

# Investigation of Some Volatile Components of Seven Fresh Wild Mushrooms (Basidiomycetes)

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**ABSTRACT:** Twenty-five volatile compounds were identified by GC/MS from seven fresh wild mushrooms (*Piptoporus betulinus*, *Oligoporus caesius*, *Amanita rubescens*, *Paxillus involutus*, *Suillus grevillei*, *Suillus luteus*, *Xerocomus subtomentosus*—Basidiomycetes). The main volatile components were 1-octen-3-ol, 3-heptanone, limonene, (E)-2-heptenal, (E)-2-decenal, 4-hydroxy-4-methyl-2-pentanone, methyl 2,4-dihydroxy-3,6-dimethylbenzoate, farnesyl acetone, 3-octanol and 3-octanone. Geranyl acetone and 1,8-cineole were identified for the first time in mushrooms.

**KEY WORD INDEX:** Mushroom, *Piptoporus betulinus*, *Oligoporus caesius*, *Amanita rubescens*, *Paxillus involutus*, *Suillus grevillei*, *Suillus luteus*, *Xerocomus subtomentosus*, Basidiomycetes, 1-octen-3-ol, 4-hydroxy-4-methyl-2-pentanone, 3-heptanone, (E)-2-heptenal, 3-octanone, 3-octanol, limonene, (E)-2-decenal, methyl 2,4-dihydroxy-3,6-dimethylbenzoate, farnesyl acetone.

**MUSHROOM NAME(3):** *Piptoporus betulinus* (Bull.:Fr.) P. Karst., *Oligoporus caesius* (Schrad.:Fr.) Gilbertson & Ryvarden, *Amanita rubescens* (Pers.:Fr.) S. F. Gray, *Paxillus involutus* (Batsch:Fr.) Fr., *Suillus grevillei* (Klotzsch) Singer, *Suillus luteus* (L.:Fr.) Roussel, *Xerocomus subtomentosus* (L.:Fr.) Quéf.

**SOURCE:** Fresh specimens representing a combination of young and old basidiocarps were collected in the South of France from October to November 1994 and wrapped in waxed paper bags. Within a few hours of collection the fruit bodies were brushed clean of forest debris.

Table I. Percentage\* of volatile compounds identified in fresh mushrooms

Compound	KI**	Mushroom type***						
		1	2	3	4	5	6	7
4-hydroxy-4-methylpenta-2-one	729	-	-	-	-	-	-	10.0
hexanal	778	-	-	-	-	4.0	-	-
3-heptanone	852	-	17.0	-	3.0	-	-	-
6-methylheptan-3-one	925	-	5.0	3.0	-	-	-	-
(E)-2-heptenal	930	-	-	-	-	20.0	30.0	-
benzaldehyde	937	-	-	-	-	-	3.0	-
2-butoxyethanol	940	-	-	-	-	-	2.0	-
1-octen-3-one	948	-	-	-	-	-	-	9.0
3-octanone	950	1.2	-	8.5	-	-	-	22.4
1-octen-3-ol	964	75.0	55.0	45.0	42.0	14.0	-	-
3-octanol	980	1.0	-	9.0	40.0	-	-	-
1,8-cineole	1024	-	-	-	-	6.0	-	-
limonene	1026	1.0	-	-	2.0	-	1.0	13.0
3,5,5-trimethylcyclohex-2-enone	1042	0.4	-	-	-	-	-	-
(2E,4E)-octadienal	1151	0.4	-	-	-	-	-	-
(E)-2-octenol	1153	3.6	-	8.5	-	6.5	-	5.0
4-methyl-5-thiazoethanol	1235	-	-	-	-	-	2.0	-
(E)-2-decenal	1243	-	-	-	-	12.0	40.0	-
(2E,4Z)-decadienal	1319	-	-	-	-	3.0	2.5	-
(2E,4E)-decadienal	1349	-	-	-	-	3.5	5.0	-
geranyl acetone	1443	5.0	-	4.0	-	-	-	-
N(2-phenylethyl)acetamide	1463	-	-	-	-	-	-	6.0
methyl 2,4-dihydroxy-3,6-dimethyl-benzoate	1659	6.8	4.0	0.5	-	10.5	-	-
(E,E)-7,11,15-trimethyl-3-methylene-hexadeca-1,6,10,14-tetraene	1860	-	-	8.5	-	-	-	-
farnesyl acetone	1865	-	-	12.0	-	-	-	-

\*relative percentage of the identified volatile based on the GC/MS chromatographic area  
\*\*Kovats index  
\*\*\* 1 = *Suillus grevillei*, 2 = *Oligoporus caesius*, 3 = *Suillus luteus*, 4 = *Piptoporus betulinus*,  
5 = *Paxillus involutus*, 6 = *Amanita rubescens*, 7 = *Xerocomus subtomentosus*

**MUSHROOM PART:** Whole mushrooms (250 g) were cubed (approximately 100 mm<sup>3</sup>) and placed in a conical flask with dichloromethane.

**PREVIOUS WORK:** The volatiles of many fresh mushrooms have been the subject of several investigations (4-6, 8-15). None of the seven wild species were previously investigated for volatiles.

**PRESENT WORK:** Analysis was performed on a Hewlett-Packard GC/MS system. The chromatograph was fitted with a 25 m x 0.25 mm dimethylpolysiloxane DB-1 fused silica capillary column. The carrier gas was helium with a flow rate close to 0.9 mL/min. The injector and detector temperatures were 200°C and 220°C, respectively. The column was temperature programmed as follows: 60°C (2 min) 60°-200°C (4°C/min). The mass spectra were recorded on a selective ion quadrupole of the HP5970A class, using a potential of 70 eV for ionization by electron impact.

Twenty-five volatile constituents were identified by the analysis method (Table I). The dichloromethane extracts were composed primarily of C<sub>8</sub> aliphatic alcohols and lactones such as

mushrooms (5,10) but, in our study, this compound was not detected in *A. rubescens* and *X. subtomentosus*. On the other hand, a low amount of 1-octen-3-one was found for the latter mushroom species. The percentage of volatile substances other than C<sub>8</sub> components ranged from 5.0-85.5%. The aldehyde constituents, i.e., (E)-2-decenal, (2E,4E)-decadienal, (2E,4Z)-decadienal, (E)-2-heptenal and hexanal appeared only in the two mushrooms, *A. rubescens* and *P. involutus*. The quantitative data listed in Table I indicated that limonene was present in four out of seven mushrooms (*S. grevillei*, *P. betulinus*, *A. rubescens*, *X. subtomentosus*). Volatile components not previously observed in mushrooms were geranyl acetone (6,10-dimethylundeca-5,9-diene-2-one) in *S. grevillei* and *S. luteus*, and 1,8-cineole in *P. involutus*.

The differences in composition indicated to us that the analysis method used was well adapted to the identification of volatile components of mushrooms (11). The screening method will allow the selection of fungi which produce volatiles that are not only interesting but also useful in bioproduction of natural compounds for cosmetics and food (1-2,7). Further screenings of Basidiomycetes may add to the broad spectrum of volatile compounds.

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