

Supplementary Materials: Recent Advances in Sorbicillinoids from Fungi and Their Bioactivities (Covering 2016-2021)

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Table S1. Occurrence of the monomeric sorbicillinoids (5–38) in fungi.

Sorbicillinoid	Fungus and its Origin	Ref.
2-Deoxysohirnone C (5)	<i>Penicillium</i> sp. GD6 from mangrove <i>Bruguiera gymnorrhiza</i>	[1]
	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
2',3'-Dihydro-epoxysorbicillinol (6)	<i>Trichoderma longibrachiatum</i> SFC100166 isolated from the foreshore soil	[3]
(4E)-1-(4,6-Dihydroxy-5-methylp yridin-3-yl)hex-4-en-1-one (7)	<i>Penicillium</i> sp. DM815 from the rhizosphere soil of a mangrove <i>Hibiscus tiliaceus</i>	[4]
Saturnispol E (8)	<i>Trichoderma saturnisporum</i> DI-IA from the marine sponge <i>Dictyonella incisa</i>	[5]
Saturnispol F (9)	<i>Trichoderma saturnisporum</i> DI-IA from the marine sponge <i>Dictyonella incisa</i>	[5]
Saturnispol G (10)	<i>Trichoderma saturnisporum</i> DI-IA from the marine sponge <i>Dictyonella incisa</i>	[5]
Saturnispol H = 5-Demethylustilopyrone A (11)	<i>Trichoderma saturnisporum</i> DI-IA from the marine sponge <i>Dictyonella incisa</i>	[5]
	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[6]
Ustilopyrone A (12)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[6]
Ustilopyrone B (13)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[6]
	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
Scipyrone K (14)	Deep-sea-derived fungus <i>Phialocephala</i> sp. FL30r	[7]
5-Hydroxy-dihydrodemethylsorbicillin (15)	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
Sorbicillpyrone A (16)	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
5,6-Dehydrovertinolide (17)	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
Trichosorbicillin B (18)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichosorbicillin C (19)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichosorbicillin D (20)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
12-Hydroxysorbicillin (21)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
8,9-Dihydro-12-hydroxysorbicillin (22)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichosorbicillin E (23)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Isotrichosorbicillin E (24)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichosorbicillin F (25)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichosorbicillin G (26)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichosorbicillin H (27)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
3-Methyltrichosorbicillin H (28)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichosorbicillin I (29)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichoreeseione A (30)	Marine derived <i>Trichoderma reesei</i> from a sponge	[9]
Trichoreeseione B (31)	Marine derived <i>Trichoderma reesei</i> from a sponge	[9]
Trichoreesin A (32)	Epiphytic fungus <i>Trichoderma reesi</i> Z56-8 from the marine brown alga <i>Sargassum</i> sp.	[10]
Ustilanthracin A (33)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[11]
Ustilanthracin B (34)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[11]

Ustinaphthalin (35)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[11]
Ustisorbicillinol F (36)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[6]
(+)-(R)-Vertinolide (37)	<i>Trichoderma citrinoviride</i> from indoor air	[12]
(-)-(S)-Dihydrovertinolide (38)	Endophytic fungus <i>Clonostachys rosea</i> B5-2 from <i>Bruguiera gymnorrhiza</i>	[13]

Table S2. Occurrence of the bisorbicillinoids (39–59) in fungi.

Sorbicillinoid	Fungus and its Origin	Ref.
Epitetrahydrotrichodimer ether (39)	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
Demethyldihydrotrichodimerol (40)	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
Bisorbicillpyrone A (41)	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
10,11-Dihydrobislongiquinolide (42)	<i>Penicillium dipodomyis</i> YJ-11 from a marine sediment	[14]
10,11,16,17-Tetrahydrobislongiquinolide (43)	<i>Penicillium dipodomyis</i> YJ-11 from a marine sediment	[14]
Saturnispol A = 15,24-Dihydroxybisvertinol (44)	<i>Trichoderma saturnisporum</i> DI-IA from the marine sponge <i>Dictyonella incisa</i>	[5]
	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Saturnispol B = 24-Hydroxybisvertinol (45)	<i>Trichoderma saturnisporum</i> DI-IA from the marine sponge <i>Dictyonella incisa</i>	[5]
	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
	Marine derived <i>Trichoderma reesei</i> from an unidentified sponge	[9]
Trichobisvertinol A (46)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichobisvertinol B (47)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichobisvertinol C (48)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
Trichobisvertinol D = Ustisorbicillinol A (49)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[6]
12- <i>epi</i> -Trichobisvertinol D = Ustisorbicillinol B (50)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]
	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[6]
Trichodermolide B (51)	Marine derived <i>Trichoderma reesei</i> from a sponge	[9]
13-Hydroxy-trichodermolide (52)	Marine derived <i>Trichoderma reesei</i> from a sponge	[9]
24-Hydroxy-trichodimerol (53)	Marine derived <i>Trichoderma reesei</i> from a sponge	[9]
15-Hydroxy-bisvertinol (54)	Marine derived <i>Trichoderma reesei</i> from a sponge	[9]
13-Hydroxy-dihydrotrichodermolide (55)	<i>Penicillium chrysogernum</i> 581F1 from the marine sponge <i>Theonella swinhoei</i>	[15]
Ustilobisorbicillinol A (56)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[11]
Ustisorbicillinol C (57)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[6]
Ustisorbicillinol D (548)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[6]
Ustisorbicillinol E (59)	Rice false smut pathogen <i>Ustilaginoidea virens</i>	[6]

Table S3. Occurrence of the hybrid sorbicillinoids (61-73) in fungi.

Sorbicillinoid	Fungus and its Origin	Ref.
10-Methylsorbiterrin A (61)	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
Dihydrotrichodermolide acid (62)	<i>Penicillium</i> sp. SCSIO06871 from the deep-sea sediment	[2]
Saturnispol C (63)	<i>Trichoderma saturnisporum</i> DI-IA from the marine sponge <i>Dictyonella incisa</i>	[5]
Saturnispol D (64)	<i>Trichoderma saturnisporum</i> DI-IA from the marine sponge <i>Dictyonella incisa</i>	[5]
Spirosorbicillinol D (65)	<i>Trichoderma longibrachiatum</i> SFC100166 isolated from the foreshore soil	[3]
Sorbicatechol C (66)	<i>Penicillium allii-sativi</i> from deep-sea	[16]
Sorbicatechol D (67)	<i>Penicillium allii-sativi</i> from deep-sea	[16]
Sorbicillfuran A (68)	Marine-derived fungus <i>Penicillium citrinum</i> SCSIO41402	[17]
Sorbicillfuran B (69)	Marine-derived fungus <i>Penicillium citrinum</i> SCSIO41402	[17]
Sorbicillasin A (70)	Deep-sea-derived fungus <i>Phialocephala</i> sp. FL30r	[7]
Sorbicillasin B (71)	Deep-sea-derived fungus <i>Phialocephala</i> sp. FL30r	[7]
Tanshisorbicin (72)	Addition of tanshinone IIA in the fermentation broth of <i>Hypocrea</i> sp.	[18]
Trichosorbicillin A (73)	Marine-derived <i>Trichoderma reesei</i> 4670 from a sponge	[8]

Table S4. Cytotoxic activity of the screened sorbicillinoids from fungi.

Sorbicillinoid	Cytotoxic Activity	Ref.
Sorbicillin (1)	Cytotoxicity against the human hepatocellular carcinoma cells	[19]
	Antiproliferative activity on HT-29 cells	[16]
24-Hydroxy-trichodimerol (53)	Cytotoxic activities on human tumor cells	[16]
Ustilobisorbicillinol A (56)	Induced cell cycle arrest, and promoted apoptosis	[11]
Sorbicatechol D (67)	Antiproliferative activity on HT-29 cells	[16]
Sorbicillfuran B (69)	Weak cytotoxicity against HL-60 cells	[17]
Trichodimerol (74)	Moderate cytotoxic activities on human carcinoma cells	[6]
Demethyltrichodimerol (75)	Moderate cytotoxic activities on human carcinoma cells	[6]
Dihydrotrichodimer ether A (76)	Moderate cytotoxic activities on human carcinoma cells	[6]
Bisvertinolone (77)	Moderate cytotoxic activities on human carcinoma cells	[6]

Table S5. Antibacterial activity of the screened sorbicillinoids from fungi.

Sorbicillinoid	Antibacterial Activity	Ref.
Saturnispol F (9)	Antibacterial activity on <i>A. aureus</i> , VRE, <i>P. aeruginosa</i> and <i>K. pneumoniae</i>	[5]
Saturnispol H (11)	Antibacterial activity on VRE and <i>B. subtilis</i>	[5]
Ustisorbicillinol B = 12- <i>epi</i> -Trichobisvertinol D (50)	Antibacterial activity against human/plant pathogenic bacteria	[6]
Tanshisorbicin (72)	Antibacterial activity	[18]
Demethyltrichodimerol (75)	Antibacterial activity against human/plant pathogenic bacteria	[6]
Dihydrotrichodimer ether A (76)	Antibacterial activity against human/plant pathogenic bacteria	[6]
Bisvertinolone (77)	Antibacterial activity on <i>Staphylococcus aureus</i>	[20]
	Antibacterial activity on <i>Escherichia coli</i> and <i>Pseudomonas lachrymans</i>	[21]
	Antibacterial activity against human/plant pathogenic bacteria	[6]
Sohirnone A (78)	Antibacterial activity	[2]
Dihydrodemethylsorbicillin (79)	Antibacterial activity	[2]
Bislongiquinolide (80)	Antibacterial activity on <i>Escherichia coli</i> and <i>Pseudomonas lachrymans</i>	[21]
Oxosorbicillinol (81)	Antibacterial activity against human/plant pathogenic bacteria	[6]

Table S6. Antifungal activity of the screened sorbicillinoids from fungi.

Sorbicillinoid	Antifungal Activity	Ref.
Sorbicillin (1)	Antifungal activity on <i>Candida albicans</i>	[19]
Demethyltrichodimerol (75)	Inhibition against the spore germination of rice blast pathogen <i>Magnaporthe oryzae</i>	[6]
Bisvertinolone (77)	Inhibition against the spore germination of rice blast pathogen <i>Magnaporthe oryzae</i>	[6]
	Antifungal activity on phytopathogenic fungi <i>Cladosporium coccodes</i> , <i>Magnaporthe oryzae</i> and <i>Phytophthora infestans</i>	[3]
Oxosorbicillinol (81)	Inhibition against the spore germination of rice blast pathogen <i>Magnaporthe oryzae</i>	[6]
	Antifungal activity on phytopathogenic fungi <i>Cladosporium coccodes</i> , <i>Magnaporthe oryzae</i> and <i>Phytophthora infestans</i>	[3]
Bisorbicillinol (82)	Antifungal activity on phytopathogenic fungi <i>Cladosporium coccodes</i> , <i>Magnaporthe oryzae</i> and <i>Phytophthora infestans</i>	[3]
Epoxyorbicillinol (83)	Antifungal activity on phytopathogenic fungi <i>Cladosporium coccodes</i> , <i>Magnaporthe oryzae</i> and <i>Phytophthora infestans</i>	[3]

Table S7. Anti-inflammatory activity of the screened sorbicillinoids from fungi.

Sorbicillinoid	Anti-Inflammatory Activity	Ref.
2',3'-Dihydrosorbicillin = Dihydrosorbicillin (2)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichosorbicillin B (18)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichosorbicillin C (19)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
12-Hydroxysorbicillin (21)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
8,9-Dihydro-12-hydroxysorbicillin (22)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichosorbicillin E (23)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Isotrichosorbicillin E (24)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichosorbicillin F (25)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichosorbicillin I (29)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Epitetrahydrotrichodimer ether (39)	<i>Penicillium</i> sp. DM815 form the rhizosphere soil of mangrove <i>Hibiscus tiliaceus</i>	[4]
24-Hydroxybisvertinol (45)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichobisvertinol A (46)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichobisvertinol B (47)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichobisvertinol C (48)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichobisvertinol D (49)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
12- <i>epi</i> -Trichobisvertinol D (50)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichodimerol (74)	Neural anti-inflammatory activity	[22]
Sohirnone A (78)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Sorrentanone (84)	Neural anti-inflammatory activity	[22]
Bisvertinol (85)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
(2 <i>E</i> ,4 <i>E</i>)-1-(2,6-Dihydroxy-3,5-dimethylphenyl)hexa-2,4-dien-1-one (86)	Inhibition of NO production in RAW264.7 cells activated by LPS	[8]
Trichodermanone C (87)	Inhibitory effect on nitrite production in LPS-stimulated macrophages	[23]
Tetrahydrotrichodimerol (88)	<i>Penicillium</i> sp. DM815 form the rhizosphere soil of mangrove <i>Hibiscus tiliaceus</i>	[4]

Table S8. Phytotoxic activity of the screened sorbicillinoids from fungi.

Sorbicillinoid	Phytotoxic Activity	Ref.
(-)-(S)-Dihydrovertinolide (38)	Phytotoxic activity against lettuce seedlings	[13]
Trichodimerol (74)	Inhibition against the radicle and germ elongation of rice and lettuce seedlings	[6]
Demethyltrichodimerol (75)	Inhibition against the radicle and germ elongation of rice and lettuce seedlings	[6]
Bisvertinolone (77)	Inhibition against the radicle and germ elongation of rice and lettuce seedlings	[6]
Bislongiquinolide (80)	Inhibition against the radicle and germ elongation of rice and lettuce seedlings	[6]

Table S9. α -Glucosidase inhibitory activity of the screened sorbicillinoids from fungi.

Sorbicillinoid	Biological Activity	Ref.
2',3'-Dihydrosorbicillin = Dihydrosorbicillin (2)	α -Glucosidase inhibitory activity	[24]
5-Hydroxy-dihydrodemethylsorbicillin (15)	α -Glucosidase inhibitory activity	[2]
Bisorbicillipyron A (41)	α -Glucosidase inhibitory activity	[2]
Dihydrodemethylsorbicillin (79)	α -Glucosidase inhibitory activity	[2]
Tetrahydrotrichodimerol (88)	α -Glucosidase inhibitory activity	[2]
Tetrahydrobisvertinolone (89)	α -Glucosidase inhibitory activity	[2]
10,11-Dihydrobisvertinolone (90)	α -Glucosidase inhibitory activity	[2]

Table S10. Other biological activities of the screened sorbicillinoids from fungi.

Sorbicillinoid	Biological Activity	Ref.
Sorbicillin (1)	Inhibitory activity on acetylcholinesterase	[24]
	Neuroprotective and neuritogenic activity	[25]
2',3'-Dihydrosorbicillin = Dihydrosorbicillin (2)	Inhibitory activity on acetylcholinesterase	[24]
	Inhibitory activity on protein tyrosine phosphatase 1B	[26]
Scipyron K (14)	Antioxidant activity	[7]
Trichoreesin A (32)	Antimicrobial activity against the marine algae	[10]
13-Hydroxy-dihydrotrichodermolide (55)	Inhibitory activities on glucagon-like peptide-1 and eukaryotic elongation factor-2 kinase	[15]
10,11,27,28-Tetrahydrotrisorbicillinone C (60)	Inhibitory activities on glucagon-like peptide-1 and eukaryotic elongation factor-2 kinase	[15]
Sohirnone A (78)	Inhibitory activity on protein tyrosine phosphatase 1B	[26]
Bisorbicillinol (82)	Anti-allergic activity	[27]
Sorrentanone (84)	Anti-HIV activity	[22]
Tetrahydrobisvertinolone (89)	Weak AChE inhibitory activity	[2]
Tetrahydrotrichodimer ether (91)	Weak AChE inhibitory activity	[2]

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