

**Supplementary Table 1. Origin and bioactivity of plant signaling metabolites.**

Compound	Category	Subcategory	Origin (Either general or specific plants reported)	Function	Reference
Linalool (1)	Terpene	Monoterpene	<i>Penstemon digitalis</i>	1) Slow the growth rate of phyllosphere origin bacterial strains. 2) Promote the maximum density of nectary-source bacterial groups.	31
β-Caryophyllene (2)		Sesquiterpene	<i>Arabidopsis thaliana</i> ; tomato ( <i>Solanum lycopersicum</i> )	1) Protect the <i>Arabidopsis</i> floral organ from <i>Pseudomonas syringae</i> pv <i>tomato</i> DC3000. 2) Shift the root microbiota composition of neighboring tomato plants.	32
Capsidiol (3)		Sesquiterpene	Pepper and tobacco	1) Act as a phytoalexin in response to pathogens including the potato late blight causer <i>Phytophthora infestans</i> .	33
Kauralexin A1 (4) Kauralexin B1 (5)		Diterpene	Maize	1) Confer maize plants with tolerance of phytopathogenic microbes such as <i>Fusarium</i> spp., <i>Aspergillus</i> spp., <i>Collectotrichum</i> spp, <i>Rhizopus</i> microspores, and <i>Cochliobolus heterostrophus</i> .	36–38
Epoxydolabrene (6) Epoxydolabrranol (7) Trihydroxydolabrene (8)		Diterpene	Maize	1) Inhibit <i>Fusarium verticillioides</i> and <i>Fusarium graminearum</i> . 2) Modulate rhizosphere microbiome with pronounced change of Alphaproteobacteria.	37, 39
Momilactone A (9) Momilactone B (10)		Diterpene	Rice	1) Respond to fungal signals e.g., chitin. 2) Protect plant from rice blast caused by <i>Magnaporthe oryzae</i> . 3) Display <i>in vitro</i> antibacterial activities against <i>Bacillus pumilus</i> , <i>Pseudomonas ovalis</i> , <i>Escherichia coli</i> , and <i>Bacillus cereus</i> .	41-45
Phytocassane A (11) Phytocassane B (12)		Diterpene	Rice	1) Suppress pathogenic microbes such as <i>Pyricularia oryzae</i> , <i>Magnaporthe grisea</i> and <i>Magnaporthe oryzae</i> .	40
Oryzalexin A (13) Oryzalexin B (14)		Diterpene	Rice		
5,10-Diketo-casbene (15)		Diterpene	Rice <i>japonica</i> varieties	1) Offer plants bacterial blight resistance by inhibiting <i>M. oryzae</i> spore germination.	19,46,47

				2) Alleviate leaf disease symptoms caused by the <i>Xoo</i> strain.	
Hordetriene (16) 11-Hydroxy-hordetriene (17)		Diterpene	Barely	1) Synthesis upon infections by bacterial and fungal pathogen not beneficial fungus.	48
Dehydroabietinal (18)		Diterpene	Conifer	1) Activate systemic acquired resistance for tomato, tobacco, and <i>A. thaliana</i> .	50
<i>ent</i> -Quiannulatene (19)		Sesterterpene	<i>A. thaliana</i>	1) Reshape the composition of root microbiota, with changes of OTUs of Firmicutes, Proteobacteria, Actinobacteria, Planctomycetes, Verrucomicrobita, and Acidobacteria.	52
Astellatene (20)		Sesterterpene	<i>A. thaliana</i>		
Thalianin (21)		Triterpene	<i>A. thaliana</i>	1) Modulate the assembly of <i>A. thaliana</i> root bacterial microbiota, sustaining <i>Arenimonas</i> proliferation and suppressing <i>Arthrobacter</i> growth.	18
Arabidin (22)		Triterpene	<i>A. thaliana</i>		
Avenacin A1 (23) Avenacin B1 (24)		Triterpene	Oat	1) Provide plants with resistance to “take-all” caused by fungus <i>Gaeumannomyces tritici</i> . 2) Structure oat-associated rhizosphere eukaryotes.	53-55
Ginsenoside Rg1 (25) Ginsenoside Rb1 (26) Ginsenoside Rd (27)		Triterpene	<i>Panax notoginseng</i>	1) Drive <i>Panax notoginseng</i> associated soil microbiota.	56
Orobanchol (28) 5-Deoxystrigol (29) Carlacton (30) Carlactonoic acid (31) Lotuslactone (32)		Higher-terpene	various monocotyledonous and dicotyledonous plants, e.g., rice, soybean, and sorghum	1) Establish plant-AMF association. 2) Steer rice plant rhizomicrobiome and promote beneficial bacteria. 3) Alter soybean rhizosphere microbial compositions. 4) Change sorghum rhizosphere bacterial groups.	57-62
Sakuranetin (33)	Phenylpropanoid	Flavonoid	Rice	1) Accumulate upon <i>Pyricularia oryzae</i> and <i>Magnaporthe grisea</i> attack.	40
Glyceollin I (34) Glyceollin III (35)		Flavonoid	Soybean	1) Serve as phytoalexins in response to fungi <i>Aspergillus</i> species, and <i>Rhizopus microspores</i> var. <i>oryzae</i> .	65–67
Medicarpin (36)		Flavonoid	Medicago	1) Act as a phytoalexin in response to fungus <i>Phoma medicaginis</i> .	
Maackiaian (37)		Flavonoid	Chickpea	1) Induced synthesis by elicitor k-carrageenan.	
Pisatin (38)		Flavonoid	Pea	1) Produced upon pathogen <i>Nectria haematococca</i> MPVI infection. 2) Induced synthesis by elicitor k-carrageenan.	

Apigenin (39)		Flavonoid	A range of legume plants and maize	1) Induce host nodulation and establish plant-rhizobia symbiotic connection. 2) Respond to infection by fungus <i>Colletotrichum graminicola</i> in maize plants. 3) Coordinate maize-special rhizosphere microorganisms, enriching <i>Massilia</i> genus and <i>Oxalobacteraceae</i> family 4) Enhance plant field performance.	13,68
Daidzein (40) Genistein (41)		Flavonoid	Legumes, e.g., soybean	1) Trigger soybean- <i>Bradyrhizobium</i> and legume- <i>Rhizobium</i> sp. NGR234 symbiosis but repress several <i>Rhizobium</i> strains.	68
Scopoletin (42)		Coumarin	<i>A. thaliana</i>	1) Shape rhizomicrobiome, sustain beneficial microbes such as bacterium <i>P. simiae</i> WCS417 <i>P. capeferrum</i> WCS358 but repressing pathogenic fungi <i>F. oxysporum</i> and <i>V. dahlia</i> . 2) Sculpt the assembly of microbiome, enriching <i>Pseudomonas</i> species.	22
Fraxetin (43)		Coumarin	<i>A. thaliana</i>	1) Alter the root microbiota and enhance plant growth under iron-restricted condition, selecting iron-beneficial commensal strains.	71
Daphnetin (44)		Coumarin	Different plant sources	1) Inhibit phytopathogenic microbes such as <i>R. solanacearum</i> .	72
Resveratrol (45)		Stilbene	Vitaceae plants	1) Respond to fungal attacks from <i>B. cinerea</i> , <i>P. viticola</i> and <i>U. necator</i> .	74
Pterostilbene (46)		Stilbene	Vitaceae plants	1) Enhance plant resistance to the pathogen <i>Rhizoctonia solani</i> and reduce root necrosis in pterostilbene-expressed soybeans.	76,77
$\epsilon$ -Viniferin (47)		Stilbene	Vitaceae plants	1) Accumulate upon infection by <i>Plasmopara viticola</i> and <i>Erysiphe necator</i> .	75
<i>p</i> -Coumaroyl-tyramine (48)		Phenolamides	Pepper and others	1) Inhibit growth of pathogenic fungus <i>Xanthomonas campestris</i> .	78
<i>N</i> -feruloyl-tyramine (49)		Phenolamides			
Avenanthramide a (50)		Phenolamides	Oat	1) Correlates to defense against crown rust in a concentration-dependent manner.	78
Cinnamoyltyramine (51)		Phenolamides	Rice	1) Protect plant against bacteria <i>Xoo</i> and fungus <i>Magnaporthe oryzae</i> along with phytoalexins synthesis.	82
Camalexin (52)	<i>N</i> -containing	Alkaloid	<i>Arabidopsis</i>	1) Affect the rhizosphere microbiome.	24
Spirobrassinin (53)		Alkaloid	<i>Brassica rapa</i> and	1) Respond to pathogens <i>Albugo candida</i> and	88,89

Rutalexin (54)	compound		<i>Brassica juncea</i>	<i>Alternaria brassicola</i> .	
Brassilexin (55)					
4-OH-ICN (56)		Cyanogenic compound	<i>Arabidopsis</i>	1) Maintain plant resistance to <i>P. syringae</i> pv. <i>tomato</i> DC3000. 2) Inhibit growth of fungi <i>Alternaria brassicicola</i> and <i>Botrytis cinerea</i> .	21
DIMBOA (57) MBOA (58) HM <sub>2</sub> BOA-Glc (59)		Benzoxazinoid	Poaceae family plants, e.g., maize	1) Impede the growth of pathogenic <i>Staphylococcus aureus</i> but promote PGP bacterium <i>Pseudomonas putida</i> . 2) Tailor microbial communities in both aboveground and belowground parts of plants.	94-98
Zeaoxazolinone (60)		Benzoxazinoid		1) Possess antimicrobial properties against <i>Aspergillus flavus</i> and <i>Candida albicans</i> .	95
Phenoxazine (61)		Benzoxazinoid		1) Display antibacterial activity <i>in vitro</i> . 2) Contribute to the stability of microbial assemblage.	99
Sulforaphane (62)	S-containing compound	Glucosinolate	Brassicales plants	1) Inhibit <i>P. syringae</i> strains by interfering with microbial type III secretion system.	103
2-Phenylethylisothiocyanate (63)		Glucosinolate	Brassicales plants	1) Control a pea disease via soil amendments or plant rotations via altering rhizosphere bacterial community.	105
<i>p</i> -Hydroxybenzylglucosinolate (64)		Glucosinolate	Brassicales plants, e.g., <i>Arabidopsis</i>	1) Shape rhizosphere microbiota. 2) Establish and maintain relationship between plants and endophytic fungi, e.g., <i>Serendipita indica</i> 3) Sustain beneficial microbe <i>Colletotrichum tofieldiae</i>	106
Indole glucosinolates, e.g., neoglucobrassicin (65)		Glucosinolate	<i>Arabidopsis</i>	1) Contain the overgrowth of <i>Colletotrichum tofieldiae</i> fungus. 2) Enable the establishment of beneficial roles for plants grown in phosphate-deficient conditions.	108
Alliin (66)		S-alkyl-cysteine sulfoxides	Alliaceae plants	1) Show antibacterial and antifungal properties against <i>Agrobacterium tumefaciens</i> , <i>Erwinia carotovora</i> , <i>P. syringae</i> , <i>Xanthomonas campestris</i> , <i>A. brassicicola</i> , <i>B. cinerea</i> , <i>Magnaporthe grisea</i> , Oomycete <i>Phytophthora</i> , <i>Plectosphaerella cucumerina</i> , among others.	109
Falcarindiol (67)		Other	Acetylenic fatty acids	Slanaceous species, e.g., tomato and eggplant	1) Produced upon induction by <i>Cladosporium fulvum</i> , <i>Fusarium oxysporum</i> , and <i>Verticillium albo-atrum</i> . 2) Correlate with plant immunity with fungus <i>B. cinerea</i> and bacteria <i>X. euvesicatoria</i> and <i>P. syringae</i> .
Acyl sugars, e.g.,	Acyl sugars		Caryophyllaceae,	1) Reduce tobacco specific fungi (i.e., <i>Fusarium</i> and	122, 123

<p>S3:18(2,8,8) (68) S3:17(2,7,8) (69)</p>			<p>Geraniaceae, Martyniaceae, and Solanaceae plants, e.g., tobacco and tomato</p>	<p><i>Alternaria</i>) spore germination. 2) Enhance protection from infection of phytopathogens, <i>B. cinerea</i> and <i>Pseudomonas viridiflava</i> when <i>Arabidopsis</i> treated with acyl glycosides. 3) Induce soybean immunity against the disease target spot. 4) Contribute to the formation of trichome-specific microbiota. 5) Interplay between tomato plants and bacterial strain <i>Bacillus subtilis</i> 3610.</p>	
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