

The volatiles of desert truffle: *Tirmania nivea*

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Received 10 July 1992; accepted in revised form 18 September 1992

Key words: Desert truffle, *Tirmania nivea*, Truffles, Volatiles

Abstract. The volatile constituents of *Tirmania nivea* (white desert truffle) have been analysed, using gas chromatography/mass spectrometric technique. 11 compounds have been identified in the ascocarp volatiles. The major components were found to be unsaturated fatty acids; whereas hexadecanoic acid represented 49% of the volatiles isolate.

Introduction

Truffle tubers are widespread around the world including various parts of the Middle East and North Africa. However, the most highly prized truffle is the Perigord truffle, *Tuber melanosporum* Vittad, that grows in Southern Europe. The Perigord truffle is valued for its aroma imparted to foods and is usually used as a condiment [11].

Desert truffles (*Tirmania* and *Terfezia* spp.) have attained particular importance as nutritive materials. They are usually used in cooked dishes and have long been utilized by the desert natives as substitutes for meat in their diet [1, 10]. They have been also used in the folk medicine for treatment of some ophthalmic diseases and as aphrodisiac [7]. Some reports have determined the nutritive values of desert truffles [1, 10], and their major constituents were preliminary screened [2, 3, 5, 6, 9]. However the important secondary metabolites of these truffles have not been investigated as yet. Therefore, we have started a research project to analyse the secondary constituents in the ascocarp of *Tirmania nivea* (Desf. Fr.) Trappe (white desert truffle). The present paper, the first of a series of reports, deals with its volatiles.

Materials and methods

Samples of the ascocarp of *T. nivea* (white truffles) were collected from those

Table 1. Composition of the major volatiles of *Tirmania nivea* analysed by GC-MS

Peak No.	Compound	Rt in min.	Relative %	Mol. Wt.	Base Peak (m/z)	Formula
1	7-octan 4-ol	4.8	5.22	128	57	C ₈ H ₁₆ O
2	Unknown	6.1	1.31	136	57	?
3	Benzoacetonitrile	6.6	1.41	117	117	C ₈ H ₇ N
4	Thujon	9.9	0.45	152	81	C ₁₀ H ₁₆ O
5	Unknown	13.5	0.23	198	71	?
6	Tetradecanoic acid	15.4	0.67	228	43	C ₁₄ H ₂₄ O ₂
7	Pentadecanoic acid	16.5	0.27	242	43	C ₁₅ H ₃₀ O ₂
8	Hexadecanoic acid	18.2	49.11	256	43	C ₁₆ H ₃₂ O ₂
9	11,14-Eicosadienoic acid methyl ester	19.8	18.8	322	67	C ₂₁ H ₃₈ O ₂
10	Octadecanoic acid	20.0	18.8	284	43	C ₁₈ H ₃₆ O ₂
11	Eicosane	20.2	0.87	282	43	C ₂₀ H ₄₂
12	Heneicosane	21.7	0.55	296	43	C ₂₁ H ₄₄
13	Pentacosane	23.1	0.51	352	43	C ₂₅ H ₅₂

growing wild in the desert area near El-Salloum, N.W. Egypt. The air dried samples were subjected to a continuous extractive-distillation technique using modified Likens and Nickerson apparatus [8], which provides hydrodistillation and simultaneous extraction of the volatiles with organic solvents (n-pentane and ethyl acetate). The resulted volatile fraction was subjected to gas chromatographic-mass spectrometric (GC-MS) analysis on Finnigan 4000 mass spectrometer attached to a Finnigan 9610 gas chromatograph equipped with a capillary DBI-column carrier gas: He, at a rate of 20 ml/min, injector temp: 270 °C, separator and transfer lines: 275 °C, column temp: programmed from 50 to 240 °C at rate of 10 °C/min, ionization energy: 70 e.v.

The identification of the components was achieved by matching their mass spectra (electron impact and chemical ionization) with the computer library.

Results and discussion

Eleven compounds have been identified from the 13 major components detected in *T. nivea* volatiles (Table 1). The composition is characterized by remarkably high amounts of hexadecanoic acid (49%), 11,14-eicosadienoic acid methyl ester (19%) and octadecanoic acid (19%). Approximately 95% of the volatile fraction was identified where the major compounds were found to be unsaturated fatty acids. The lipid fraction of *Tuber magnatum* and *Tuber melanosporum* have been previously studied where 11,14-eicosadienoic acid was also detected [12]. The aroma of *T. mangnatum* and

T. aestivum have been reported to be characterized by bis (methylthio) methane [4]. This compound and other alcoholic compounds (e.g. ethanol, 2-butanol, 1-propanol, 2-methyl-1-propanol, 2-methyl-1-butanol) previously reported in *T. magnatum*, *T. aestivum* and *T. mesentericum* [4] have not been detected as volatiles in desert truffle *Tirmania nivea*.

This study appears to be the first report on the composition of the volatiles of *Tirmania nivea*. Other secondary metabolites are now under investigation.

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