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Original Research Article

Effect of drying methods on the phytochemical composition and bioactive compounds of two oyster mushroom species using GC-MS

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ABSRTACT

Pleurotus ostreatus is a treasured mushroom known for its abundance of bioactive compounds with high nutritional, medicinal, and therapeutic properties. The study evaluated the effects of two drying methods; oven drying and sun drying, on the phytochemical composition of *Pleurotus ostreatus* (grey and white varieties). Samples were collected from an indoor mushroom farm, cleaned with water, and subjected to pre-treatment and drying. One portion was sun-dried at room temperature, another oven-dried at 120 °C for 1 hour, while fresh mushrooms served as the control. Soxhlet extraction was used for sample preparation, and Gas Chromatography-Mass Spectrometry (GC-MS) was utilized for the detection of compounds. Bioactive compounds were identified using Retention Time (RT) compared with standards in the National Institute of Standards and Technology (NIST) library. Results showed that sun-dried grey mushrooms had 26 compounds, oven-dried had 22, and fresh samples had 24, including hydrocarbons, siloxanes, and aromatic acids. White oyster mushrooms contained 19 compounds in sun-dried samples and 14 in oven-dried samples, with linoleic acid derivatives and phenolic compounds present in high concentrations. Key bioactive compounds identified include 9, 12-Octadecadienoic acid (Z, Z)-methyl ester, Heptasiloxane, and Bicyclo [3.1.0] hex-3-en-2-one derivatives, all of which are known for their antioxidant, antimicrobial, and anti-inflammatory properties. The presence of sulfur-containing and siloxane-based compounds suggests possible uses in the food, agriculture, and pharmaceutical sectors. Both drying procedures significantly affected the mushrooms' chemical profiles; however, sun-dried samples retained more phytochemicals across both species, indicating that sun drying can preserve important bioactive constituents and improve compound availability.

Keywords: Oyster mushrooms, sundried, oven-dried, bioactive compounds

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Introduction

Oyster mushrooms belonging to the genus *Pleurotus* are common edible mushrooms grown on lignocellulosic waste.[1] They are the most sought-after and third-cultivated mushrooms worldwide, after *Agaricus bisporus* and *Lentinula edodes*, due to their capacity to flourish on low-cost lignocellulosic agricultural leftovers, their rapid growth rate, and the simplicity of their cultivation.[2] In Nigeria and other sub-Saharan African nations, oyster mushrooms' potential to support sustainable food systems and improve smallholder farmers' financial viability is becoming more widely acknowledged.[3,4] Proteins, dietary fiber, essential amino acids, vitamins (especially B-complex), and trace elements like zinc and selenium are all abundant in oyster mushrooms.[5,6] More significantly, they are rich in a range of bioactive substances that have anti-inflammatory, anticancer, antioxidant, and immunomodulatory properties. These include polysaccharides such as lentinan, alkaloids, terpenoids, flavonoids, phenols, and β-glucans.[7,8] These qualities lend credence to their designation as functional foods, which reduce the risk of disease and promote health, also due to their diverse phytochemical composition, including bioactive compounds, antioxidants, anti-inflammatory, and anticancer properties[9,10].

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Phytochemical screening analyzes and identifies bioactive compounds in plants and fungal species. These compounds occur naturally and are responsible for the organoleptic properties of these species. Owing to the rising attention as regards natural remedies, nutraceuticals, identification, and quantification of physiologically active compounds has become important in mushroom research.[11,12] Over 4,000 phytochemicals have been reported in several plant and fungal species, many of which have strong pharmacological effects.[13,14] These substances play significant role in the medicinal and nutritional properties of *Pleurotus* species.

Oyster mushrooms' high moisture content, which is usually above 85 %, makes them susceptible to microbial spoiling, enzymatic browning, and disintegration in a short amount of time, making their extreme per ishability a significant obstacle to maximizing their health and comme rcial potential.[15] The maximum shelf life for most mushrooms ranges from one to three days at room temperature (25°C) and five to seven days when refrigerated (4°C). Therefore, postharvest preservation is required to preserve their bioactivity and quality. Drying is the most accessible and reasonably priced preservation process for increasing product variety and extending shelf life. Dried mushrooms can be packaged as nutraceutical products, processed into flour, and used in infant formulas, soups, and sauces. Depending on the method, drying changes the phytochemical and antioxidant profiles of these mushrooms. Research on drying methods for mushrooms has primarily focused on their impact on antioxidant and nutritional properties.[16,17,18] The influences of several drying methods on the phenolic properties, a ntioxidant activity, and other nutritional characteristics of mushrooms have been the subject of several investigations.According to these rese arches, drying techniques have a significant impact on how well these qualities are retained, and specific techniques work better than.[19,20,21]

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Although much research has been done on the nutritional and antioxidant qualities of oyster mushrooms, nothing is known about how different drying methods affect the volatile bioactive chemicals in these mushrooms. These volatile substances may have pharmacological value in addition to adding flavor and scent. Moreover, insufficient research has been conducted on the relative impacts of various drying conditions on the phytochemical profiles of *Pleurotus* species cultivated in tropical environments, such as those found in Nigeria. This research examined the effects of two drying methods, oven drying and sun drying, on the phytochemical composition and bioactive compounds of two *Pleurotus ostreatus* varieties (white and grey). The practical implications of this study findings could significantly enhance our understanding of mushroom processing for use in food, pharmaceutical, and nutraceutical sectors.

Materials and Methods

Samples collection and identification

The fresh oyster mushroom (*Pleurotus ostreatus*) used in the present study was collected in April 2024 from Johncollins Farms and Agro-allied Services Ltd., Calabar, Nigeria (GPS: 4053'57" N, 8 ° 340'29" E). The mushrooms were identified and authenticated by Professor A.A Markson, an applied mycologist and deposited at the Department of Plant and Ecological Studies herbarium, University of Calabar, with voucher number BOT/herb/UCC/003 (white variety) and BOT/herb/UCC/004 (grey variety). The samples were cleaned with water, followed by pre-treatments and drying methods.

Samples preparation

Samples were dried using two different methods: sundry and oven dry, while fresh mushroom samples served as the control. One kilogram of fresh oyster mushrooms (both white and grey) was dried in the open air under the sun for two days using trays at about 25–37 0C and relative humidity of 41–46 %. Frequent turning was ensured during the drying process to achieve effective drying. For oven-dried samples, the mushroom samples were placed on a clean, plain sheet (A4 paper), and dried at 120 ^{0}C and then dried in an oven at 120 ^{0}C for 2 hours with a relative air humidity of 75%, according to Dunkwal [22] The dried mushroom samples were crushed and stored in a sealed plastic vial and kept in a calm environment for future use.

Sample extraction

Sample extraction took place at the BGI Resource Laboratory in Port Harcourt, Rivers State, Nigeria. Extraction process followed methods described by Kumar.[23] An electronic weighing balance was used to weigh 5 g of the sample into an extraction protector of a Soxhlet extractor. 50 mL of methanol was diluted with dimethyl sulfoxide and dispensed into a round-bottom flask attached to the extractor and subjected to reflux 3 times. After reflux, the solvent was evaporated to 2mL concentration using a rotary evaporator. The extract was then transferred into an appropriately labeled Teflon screw-cap vial. To purify the extract, it was cleaned using a 200 mm mesh silica gel column containing 3 g of anhydrous sodium sulfate. After cleaning, the extract was then subjected to GC-MS analysis.[24]

GC-MS operation conditions

An Agilent 5890N gas chromatography autosampler was connected to an Agilent mass spectrophotometric detector. 1 µl of the sample was injected in the pulsed splitless mode into a 30 m x 0.25 mm id DB 5MS coated fused silica column with a film thickness of 0.15 µm. Helium was employed as the carrier gas, and a steady flow rate of 1 mL/min was made possible by maintaining the column head pressure at 20 psi. There were additional operational conditions. After being maintained at 55°C for four minutes, the column temperature was raised to 200°C at 25°C per minute, 280°C at 8°C per minute, and 300°C at 25°C per minute, all of which were maintained for two minutes.

Bioactive compound characterization in the extract

Since each active ingredient has a different retention time (RT) in the column, the characterization of the bioactive chemicals found in the extract was based on RT. The National Institute of Standards and Technology (NIST) Library version 2.1 was used to interpret GC-MS mass spectra. The unknown spectrum matched more than 62,000 patterns in the spectra of known substances that were kept in the NIST Library. As a result, the query hit was determined by how closely it matched a known pattern.

Results and Discussion

Phytochemical profiles and compound diversity across drying methods

The GC-MS chromatograms (Figures 1–6) and the bioactive compound profiles (Tables 1–6) revealed clear differences in compound diversity across the drying methods and mushroom varieties. Notably, sun-dried grey *Pleurotus* (SDGP) recorded the highest number of bioactive compounds (26), followed by fresh grey (FGP) with 24, and oven-dried grey (ODGP) with 22 compounds. In contrast, the white variety showed fewer compounds, with sun-dried white (SDWP) yielding 19 compounds, fresh white (FWP) 15, and oven-dried white (ODWP) yielding the least, with 14 compounds. This trend suggests that sun drying retained or enhanced more phytochemicals than oven drying, particularly in grey mushrooms. The slower rate of moisture loss during sun drying may have allowed for better preservation of heat-sensitive compounds.[25] Figures 1 and 4 (sun-dried chromatograms) exhibited more complex and pronounced peaks compared to Figures 2 and 5 (oven-dried), visually confirming this chemical richness. According to ElGamal et al, [26] moderate drying temperatures can enhance the retention of bioactive compounds. However, Mohamad and Fargahly,[27]reported a contrary view that fresh oyster mushrooms contained more bioactive compounds than dried ones. Conversely, oven drying at 120 °C appeared to degrade some volatile and thermolabile constituents, as seen in the simpler chromatographic patterns and reduced compound counts (Figures 2 and 5). This finding aligns with previous studies that report significant losses of antioxidants and phytochemicals during high-temperature drying.[17, 18].

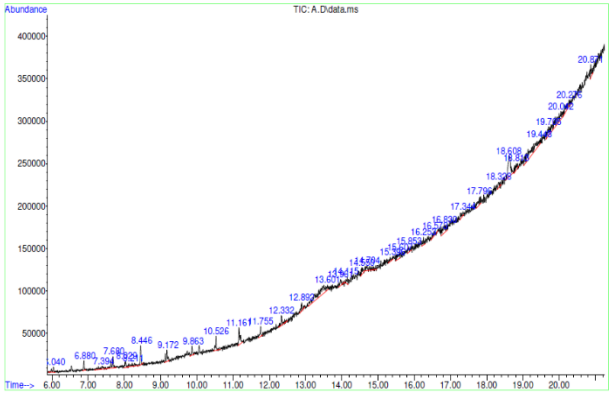

Figure 1: GC-MS chromatogram of methanolic extract of oven-dried grey *Pleurotus* mushroom

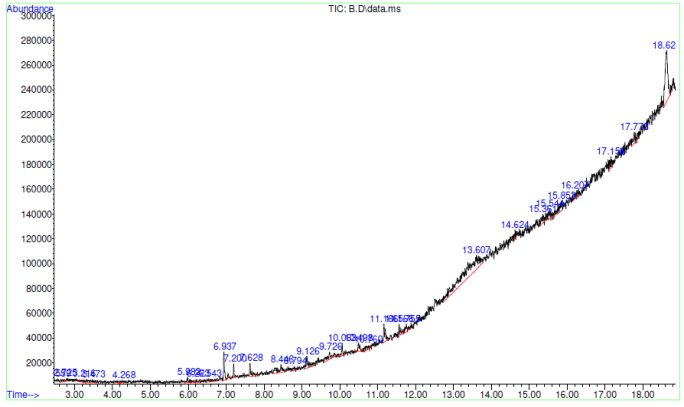

Figure 2: GC-MS chromatogram of methanolic extract of sun-dried grey *Pleurotus* mushroom

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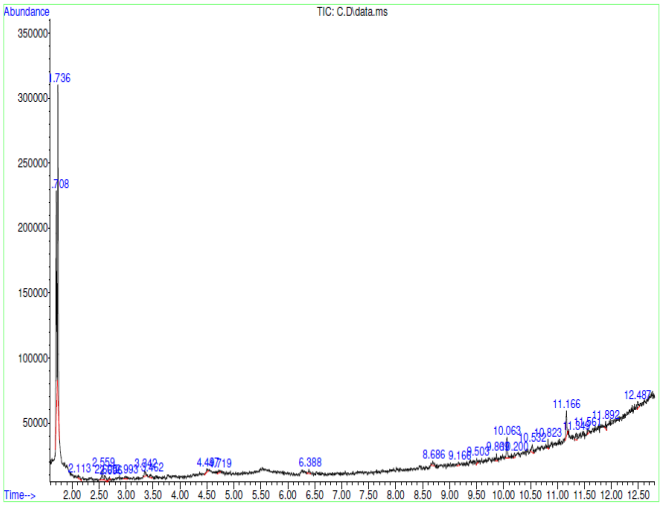

Figure 3: GC-MS chromatogram of methanolic extract of fresh grey *Pleurotus* mushroom

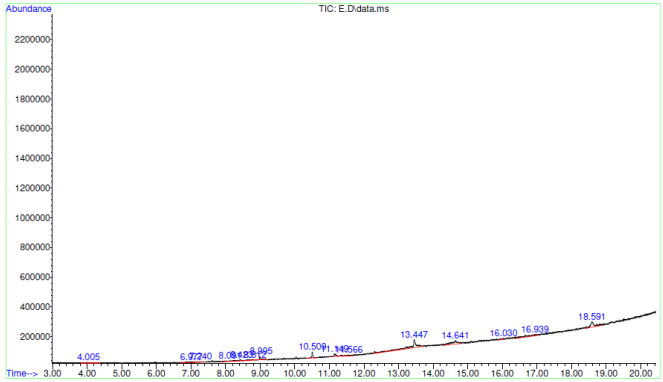

Figure 4: GC-MS chromatogram of methanolic extract of oven-dried white *Pleurotus* mushroom

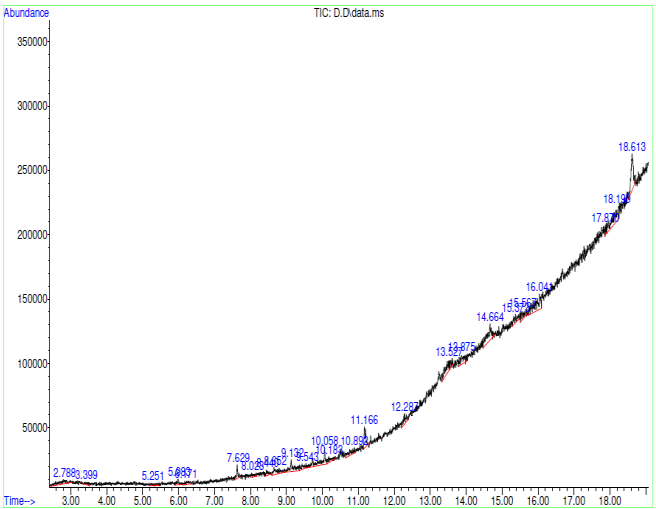

Figure 5: GC-MS chromatogram of methanolic extract of sun-dried white *Pleurotus* mushroom

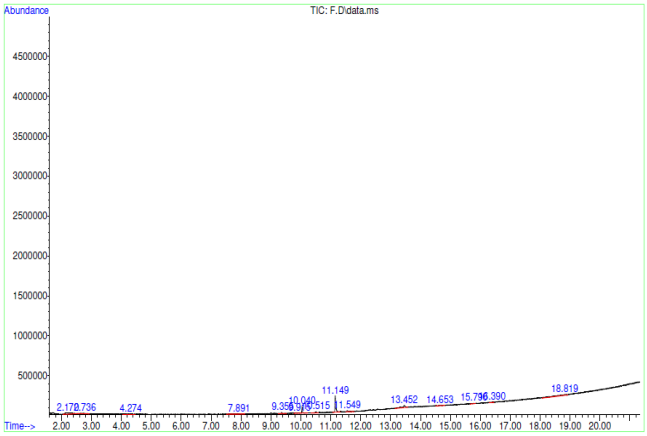

Figure 6: GC-MS chromatogram of methanolic extract of fresh white *Pleurotus* mushroom

Comparative abundance of key bioactive compounds

Beyond the number of compounds, the relative abundance (in terms of % peak area) also varied significantly. In SDGP (Table 1), Octasiloxane,1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl dominated with 27.48%, followed by 1H-Indole-2-carboxylic acid derivatives (17.51%). These compounds are associated with antioxidant, antimicrobial, and neuroprotective properties. [28,29].

Similarly, ODGP (Table 2) contained notable levels of 2-Ethylacridine (11.01%), Heptasiloxane (11.18%), and Octasiloxane (19.13%) compounds, which have also been reported to have therapeutic potential. In SDWP (Table 4), 1,2-Benzenediol derivatives (11.07 %) and Octasiloxane (9.68%) were highly abundant, reflecting their rich antioxidant and antimicrobial potential. ODWP (Table 5) featured bicyclo[3.1.0] hex-3-en-2-one derivatives (30.16%), which have been associated with anti-inflammatory effects.[31,32]

Interestingly, fresh white mushrooms (FWP, Table 6) had the highest level of 9,12-Octadecadienoic acid (Z, Z)-, methyl ester (21.23%), a well-known compound for its cholesterol-lowering, antimicrobial, and cardioprotective functions.[30,37] The presence of bicyclo[3.1.0]hex-3-en-2-one and 1,2-benzenediol in FWP also supports their potential as nutraceuticals. In the FGP sample (Table 3), 1,1-Diisobutoxybutane (36.84%) and 1,3-Propanediol dipropanoate (33.23%) were uniquely abundant. These compounds are known to enhance solubility and may act as delivery agents for bioactive compounds,[33,34] suggesting the potential of fresh grey mushrooms in medicinal formulations.

The effect of drying technique and mushroom variety

When comparing across mushroom varieties, grey *Pleurotus* consistently demonstrated greater phytochemical diversity and abundance than the white variant across all drying methods. For instance, Figures 1–3 (grey chromatograms) exhibited denser peak clusters than Figures 4–6 (white), reinforcing this observation. The genetic and biochemical differences between grey and white strains may influence how compounds are synthesized or retained post-harvest. Among all samples, sun-dried grey mushrooms (SDGP) emerged as the most chemically enriched, both in compound diversity and relative abundance, suggesting that sun drying is an optimal technique for preserving *Pleurotus ostreatus* bioactivity in tropical settings. This finding is consistent with ElGamal et al.[26] who demonstrated that moderate drying temperatures facilitate the preservation of sensitive phytochemicals.

Moreover, the detection of sulfur-containing compounds across most samples highlights the broad antimicrobial and antioxidant activity of these mushrooms.[40] The recurrent presence of siloxanes, fatty acid esters, and benzenediols further supports their use in the pharmaceutical, food, and agricultural sectors. [28, 31, 37]

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Table 1: Bioactive compounds identified in the methanolic extract of sun-dried grey *Pleurotus* mushroom

SN	RT (min.)	Compound	Molecular formula	Molecular weight g/mol	Peak Area %
1	2.559	2,2-Dimethylthiazolidine	$C_5H_{11}NS$	117	1.64
2	2.725	2-Methyl-3-(methylthio)-1-propene	$C_5H_{10}S$	102	0.95
3	3.216	Dodecanoic acid, 1-methylethyl ester	$C_{15}H_{30}O_2$	242	0.93
4	3.473	1,4,10,13-tetraoxa-7,16-dithiacyclooctadecane	$C_{12}H_{26}N2O_4$	262	1.46
5	4.268	Benzenamine, 4-bromo-2-chloro-	C_6H_5BrClN	205	0.71
6	5.982	Cyclotetradecane	$C_{14}H_{28}$	196	1.20
7	6.223	Decanoic acid, 2-methylene-, methyl ester	$C_{12}H_{22}O_2$	198	0.71
8	6.543	1-(3-n-Propoxyphenyl)-2-propanone oxime	$C_{12}H_{17}NO_2$	207	1.31
9	6.937	trans-.alpha.-Bergamotene	$C_{15}H_{24}$	204	3.59
10	7.200	Cyclohexene, 3-(1,5-dimethyl-4-hexenyl)-6-methylene-, [S-(R*,S*)]-	$C_{15}H_{24}$	204	1.01
11	7.628	Fumaric acid, 2,2-dichloroethyl tridecyl ester	$C_{19}H_{32}C_{l2}O_4$	394	2.55
12	8.446	Eicosyl isopropyl ether	$C_{23}H_{48}O$	340	3.44
13	8.794	5-Decenedioic acid, 5,6-dimethyl-dimethyl ester	$C_{14}H_{24}O_4$	256	1.09
14	9.126	1-Octadecene	$C_{18}H_{36}$	252	3.66
15	9.726	9,12-Octadecadiynoic acid, trimethylsilyl ester	$C_{21}H_{36}O_2Si$	384	3.07
16	10.063	Hexadecanoic acid, methyl ester	$C_{17}H_{34}O_2$	270	1.69
17	10.498	Phenol, 3-methyl-	C_7H_8O	108	1.97
18	10.760	Androsterone, methyl ether	$C_{20}H_{32}O_2$	304	1.46
19	11.166	1-Methylhistamine, N-trifluoroacetyl	$C_8H_{10}F_3N_{3O}$	221	3.48
20	11.566	-2,2,5a,9-Tetramethyloctahydro-2H-3,9a-methanobenzo[b]oxepine	$C_{15}H_{26}O$	222	1.75
21	11.755	1H-Indole-2-carboxylic acid, 6-(4-methoxyphenyl)-3-methyl-4-oxo-4,5,6,7-tetrahydro-, isopropyl ester	$C_{21}H_{25}NO_4$	578	1.89
22	13.607	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	$CH_{50}O7Si_8$	578	27.48
23	16.207	1,2-Benzenediol, 3,5-bis(1,1-dimet hylethyl)-	$C_{14}H_{22}O_2$	222	1.58
24	17.156	2-Ethylacridine	$C_{15}H_{13}N$	207	2.78
25	17.773	4-Dehydroxy-N-(4,5-methylenedioxy-2-nitrobenzylidene)tyramine	$C_{16}H_{14}N_2O_4$	298	2.82
26	18.625	1H-Indole-2-carboxylic acid, 6-(4- methoxyphenyl)-3-methyl-4-oxo-4,5,6,7-tetrahydro-, isopropyl ester	$C_{21}H_{25}NO_4$	355	17.51

Table 2: Bioactive compounds identified in the methanolic extract of oven-dried grey *Pleurotus* mushroom

SN	RT (min.)	Compound	Molecular formula	Molecular weight g/mol	Peak Area %
1	6.880	Pentadecane	$C_{15}H_{32}$	212	1.09
2	7.394	Pyridine-3-carbonitrile, 1,4,5,6-tetrahydro-	$C_6H_8N_2$	108	1.63
3	7.680	Hexadecane	$C_{16}H_{34}$	226	2.81
4	8.029	Nonane, 2,2,4,4,6,8,8-heptamethyl-	$C_{16}H_{34}$	226	1.09
5	8.211	Fumaric acid, pentafluorophenyl tridecyl ester	$C_{23}H_{29}F_5O_4$	464	1.58
6	8.446	Heptadecane	$C_{17}H_{36}$	240	2.20
7	9.172	Octadecane	$C_{18}H_{38}$	254	2.54
8	9.863	Nonadecane	$C_{19}H_{40}$	268	1.30
9	10.526	Eicosane	$C_{20}H_{42}$	282	2.13
10	11.161	Oxirane, 2,2-dimethyl-3-[3,7-dimethyl-9-(phenylthio)-3,7-nonadienyl]	$C_{21}H_{30}OS$	330	3.80
11	11.755	Heneicosane, 3-methyl-	$C_{22}H_{24}$	310	1.57

12	12.332	1H-Indole-2-carboxylic acid, 6-(4-methoxyphenyl)-3-methyl-4-oxo-4,5,6,7-tetrahydro-, isopropyl ester	$C_{16}H_{50}O_7Si_8$	578	2.30
13	12.892	Octasiloxane,1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	$C_{16}H_{50}O_7Si_8$	578	1.77
14	13.601	2-Ethylacridine	$C_{15}H_{13}N$	207	11.01
15	17.796	1H-Indole, 5-methyl-2-phenyl-	$C_{15}H_{13}N$	207	2.71
16	18.608	(E)-2-bromobutyloxychalcone - nitrobenzylidene)tyramine	$C_{16}H_{14}N_2O_4$	298	8.63
17	18.813	1,2-Benzenediol, 3,5-bis(1,1-dimethylethyl)-	$C_{14}H_{22}O_2$	222	1.75
18	19.448	Heptasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13-tetradecamethyl-	$C_{16}H_{50}O_7Si_8$	578	11.18
19	19.705	4-Dehydroxy-N-(4,5-methylenedioxy- 2-nitrobenzylidene)tyramine	$C_{16}H_{14}N_2O_4$	298	2.85
20	20.042	1,2-Benzenediol, 3,5-bis(1,1-dimethylethyl)-	$C_{14}H_{22}O_2$	222	1.90
21	20.276	4-Dehydroxy-N-(4,5-methylenedioxy-	$C_{16}H_{14}N_2O_4$	298	3.71
22	20.871	Cyclotrisiloxane, hexamethyl-	$C_6H_{18}O_3Si_3$	222	2.24

Table 3: Bioactive compounds identified in the methanolic extract of fresh grey *Pleurotus* mushroom

SN	RT (min.)	Compound	Molecular formula	Molecular weight g/mol	Peak Area %
1	1.708	1,3-Propanediol, 2-methyl-, propanoate	$C_{10}H_{18}O_4$	202	33.23
2	1.736	1,1-Diisobutoxy-butane	$C_{12}H_{26}O_2$	202	36.84
3	2.113	1-hexadecanesulfonamide, N-(2-aminoethyl)-	$C_{18}H_{40}N_2O2S$	348	0.894
4	2.559	Methyl-2-deoxy-2-fluoro-3,4,6-tri-O-methyl.beta.d-galactopyranoside	$C_{10}H_{19}FO_5$	238	2.473
5	2.605	2,2-Dimethylthiirane	C_4H_8S	88	1.275
6	2.696	Undecanoic acid	$C_{11}H_{22}O_2$	186	0.678
7	2.993	Dimethylamine, TMS derivative	$C_5H_{15}NSi$	117	0.783
8	3.342	N-Hydroxymethylacetamide	$C_3H_7NO_2$	87	1.446
9	3.462	Diglycolic acid, 2-octyl propyl ester	$C_{27}H_{52}O_5$	456	0.779
10	4.497	N,N-Dimethyl-3-benzyloxypropylamin	$C_{12}H_{19}NO$	193	0.934
11	4.719	3-Ethoxypropyl acetate	$C_7H_{14}O_3$	146	0.781
12	6.388	Hexanoic acid, (2-hexanoylaminoethyl)-amide	$C_{14}H_{28}N_2O_2$	256	0.787
13	8.686	Borazine, 1,3-dimethyl-	$C_2H_{10}B_3N_3$	109	0.893
14	9.166	Azulene, 1,2,3,5,6,7,8,8a-octahydro-1,4-dimethyl-7-(1-methylethenyl) -, [1S-(1.alpha. 7.alpha.,8a.beta.)]-	$C_{15}H_{24}$	204	0.635
15	9.863	Glutamine, O(1)-t-butyl-O(5)-[4-nitrobenzyl]-, ester	$C_{16}H_{22}N_2O_6$	338	0.808
16	10.063	Hexadecanoic acid, methyl ester	$C_{17}H_{34}O_2$	270	4.189
17	10.200	5H-Inden-5-one, 1,2,3,3a,4,7a-hexahydro-7a-methyl-, trans-	$C_{10}H_{14}O$	150	0.764
18	10.532	Cyclohexa-2,5-diene-1,4-dione, 2-methyl-5-(4-morpholinyl)-	$C_{11}H_{13}NO_3$	207	0.695
19	10.823	1-Methylsulfanyl-9,10-dioxo-9,10-dihydro-anthracene-2-carboxylic acid o-tolylamide	$C_{23}H_{17}NO_3S$	387	0.714
20	11.166	Methyl 9-cis,11-trans-octadecadien oate	$19H_34O_2$	294	4.279
21	11.346	Pentasiloxane, dodecamethyl-	$C_{12}H_{36}O_4Si_5$	384	1.304
22	11.561	Methyl 3-(1-pyrrolo)thiophene-2-carboxylate	$C_{10}H_9NO_2S$	207	0.873
23	11.892	Benzo[h]quinoline, 2,4-dimethyl-	$C_{15}H_{13}N$	207	0.921
24	12.487	5-Hexenoic acid, 6-[p-chlorophenyl]-2,4-dioxo-, ethyl ester	$C_{14}H_{13}ClO_4$	280	1.242

Table 4: Bioactive compounds identified in the methanolic extract of sun-dried white *Pleurotus* mushroom

SN	RT (min.)	Compound	Molecular formula	Molecular weight g/mol	Peak Area %
1	2.788	2-O-Mesyl arabinose	$C_6H_{12}O_7S$	228	3.85
2	3.399	Benz[e]azulene-3,8-dione, 3a,4,6a7,9,10,10a,10b-octahydro-3a,10a-dihydroxy-5-(hydroxymethyl)-7-(1-hyd roxy-1-methyl ethyl)-2,10-dimethyl-, [3aR (3a.alpha.,6a.alpha.,7.alpha.,10.beta.,10a.beta.,10b.beta.)]-	$C_{20}H_{28}O_6$	364	0.94
3	5.251	2-Methyl-3-(methylthio)-1-propene	$C_5H_{10}S$	102	0.95
4	5.983	1-Pentadecene	$C_{15}H_{30}$	210	1.31
5	6.171	2-Methyl-3-butene-1-thiol	$C_5H_{10}S$	102	1.35
6	.629	3-Eicosene, (E)-	$C_{20}H_{40}$	280	2.17
7	8.023	trans-3-Ethoxy-b-methyl-b-nitrostyrene	$C_{11}H_{13}NO_3$	207	1.01
8	8.440	1-Tetradecanamine	$C_{14}H_{31}N$	213	1.51
9	8.652	7.beta.-Ethyl-8.beta.-hydroxy-2,6-dimethylbicyclo[4.4.0]dec-1-ene Piconol	$C_{14}H_{24}O$	208	3.65
10	9.132	Carbonic acid, octadecyl 2,2,2-trichloromethyl ester	$C_{21}H_{39}Cl3_O3$	444	5.20
11	9.543	Dipyridamole	$C_{24}H_{40}N8_O4$	504	1.90
12	10.058	Hexadecanoic acid, methyl ester	$C_{17}H_{34}O_2$	270	6.93
13	10.183	3-(Furan-2-yl)propane-1-amine	$C_7H_{11}NO$	125	1.58

14	10.892	Borazine, 1,3-dimethyl-	$C_2H_{10}B3N_3$	109	2.82
15	11.166	9,15-Octadecadienoic acid, methyl ester, (Z, Z)-	$C_{19}H_{34}O_2$	294	3.88
16	12.287	Phentolamine	$C_{17}H_{19}N_3O$	281	3.76
17	13.527	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	$C_{16}H_{50}O_7Si_8$	578	9.68
18	18.190	2-(n-Propyl)oxybenzylidene acetophenone	$C_{18}H_{18}O_2$	266	8.91
19	18.613	1,2-Benzenediol, 3,5-bis(1,1-dimethylethyl)-	$C_{14}H_{22}O_2$	222	11.07

Table 5: Bioactive compounds identified in the methanolic extract of oven-dried white *Pleurotus* mushroom

SN	RT (min.)	Compound	Molecular formula	Molecular weight g/mol	Peak Area %
1	4.005	Benzene, 1,3-dichloro-	$C_6H_4Cl_2$	146	1.92
2	6.977	trans-2,3-Methylenedioxy-b-methyl-b-nitrostyrene	$C_{10}H_9NO_4$	207	1.68
3	7.240	Acetic acid, 4-methyl phenyl ester	$C_9H_{10}O_2$	150	2.22
4	8.091	2-(1-Piperidino)-5-nitropyridine	$C_{10}H_{13}N_3O_2$	207	2.32
5	8.423	Phenol, 2-methyl-	C_7H_8O	108	2.91
6	8.812	4-Fluoro-3-nitrobenzyl alcohol, trifluoroacetate	$C_9H_5F_4NO_4$	267	2.34
7	8.995	Atrazine	$C_8H_{14}ClN_5$	215	5.22
8	10.509	Metolachlor	$C_{15}H_{22}ClNO_2$	283	4.45
9	11.149	p-Cresol	C_7H_8O	108	3.20
10	11.566	Phenol, 3-methyl-	C_7H_8O	108	3.61
11	13.447	Bicyclo[3.1.0]hex-3-en-2-one, 4-methyl-1-(1-methyl ethyl)-	$C_{10}H_{14}O$	150	30.16
12	14.641	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	$C_{16}H_{50}O_7Si_8$	578	13.83
13	16.939	1H-Indole-2-carboxylic acid, 6-(4-methoxyphenyl)-3-methyl-4-oxo-4,5,6,7-tetrahydro-, isopropyl ester	$C_{21}H_{25}NO_4$	355	10.71
14	18.591	4-Dehydroxy-N-(4,5-methylenedioxy-2-nitrobenzylidene)tyramine	$C_{16}H_{14}N_2O_4$	298	13.46

Table 6: Bioactive compounds identified in the methanolic extract of fresh white *Pleurotus* mushroom

SN	RT (min.)	Compound	Molecular formula	Molecular weight g/mol	Peak Area %
1	2.170	2-Methyl-3-(methylthio)-1-propene	$C_5H_{10}S$	102	13.07
2	2.736	Dimethylamine, TMS derivative	$C_5H_{15}NSi$	117	2.55
3	4.274	ziridine-2-carbothioamide	$C_3H_6N_2S$	102	2.07
4	7.891	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	$C_{16}H_{50}O_7Si_8$	578	5.84
5	9.355	Pentadecanoic acid, methyl ester	$C_{16}H_{32}O_2$	256	2.02
6	9.915	Cyclononasiloxane, octadecamethyl-	$C_{18}H_{54}O_9Si_9$	666	1.52
7	10.040	Hexadecanoic acid, methyl ester	$C_{17}H_{34}O_2$	270	6.98
8	10.515	2-(1-Cyclohepten-1-yl)furan	$C_{11}H_{14}O$	162	3.80
9	11.149	9,12-Octadecadienoic acid (Z, Z)-, methyl ester	$C_{19}H_{34}O_2$	294	21.23
10	11.549	Linoleic acid ethyl ester	$C_{20}H_{36}O_2$	308	3.17
11	13.452	Bicyclo[3.1.0]hex-3-en-2-one, 4-me	$C_{10}H_{14}O$	150	11.24
14	16.390	4-Dehydroxy-N-(4,5-methylenedioxy-2-nitrobenzylidene)tyramine	$C_{16}H_{14}N_2O_4$	298	2.22
15	18.819	1,2-Benzenediol, 3,5-bis(1,1-dimethylethyl)-	$C_{14}H_{22}O_2$	222	19.58

Conclusion

This study demonstrates that drying methods have a significant influence on the phytochemical composition and diversity of bioactive compounds in *Pleurotus ostreatus* mushrooms. Among the tested treatments, sun drying preserved a higher number and abundance of bioactive compounds, particularly in the grey variety, compared to oven drying and fresh samples. Key compounds such as siloxanes, fatty acid esters, and indole derivatives were more prevalent in sun-dried samples, indicating enhanced antioxidant, antimicrobial, and anti-inflammatory potential. The findings further reveal that the mushroom variety plays a critical role in bioactive retention, with grey oyster mushrooms consistently outperforming the white variety in terms of compound diversity and intensity. The sun drying method, being cost-effective and environmentally friendly, offers a practical preservation strategy for maximizing the medicinal and nutritional value of oyster mushrooms, especially in resource-limited tropical regions.

Conflict of interest

The authors declare no conflict of interest

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them

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