Keywords: *Nigella sativa, Essential oil, p-Cymene, Thymol .*

Received 21.11.2014 Revised 21.01.2015 Accepted 22.02. 2015

INTRODUCTION

Black cumin (*Nigella sativa* L.), belonging to Ranunculaceae family. As an aromatic plant, *Nigella sativa* is widely grown in different parts of the world and the seeds of black cumin have been used to promote health for countries especially in the Middle East and Southeast Asia [1]. *Nigella sativa* seeds yield esters of fatty acids, free sterols and steryl esters [2]. The seeds also contain lipase, phytosterols and sitosterol [3]. During the past few decades, many phytochemical and pharmacological studies have been conducted on *Nigella sativa* seeds because of its marked biological activities, antioxidant, anti-inflammatory and antiulcer activity [3]. The biological properties of the essential oils have been found to be directly linked to their chemical compositions, which are influenced by the origin of the plants [4]. An Iranian *Nigella sativa* essential oil was found to be dominated by phenylpropanoid components and displayed a trans-anethole chemotype [5]. The main objectives of the present study were to evaluate of the essential oil from *Nigella sativa* seeds.

MATERIALS AND METHODS

Plant material and oil isolation

The plant materials were collected from the mountains in the city of Ilam-Iran in 2012- 2013. The *Nigella sativa* seeds were ground and the resulting powder was subjected to hydrodistillation for 3 hours in an all glass Clevenger-type apparatus according to the method recommended by the European Pharmacopoeia [6]. The obtained essential oils were dried over anhydrous sodium sulphate and after filtration, stored at +4 ºC until tested and analysed.

Essential oil analysis

The GC/MS analyses were executed on a Hewlett–Packard 5973N gas chromatograph equipped with a column HP-5MS (30 m length × 0.25 mm i.d., film thickness 0.25 lm) coupled with a Hewlett–Packard 5973N mass spectrometer. The column temperature was programmed at 50 ºC as an initial temperature, holding for 6 min, with 3 ºC increases per minute to the temperature of 240 ºC, followed by a temperature enhancement of 15 ºC per minute up to 300 ºC, holding at the mentioned temperature for 3 min. Injector port temperature was 290 ºC and helium used as carrier gas at a flow rate 1.5 ml/min. Ionization voltage of mass spectrometer in the EI-mode was equal to 70 eV and ionization source temperature was 250 ºC. Linear retention indices for all components were determined by coinjection of the samples with a solution containing homologous series of C8-C22 *n*-alkanes
and comparing them and their mass spectra with those of authentic samples or with available library data of the GC/MS system (WILEY 2001 data software) and Adams libraries spectra [7].

RESULTS AND DISCUSSION

Chemical composition of the essential oils

The essential oil of *Nigella sativa* seeds obtained using hydrodistillation was isolated in high yield (0.84%). Results of GC/MS analysis of the essential oil (Table 1) indicate that the essential oil was characterized mainly by monoterpenes. The major constituent of the oil was the hydrocarbon monoterpene *p*-cymene, with a relative concentration of 32.05%. The GC/MS analysis of *N. sativa* oil showed eighteen compounds representing 98.39 % of the total oil; *p*-cymene was the main constituent (32.05%) followed by *α*-thujene (6%), *α*-pinene (1.11%), camphene (11%), sabinene (1%), *β*-pinene (7%), *β*-myrcene (0.21%), *α*-phellandrene (0.45%), limonene (0.13), γ-terpinene (5.12%), terpinolene (0.23%), camphor (1%), carvone (0.32%), thymoquinone (20.32%), thymol (10.12%), carvacrol (1%), longicyclene (0.9%) and borneol (0.43%). Previous studies have shown monoterpenes, including *p*-cymene, α-thujene, γ-terpinene, carvacrol, α-pinene and *b*-pinene, to be the main components of the essential oil from black cumin [8,9]. Our results reinforce previous data on the variability seed volatile oils, depending on the origin of the samples, environmental and climatic conditions. A variety of chemotypes have been described in the literature. An Iranian *Nigella sativa* essential oil was found to be dominated by phenylpropanoid components and displayed a trans-anethole chemotype [6]; other *Nigella sativa* from Iran [10], Algeria [11] and India [12] was found *p*-cymene/thymoquinone chemotype. It has been reported that the chemical compositions of the essential oil are highly influenced by climatic conditions and geographical factors [13,14]. The high level of *p*- cymene, thymoquinone and thymol in the essential oil could contribute to the valorization of Iranian *Nigella sativa* species, since this monoterpene is of great importance in industry as intermediate for synthesis of fragrances, pharmaceuticals and herbicides.

Table 1. Chemical composition of *Nigella sativa* volatile oil constituents.

Compound	%	RI	Compound	%	RI
α-Thujene	6	916	γ-Terpinene	5.12	1068
α-Pinene	1.11	920	Terpinolene	0.23	1080
Camphene	11	928	Camphor	1	1120
Sabinene	1	956	Borneol	0.43	1168
β-pinene	7	960	Carvone	0.32	1240
β-myrcene	0.21	968	Thymoquinone	20.32	1252
α-phellandrene	0.45	1000	Thymol	10.12	1290
limonene	0.13	1020	Carvacrol	1	1301
p-Cymene	32.05	1022	Longicyclene	0.9	1387
Total			98.39		

[a] The retention Kovats indices were determined on HP5 capillary column.

REFERENCES

1. Hedrick, U.P.(1972). Sturtevant's Edible Plants of the World. Dover Publications, New York.
2. Menounos, P., Staphylakis, K. & Gegiou, D.(1986). The sterols of *Nigella sativa* seed oil. Phytochem., 25:761-763.
3. Duke, J. A. (1992). Handbook of Phytochemical Constituents of GRAS Herbs and other Economic Plants. CRC press, Inc. Florida, USA.
4. Ali, B. H. & Blunden. G. (2003). Pharmacological and toxicological properties of *Nigella sativa.* Phytother. Res., 17:299–305.
5. Celiktas, O.Y., Kocabas, E.E.H., Bedir, E., Sukan, F.V., Ozek, T. & Baser, K.H.C. (2007). Antimicrobial activities of methanol extracts and essential oils of *Rosmarinus officinalis*, depending on location and seasonal variations. Food Chemistry., 100:553–559.
6. Nickavar, B., Mojab, F., Javidinia, K. & Amoli, M.A.R. (2003). Chemical composition of the fixed and volatile oils of *Nigella sativa* L. from Iran. Zeitschrift Fur Naturforschung., 58:629–631.
7. European Pharmacopoeia (1975). Vol. 3, Maisonneuve S. A., Sainte–Ruffine.
8. Adams, R.P. (2001). Identification of Essential Oils Components by Gas Chromatography/Quadra pole Mass Spectroscopy. Carol Stream, IL, Allured.61- 367.
9. Burits, M. & Bucar, F. (2000). Antioxidant activity of Nigella sativa essential oil. Phytotherapy Research., 14(5):323-328.
10. Hajhashemi, V., Ghannadi, A. and Jafarabadi, H. (2004). Black cumin seed essential oil, as a potent analgesic and antiinflammatory drug. Phytother. Res. 18: 195–199.

11. Benkaci-Ali, F., Baaliouamer, A., Meklati, & Chemat, F. (2007). Chemical composition of seed essential oils from Algerian Nigella sativa extracted by microwave and hydrodistillation. Flavour Fragr. J., 22:148–153.
12. Singh, G., Marimuthu, P., de Heluani, C.S. & Catalan, C. (2005). Chemical constituents and antimicrobial and antioxidant potentials of essential oil and acetone extract of *Nigella sativa* seeds. J. Sci. Food Agr., 85:2297–2306.
13. Fatima, S., Farooqi, A.A. & Sharma, S. (2002). Physiological and metabolic responses of different genotypes of Cymbopogon martinii and C. winterianus to water stress. Plant growth regulation., 37(2):143-9
14. Shareef, AA. (2011). Evaluation of antibacterial activity of essential oils of Cinnamomum sp. and Boswellia sp. Journal of Basrah Researches., 37(5): 60-73.

CITATION OF THIS ARTICLE

Ali Reza L M. Essential Oil Constituents of *Nigella sativa*. Bull. Env.Pharmacol. Life Sci., Vol 4 [4] March 2015: 68-72

 ©2015 AELS, INDIA