

Supplementary data

Article

Effectiveness of Some Plant Methanol Extracts in Biocontrol of *Fusarium oxysporum*-Induced Onion Basal Rot Disease in Greenhouse Conditions

Mohamed G.A. Hegazy^{1,*}, Abdel-Raddy M. Ahmed², Ahmed Fathy Yousef³, Waleed M. Ali³, Alyaa Nasr⁴, Ezzat H. Elshazly⁵, Mohamed E. Shalaby⁶, Islam I. Teiba⁷, Osama A.M. Al-Bedak^{8,*}

¹ Department of Agricultural Botany, Faculty of Agriculture, Al-Azhar University (Assiut Branch), 71524, Assiut, Egypt; mohamedhegazy.5419@azhar.edu.eg

² Department of Agronomy (Biochemistry), Faculty of Agriculture, Al-Azar University, (Assiut Branch), 71524, Assiut, Egypt; dr_abdelrady@yahoo.com

³ Department of Horticulture, Faculty of Agriculture, University of Al-Azhar (Assiut Branch), 71524, Assiut, Egypt; ahmed.yousuf@azhar.edu.eg; waleed.mohammed@azhar.edu.eg

⁴ Botany & Microbiology Department, Faculty of Science, Menoufia University, Shebin Elkom, 32511 Egypt; alyaa.abd@science.menofia.edu.eg

⁵ Botany & Microbiology Department Faculty of Science, Al-Azhar University (Assiut Branch), 71524, Assiut, Egypt; ezzathamdy83@azhar.edu.eg

⁶ Department of Plant Production, Faculty of Agriculture (Saba Basha), Alexandria University, Alexandria 21531, Egypt; m-shalaby@alexu.edu.eg

⁷ Microbiology, Botany Department, Faculty of Agriculture, Tanta University, 31527, Tanta, Egypt; islam.tayba@agr.tanta.edu.eg

⁸ Assiut University Mycological Centre, Assiut, 71511, Egypt; osamaalbedak@science.au.edu.eg

*Correspondences: osamaalbedak@science.au.edu.eg - mohamedhegazy.5419@azhar.edu.eg

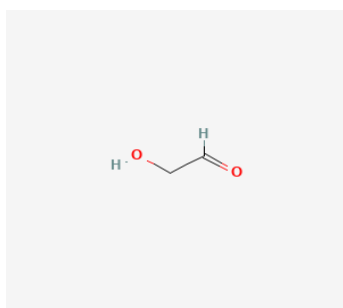
Table S1: GC-MS identified bioactive compounds in *S. aromaticum*

No.	RT	Compound Name	Molecular Formula	Molecular Weight	Area (%)
1	4.27	Hydroxylamine	H ₃ NO	33	0.10
2	4.66	Silane	H ₄ Si	32	0.17
3	5.06	1,2-Ethanediol (Ethylene Glycol)	C ₂ H ₆ O ₂	62	34.01
4	5.06	Methyl Alcohol	CH ₄ O	32	34.01
5	5.29	Acetaldehyde, hydroxy-	C ₂ H ₄ O ₂	60	42.71
6	5.29	2-Propanone, 1,1,3,3-tetrachloro-	C ₃ H ₂ Cl ₄ O	194	42.71
7	6.03	Hydroxyacetic acid, hydrazide	C ₂ H ₆ N ₂ O ₂	90	0.13
8	6.67	Acetic acid	C ₂ H ₄ O ₂	60	2.37
9	6.67	Hydrazine, ethyl-	C ₂ H ₈ N ₂	60	2.37
10	6.67	Tetraacetyl-d-xylonic nitrile	C ₁₄ H ₁₇ NO ₉	343	2.37

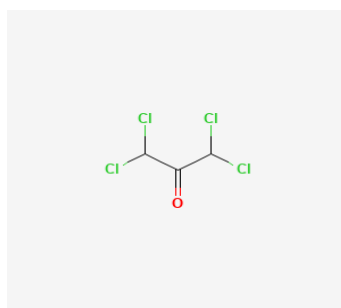
12	7.49	14-Formol-9-hydroxyarteether	C ₁₇ H ₂₆ O ₇	342	0.18
13	7.49	Gibb-3-ene-1,10-dicarboxylic acid, 2,4a-dihydroxy-1-methyl-8-methylene-, 1,4a-lactone, 10-methyl ester, (1à,2á,4aà,4bá,10á)-(Gibberillic acid)	C ₂₀ H ₂₄ O ₅	344	0.18
14	8.00	Pregna-5,8-diene-3á,11à-diol-20-one	C ₂₅ H ₃₄ O ₅	414	0.6
15	8.00	2,6-dibromo-4-(4-morpholinylthiocarbonyl)phenyl ester	C ₁₃ H ₁₃ Br ₂ NO ₃ S	421	0.60
16	8.00	Pregna-6,16-diene-11,20-diol, 3,9-epoxy-18-[N-methyl-N-[14-(2'-epoxyethyl)]amino]-	C ₂₅ H ₃₇ NO ₅	431	0.60
17	8.00	1-Nitro-á-d-arabinofuranose, tetraacetate	C ₁₃ H ₁₇ NO ₁₁	363	0.60
18	8.00	1-Nitro-2-acetamido-1,2-dideoxy-d-glucitol	C ₈ H ₁₆ N ₂ O ₇	252	0.60
19	9.96	Cyclopropanebutanoic acid, 2-[[2-[(2-pentylcyclopropyl)methyl]cyclopropyl]methyl]cyclopropyl]methyl]-, methyl ester	C ₂₅ H ₄₂ O ₂	374	0.96
20	9.96	3-(2,5,8,11,14-Pentaoxacyclohexadecyl)-1,5,8,11,14,17-hexooxacyclononadecane	C ₂₄ H ₄₆ O ₁₁	510	0.96
21	9.96	Tetradecanoic acid, 2-hydroxy-	C ₁₄ H ₂₈ O ₃	244	0.96
22	9.96	Salmeterol	C ₂₅ H ₃₇ NO ₄	415	0.96
23	9.96	Cholesta-8,24-dien-3-ol, 4-methyl-, (3á,4à)-	C ₂₈ H ₄₆ O	398	0.96
24	12.32	Glycine, N-[(3à,5á,7à,12à)-24-oxo-3,7,12-tris[(trimethylsilyl)oxy]cholan-24-yl]-, methyl ester	C ₃₆ H ₆₉ NO ₆ Si ₃	695	0.20
25	12.32	4,25-Secoobscurinervan-4-one, O-acetyl-22-ethyl-15,16-dimethoxy-, (22à)-	C ₂₇ H ₃₆ N ₂ O ₆	484	0.20
26	12.32	Milbemycin B, 6,28-anhydro-15-chloro-25-isopropyl-13-dehydro-5-O-demethyl-4-methyl-	C ₃₃ H ₄₇ ClO ₇	590	0.20
27	12.32	2-Formamido-2',4'-dinitro-4-[trifluoromethyl]-diphenylsulfide	C ₁₄ H ₈ F ₃ N ₃ O ₅ S	387	0.20
28	12.32	9-Octadecenoic acid (Z)-, 2-butoxyethyl ester	C ₂₄ H ₄₆ O ₃	382	0.20
29	25.03	Octadecane, 6-methyl-	C ₁₉ H ₄₀	268	1.41
30	25.03	Undecane	C ₁₁ H ₂₄	156	1.41
31	25.03	Tetradecane, 2,6,10-trimethyl-	C ₁₇ H ₃₆	240	1.41
32	25.03	Dodecane, 5,8-diethyl-	C ₁₆ H ₃₄	226	1.41
33	25.03	Heptadecane, 9-hexyl-	C ₂₃ H ₄₈	324	1.41
34	27.15	Calconcarboxylic acid	C ₂₁ H ₁₄ N ₂ O _{7S}	438	0.37
35	27.15	Dihydroartemisinin, 9-deoxy-9-[2-(isopropylaminocarbonyl)ethyl]-	C ₂₁ H ₃₅ NO ₅	381	0.37
36	27.15	8H-Azecino[5,4-b]indol-8-one, 5-ethylidene-1,2,3,4,5,6,7,9-octahydro-6-(2-hydroxyethyl)-3-methyl-, [S-(E)]-	C ₂₀ H ₂₆ N ₂ O ₂	326	0.37
37	27.15	Pregan-20-one, 2-hydroxy-5,6-epoxy-15-methyl-	C ₂₂ H ₃₄ O ₃	346	0.37
38	27.15	Pregnane-3,11,20,21-tetrol, cyclic20,21-(butyl boronate), (3à,5á,11á,20R)-	C ₂₅ H ₄₃ BO ₄	418	0.37
39	27.15	Cyclopentanone, 2-(2-octenyl)-	C ₁₃ H ₂₂ O	194	0.14
40	37.36	Phenol, 2-methoxy-3-(2-propenyl)-	C ₁₀ H ₁₂ O ₂	164	2.25

41	37.66	3-Allyl-6-methoxyphenol	C ₁₀ H ₁₂ O ₂	164	2.25
42	37.66	Eugenol	C ₁₀ H ₁₂ O ₂	164	2.25
43	37.66	Phenol, 2-methoxy-4-(1-propenyl)-	C ₁₀ H ₁₂ O ₂	164	2.25
44	39.39	6,7-Epoxy pregn-4-ene-9,11,18-triol-3,20-dione, 11,18-diacetate	C ₂₅ H ₃₂ O ₈	460	0.39
45	39.39	6-Methyl-11-propenyl-5-(toluene-4-sulfonyloxy)-12,13-dioxatricyclo[7.3.1.0(1,6)]tridecane-8-carboxylic acid, methylester	C ₂₄ H ₃₂ O ₇ S	464	0.39
46	39.39	Vanillin lactoside	C ₂₀ H ₂₈ O ₁₃	476	0.39
47	39.39	10,13-Dioxatricyclo[7.3.1.0(4,9)]tridecan-5-ol-2-carboxylic acid, 4-methyl-11-(1-propenyl)-, methyl ester	C ₁₇ H ₂₆ O ₅	310	0.39
48	39.39	4-methyl-11-(1-propenyl)-, methyl ester Androstan-3-one, cyclic 1,2-ethanediyl mercaptole, (5a)-	C ₂₁ H ₃₄ S ₂	350	0.39
49	40.17	2-[4-methyl-6-(2,6,6-trimethylcyclohex-1-enyl)hexa-1,3,5-trienyl]cyclohex-1-en-1-carboxaldehyde	C ₂₃ H ₃₂ O	324	0.83
50	40.17	Butyl 6,9,12,15-octadecatetraenoate	C ₂₂ H ₃₆ O ₂	332	0.83
51	40.17	Ethyl 6,9,12,15-octadecatetraenoate	C ₂₀ H ₃₂ O ₂	304	0.83
52	40.75	2-Methyl-E,E-3,13-octadecadien-1-ol	C ₁₉ H ₃₆ O	280	0.23
53	40.57	Gibberellic acid	C ₁₉ H ₂₂ O ₆	346	0.23
54	40.57	6-Aminohexanamide, N-methyl-N-[4-(1-pyrrolidinyl)-2-butynyl]-N'-[2-aminobutanoyl]-	C ₁₈ H ₃₂ N ₄ O ₂	336	0.23
55	40.85	Ergosta-5,22-dien-3-ol, acetate,	C ₃₀ H ₄₈ O ₂	440	0.20
56	41.49	Ethyl iso-allocholate	C ₂₆ H ₄₄ O ₅	436	0.10
57	41.49	n-Butyl ricinoleate	C ₂₂ H ₄₂ O ₃	354	0.10
58	42.71	3-Allyl-6-methoxyphenyl acetate	C ₁₂ H ₁₄ O ₃	206	4.10
59	42.71	Phenol, 2-methoxy-4-(2-propenyl)-, acetate	C ₁₂ H ₁₄ O ₃	206	4.10
60	46.83	4-Piperidineacetic acid, 1-acetyl-5-ethyl-2-[3-(2-hydroxyethyl)- 1H-indol-2-yl]-à-methyl-, methyl ester	C ₂₃ H ₃₂ N ₂ O ₄	400	0.47
61	46.83	Hexadecanoic acid, 1-(hydroxymethyl)-1,2-ethanediyl ester	C ₃₅ H ₆₈ O ₅	568	0.47
62	46.83	3-Pyridinecarboxylic acid, 2,7,10-tris(acetyloxy)-1,1a,2,3,4,6,7,10, 11,11a-decahydro-1,1,3,6,9-pentamethyl-4-oxo-4a,7a-epoxy-5H-cyclopenta[a]cyclopropa[f]cycloundecen-11-ylester, (pyridine alkaloid)	C ₃₂ H ₃₉ NO ₁₀	597	0.47
63	54.08	Cyclononasiloxane, octadecamethyl-	C ₁₈ H ₅₄ O ₉ Si ₉	666	0.98
64	58.32	Oleic Acid	C ₁₈ H ₃₄ O ₂	282	0.20
65	58.32	Oleic acid, 3-(octadecyloxy)propylester	C ₃₉ H ₇₆ O ₃	592	0.20
66	59.20	Cyclodecasiloxane, eicosamethyl-	C ₂₀ H ₆₀ O ₁₀ Si ₁₀	740	1.00
67	59.20	1-Monolinoleoylglycerol trimethylsilylether	C ₂₇ H ₅₄ O ₄ Si ₂	498	1.00
68	59.20	Propanoic acid, 2-(3-acetoxy-4,4,14-trimethylandro-8-en-17-yl)-	C ₂₇ H ₄₂ O ₄	430	1.00
69	59.20	(5a)Pregnane-3,20a-diol, 14a,18a-[4-methyl-3-oxo-(1-oxa-4-aza	C ₂₈ H ₄₃ NO ₆	489	1.00

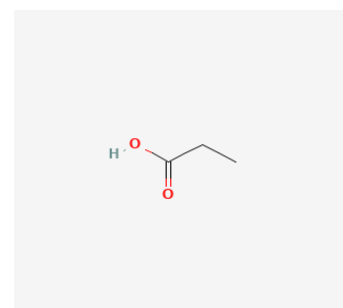
		butane-1,4-diyl)]-, diacetate			
70	59.20	9,12,15-Octadecatrienoic acid, 2,3-bis[(trimethylsilyl)oxy]propylester, (Z,Z,Z)-	C ₂₇ H ₅₂ O ₄ Si ₂	496	1.00
71	60.08	9-Octadecenoic acid (Z)-, tetradecylester	C ₃₂ H ₆₂ O ₂	478	0.14
72	60.08	9-Octadecenoic acid, 1,2,3-propanetriylester, (E,E,E)-	C ₅₇ H ₁₀₄ O ₆	884	0.14
73	62.46	5H-Cyclopropa[3,4]benz[1,2-e]azulen-5-one, 3,9,9a-tris(acetyloxy)-3-[(acetyloxy)methyl]-2-chloro-1,1a,1b,2,3,4,4a,7a,7b,8, 9,9a-dodecahydro-4a,7b-dihydroxy-1,1,6,8-tetramethyl-, [1aR-(1aà,1bá,2à,3á,4aá,7aà,7bà,8à,9á, 9aà)]-	C ₂₈ H ₃₇ ClO ₁₁	584	0.23
74	62.46	8,14-Seco-3,19-epoxyandrostane-8,14-dione, 17-acetoxy-3á-methoxy-4,4-dimethyl-	C ₂₄ H ₃₆ O ₆	420	0.23
75	62.92	Oleic acid, eicosyl ester	C ₃₈ H ₇₄ O ₂	562	0.28
76	63.79	7,8-Epoxy lanostan-11-ol, 3-acetoxy-	C ₃₂ H ₅₄ O ₄	502	0.88
77	63.79	3,5,9-Trioxa-5-phosphaheptacos-18-en-1-aminium, 4-hydroxy-N,N,N-trimethyl-10-oxo-7-[(1-oxo-9-octadecenyl)oxy]-, hydroxide, inner salt, 4-oxide, (R)-	C ₄₄ H ₈₄ NO ₈ P	785	0.88
78	63.79	5H-Cyclopropa[3,4]benz[1,2-e]azulen-5-one, 3,9,9a-tris(acetyloxy)-3-[(acetyloxy)methyl]-2-chloro-1,1a,1b,2,3,4,4a,7a,7b,8, 9,9a-dodecahydro-4a,7b-dihydroxy-1,1,6,8-tetramethyl-, [1aR-(1aà,1bá,2à,3á,4aá,7aà,7bà,8à,9á, 9aà)]-	C ₂₈ H ₃₇ ClO ₁₁	584	0.88
79	63.79	Docosanoic acid, 1,2,3-propanetriylester	C ₆₉ H ₁₃₄ O ₆	1058	0.88
80	69.61	.psi.,.psi.-Carotene, 1,1',2,2'-tetrahydro-1,1'-dimethoxy-	C ₄₂ H ₆₄ O ₂	600	0.53
81	70.02	9-Hexadecenoic acid, 9-octadecenylester, (Z,Z)-	C ₃₄ H ₆₄ O ₂	504	0.14
82	70.08	Dasycarpidan-1-methanol, acetate (ester)	C ₂₀ H ₂₆ N ₂ O ₂	326	0.12



Acetaldehyde, hydroxy-



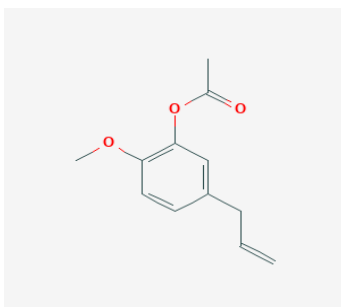
2-propanone, 1,1,3,3-tetrachloro-



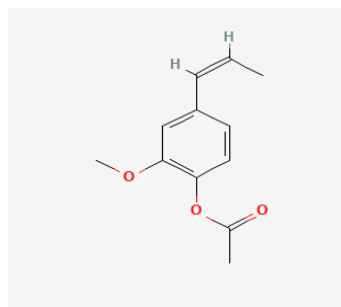
Propanoic acid



1,2-Ethandiol



3-Allyl-6-methoxyphenyl
acetate



Phenol, 2-methoxy-4-(2-
propenyl)-, acetate

Figure S1: The depiction of some major compounds in the methanol extract of *S. aromaticum* as detected by GC-MS analysis (*Information, 2023*)

Information, N. C. f. B. (2023). PubChem Compound Summary for CID 1715136, Phenol, 2-methoxy-4-(1-propenyl)-, acetate, (Z)-. Retrieved from <https://pubchem.ncbi.nlm.nih.gov/compound/1715136>.