Supplementary Materials
The biological activities of *Citrus* species in crop protection

Table S 1. *Citrus* species and related information.

***Citrus* sp.**	**Protologue**	**Common name**	**Hybrid formula**	**References**
Citrus x *aurantiifolia* (Christm.) Swingle	J. Whashington Acad. Sci. 3: 465 (1913)	Lime	*C. hystrix* x *C. medica*	[1]
Citrus x *aurantium* L.	Sp. Pl.: 783 (1753)	Bitter orange	*C. maxima* x *C. reticulata*	[1]
Citrus x *bergamia* (Risso) Risso & Poit.	Nat. Orangers: t. 53-56 (1819)	Bergamot	The botanical origin of this plant is still uncertain Mostly defined as *C. aurantium* x *C. limon* or *C. aurantium* x *C. aurantiifolia*	[1,2]
Citrus hystrix DC.	Cat. Pl. Horti Monsp.: 97 (1813)	Kaffir lime Thai lime	-	[1]
Citrus x *junos* Siebold ex Yu. Tanaka	Sieb. Sens. Tor. Hyakun. Kin. Ronbunshu: 65 (1924)	Yuzu	*C. cavalierei* x *C. maxima* x *C. reticulata*	[1]
Citrus x *latifolia* (Yu. Tanaka) Yu Tanaka	Syst. Pomol.: 140 (1951)	Tahiti lime	*C. hystrix* x *C. maxima* x *C. medica* x *C. reticulata*	[1]
Citrus x *limetta* Risso	Ann. Mus. Hist. Nat. 20:195 (1813)	Limetta	*C. aurantium* x *C. medica*	[1,3]
Citrus x *limon* (L.) Osbeck	Reise Ostindien: 250 (1765)	Eureka lemon	*C. maxima* x *C. medica* x *C. reticulata.*	[1]
Citrus x *limonia* (L.) Osbeck	Reise Ostindien: 250 (1765)	Rangpur lime	*C. medica* x *C. reticulata*	[1,4]
Citrus maxima (Burm.) Merr.	Herb. Amboin.: 296 (1917)	Pomelo	-	[1]
Citrus x *paradisi* Macfad	Bot. Misc. 1: 304 (1830)	Marsh grapefruit	*C. maxima* x *C. sinensis*	[1,5]
Citrus reticulata Blanco	Fl. Filip.: 610 (1827), nom. cons.	Mandarin	-	[1]
Citrus x *sinensis* (L.) Osbeck	Reise Ostindien: 250 (1765)	Sweet orange	*C. maxima* x *C. reticulata*	[1]

Table S 2. Antibacterial activity of EOs.

***Citrus* sp.**	**Plant portion**	**Bacteria**	**Test method**	**Effect**	**References**
C. aurantiifolia	leaves	*Xanthomonas citri* subsp. *citri*	broth microdilution method	MIC = 0.50 mg/mL	[6]
				MBC = 0.90 mg/mL	
			disc diffusion method	IZ = 15.00 ± 0.33 mm at 100%	
	pericarp	*Serratia marcescens*	disc diffusion method	IZ = 12.66 ± 0.58 mm at 100%	[7]
			broth microdilution method	MIC_{50} = 6.18 µL/mL	
				MIC_{90} = 8.26 µL/mL	
			in vivo assay on apple	Growth inhibition (%) = 71.35 ± 1.90 at 500 µL/L	
			in vivo assay on pear	Growth inhibition (%) = 64.73 ± 3.30 at 500 µL/L	
			in vivo assay on potato	Growth inhibition (%) = 74.04 ± 2.18 at 500 µL/L	
			in vivo assay on kohlrabi	Growth inhibition (%) = 99.05 ± 1.09 at 500 µL/L	
	peel	*Serratia marcescens*	agar well diffusion	IZ = 8.7 ± 0.5 mm at 100 mg/mL	[8]
			pour plate technique	MIC = 50 mg/mL	
				MBC = 100 mg/mL	
	peel	*Erwinia cacticida*	agar well diffusion	IZ = 11.3 ± 0.6 mm at 100 mg/mL	[8]
			pour plate technique	MIC = 25 mg/mL	
				MBC = 25 mg/mL	
	-	*Clavibacter michiganensis* sp. *insidiosus*	agar diffusion method	IZ = 14.33 ± 0.87 cm at 100%	[9]
	-	*Clavibacter michiganensis* sp. *sepedonicus*	agar diffusion method	IZ = 10.33 ± 0.44 cm at 100%	[9]
	leaves	*Pseudomonas putida*	disc diffusion method	IZ = 12.1 ± 0.9 mm at 100%	[10]
	leaves	*Erwinia herbicola*	disc diffusion method	Complete inhibition at 100%	[10]
C. aurantium	leaves	*Erwinia herbicola*	disc diffusion method	Complete inhibition at 100%	[10]
			agar dilution bioassay	MIC = 8.0 µL/mL	

	leaves	*Pseudomonas putida*	disc diffusion method	Complete inhibition at 100%	[10]
			agar dilution bioassay	MIC = 4.0 µL/mL	
	leaves/twigs	*Agrobacterium tumefaciens*	disc diffusion method	IZ = 15.66 ± 0.57 mm at 20 µL/disc	[11]
	branches			IZ = 17.66 ± 0.57 mm at 25 µL/disc	
	leaves/twigs	*Dickeya solani*	disc diffusion method	IZ = 17.33 ± 0.57 mm at 25 µL/disc	[11]
	branches			IZ = 16.66 ± 0.57 mm at 25 µL/disc	
	branch bark			IZ = 9.66 ± 0.57 mm at 25 µL/disc	
	branch wood			IZ = 13.66 ± 0.57 mm at 25 µL/disc	
	leaves/twigs	*Erwinia amylovora*	disc diffusion method	IZ = 17.33 ± 0.57 mm at 20 µL/disc	[11]
	branches			IZ = 15.33 ± 0.57 mm at 25 µL/disc	
	branch bark			IZ = 12.33 ± 0.57 mm at 25 µL/disc	
	branch wood			IZ = 12.00 ± 0.00 mm at 25 µL/disc	
	leaves	*Xanthomonas citri* subsp. *citri*	broth microdilution method	MIC = 1.30 mg/mL	[6]
				MBC = 2.00 mg/mL	
			disc diffusion method	IZ = 8.00 ± 1.00 mm at 100%	
	fruit	*Xanthomonas campestris*	broth microdilution method	MIC = 20-25 µg/mL	[12]
	-	*Erwinia amylovora*	microdilution assay	MIC = 6.3% v/v	[13]
				MBC = 6.3% v/v	
	-	*Pseudomonas savastanoi* sp. *savastanoi*	microdilution assay	MIC = 1.6% v/v	[13]
				MBC = 3.1% v/v	
	-	*Xanthomonas vesicatoria*	microdilution assay	MIC = 3.1% v/v	[13]
				MBC = 3.1% v/v	
	-	*Allorhizobium vitis*	microdilution assay	MIC = 0.8% v/v	[13]
				MBC = 3.1% v/v	
C. limon	leaves	*Erwinia herbicola*	disc diffusion method	IZ = 7.3 ± 2.1 mm at 100%	[10]
	leaves	*Pseudomonas putida*	disc diffusion method	IZ = 10.9 ± 3.6 mm at 100%	[10]
	peel	*Serratia marcescens*	agar well diffusion	IZ = 8.3 ± 0.5 mm at 100 mg/mL	[8]

			pour plate technique	MIC = 50 mg/mL MBC = 100 mg/mL	
	peel	*Erwinia cacticida*	agar well diffusion pour plate technique	IZ = 11.3 ± 0.5 mm at 100 mg/mL MIC = 25 mg/mL MBC = 25 mg/mL	[8]
	-	*Clavibacter miciganensis* sp. *sepedonicus*	agar diffusion method	IZ = 10.17 ± 0.34 cm at 100%	[9]
	-	*Clavibacter miciganensis* sp. *insidiosus*	agar diffusion method	IZ = 8.67 ± 0.87 cm at 100%	[9]
	fruit	*Xanthomonas campestris*	broth microdilution method	MIC = 15-20 µg/mL	[12]
C. paradisi	peel	*Serratia marcescens*	agar well diffusion pour plate technique	IZ = 7.6 ± 0.5 mm at 100 mg/mL MIC = 50 mg/mL MBC = 100 mg/mL	[8]
	peel	*Erwinia cacticida*	agar well diffusion pour plate technique	IZ = 9.0 ± 1.0 mm at 100 mg/mL MIC = 75 mg/mL MBC = 75 mg/mL	[8]
C. reticulata	fruit	*Xanthomonas campestris*	broth microdilution method	MIC = 20-25 µg/mL	[12]
C. sinensis	fruit	*Xanthomonas campestris*	broth microdilution method	MIC = 20-25 µg/mL	[12]

MIC: minimum inhibitory concentrazion

MIC_{50}: minimum concentration that is required to inhibit 50% of tested weeds

MIC_{90}: minimum concentration that is required to inhibit 90% of tested weeds

MBC: minimum bactericidal concentration

IZ: inhibition zone

Table S 3. Antifungal activity of EOs.

***Citrus* sp.**	**Plant portion**	**Fungi**	**Test method**	**Effect**	**References**
C. aurantiifolia	peel	*Mucor hiemalis*	agar dilution method	Growth inhibition (%) = 100.0 ± 0.0 at 2000 ppm	[14]
	peel	*Penicillium expansum*	agar dilution method	Growth inhibition (%) = 52.0 ± 1.0 at 2000 ppm	[14]
	peel	*Fusarium proliferatum*	agar dilution method	Growth inhibition (%) = 91.5 ± 2.4 2000 ppm	[14]
	-	*Botrytis cinerea*	direct contact assay volatile phase assay	Growth inhibition (%) = 100 at 35% Growth inhibition (%) = 63% at 1%	[15]
	peel	*Colletotrichum gloeospori-oides*	food poisoned technique *in vivo* assay	Growth inhibition at 0.09% v/w Disease incidence (%) = 0 at 0.14 % w/w	[16]
	peel	*Rhizopus stolonifer*	food poisoned technique *in vivo* assay	Growth inhibition at 0.10% v/w Growth inhibition (%) = 40 at 0.12% v/w	[16]
	peel	*Aspergillus niger*	agar well diffusion pour plate technique	IZ = 9.3 ± 0.5 mm at 100 mg/mL MIC = 50 mg/mL MFC = 100 mg/mL	[8]
	peel	*Aspergillus flavus*	agar well diffusion pour plate technique	IZ = 8.1 ± 0.3 mm at 100 mg/mL MIC = 50 mg/mL MFC > 100 mg/mL	[8]
	peel	*Aspergillus fumigatus*	agar well diffusion pour plate technique	IZ = 9.0 ± 1.0 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]
	peel	*Aspergillus parasiticus*	agar well diffusion pour plate technique	IZ = 7.8 ± 0.2 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]

	peel	*Geotrichum candidum*	agar well diffusion pour plate technique	IZ = 9.7 ± 0.6 mm at 100 mg/mL MIC = 25 mg/mL MFC = 50 mg/mL	[8]
	peel	*Alternaria alternata*	agar well diffusion pour plate technique	IZ = 16.5 ± 0.5 mm at 100 mg/mL MIC = 25 mg/mL MFC = 75 mg/mL	[8]
	peel	*Fusarium avenaceum*	agar well diffusion pour plate technique	IZ = 6.1 ± 0.2 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Fusarium solani*	agar well diffusion pour plate technique	IZ = 4.6 ± 0.5 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Penicillium digitatum*	agar well diffusion pour plate technique	IZ = 21.3 ± 0.5 mm at 100 mg/mL MIC = 12.5 mg/mL MFC = 25 mg/mL	[8]
	peel	*Penicillium expansum*	agar well diffusion pour plate technique	IZ = 18.9 ± 0.5 mm at 100 mg/mL MIC = 25 mg/mL MFC = 25 mg/mL	[8]
	peel	*Rhizopus oryzae*	agar well diffusion pour plate technique	IZ = 11.7 ± 0.5 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]
	peel	*Rhizopus stolonifer*	agar well diffusion pour plate technique	IZ = 12.3 ± 0.5 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]
	peel	*Mucor piriformis*	agar well diffusion pour plate technique	IZ = 17.5 ± 0.0 mm at 100 mg/mL MIC = 25 mg/mL MFC = 50 mg/mL	[8]

	peel	*Mucor racemosis*	agar well diffusion pour plate technique	IZ = 14.6 ± 0.5 mm at 100 mg/mL MIC = 25 mg/mL MFC = 50 mg/mL	[8]
	peel	*Phaeoramularia angolensis*	food poisoned technique	Growth inhibition (%) = 50.56 at 2500 µL/L	[17]
	peel	*Botrytis cinerea*	microdilution broth	MIC = 625 µg/mL	[18]
	epicarp	*Aspergillus flavus*	disc diffusion microdilution broth	IZ = 24.13 ± 0.32 mm at 50 mg/mL MIC = 0.56 mg/mL MFC = 1.13 mg/mL	[19]
	epicarp	*Aspergillus parasiticus*	disc diffusion microdilution broth	IZ = 18.13 ± 0.32 mm at 50 mg/mL MIC = 0.56 mg/mL MFC = 1.13 mg/mL	[19]
	epicarp	*Aspergillus fumigatus*	disc diffusion microdilution broth	IZ = 28.63 ± 1.09 mm at 50 mg/mL MIC = 1.13 mg/mL MFC = 2.25 mg/mL	[19]
	epicarp	*Aspergillus niger*	disc diffusion microdilution broth	IZ = 22.82 ± 0.42 mm at 50 mg/mL MIC = 0.56 mg/mL MFC = 1.13 mg/mL	[19]
	epicarp	*Penicillium sp*	disc diffusion microdilution broth	IZ = 22.85 ± 6.15 mm at 50 mg/mL MIC = 1.13 mg/mL MFC = 2.25 mg/mL	[19]
	leaves	*Phaeoramularia angolensis*	disc diffusion	MIC = 1.5 mg/mL	[20]
C. aurantium	leaves	*Aspergillus sp.*	disc diffusion	IZ = 22 mm at 100%	[21]
	flowers	*Alternaria sp.*	disc diffusion	IZ = 12 mm at 100%	[21]
	leaves	*Penicillium sp.*	disc diffusion	IZ = 8 mm at 100%	[21]
	leaves peel	*Fusarium oxysporum*	disc diffusion	IZ = 8 mm at 100% IZ = 8 mm at 100%	[21]

	leaves	*Aspergillus flavus*	radial growth technique method	Growth inhibition (%) = 62.66 ± 1.21 at 50 µL/mL	[22]
	leaves	*Aspergillus niger*	radial growth technique method	Growth inhibition (%) = 75.66 ± 0.66 at 50 µL/mL	[22]
	leaves	*Aspergillus terreus*	radial growth technique method	Growth inhibition (%) = 100.00 ± 0.00 at 50 µL/mL	[22]
	leaves	*Fusarium culmorum*	radial growth technique method	Growth inhibition (%) = 65.66 ± 0.33 at 50 µL/mL	[22]
	leaves	*Verticillium fungicola*	macrodilution test microdilution test	MIC = 25.0–35.0 µL/mL MIC = 10.0–15.0 µL/mL MFC = 10.0–15.0 µL/mL	[23]
	flowers	*Aspergillus niger*	agar diffusion method broth microdilution method	IZ = 17.0 ± 0.4 mm at 50 mg/mL MFC = 1.25 ± 0.30 mg/mL	[24]
	flowers	*Aspergillus flavus*	agar diffusion method broth microdilution method	IZ = 22.0 ± 1.1 mm at 50 mg/mL MFC = 0.08 ± 0.20 mg/mL	[24]
	flowers	*Aspergillus nidulans*	agar diffusion method broth microdilution method	IZ = 15.0 ± 0.3 mm at 50 mg/mL MFC = 0.63 ± 0.20 mg/mL	[24]
	flowers	*Aspergillus fumigatus*	agar diffusion method broth microdilution method	IZ = 18.0 ± 0.6 mm at 50 mg/mL MFC = 0.31 ± 0.20 mg/mL	[24]
	flowers	*Fusarium graminearum*	agar diffusion method broth microdilution method	IZ = 22.0 ± 0.6 mm at 50 mg/mL MFC = 0.08 ± 0.40 mg/mL	[24]
	flowers	*Fusarium oxysporum*	agar diffusion method broth microdilution method	IZ = 20.0 ± 0.9 mm at 50 mg/mL MFC = 0.16 ± 0.30 mg/mL	[24]
	flowers	*Fusarium culmorum*	agar diffusion method broth microdilution method	IZ = 19.0 ± 0.4 mm at 50 mg/mL MFC = 0.16 ± 0.10 mg/mL	[24]
	flowers	*Alternaria alternata*	agar diffusion method broth microdilution method	IZ = 15.0 ± 0.4 mm at 50 mg/mL MFC = 1.25 ± 0.80 mg/mL	[24]

C. bergamia	pericarp	*Phytophthora infestans*	direct contact technique *in vivo* assay	Growth inhibition (%) = 55 at 1% Growth inhibition (%) = 69 at 100%	[25]
C. hystrix	epicarp	*Aspergillus flavus*	disc diffusion microdilution broth	IZ = 17.33 ± 0.28 mm at 50 mg/mL MIC = 0.56 mg/mL MFC = 1.13 mg/mL	[19]
	epicarp	*Aspergillus parasiticus*	disc diffusion microdilution broth	IZ = 29.63 ± 0.23 mm at 50 mg/mL MIC = 0.56 mg/mL MFC = 1.13 mg/mL	[19]
	epicarp	*Aspergillus fumigatus*	disc diffusion microdilution broth	IZ = 29.85 ± 0.25 mm at 50 mg/mL MIC = 0.56 mg/mL MFC = 0.56 mg/mL	[19]
	epicarp	*Aspergillus niger*	disc diffusion microdilution broth	IZ = 27.38 ± 0.24 mm at 50 mg/mL MIC = 0.56 mg/mL MFC = 1.13 mg/mL	[19]
	epicarp	*Penicillium sp*	disc diffusion microdilution broth	IZ = 24.91 ± 0.38 mm at 50 mg/mL MIC = 1.13 mg/mL MFC = 1.13 mg/mL	[19]
C. latifolia	peel	*Botrytis cinerea*	microdilution broth	MIC = 625 µg/mL	[18]
C. limon	-	*Aspergillus niger*	disc diffusion	IZ = 10 mm at 100%	[26]
	-	*Aspergillus flavus*	disc diffusion	IZ = 13 mm at 100%	[26]
	-	*Rhizopus spp.*	disc diffusion	IZ = 12 mm at 100%	[26]

	-	*Botrytis cinerea*	food poisoned technique	MIC = 17 µL/mL ED_{50} = 11 µL/mL	[27]
			spore germination assay	MIC = 22 µL/mL ED_{50} = 13 µL/mL	
			in vivo assay on strawberries	Disease incidence (%) = 0.0 at 0.05 µL/mL	
			in vivo assay on cucumbers	Disease incidence (%) = 2.3 at 0.125 µL/mL	
	leaves	*Aspergillus flavus*	disc diffusion	IZ = 21.30 ± 0.17 mm at 10 mg/mL	[28]
			microdilution broth	MIC = 4.00 ± 0.11 mg/mL	
	leaves	*Rhizoctonia solani*	disc diffusion	IZ = 26.90 ± 0.12 mm at 10 mg/mL	[28]
			microdilution broth	MIC = 2.50 ± 0.10 mg/mL	
	leaves	*Alternaria alternata*	disc diffusion	IZ = 23.50 ± 0.12 mm at 10 mg/mL	[28]
			microdilution broth	MIC = 3.00 ± 0.11 mg/mL	
	-	*Botrytis cinerea*	direct contact assay	Growth inhibition (%) = 100% at 20%	[15]
			volatile phase assay	Growth inhibition (%) = 52% at 1%	
	peel	*Phaeoramularia angolensis*	food poisoned technique	Growth inhibition (%) = 42.61 at 2500 µL/L	[17]
	peel	*Botrytis cinerea*	microdilution broth	MIC = 312 µg/mL	[18]
	epicarp	*Eutypa sp.*	disc diffusion assay	Growth inhibition (%) = 82 at 0.25%	[29]
	epicarp	*Botryosphaeria dothidea*	disc diffusion assay	Growth inhibition (%) = 48 at 0.25%	[29]
	epicarp	*Fomitiporia mediterranea*	disc diffusion assay	Growth inhibition (%) = 33 at 0.25%	[29]
	leaves	*Verticillium fungicola*	macrodilution test	MIC = 25.0–35.0 µL/mL	[23]
			microdilution test	MIC = 10.0–15.0 µL/mL MFC = 10.0–15.0 µL/mL	
	peel	*Aspergillus niger*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]

	peel	*Aspergillus flavus*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	peel	*Penicillium chrysogenum*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	peel	*Penicillium verrucosum*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	-	*Aspergillus carbonarius*	agar dilution method vapor phase method	Growth inhibition (%) = 100.0 ± 0.0 at 1.25 µL/mL Growth inhibition (%) = 100.0 ± 0.0 at 2.5 µL/mL	[31]
	-	*Aspergillus parasiticus*	agar plate method vapor phase method	Growth inhibition (%) = 100.0 ± 0.0 at 2.5 µL/mL Growth inhibition (%) = 100.0 ± 0.0 at 1.25 µL/mL	[31]
	-	*Cladosporium cladosporioides*	agar plate method vapor phase method	Growth inhibition (%) = 100.0 ± 0.0 at 2.5 µL/mL Growth inhibition (%) = 100.0 ± 0.0 at 1.25 µL/mL	[31]
	-	*Eurotium herbariorum*	agar plate method vapor phase method	Growth inhibition (%) = 100.0 ± 0.0 at 1.25 µL/mL Growth inhibition (%) = 100.0 ± 0.0 at 1.25 µL/mL	[31]
	-	*Penicillium chrysogenum*	agar plate method vapor phase method	Growth inhibition (%) = 100.0 ± 0.0 at 1.25 µL/mL Growth inhibition (%) = 100.0 ± 0.0 at 1.25 µL/mL	[31]

	peel	*Aspergillus niger*	agar well diffusion pour plate technique	IZ = 8.3 ± 0.5 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]
	peel	*Aspergillus flavus*	agar well diffusion pour plate technique	IZ = 7.8 ± 1.0 mm at 100 mg/mL MIC = 75 mg/mL MFC > 100 mg/mL	[8]
	peel	*Aspergillus fumigatus*	agar well diffusion pour plate technique	IZ = 8.0 ± 1.0 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]
	peel	*Aspergillus parasiticus*	agar well diffusion pour plate technique	IZ = 8.2 ± 0.7 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]
	peel	*Alternaria alternata*	agar well diffusion pour plate technique	IZ = 14.7 ± 0.5 mm at 100 mg/mL MIC = 50 mg/mL MFC = 50 mg/mL	[8]
	peel	*Fusarium avenaceum*	agar well diffusion pour plate technique	IZ = 5.3 ± 0.5 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Fusarium solani*	agar well diffusion pour plate technique	IZ = 5.7 ± 0.5 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Penicillium digitatum*	agar well diffusion pour plate technique	IZ = 21.0 ± 1.0 mm at 100 mg/mL MIC = 12.5 mg/mL MFC = 25 mg/mL	[8]
	peel	*Penicillium expansum*	agar well diffusion pour plate technique	IZ = 18.7 ± 0.5 mm at 100 mg/mL MIC = 25 mg/mL MFC = 25 mg/mL	[8]

	peel	*Rhizopus oryzae*	agar well diffusion pour plate technique	IZ = 12.5 ± 0.5 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]
	peel	*Rhizopus stolonifer*	agar well diffusion pour plate technique	IZ = 11.3 ± 0.5 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]
	peel	*Geotrichum candidum*	agar well diffusion pour plate technique	IZ = 10.7 ± 0.2 mm at 100 mg/mL MIC = 25 mg/mL MFC = 50 mg/mL	[8]
	peel	*Mucor piriformis*	agar well diffusion pour plate technique	IZ = 17.7 ± 0.5 mm at 100 mg/mL MIC = 25 mg/mL MFC = 75 mg/mL	[8]
	peel	*Mucor racemosis*	agar well diffusion pour plate technique	IZ = 13.3 ± 0.3 mm at 100 mg/mL MIC = 50 mg/mL MFC = 75 mg/mL	[8]
	pericarp	*Phytophthora infestans*	direct contact technique *in vivo* assay	Growth inhibition (%) = 36 at 1% Growth inhibition (%) = 0 at 100%	[25]
	peel	*Aspergillus flavus*	disc diffusion macrodilution method	IZ = 13.20 ± 1.05 mm at 100% MIC = 0.06 ± 0.05 mg/L MFC = 0.02 ± 0.01 mg/L	[32]
	peel	*Penicillium citrinum*	disc diffusion macrodilution method	IZ = 11.90 ± 0.12 mm at 100% MIC = 0.19 ± 0.00 mg/L MFC = 0.09 ± 0.04 mg/L	[32]
	peel	*Botrytis cinerea*	disc diffusion macrodilution method	IZ = 10.46 ± 0.54 mm at 100% MIC = 0.38 ± 0.00 mg/L MFC = 0.25 ± 0.00 mg/L	[32]

	peel	*Mucor racemosus*	disc diffusion macrodilution method	IZ = 12.67 ± 0.77 mm at 100% MIC = 0.49 ± 0.62 mg/L MFC = 0.02 ± 0.01 mg/L	[32]
	peel	*Rhizopus nigricans*	disc diffusion macrodilution method	IZ = 14.15 ± 0.17 mm at 100% MIC = 0.06 ± 0.05 mg/L MFC = 0.03 ± 0.00 mg/L	[32]
C. limonia	peel	*Botrytis cinerea*	agar dilution method	MIC = 312 µg/mL	[18]
C. maxima	leaves	*Aspergillus flavus*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Aspergillus fumigatu*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Fusarium oxysporum*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Alternaria alternata*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Aspergillus terreus*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Helminthosporium oryzae*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	peel	*Phaeoramularia angolensis*	food poisoned technique	Growth inhibition (%) = 61.60 at 2500 µL/L	[17]
	peel	*Mucor hiemalis*	agar diffusion method	Growth inhibition (%) = 42.1 ± 0.4 at 2000 ppm	[14]
	peel	*Penicillium expansum*	agar diffusion method	Growth inhibition (%) = 53.8 ± 0.9 at 2000 ppm	[14]
	peel	*Fusarium proliferatum*	agar diffusion method	Growth inhibition (%) = 63.0 ± 1.0 at 2000 ppm	[14]
C. paradisi	peel	*Aspergillus niger*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	peel	*Aspergillus flavus*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	peel	*Penicillium chrysogenum*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]

	peel	*Penicillium verrucosum*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	peel	*Phaeoramularia angolensis*	poisoned food assay sporulation assay	Growth inhibition (%) = 15.92 at 2500 µL/L Sporulation inhibition (%) = 64.24 at 1000 ppm	[17]
	peel	*Aspergillus niger*	agar well diffusion pour plate technique	IZ = 4.3 ± 0.5 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Aspergillus flavus*	agar well diffusion pour plate technique	IZ = 5.5 ± 0.8 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Aspergillus fumigatus*	agar well diffusion pour plate technique	IZ = 3.7 ± 0.5 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Aspergillus parasiticus*	agar well diffusion pour plate technique	IZ = 7.3 ± 0.6 mm at 100 mg/mL MIC = 75 mg/mL MFC = 100 mg/mL	[8]
	peel	*Alternaria alternata*	agar well diffusion pour plate technique	IZ = 15.0 ± 1.0 mm at 100 mg/mL MIC = 50 mg/mL MFC = 50 mg/mL	[8]
	peel	*Fusarium solani*	agar well diffusion pour plate technique	IZ = 4.2 ± 0.3 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Penicillium digitatum*	agar well diffusion pour plate technique	IZ = 17.3 ± 0.6 mm at 100 mg/mL MIC = 25 mg/mL MFC = 50 mg/mL	[8]

	peel	*Penicillium expansum*	agar well diffusion pour plate technique	IZ = 17.3 ± 0.6 mm at 100 mg/mL MIC = 25 mg/mL MFC = 25 mg/mL	[8]
	peel	*Rhizopus oryzae*	agar well diffusion pour plate technique	IZ = 6.8 ± 0.7 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Rhizopus stolonifer*	agar well diffusion pour plate technique	IZ = 8.5 ± 0.5 mm at 100 mg/mL MIC = 100 mg/mL MFC > 100 mg/mL	[8]
	peel	*Geotrichum candidum*	agar well diffusion pour plate technique	IZ = 8.3 ± 0.5 mm at 100 mg/mL MIC = 50 mg/mL MFC = 75 mg/mL	[8]
	peel	*Mucor piriformis*	agar well diffusion pour plate technique	IZ = 16.3 ± 0.5 mm at 100 mg/mL MIC = 12.5 mg/mL MFC = 50 mg/mL	[8]
	peel	*Mucor racemosis*	agar well diffusion pour plate technique	IZ = 15.3 ± 0.5 mm at 100 mg/mL MIC = 25 mg/mL MFC = 50 mg/mL	[8]
C. reticulata	peel	*Mucor hiemalis*	agar dilution method	Growth inhibition (%) = 37.1 ± 0.5 at 2000 ppm	[14]
	peel	*Penicillium expansum*	agar dilution method	Growth inhibition (%) = 39.3 ± 0.7 at 2000 ppm	[14]
	peel	*Fusarium proliferatum*	agar dilution method	Growth inhibition (%) = 50.9 ± 1.6 at 2000 ppm	[14]

	peel	*Alternaria alternata*	food poisoned technique	Growth inhibition (%) = 100 at 0.2 mL/100 mL	[34]
			volatile activity assay	MIC = 0.2 mL/100 mL	
			spore inhibition assay	Spore inhibition (%) = 100 at 0.2 mL/100 mL	
	peel	*Rhizoctonia solani*	food poisoned technique	Growth inhibition (%) = 100 at 0.2 mL/100 mL	[34]
			volatile activity assay	MIC > 0.2 mL/100 mL	
			spore inhibition assay	Spore inhibition (%) = 100 at 0.2 mL/100 mL	
	peel	*Curvularia lunata*	food poisoned technique	Growth inhibition (%) = 100 at 0.2 mL/100 mL	[34]
			volatile activity assay	MIC = 0.2 mL/100 mL	
			spore inhibition assay	Spore inhibition (%) = 100 at 0.2 mL/100 mL	
	peel	*Fusarium oxysporum*	food poisoned technique	Growth inhibition (%) = 42 at > 0.1 mL/100 mL	[34]
			volatile activity assay	MIC = 0.2 mL/100 mL	
			spore inhibition assay	Spore inhibition (%) = 1 at 0.2 mL/100 mL	
	peel	*Helminthosporium oryzae*	food poisoned technique	Growth inhibition (%) = 54 at > 0.1 mL/100 mL	[34]
			volatile activity assay	MIC > 0.2 mL/100 mL	
			spore inhibition assay	Spore inhibition (%) = 0 at 0.2 mL/100 mL	
	flavedo	*Penicillium italicum*	food poisoned technique	Growth inhibition (%) = 100.00 ± 0.00 at 2.50 µg/mL	[35]

	flavedo	*Penicillium digitatum*	food poisoned technique	Growth inhibition (%) = 100.00 ± 0.00 at 40 µg/mL	[35]
	peel	*Aspergillus niger*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	peel	*Aspergillus flavus*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	peel	*Penicillium chrysogenum*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	peel	*Penicillium verrucosum*	agar dilution method	Growth inhibition (%) = 100 at 0.94% (v/v)	[30]
	peel	*Phaeoramularia angolensis*	food poisoned technique	Growth inhibition (%) = 17.32 at 2500 µL/L	[17]
			sporulation assay	Sporulation inhibition (%) = 24.94 at 1000 ppm	
	peel	*Aspergillus niger*	microdilution broth	MIC = 0.2 mg/mL	[36]
C. sinensis	flavedo	*Penicillium chrysogenum*	agar disc diffusion	IZ = 18.99 ± 1.17 mm at 50%	[37]
			broth microdilution	MIC = 9.33 µL/mL	
	leaves	*Aspergillus flavus*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Alternaria alternata*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Fusarium oxysporum*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Helminthosporium oryzae*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Aspergillus fumigatus*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	leaves	*Aspergillus terreus*	poisoned food assay	Growth inhibition (%) = 100 at 750 ppm	[33]
	peel	*Aspergillus flavus*	radial growth technique method	Growth inhibition (%) 86.66 ± 0.33 at 50 µL/mL	[22]
	peel	*Aspergillus niger*	radial growth technique method	Growth inhibition (%) 96.00 ± 4.00 at 50 µL/mL	[22]

	peel	*Aspergillus terreus*	radial growth technique method	Growth inhibition (%) = 100.00 ± 0.00 at 50 µL/mL	[22]
	peel	*Fusarium culmorum*	radial growth technique method	Growth inhibition (%) 100.00 ± 0.00 at 50 µL/mL	[22]
	peel	*Mucor hiemalis*	agar dilution method	Growth inhibition (%) 36.5 ± 0.2 at 2000 ppm	[14]
	peel	*Penicillium expansum*	agar dilution method	Growth inhibition (%) 34.9 ± 1.4 at 2000 ppm	[14]
	peel	*Fusarium proliferatum*	agar dilution method	Growth inhibition (%) = 59.5 ± 1.6 at 2000 ppm	[14]
	peel	*Phaeoramularia angolensis*	food poisoned technique	Growth inhibition (%) = 32.56 at 2500 µL/L	[17]
			sporulation assay	Spore inhibition (%) = 19.87 at 1000 ppm	
	epicarp	*Alternaria alternata*	agar medium assay	Growth inhibition (%) = 100 at 800 µg/mL MIC = 700 ± 59 µg/mL MFC = 1000 ± 59 µg/mL IC_{50} = 326 ± 20 µg/mL	[38]
			spore inhibition assay	Spore inhibition (%) = 100 at 800 µg/mL	
	epicarp	*Alternaria dumosa*	agar medium assay	Growth inhibition (%) = 100 at 600 µg/mL MIC = 550 ± 29 µg/mL MFC = 900 ± 59 µg/mL IC_{50} = 176 ± 2 µg/mL	[38]
			spore inhibition assay	Spore inhibition (%) = 100 at 600 µg/mL	

	epicarp	*Alternaria atra*	agar medium assay	Growth inhibition (%) = 100 at 800 µ/mL MIC = 750 ± 29 µg/mL MFC = 1000 ± 59 µg/mL IC_{50} = 360 ± 12 µg/mL	[38]
			spore inhibition assay	Spore inhibition (%) = 100 at 800 µg/mL	
	peel	*Aspergillus flavus*	direct addition assay	MIC = 16000 mg/L	[39]
			volatile phase assay	MIC = 8000 mg/L	
	peel	*Aspergillus niger*	microdilution broth	MIC = 1.0 mg/mL	[36]
	peel	*Aspergillus niger*	agar dilution method	Growth inhibition (%) = 100 at 0.94%	[30]
	peel	*Aspergillus flavus*	agar dilution method	Growth inhibition (%) = 100 at 0.94%	[30]
	peel	*Penicillium chrysogenum*	agar dilution method	Growth inhibition (%) = 100 at 0.94%	[30]
	peel	*Penicillium verrucosum*	agar dilution method	Growth inhibition (%) = 100 at 0.94%	[30]
	epicarp	*Aspergillus niger*	food poisoned technique	Growth inhibition (%) = 100 at 3.0 µg/mL	[40]
			spore germination assay	Spore germination (%) = 100 at 1.5 mg/mL	
	pericarp	*Phytophthora infestans*	direct contact technique	Growth inhibition (%) = 53 at 1%	[25]
			in vivo assay	Growth inhibition (%) = 42 at 100%	
	epicarp	*Aspergillus niger*	poisoned food technique	Growth inhibition (%) = 100.0 at 700 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 500 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 400 ppm	
	epicarp	*Botryodiplodia theobromae*	poisoned food technique	Growth inhibition (%) = 82.6 at 700 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 600 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 600 ppm	
	epicarp	*Alternaria alternata*	poisoned food technique	Growth inhibition (%) = 100.0 at 600 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 500 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 400 ppm	

	epicarp	*Cladosporium fulvum*	poisoned food technique	Growth inhibition (%) = 100.0 at 700 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 500 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 500 ppm	
	epicarp	*Botrytis cinerea*	poisoned food technique	Growth inhibition (%) = 100.0 at 500 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 400 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 300 ppm	
	epicarp	*Penicillium expansum*	poisoned food technique	Growth inhibition (%) = 100.0 at 600 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 400 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 500 ppm	
	epicarp	*Ulocladium chartarum*	poisoned food technique	Growth inhibition (%) = 49.2 at 700 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 58.9 at 700 ppm	
			spore germination assay	Spore germination (%) = 61.2 at 700 ppm	
	epicarp	*Alternaria mali*	poisoned food technique	Growth inhibition (%) = 100.0 at 500 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 400 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 300 ppm	
	epicarp	*Penicillium chrysogenum*	poisoned food technique	Growth inhibition (%) = 100.0 at 600 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 400 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 500 ppm	
	epicarp	*Cladosporium cladospori-oides*	poisoned food technique	Growth inhibition (%) = 100.0 at 500 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 400 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 400 ppm	
	epicarp	*Myrothecium roridum*	poisoned food technique	Growth inhibition (%) = 96.2 at 700 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 100.0 at 700 ppm	
			spore germination assay	Spore germination (%) = 0.0 at 700 ppm	
	epicarp	*Ulocladium* sp.	poisoned food technique	Growth inhibition (%) = 53.2 at 700 ppm	[41]
			volatile activity assay	Growth inhibition (%) = 59.3 at 700 ppm	
			spore germination assay	Spore germination (%) = 59.2 at 700 ppm	

	peel	*Aspergillus flavus*	disc diffusion macrodilution method	IZ = 13.84 ± 0.39 mm at 100% MIC = 0.02 ± 0.08 mg/L MFC = 0.01 ± 0.00 mg/L	[32]
	peel	*Penicillium citrinum*	disc diffusion macrodilution method	IZ = 15.59 ± 0.28 mm at 100% MIC = 0.14 ± 0.07 mg/L MFC = 0.09 ± 0.04 mg/L	[32]
	peel	*Botrytis cinerea*	disc diffusion macrodilution method	IZ = 11.88 ± 0.30 mm at 100% MIC = 0.38 ± 0.00 mg/L MFC = 0.19 ± 0.08 mg/L	[32]
	peel	*Mucor racemosus*	disc diffusion macrodilution method	IZ = 13.97 ± 0.27 mm at 100% MIC = 0.04 ± 0.02 mg/L MFC = 0.02 ± 0.02 mg/L	[32]
	peel	*Rhizopus nigricans*	disc diffusion macrodilution method	IZ = 17.23 ± 0.47 mm at 100% MIC = 0.01 ± 0.04 mg/L MFC = 0.01 ± 0.00 mg/L	[32]

MIC: minimum inhibitory concentrazion

MFC: minimum fungicidal concentration

IZ: inhibition zone

IC_{50}: concentration that is required to inhibit 50% of tested fungi

ED_{50}: the effect dose at which 50% effect is observed

Table S 4. Antifungal activity of extracts.

Citrus sp.	**Plant portion**	**Solvent used**	**Fungi**	**Test method**	**Effect**	**References**
C. aurantifolia	epicarp	ehtyl acetate	*Aspergillus flavus*	microdilution broth	MIC > 2.25 mg/mL MFC > 2.25 mg/mL	[19]
	epicarp	ehtyl acetate	*Aspergillus fumigatus*	disc diffusion microdilution broth	IZ = 9.65 ± 0.56 mm at 50 mg/mL MIC > 2.25 mg/mL MFC > 2.25 mg/mL	[19]
	epicarp	ehtyl acetate	*Aspergillus niger*	microdilution broth	MIC = 2.25 mg/mL MFC = 2.25 mg/mL	[19]
	epicarp	ehtyl acetate	*Aspergillus parasiticus*	microdilution broth	MIC > 2.25 mg/mL MFC > 2.25 mg/mL	[19]
	epicarp	ehtyl acetate	*Penicillium* sp.	microdilution broth	MIC = 2.25 mg/mL MFC > 2.25 mg/mL	[19]
	juice	-	*Phytophtora colocasiae*	*in vivo* test	Disease incidence (%) = 0 at 20% Disease severity (%) = 0 at 10%	[42]
C. hystrix	epicarp	ehtyl acetate	*Aspergillus flavus*	disc diffusion microdilution broth	IZ = 13.33 ± 0.57 mm at 50 mg/mL MIC > 2.25 mg/mL MFC > 2.25 mg/mL	[19]
	epicarp	ehtyl acetate	*Aspergillus fumigatus*	disc diffusion microdilution broth	IZ = 14.78 ± 0.73 mm at 50 mg/mL MIC > 2.25 mg/mL MFC > 2.25 mg/mL	[19]
	epicarp	ehtyl acetate	*Aspergillus niger*	disc diffusion microdilution broth	IZ = 12.98 ± 0.02 mm at 50 mg/mL MIC > 2.25 mg/mL MFC > 2.25 mg/mL	[19]

	epicarp	ehtyl acetate	*Aspergillus parasiticus*	disc diffusion microdilution broth	IZ = 15.13 ± 0.32 mm at 50 mg/mL MIC > 2.25 mg/mL MFC > 2.25 mg/mL	[19]
	epicarp	ehtyl acetate	*Penicillium* sp.	disc diffusion microdilution broth	IZ = 12.25 ± 0.25 mm at 50 mg/mL MIC > 2.25 mg/mL MFC > 2.25 mg/mL	[19]
C. limon	leaves	mehanol	*Alternaria* spp.	food poisoned technique	Growth inhibition (%) = 60.62 at 100%	[43]
	leaves	hexane	*Alternaria alternata*	disc diffusion microdilution broth	IZ = 19.51 ± 0.19 mm at 10 mg/mL MIC = 4.00 ± 0.11 mg/mL	[28]
	leaves	hexane	*Aspergillus flavus*	disc diffusion microdilution broth	IZ = 17.50 ± 0.16 mm at 10 mg/mL MIC = 4.50 ± 0.12 mg/mL	[28]
	leaves	hexane	*Rhizoctonia solani*	disc diffusion microdilution broth	IZ = 22.60 ± 0.17 at 10 mg/mL MIC = 3.50 ± 0.11 mg/mL	[28]
	peel	ethanol	*Aspergillus flavus*	agar dilution test	Growth inhibition (%) = 13.51 at 10 mg/mL	[44]
	peel	ethanol	*Colletotrichum gloeosporioides*	food poisoned technique	Growth inhibition (%) = 100 at 1.75 g/L	[45]
	peel	hexane	*Colletotrichum* spp.	microdilution technique	MIC = 1000 µg/mL	[46]
	peel	hexane	*Curvularia* spp.	microdilution technique	MIC = 1000 µg/mL	[46]
	peel	hexane	*Penicillium digitatum*	microdilution technique	MIC = 500 µg/mL	[46]
	leaves	ethanol	*Fusarium oxysporum*	poisoned food technique	Growth inhibition (%) = 64.44 at 80%	[47]
	leaves	ethanol	*Penicillium digitatum*	poisoned food technique	Growth inhibition (%) = 67.78 at 80%	[47]
	leaves	water aceton ethanol	*Curvularia mebaldsii*	food poisoned technique	Growth inhibition (%) = 100 at 50 g/L Growth inhibition (%) = 100 at 50 g/L Growth inhibition (%) = 100 at 50 g/L	[48]
	leaves	water acetone ethanol	*Fusarium oxysporum*	food poisoned technique	Growth inhibition (%) = 100 at 50 g/L Growth inhibition (%) = 100 at 50 g/L Growth inhibition (%) = 100 at 50 g/L	[48]

	leaves	water	*Penicillium* spp.	food poisoned technique	Growth inhibition (%) = 91 at 50 g/L	[48]
		acetone			Growth inhibition (%) = 91 at 50 g/L	
		ethanol			Growth inhibition (%) = 91 at 50 g/L	
C. reticulata	peel	hexane	*Colletotrichum* spp.	microdilution technique	MIC < 1000 µg/mL	[46]
	peel	hexane	*Curvularia* spp.	microdilution technique	MIC < 1000 µg/mL	[46]
	peel	hexane	*Penicillium digitatum*	microdilution technique	MIC < 1000 µg/mL	[46]
	peel	ethanol	*Aspergillus flavus*	agar dilution test	Growth inhibition (%) = 39.60 at 10 mg/mL	[44]
C. sinensis	peel	ethanol	*Aspergillus flavus*	agar dilution test	Growth inhibition (%) = 32.31 at 10 mg/mL	[44]
	peel	hexane	*Colletotrichum* spp.	microdilution technique	MIC < 1000 µg/mL	[46]
	peel	hexane	*Curvularia* spp.	microdilution technique	MIC < 1000 µg/mL	[46]
	peel	hexane	*Penicillium digitatum*	microdilution technique	MIC = 1000 µg/mL	[46]

MIC: minimum inhibitory concentrazion

MFC: minimum fungicidal concentration

IZ: inhibition zone

Table S 5. Insecticidal and acaricidal activity of EOs.

***Citrus* sp.**	**Plant portion**	**Insect**	**Test method**	**Effect**	**References**
C. auratiifolia	pericarp	*Pyrrhocoris apterus*	fumigant toxicity assay	Mortality (%) = 90 at 100%	[7]
	peel	*Sitophilus zeamais*	contact bioassay	LC_{50} = 71.18 µL/mL	[49]
				LC_{95} = 88.63 µL/mL	
			ingestion bioassay	LC_{50} = 2.75 µL/g	
				LC_{95} = 7.17 µL/g	
			fumigant bioassay	LC_{50} = 58.51 µL/L air	
				LC_{95} = 73.75 µL/L air	
			repellency bioassay	RI (%) = 53 at 40 µL/mL	
	peel	*Spodoptera littoralis*	fumigant toxicity assay	LC_{50} = 6.84 µL/L	[50]
	peel	*Spodoptera littoralis*	fumigant toxicity assay	Mortality (%) = 100 at 200 µL/L air	[51]
				LC_{50} = 17.56 µL/L air	
				LC_{90} = 24.41 µL/L air	
	peel	*Tuta absoluta*	fumigant toxicity assay	Mortality (%) = 100 at 50 µL/L air	[51]
				LC_{50} = 59.93 µL/L air	
				LC_{90} = 100.01 µL/L air	
	peel	*Tetranychus urticae*	fumigant assay	LC_{50} = 11.24 µL/L air	[52]
			residual contact assay	LC_{50} = 106.14 µL/mL	
			fecundity bioassay	E (%) = 55.54 at 2.0 µL/L air	
	peel	*Tribolium castaneum*	contact toxicity	LC_{50} = 13.55 mg/cm^2	[53]
			fumigant assay	LC_{50} = 1.35 mg/L air	
			repellency test	R (%) = 94 ± 3 at 2.5 mg/cm^2	
	peel	*Callosobruchus chinensis*	contact toxicity	LC_{50} = 4.02 mg/cm^2	[53]
			fumigant assay	LC_{50} = 0.57 mg/L air	
			repellency test	R (%) = 92 ± 2 at 2.5 mg/cm^2	
C.	peel	*Ceratitis capitata*	dietary exposure assays	LC_{90} = 13.00 µL/g	[54]

aurantium	peel	*Cryptolestes ferrugineus*	fumigant assay	Mortality (%) = 96 at 50 µL/L air LD_{50} = 20.62 µL/L air LD_{90} = 35.35 µL/L air	[21]
	peel	*Liposcelis bostrychophila*	fumigant assay	Mortality (%) = 100 at 200 µL/L air LD_{50} = 23.11 µL/L air LD_{90} = 40.04 µL/L air	[21]
	peel	*Sitophilus graniarus*	fumigant assay	Mortality (%) = 80 at 200 µL/L air LD_{50} = 101.50 µL/L air LD_{90} = 181.27 µL/L air	[21]
	peel	*Tribolium castaneum*	fumigant assay	Mortality (%) = 88 at 200 µL/L air LD_{50} = 64.78 µL/L air LD_{90} = 103.55 µL/L air	[21]
			repellency test	RI (%) = 84 at 200 µL/L air	
	peel	*Bemisia tabaci*	fumigant assay	Mortality (%) = 100 at 20 µL/L air LC_{50} = 3.97 µL/L air	[55]
	peel	*Aphis punicae*	toxicity test	LC_{50} = 0.37 µL/mL LC_{90} = 1.13 µL/mL	[56]
			repellency test	R (%) = 100 ± 0 at 2.5 µL/cm^2	
	peel	*Aphis illinoisensis*	toxicity test	LC_{50} = 0.82 µL/mL LC_{90} = 2.15 µL/mL	[56]
			repellency test	R (%) = 88 ± 4 at 2.5 µL/cm^2	
	peel	*Trogoderma granarium*	toxicity test	Mortality (%) = 27.30 ± 3.38 at 8%	[57]
	peel	*Acyrtosiphon pisum*	fumigant assay	Mortality (%) = 98 µL/L air LC_{50} = 16.12 µL / L air LC_{90} = 31.27 µL / L air	[58]
	peel	*Rhopalosiphum padi*	fumigant assay	Mortality (%) = 74 t 33 µL/L air LC_{50} = 31.67 µL/L air	[58]

				LC_{90} = 55.44 µL/L air	
	peel	*Aphis fabae*	fumigant assay	Mortality (%) = 60 µL/L air	[58]
				LC_{50} = 31.22 µL/L air	
				LC_{90} = 58.63 µL/L air	
			in vivo assay	Mortality (%) = 91 ± 7 at 31.22 µL/L air	
	peel	*Macrosiphum euphorbiae*	fumigant assay	Mortality (%) = 54 µL/L air	[58]
				LC_{50} = 30.54 µL/L air	
				LC_{90} = 56.03 µL/L air	
C. limetta	peel	*Tribolium castaneum*	contact toxicity	LC_{50} = 17.51 mg/cm^2	[53]
			fumigant assay	LC_{50} = 3.51 mg/L air	
			repellency test	R (%) = 90 ± 3 at 2.5 mg/cm^2	
	peel	*Callosobruchus chinensis*	contact toxicity	LC_{50} = 4.51 mg/cm^2	[53]
			fumigant assay	LC_{50} = 1.09 mg/L air	
			repellency test	R (%) = 87 ± 3 at 2.5 mg/cm^2	
C. limon	peel	*Agrotis ipsilon*	feeding bioassay	Larvae Mortality (%) = 80.00 ± 15.28 at 75 mg/mL	[59]
				Pupal Mortality (%) = 6.67 ± 6.67 at 75 mg/mL	
	peel	*Ceratitis capitata*	dietary exposure assays	LC_{90} = 16.50 µL/g	[54]
	peel	*Planococcus ficus*	contact toxicity assay	Larvae LC_{50}= 3.6 mg/mL	[60]
				Larvae LC_{90} = 29.7 mg/mL	
				Adults LC_{50} = 2.7 mg/mL	
				Adults LC_{90} = 14.4 mg/mL	
	peel	*Spodoptera littoralis*	fumigant toxicity assay	LC_{50} = 15.32 µL/L	[50]
	peel	*Tetranychus urticae*	fumigant assay	LC_{50} = 9.34 µL/L air	[52]
			contact assay	LC_{50} = 25.18 µL/mL	
				E (%) = 41.91 at 3.0 µL/L air	
	industrial byproducts	*Tribolium castaneum*	contact toxicity assay	Larvae Mortality (%) = 93.3 ± 2.4 at 1000 ppm	[61]
				Adults Mortality (%) = 16.7 ± 6.9 at 1000 ppm	

	industrial byproducts	*Trogoderma granarium*	contact toxicity assay	Larvae Mortality (%) = 13.3 ± 3.7 at 1000 ppm Adults Mortality (%) = 72.2 ± 4.0 at 1000 ppm	[61]
	-	*Aphis fabae*	contact insecticidal activity	LC_{30} = 1.16 µL/L LC_{40} = 2.56 µL/L LC_{50} = 3.86 µL/L LC_{90} = 10.46 µL/L	[62]
	aerial parts	*Sitophilus graniarus*	fumigant assay	Mortality (%) = 92.50 at 400 µL/L air LC_{10} = 12.07 µL/L LC_{25} = 35.73 µL/L LC_{50} = 105.80 µL/L	[63]
			repellency bioassay	R (%) = 70 ± 10 µL/mL at 8 µL/L	
	peel	*Tribolium castaneum*	contact toxicity	LC_{50} = 18.31 mg/cm^2	[53]
			fumigant assay	LC_{50} = 1.53 mg/L air	
			repellency test	R (%) = 92 ± 2 at 2.5 mg/cm^2	
	peel	*Callosobruchus chinensis*	contact toxicity	LC_{50} = 5.78 mg/cm^2	[53]
			fumigant assay	LC_{50} = 0.79 mg/L air	
			repellency test	R (%) = 88 ± 2 at 2.5 mg/cm^2	
C. paradisi	peel	*Spodoptera littoralis*	fumigant toxicity assay	LC_{50} = 18.01 µL/L	[50]
	peel	*Trogoderma granarium*	toxicity test	Mortality (%) = 20.00 ± 2.88 at 8%	[57]
C. reticulata	peel	*Sitophilus zeamais*	contact bioassay	LC_{50}= 51.29 µL/mL LC_{95} = 60.09 µL/mL	[49]
			ingestion bioassay	LC_{50} = 1.52 µL/g LC_{95} = 2.73 µL/g	
			fumigant bioassay	LC_{50} = 41.92 µL/L air LC_{95} = 65.74 µL/L air	
			repellency bioassay	RI (%) = 35 at 40 µL/mL	

	peel	*Tetranychus urticae*	fumigant assay	LC_{50} = 6.09 µL/L air	[52]
			contact assay	LC_{50} = 167.80 µL/mL	
				E (%) = 57.92 at 1.5 µL/L air	
	peel	*Aphis punicae*	toxicity test	LC_{50} = 1.03 µL/mL	[56]
				LC_{90} = 4.13 µL/mL	
			repellency test	R (%) = 70 ± 3 at 2.5 µL/cm^2	
	peel	*Aphis illinoisensis*	toxicity test	LC_{50} = 2.21 µL/mL	[56]
				LC_{90} = 5.24 µL/mL	
			repellency test	R (%) = 62 ± 4 at 2.5 µL/cm^2	
	peel	*Trogoderma granarium*	toxicity test	Mortality (%) = 26.85 ± 2.58 at 8%	[57]
	peel	*Tribolium castaneum*	contact toxicity	LC_{50} = 44.23 mg/cm^2	[53]
			fumigant assay	LC_{50} = 3.98 mg/L air	
			repellency test	R (%) = 87 ± 3 at 2.5 mg/cm^2	
	peel	*Callosobruchus chinensis*	contact toxicity	LC_{50} = 7.34 mg/cm^2	[53]
			fumigant assay	LC_{50} = 1.13 mg/L air	
			repellency test	R (%) = 82 ± 2 at 2.5 mg/cm^2	
C. sinensis	peel	*Callosobruchus maculatus*	contact toxicity assay	Mortality (%) = 100.00 ± 0.00 at 3%	[64]
	peel	*Ceratitis capitata*	dietary exposure assays	LC_{90} = 13.00 µL/g	[54]
	peel	*Planococcus ficus*	contact toxicity assay	Larvae LC_{50} = 5.4 mg/mL	[60]
				Larvae LC_{90} = 13.5 mg/mL	
				Adults LC_{50} = 5.4 mg/mL	
				Adults LC_{90} = 16.2 mg/mL	
	peel	*Spodoptera littoralis*	fumigant toxicity assay	LC_{50} = 6.88 µL/L	[50]
	peel	*Callosobrunchus maculatus*	fumigant toxicity assay	$LC_{50,}$ = 15.91 µL/L air	[65]
			contact toxicity assay	LD_{50} = 38.76 µg/adult	
	peel	*Sitophilus zeamais*	fumigant toxicity assay	LC_{50} = 80.01 µL/L air	[65]
			contact toxicity assay	LD_{50} = 95.63 µg/adult	

	peel	*Sitophilus zeamais*	contact toxicity assay	Mortality (%) = 100.00 at 750 mg/10 mL	[66]
			fumigant toxicity assay	Mortality (%) = 61.25 ± 3.75 at 0.3 g/100 g seed	
			repellency bioassay	RI (%) = 35.95 at 0.3 g/100 g seed	
	-	*Aphis fabae*	contact insecticidal activity	LC_{30} = 1.90 µL/L	[62]
				LC_{40} = 3.40 µL/L	
				LC_{50} = 4.79 µL/L	
				LC_{90} = 11.86 µL/L	
	peel	*Trogoderma granarium*	toxicity test	Mortality (%) = 22.36 ± 3.53 at 8%	[57]

LC_{10} = lethal concentration that is required to kill 10% of a tested insect

LC_{25} = lethal concentration that is required to kill 25% of a tested insect

LC_{30}: lethal concentration that is required to kill 30% of a tested insect

LC_{40}: lethal concentration that is required to kill 40% of a tested insect

LC_{50}: lethal concentration that is required to kill 50% of a tested insect

LC_{90}: lethal concentration that is required to kill 90% of a tested insect

LC_{95}: lethal concentration that is required to kill 95% of a tested insect

LD_{50}: lethal dose that is required to kill 50% of a tested insect

LD_{90}: lethal dose that is required to kill 90% of a tested insect

RI: repellency index

E: reduce in female mite fecundity

Table S 6. Insecticidal and acaricidal activity of extracts.

***Citrus* sp.**	**Plant portion**	**Solvent used**	**Insect**	**Test method**	**Effect**	**References**
Citrus aurantium	peel	methanol	*Bactrocera oleae*	residual exposure bioassay	Mortality (%) = 100.0 ± 0.0 at 200 µg/cm^2	[67]
	intact fruit				Mortality (%) = 70.7 ± 0.0 at 200 µg/cm^2	
	peel	petroleum ether	*Bactrocera oleae*	topical application bioassay residual bioassay	Female LD_{50} = 40.1 µg/insect Male LD_{50} = 44.8 µg/insect Female LC_{50} = 17.8 µg/cm² Male LC_{50} = 18.8 µg/cm²	[68]
	peel	petroleum ether	*Ceratitis capitata*	topical application bioassay residual bioassay	Female LD_{50} = 67.8 µg/insect Male LD_{50} = 38.8 µg/insect Female LC_{50} = 147.1 µg/cm² Male LC_{50} = 70.6 µg/cm²	[68]
	seeds	water	*Drosicha mangiferae*	Toxicity bioassay	Adult female LC_{50} (%) = 99.45 2nd instar mealybugs LC_{50} (%) = 45.38	[69]
		ethanol			Adult female LC_{50} (%) = 99.38 2nd instar mealybugs LC_{50} (%) = 51.08	
		acetone			Adult female LC_{50} (%) = 107.23 2nd instar mealybugs LC_{50} (%) = 41.61	
	leaves	water			Adult female LC_{50} (%) = 51.54 2nd instar mealybugs LC_{50} (%) = 138.50	
		ethanol			Adult female LC_{50} (%) = 45.63 2nd instar mealybugs LC_{50} (%) = 80.04	
		acetone			Adult female LC_{50} (%) = 54.33 2nd instar mealybugs LC_{50} (%) = 57.09	
	peel	water			Adult female LC_{50} (%) = 55.17 2nd instar mealybugs LC_{50} (%) = 72.88	

		ethanol			Adult female LC_{50} (%) = 45.30 2^{nd} instar mealybugs LC_{50} (%) = 113.16	
		acetone			Adult female LC_{50} (%) = 43.97 2^{nd} instar mealybugs LC_{50} (%) = 96.24	
Citrus limon	peel	ethyl ether	*Ceratitis capitata*	contact toxicity assay	LC_{50} = 113.46 µL/mL for eggs LC_{90} = 323.94 µL/ mL for eggs LC_{50} = 0.44 µL/ mL for larvae LC_{90} = 0.84 µL/ mL for larvae	[70]
	peel	ethyl ether	*Anastrepha fraterculus*	fumigant assay	LC_{50} = 0.23 µL/cm^3 air for eggs LC_{90} = 0.36 µL/cm^3 air for eggs LC_{50} = 0.07 µL/cm^3 air for larvae LC_{90} = 0.34 µL/cm^3 air for larvae	[70]
				contact toxicity assay	LC_{50} = 18.12 µL/mL for eggs LC_{90} = 36.87 µL/ mL for eggs LC_{50} = 0.43 µL/ mL for larvae LC_{90} = 2.07 µL/ mL for larvae	
Citrus paradisi	peel	ethyl ether	*Ceratitis capitata*	contact toxicity assay	LC_{50} = 72.94 µL/ mL for eggs LC_{90} = 240.43 µL/ mL for eggs LC_{50} = 0.60 µL/ mL for larvae LC_{90} = 1.16 µL/cm^3 air for larvae	[70]
	peel	ethyl ether	*Anastrepha fraterculus*	fumigant assay	LC_{50} = 0.28 µL/cm^3 air for eggs LC_{90} = 0.62 µL/cm^3 air for eggs LC_{50} = 0.08 µL/cm^3 air for larvae LC_{90} = 0.40 µL/cm^3 air for larvae	[70]
				contact toxicity assay	LC_{50} = 26.25 µL/ mL for eggs LC_{90} = 57.64 µL/ mL for eggs LC_{50} = 0.61 µL/ mL for larvae	

					LC_{90} = 3.51 µL/ mL for larvae	
Citrus reticulata	peel	methanol	*Agonoscena pistaciae*	contact toxicity assay	LC_{50} = 38.84 µL/mL	[71]
Citrus sinensis	peel	hexane	*Callosobruchus maculatus*	contact toxicity assay	Mortality (%) = 99.33 ± 1.15 at 1%	[64]
	peel	methanol	*Agonoscena pistaciae*	contact toxicity assay	LC_{50} = 62.04 µl/mL	[71]
	seeds	methanol			LC_{50} = 43.60 µl /mL	
	peel	-	*Sitophilus zeamais*	contact toxicity assay	Mortality rate (%) = 78.3 at 15 g	[72]
	seeds	water	*Drosicha mangiferae*	Toxicity bioassay	Adult female LC_{50} (%) = 29.42	[69]
					2^{nd} instar mealybugs LC_{50} (%) = 67.79	
		ethanol			Adult female LC_{50} (%) = 47.98	
					2^{nd} instar mealybugs LC_{50} (%) = 39.40	
		acetone			Adult female LC_{50} (%) = 115.93	
					2^{nd} instar mealybugs LC_{50} (%) = 98.28	
	leaves	water			Adult female LC_{50} (%) = 139.93	
					2^{nd} instar mealybugs LC_{50} (%) = 46.19	
		ethanol			Adult female LC_{50} (%) = 92.24	
					2^{nd} instar mealybugs LC_{50} (%) = 52.48	
		acetone			Adult female LC_{50} (%) = 107.80	
					2^{nd} instar mealybugs LC_{50} (%) = 106.66	
	peel	water			Adult female LC_{50} (%) = 31.71	
					2^{nd} instar mealybugs LC_{50} (%) = 64.07	
		ethanol			Adult female LC_{50} (%) = 45.63	
					2^{nd} instar mealybugs LC_{50} (%) = 56.43	
		acetone			Adult female LC_{50} (%) = 47.35	
					2^{nd} instar mealybugs LC_{50} (%) = 81.31	

LC_{50}: lethal concentration that is required to kill 50% of a tested insect

LC_{90}: lethal concentration that is required to kill 90% of a tested insect

LD_{50}: lethal dose that is required to kill 50% of a tested insect

Table S 7. Nematocidal activity of extracts.

Citrus sp.	Plant portion	Solvent used	Insect	Test method	Effect	References
C. aurantium	peel	methanol	*Meloidogyne incognita*	hatching bioassay	Hatching (%) = 7.5 at 1000 ppm	[73]
				mortality bioassay	Mortality (%) = 28.7 at 1000 ppm	
	seeds	methanol		hatching bioassay	Hatching (%) = 6.5 at 1000 ppm	
				mortality bioassay	Mortality (%) = 46.8 at 1000 ppm	
	peel	methanol	*Rotylenchulus reniformis*	hatching bioassay	Hatching (%) = 9.0 at 1000 ppm	[73]
				mortality bioassay	Mortality (%) = 69.1 at 1000 ppm	
	seeds	methanol		hatching bioassay	Hatching (%) = 6.0 at 1000 ppm	
				mortality bioassay	Mortality (%) = 73.7 at 1000 ppm	
	peel	methanol	*Tylenchulus semipenetrans*	hatching bioassay	Hatching (%) = 8.0 at 1000 ppm	[73]
				mortality bioassay	Mortality (%) = 92.3 at 1000 ppm	
	seeds	methanol		hatching bioassay	Hatching (%) = 6.0 at 1000 ppm	
				mortality bioassay	Mortality (%) = 60.5 1000 ppm	
C. limon	peel	water	*Meloidogyne incognita*	mortality bioassay	Mortality (%) = 90.8 at 6 mL/dish	[74]
				hatching bioassay	Hatching inhibition (%) = 85.7 at 0.3 mL/dish	
				reduction in infection bioassay	Reduction in infection (%) = 93.3 at 30 mL/cup	
C. paradisi	peel	water	*Meloidogyne incognita*	mortality bioassay	Mortality (%) = 85.0 at 6 mL/dish	[74]
				hatching bioassay	Hatching inhibition (%) = 78.3 at 0.3 mL/dish	
				reduction in infection bioassay	Reduction in infection (%) = 80.0 at 30 mL/cup	
C. sinensis	peel	water	*Meloidogyne incognita*	gallex index assay	Gallex index = 2.88 at 75%	[75]
				hatching bioassay	Hatching (%) = 0 at 50%	
				mortality bioassay	Mortality (%) = 100 at 25%	
	peel	water	*Meloidogyne incognita*	gall index assay on pot	Gallex index = 1.10 at 100%	[76]
				gall index assay on field	Gallex index = 0.40 at 100%	

	peel	water	*Meloidogyne incognita*	mortality bioassay	Mortality (%) = 93.5 at 6 mL/dish	[74]
				hatching bioassay	Hatching inhibition (%) = 91.0 at 0.3 mL/dish	
				reduction in infection bioassay	Reduction in infection (%) = 91.5 at 30 mL/cup	

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Table S 8. Herbicidal activity of EOs.

Citrus sp.	Plant portion	Weeds	Test method	Effect	References
C. aurantifolia	peel	*Sylibum marianum*	phytotoxic assay	Seed germination inhibition (%) = 26.7 ± 3.3 at 10 µL Root growth inhibition (%) = 77.8 at 10 µL Shoot growth inhibition (%) = 58.6 at 10 µL	[50]
	leaves	*Avena fatua*	dose-response assay	IC_{50} of seed germination = 0.46 mg/mL Coleoptile growth inhibition (%) = 35 at 0.50 mg/mL Root growth inhibition (%) = 56 at 0.50 mg/mL	[77]
	leaves	*Echinochloa crus-galli*	dose-response assay	IC_{50} of seed germination = 1.08 mg/mL Coleoptile growth inhibition (%) = 40 at 0.75 mg/mL Root growth inhibition (%) = 75 at 0.75 mg/mL	[77]
	leaves	*Phalaris minor*	dose-response assay	IC_{50} of seed germination = 0.37 mg/mL Coleoptile growth inhibition (%) = 85 at 0.50 mg/mL Root growth inhibition (%) = 88 at 0.50 mg/mL	[77]
C. aurantium	peel	*Portulaca oleracea*	phytotoxic assay	Seed germination (%) = 0.0 at 2%	[78]
	peel	*Malva parviflora*	phytotoxic assay	Seed germination (%) = 0.0 at 3%	[78]
C. bergamia	peel	*Amaranthus retroflexus*	*in vitro* assay	Seed germination inhibition (%) = 100.0 at 20 µg/mL Root growth inhibition (%) = 100.0 at 20 µg/mL Radical growth inhibition (%) = 100.0 at 20 µg/mL	[79]
			in vivo assay	Phytotoxic effect (%) = 62.5 ± 1.4 at 20 µg/mL	
	peel	*Convolvulus arvenis*	*in vitro* assay	Seed germination inhibition (%) = 84.5 at 20 µg/mL Root growth inhibition (%) = 99.1 at 20 µg/mL Radical growth inhibition (%) = 88.2 at 20 µg/mL	[79]
			in vivo assay	Phytotoxic effect (%) = 33.3 ± 2.2 at 20 µg/mL	
	peel	*Rumex crispus*	*in vitro* assay	Seed germination inhibition (%) = 74.8 at 20 µg/mL Root growth inhibition (%) = 96.5 at 20 µg/mL Radical growth inhibition (%) = 97.6 at 20 µg/mL	[79]

			in vivo assay	Phytotoxic effect (%) = 59.1 ± 2.2 at 20 µg/mL	
C. limon	peel	*Silybum marianum*	phytotoxic assay	Seed germination inhibition (%) = 70.0 ± 0.0 at 10 µL Root growth inhibition (%) = 65.1 at 10 µL Shoot growth inhibition (%) = 41.4 at 10 µL	[50]
C. paradisi	peel	*Silybum marianum*	phytotoxic assay	Seed germination inhibition (%) = 50.0 ± 0.0 at 10 µL Shoot growth inhibition (%) = 34.5 at 10 µL	[50]
C. reticulata	peel	*Portulaca oleracea*	phytotoxic assay	Seed germination (%) = 0.0 at 1%	[78]
	peel	*Malva parviflora*	phytotoxic assay	Seed germination (%) = 0.0 at 1%	[78]
C. sinensis	peel	*Silybum marianum*	phytotoxic assay	Seed germination inhibition (%) = 66.6 ± 3.3 at 10 µL Root growth inhibition (%) = 79.4 at 10 µL Shoot growth inhibition (%) = 58.6 at 10 µL	[50]
	peel	*Anagallis arvensis*	pot experiment	Growth inhibition (%) = 76.5 at 5%	[80]
	peel	*Malva parviflora*	pot experiment	Growth inhibition (%) = 57.0 at 5%	[80]
	peel	*Portulaca oleracea*	phytotoxic assay	Seed germination (%) = 0.0 at 3%	[78]
	peel	*Malva parviflora*	phytotoxic assay	Seed germination (%) = 83.5 at 3%	[78]

IC_{50}: concentration that is required to inhibit 50% of tested weeds

Table S 9. Herbicidal activity of extracts.

Citrus sp.	Plant portion	Solvent used	Weeds	Test method	Effect	References
C. aurantifolia	peel	methanol	*Lemna minor*	phytotoxicity assay	Growth inhibition (%) = 77.83 at 800 ppm	[81]
					EC_{10} = 88.1 µg/mL	
					EC_{20} = 134.2 µg/mL	
					EC_{50} =473.3 µg/mL	
		80% methanol			Growth inhibition (%) = 100.00 at 800 ppm	
					EC_{10} = 247.9 µg/mL	
					EC_{20} = 312.3 µg/mL	
					EC_{50} = 624.3 µg/mL	
C. hystrix	peel	methanol	*Lemna minor*	phytotoxicity assay	Growth inhibition (%) = 89.84 at 800 ppm	[81]
					EC_{10} = 111.7 µg/mL	
					EC_{20} = 152.0 µg/mL	
					EC_{50} = 383.3 µg/mL	
		80% methanol			Growth inhibition (%) = 57.43 at 800 ppm	
					EC_{10} = 147.4 µg/mL	
					EC_{20} = 229.9 µg/mL	
					EC_{50} = 872.3 µg/mL	
C. junos	peel	methanol	*Pheleum pratense*	phytotoxicity assay	I_{50} for root growth = 0.93 ± 0.09 mg/mL	[82]
					I_{50} for shoot growth = 1.35 ± 0.11 mg/mL	
	inside				I_{50} for root growth = 2.93 ± 0.19 mg/mL	
					I_{50} for shoot growth = 5.09 ± 0.37 mg/mL	
	seeds				I_{50} for root growth = 25.80 ± 2.40 mg/mL	
					I_{50} for shoot growth = 35.70 ± 2.90 mg/mL	
	peel	methanol	*Digitaria sanguinalis*	phytotoxicity assay	I_{50} for root growth = 1.38 ± 0.12 mg/mL	[82]
					I_{50} for shoot growth = 1.91 ± 0.15 mg/mL	
	inside				I_{50} for root growth = 4.91 ± 0.39 mg/mL	

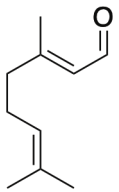
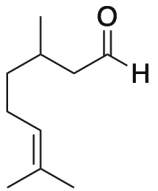
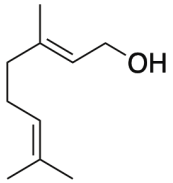
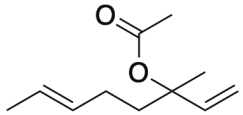
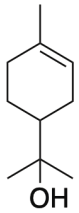
					I_{50} for shoot growth = 7.13 ± 0.68 mg/mL	
	seeds				I_{50} for root growth = 38.60 ± 2.50 mg/mL	
					I_{50} for shoot growth = 47.60 ± 5.90 mg/mL	
	peel	methanol	*Lolium multiflorum*	phytotoxicity assay	I_{50} for root growth = 2.65 ± 0.17 mg/mL	[82]
					I_{50} for shoot growth = 3.11 ± 0.28 mg/mL	
	inside				I_{50} for root growth = 9.12 ± 0.87 mg/mL	
					I_{50} for shoot growth = 9.73 ± 0.89 mg/mL	
	seeds				I_{50} for root growth = 67.30 ± 7.90 mg/mL	
					I_{50} for shoot growth = 76.80 ± 7.80 mg/mL	
C. reticulata	peel	70% methanol	*Echinochloa crus-galli*	phytotoxicity assay	Seed germination (%) = 15.00 ± 1.00 at 2500 mg/100 mL	[83]
					Seed inhibition (%) = 79.07 ± 1.00 at 2500 mg/100 mL	
C. sinensis	peel	water	*Amaranthus hybridus*	phytotoxicity assay	Seed germination (%) = 20.0 at 50%	[84]
					Seed inhibition (%) = 77.8 at 50%	
		methanol			Seed germination (%) = 13.0 at 50%	
					Seed inhibition (%) 85.6 at 50%	
	pastazzo	water	*Chenopodium album*	*in vitro* phytotoxicity assay	Germination (%) = 2 ± 6 at 50%	[85]
				in vivo phytotoxicity assay	Germination (%) = 0 ± 0 at 75%	

EC_{10}: the effect concentration at which 10% effect is observed

EC_{20} : the effect concentration at which 20% effect is observed

EC_{50}: the effect concentration at which 50% effect is observed

Table S 10. Antibacterial activity of pure compounds.

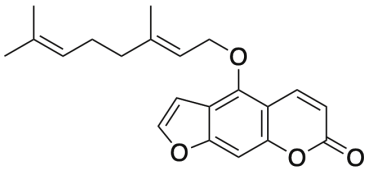
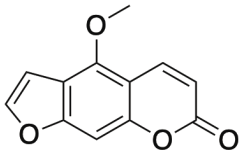
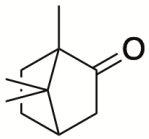
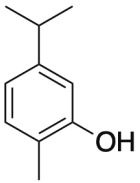
Bioactive compound	Structure	Bacteria	Test method	Effect	References
citral		*Xanthomonas citri* subsp. *citri*	broth microdilution method	MIC = 0.38 mg/mL MBC = 0.73 mg/mL	[6]
			disc diffusion method	IZ = 16.67 ± 0.88 mm at 100%	
citronellal		*Xanthomonas citri* subsp. *citri*	broth microdilution method	MIC = 1.00 mg/mL MBC = 1.41 mg/mL	[6]
geraniol		*Xanthomonas citri* subsp. *citri*	broth microdilution method	MIC = 0.90 mg/mL MBC = 1.33 mg/mL	[6]
		Xanthomonas citri subsp. *citri*	broth microdilution method	MIC = 0.85 mg/mL MBC = 1.23 mg/mL	[6]
linalyl acetate		*Xanthomonas citri* subsp. *citri*	broth microdilution method	MIC = 8.50 mg/mL MBC = 14.50 mg/mL	[6]
			disc diffusion method	IZ = 1.00 ± 0.33 mm at 100%	
α-terpineol		*Xanthomonas citri* subsp. *citri*	broth microdilution method	MIC = 0.63 mg/mL MBC = 1.10 mg/mL	[6]

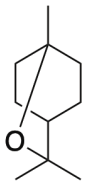
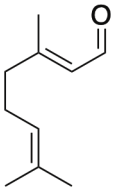
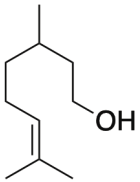
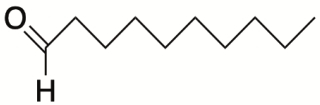
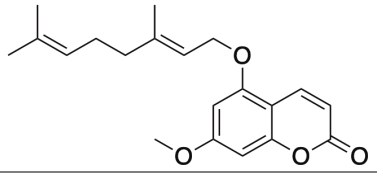
MIC: minimum inhibitory concentration

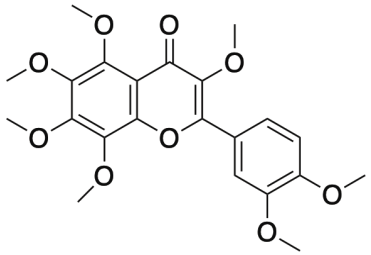
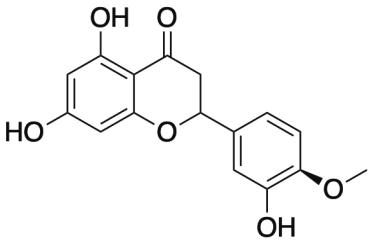
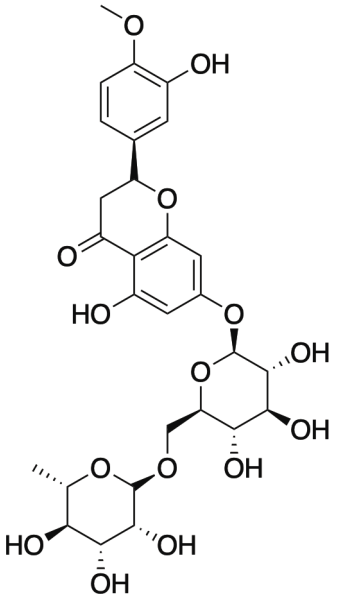
MBC: minimum bactericidal concentration

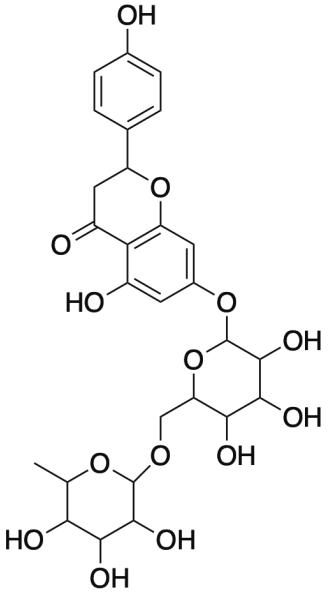
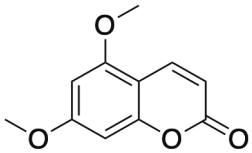
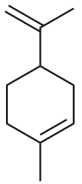
IZ: inhibition zone

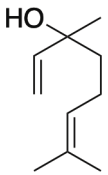
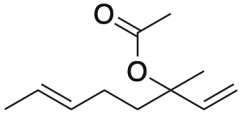
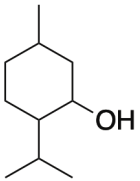
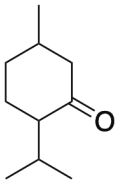
Table S 11. Antifungal activity of pure compounds.

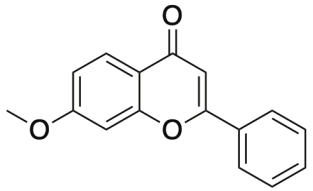
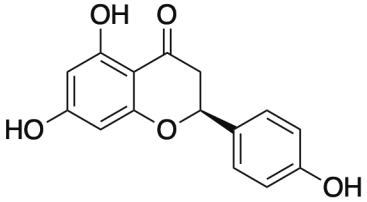
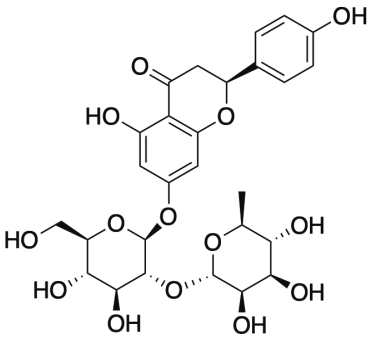
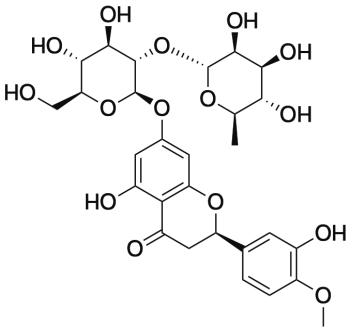
Bioactive compound	Structure	Fungi	Test method	Effect	References
bergamottin		*Colletotrichum* sp.	food poisoned technique spore germination assay	Growth inhibition (%) = 21.4 at 1.00 mM Spore inhibition (%) = 30.0 at 1.00 mM	[86]
bergaptene		*Colletotrichum* sp.	food poisoned technique spore germination assay	Growth inhibition (%) = 32.0 at 1.00 mM Spore inhibition (%) = 95.3 at 1.00 mM	[86]
camphor		*Verticillium fungicola*	microatmosphere test macrodilution test microdilution test	MIC = 4.00-9.00 µL/mL MIC = 4.00-9.00 µL/mL MIC = 3.00-8.00 µL/mL MFC = 4.00-9.00 µL/mL	[23]
carvacrol		*Verticillium fungicola*	microatmosphere test macrodilution test microdilution test	MIC = 0.05-0.50 µL/mL MIC = 0.05-0.50 µL/mL MIC = 0.02-0.25 µL/mL MFC = 0.05-0.25 µL/mL	[23]
		Penicillium digitatum	tube experiment PDA plate technique disc diffusion *in vivo* assay	Growth inhibition (%) = 32 at 100 µL/L Growth inhibition (%) = 100 at 500 µL/L Growth inhibition (%) = 29 at 50 µL/L Growth inhibition (%) = 100 at 500 µL/L	[87]
		Penicillium italicum	tube experiment PDA plate technique disc diffusion *in vivo* assay	Growth inhibition (%) = 54 at 100 µL/L Growth inhibition (%) = 100 at 500 µL/L Growth inhibition (%) = 37 at 50 µL/L Growth inhibition (%) = 100 at 500 µL/L	[87]

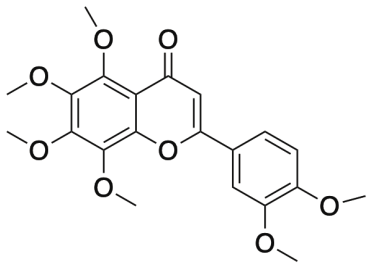
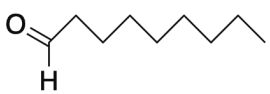
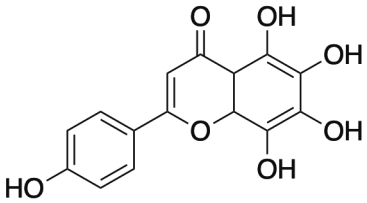
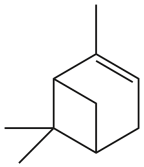
1,8-cineole		*Verticillium fungicola*	microatmosphere test macrodilution test microdilution test	MIC = 4.00-9.00 µL/mL MIC = 4.00-9.00 µL/mL MIC = 2.00-7.00 µL/mL MFC = 3.00-7.00 µL/mL	[23]
citral		*Penicillium italicum*	food poisoned technique	Growth inhibition (%) = 11.52 ± 5.08 at 0.008 µL/mL	[35]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 24.14 ± 3.66 at 0.120 µL/mL	[35]
		Penicillium italicum	agar diffusion method	Growth inhibition (%) = 100 at 40 µL	[88]
citronellol		*Penicillium italicum*	food poisoned technique	Growth inhibition (%) = 34.42 ± 2.49 at 0.011 µL/mL	[35]
decanal		*Penicillium italicum*	food poisoned technique	Growth inhibition (%) = 9.44 ± 5.37 at 0.043 µL/mL	[35]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 70.56 ± 1.68 at 0.692 µL/mL	[35]
5-geranyloxy-7-methoxycoumarin		*Colletotrichum* sp.	spore germination assay	Spore inhibition (%) = 14.7 at 1.00 mM	[86]
3,5,6,7,8,3′,4′-heptamethoxyflavone		*Botrytis cinerea*	food poisoned technique	Growth inhibition (%) > 40 at 0.1 mM	[89]
		Fusarium oxysporum	food poisoned technique	Growth inhibition (%) > 50 at 0.1 mM	[89]

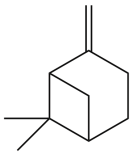
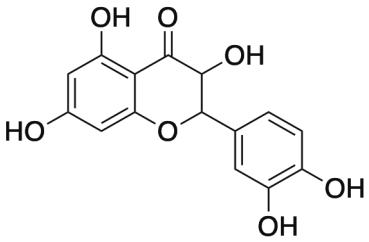
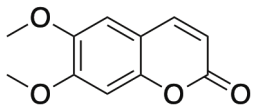
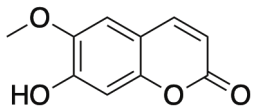
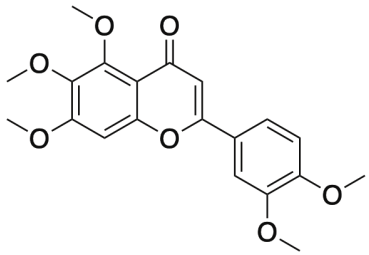
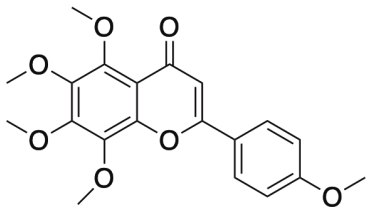
		*Phytophthora citrophthora*	food poisoned technique	IC_{50} = 1.06 ± 0.12 mM	[90]
hesperetin		*Phytophthora citrophthora*	food poisoned technique	IC_{50} = 0.21 ± 0.01 mM	[90]
hesperidin		*Phytophthora citrophthora*	food poisoned technique	IC_{50} = 19.00 ± 2.30 mM	[90]
		Aspergillus parasiticus	agar dilution method	Growth inhibition (%) = 33 at 0.25 mM	[91]
		Aspergillus flavus	agar dilution method	Growth inhibition (%) = 33 at 0.25 mM	[91]
		Fusarium semitectum	agar dilution method	Growth inhibition (%) = 39 at 0.25 mM	[91]
		Penicillium expansum	agar dilution method	Growth inhibition (%) = 11 at 0.25 mM	[91]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 38 at 8 mM	[92]

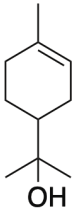
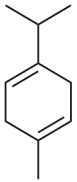
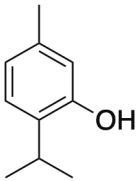
isonaringin		*Phytophthora citrophthora*	food poisoned technique	IC_{50}= 25.00 ± 1.20 mM	[90]
limettin		*Colletotrichum* sp.	food poisoned technique spore germination assay	Growth inhibition (%) = 25.0 at 1.00 mM Spore inhibition (%) = 96.7 at 1.00 mM	[86]
limonene		*Verticillium fungicola*	microatmosphere test macrodilution test microdilution test	MIC = 8.00-13.00 µL/mL MIC = 8.00-13.00 µL/mL MIC = 5.00-9.00 µL/mL MFC = 6.00-11.00 µL/mL	[23]
		Fusarium verticillioides	modified semisolid agar antifungal susceptibility technique	Growth inhibition (%) = 100 at 1000 µL/L	[93]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 42.94 ± 18.83 at 24.296 µL/mL	[35]
linalool		*Verticillium fungicola*	microatmosphere test	MIC = 2.00-8.00 µL/mL	[23]

			macrodilution test microdilution test	MIC = 2.00-8.00 µL/mL MIC = 2.00-5.50 µL/mL MFC = 2.00-6.00 µL/mL	
		Penicillium italicum	food poisoned technique	Growth inhibition (%) = 6.12 ± 5.81 at 0.073 µL/mL	[35]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 8.34 ± 7.16 at 1.168 µL/mL	[35]
		Penicillium italicum	agar diffusion method	Growth inhibition (%) = 100 at 40 µL	[88]
linalyl acetate		*Verticillium fungicola*	microatmosphere test macrodilution test microdilution test	MIC = 6.00-11.00 µL/mL MIC = 6.00-11.00 µL/mL MIC = 7.50-10.50 µL/mL MFC = 8.00-11.00 µL/mL	[23]
menthol		*Verticillium fungicola*	microatmosphere test macrodilution test microdilution test	MIC = 0.25-1.50 µL/mL MIC = 0.25-1.50 µL/mL MIC =0.05-1.50 µL/mL MFC = 0.25-1.50 µL/mL	[23]
		Fusarium verticillioides	modified semisolid agar antifungal susceptibility technique	Growth inhibition (%) = 100 at 1000 µL/L	[93]
menthone		*Fusarium verticillioides*	modified semisolid agar antifungal susceptibility technique	Growth inhibition (%) = 75 at 1000 µL/L	[93]

7-methoxyflavone		*Fusarium oxysporum*	food poisoned technique	Growth inhibition (%) > 50 at 0.1 mM	[89]
naringenin		*Phytophthora citrophthora*	food poisoned technique	IC_{50} = 0.19 ± 0.02 mM	[90]
naringin		*Penicillium digitatum*	food poisoned technique	IC_{50} = 10.4 ± 0.2 g/L	[94]
		Aspergillus parasiticus	agar dilution method	Growth inhibition (%) = 41 at 0.25 mM:	[91]
		Aspergillus flavus	agar dilution method	Growth inhibition (%) = 41 at 0.25 mM:	[91]
		Fusarium semitectum	agar dilution method	Growth inhibition (%) = 29 at 0.25 mM:	[91]
		Penicillium expansum	agar dilution method	Growth inhibition (%) = 22 at 0.25 mM:	[91]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 25 at 8 mM	[92]
neohesperidin		*Aspergillus parasiticus*	agar dilution method	Growth inhibition (%) = 38 at 0.25 mM	[91]
		Aspergillus flavus	agar dilution method	Growth inhibition (%) = 41 at 0.25 mM:	[91]
		Fusarium semitectum	agar dilution method	Growth inhibition (%) = 50 at 0.25 mM	[91]
		Penicillium expansum	agar dilution method	Growth inhibition (%) = 44 at 0.25 mM:	[91]
nobiletin		*Phytophthora citrophthora*	food poisoned technique	IC_{50} = 0.62 ± 0.02 mM	[90]

		*Botrytis cinerea*	food poisoned technique	Growth inhibition (%) > 50 at 0.1 mM	[89]
		Fusarium oxysporum	food poisoned technique	Growth inhibition (%) > 50 at 0.1 mM	[89]
		Sclerotinia sclerotiorum	food poisoned technique	Growth inhibition (%) > 50 at 0.1 mM	[89]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 75 at 8 mM	[92]
		Colletotrichum gloeospori-oides	food poisoned technique	Growth inhibition (%) = 100 at 100 µg/mL	[95]
nonanal		*Penicillium italicum*	food poisoned technique	Growth inhibition (%) = 7.61 ± 4.38 at 0.008 µL/mL	[35]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 47.91 ± 4.72 at 0.132 µL/mL	[35]
nortangeretin		*Colletotrichum gloeospori-oides*	food poisoned technique	Growth inhibition (%) = 98 at 100 µg/mL	[95]
octanal		*Penicillium italicum*	food poisoned technique	Growth inhibition (%) = 18.19 ± 0.03 at 0.059 µL/mL	[35]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 100.00 ± 0.00 at 0.936 µL/mL	[35]
α-pinene		*Verticillium fungicola*	microatmosphere test macrodilution test microdilution test	MIC = 4.00-9.00 µL/mL MIC = 4.00-9.00 µL/mL MIC = 3.00-8.00 µL/mL MFC = 3.00-8.00 µL/mL	[23]
β-pinene		*Verticillium fungicola*	microatmosphere test macrodilution test microdilution test	MIC = 6.00-11.00 µL/mL MIC = 6.00-11.00 µL/mL MIC = 4.00-7.00 µL/mL	[23]

				MFC = 5.00-8.00 µL/mL	
		Penicillium italicum	food poisoned technique	Growth inhibition (%) = 7.39 ± 0.48 at 0.054 µL/mL	[35]
quercetin		*Penicillium digitatum*	food poisoned technique *in vivo* assay	IZ = 47.7 ± 1.2 mm at 100 µg/mL Growth inhibition (%) = 60 at 100 µg/mL	[96]
scoparone		*Penicillium digitatum*	food poisoned technique *in vivo* assay	IZ = 50.3 ± 0.9 mm at 100 µg/mL Growth inhibition (%) = 69 at 100 µg/mL	[96]
scopoletin		*Penicillium digitatum*	food poisoned technique *in vivo* assay	IZ = 51.5 ± 1.8 mm at 100 µg/mL Growth inhibition (%) = 40 at 100 µg/mL	[96]
sinensetin		*Phytophthora citrophthora*	food poisoned technique	IC_{50} = 0.88 ± 0.03 mM	[90]
tangeretin		*Phytophthora citrophthora*	food poisoned technique	IC_{50} = 1.68 ± 0.09 mM	[90]
		Penicillium digitatum	food poisoned technique	IC_{50} = 2.4 ± 0.2 g/L	[94]
		Sclerotinia sclerotiorum	food poisoned technique	Growth inhibition (%) > 60 at 0.1 mM	[89]
		Botrytis cinerea	food poisoned technique	Growth inhibition (%) > 40 at 0.1 mM	[89]
		Fusarium oxysporum	food poisoned technique	Growth inhibition (%) > 50 at 0.1 mM	[89]

a-terpineol		*Penicillium italicum*	food poisoned technique	Growth inhibition (%) = 1.12 ± 6.78 at 0.021 µL/mL [35]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 7.88 ± 0.02 at 0.328 µL/mL [35]
γ -terpinene		*Penicillium italicum*	food poisoned technique	Growth inhibition (%) = 5.33 ± 4.38 at 0.251 µL/mL [35]
		Penicillium digitatum	food poisoned technique	Growth inhibition (%) = 14.62 ± 8.41 at 4.016 µL/mL [35]
thymol		*Verticillium fungicola*	microatmosphere test macrodilution test microdilution test	MIC = 0.125-0.5 µL/mL [23] MIC = 0.125-0.5 µL/mL MIC = 0.05-0.25 µL/mL MFC = 0.125-0.5 µL/mL
		Penicillium digitatum	tube experiment PDA plate technique disc diffusion *in vivo* assay	Growth inhibition (%) = 47 at 100 µL/L [87] Growth inhibition (%) = 100 at 500 µL/L Growth inhibition (%) = 44 at 50 µL/L Growth inhibition (%) = 100 at 500 µL/L
		Penicillium italicum	tube experiment PDA plate technique disc diffusion *in vivo* assay	Growth inhibition (%) = 68 at 100 µL/L [87] Growth inhibition (%) = 100 at 500 µL/L Growth inhibition (%) = 52 at 50 µL/L Growth inhibition (%) = 100 at 500 µL/L
		Fusarium verticillioides	Modified semisolid agar antifungal susceptibility technique	Growth inhibition (%) = 100 at 500 µL/L [93]

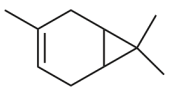
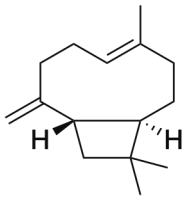
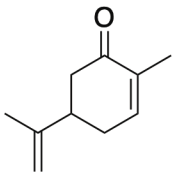
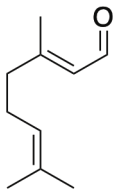
MIC: minimum inhibitory concentration

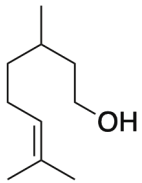
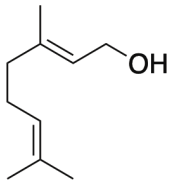
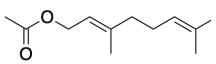
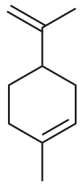
MFC: minimum fungicidal concentration

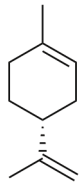
IZ: inhibition zone

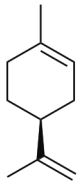
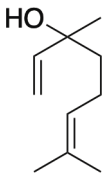
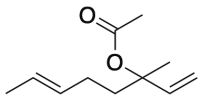
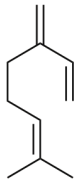
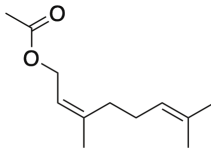
IC_{50} = concentration that is required to inhibit 50% of tested fungi

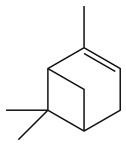
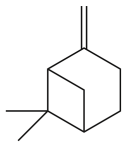
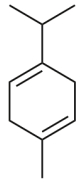
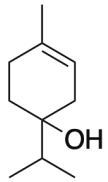
Table S 12. Insecticidal and acaricidal activity of pure compounds.

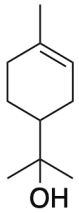
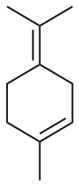
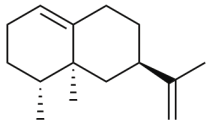
Bioactive compound	Structure	Instect	Test method	Effect	References
3-carene		*Callosobrunchus maculatus*	fumigant toxicity assay	LC_{50} = 5.68 µL/Lair	[65]
			contact toxicity assay	LD_{50} = 26.01 µg/adult	
		Sitophilus zeamais	fumigant toxicity assay	LC_{50} = 14.75 µL/Lair	[65]
			contact toxicity assay	LD_{50} = 30.35 µg/adult	
β-caryophyllene		*Ceratitis capitata*	dietary exposure assay	LC_{50} = 8.30 µL/g	[54]
		Callosobrunchus maculatus	fumigant toxicity assay	LC_{50} = 17.65 µL/Lair	[65]
			contact toxicity assay	LD_{50} = 47.02 µg/adult	
		Sitophilus zeamais	fumigant toxicity assay	LC_{50} = 78.59 µL/Lair	[65]
			contact toxicity assay	LD_{50} = 56.76 µg/adult	
carvone		*Callosobrunchus maculatus*	fumigant toxicity assay	LC_{50} = 10.87 µL/Lair	[65]
			contact toxicity assay	LD_{50} = 34.04 µg/adult	
		Sitophilus zeamais	fumigant toxicity assay	LC_{50} = 26.53 µL/Lair	[65]
			contact toxicity assay	LD_{50} = 42.06 µg/adult	
citral		*Callosobrunchus maculatus*	fumigant toxicity assay	LC_{50} = 0.19 µL/Lair	[65]
			contact toxicity assay	LD_{50} = 31.79 µg/adult	
		Sitophilus zeamais	fumigant toxicity assay	LC_{50} = 2.02 µL/Lair	[65]
			contact toxicity assay	LD_{50} = 39.36 µg/adult	
		Ceratitis capitata	dietary exposure assay	LC_{50} = 3.26-4.13 µL/g	[54]
		Ceratitits capitata	contact toxicity assay	LC_{50} = 22.44 µL/mL for eggs	[70]
				LC_{90} = 41.76 µL/mL for eggs	
				LC_{50} = 3.18 µL/mL for larvae	
				LC_{90} = 7.69 µL/mL for larvae	
		Anastrepha fraterculus	fumigant toxicity assay	LC_{50} = 0.04 µL/cm^3 air for eggs	[70]

			contact toxicity assay	LC_{90} = 0.16 µL/cm^3 air for eggs LC_{50} = 12.82 µL/mL for eggs LC_{90} = 16.79 µL/mL for eggs LC_{50} = 1.62 µL/mL for larvae LC_{90} = 4.98 µL/mL for larvae	
citronellol		*Callosobrunchus maculatus*	fumigant toxicity assay contact toxicity assay	LC_{50} = 10.87 µL/L air LD_{50} = 45.60 µg/adult	[65]
		Sitophilus zeamais	fumigant toxicity assay contact toxicity assay	LC_{50} = 66.18 µL/L air LD_{50} = 57.28 µg/adult	[65]
geraniol		*Callosobrunchus maculatus*	fumigant toxicity assay contact toxicity assay	LC_{50} = 9.55 µL/L air LD_{50} = 23.44 µg/adult	[65]
		Sitophilus zeamais	fumigant toxicity assay contact toxicity assay	LC_{50} = 642.25 µL/L air LD_{50} = 38.89 µg/adult	[65]
geranyl acetate		*Ceratitis capitata*	dietary exposure assay	LC_{50} = 3.26-4.13 µL/g	[54]
limonene		*Callosobrunchus maculatus*	fumigant toxicity assay contact toxicity assay	LC_{50} = 2.18 µL/Lair LD_{50} = 20.84 µg/adult	[65]
		Cryptolestes ferrugineus	fumigant assay	LD_{50} = 20.62 µL/Lair LD_{90} = 35.35 µL/Lair	[21]
		Liposcelis bostrychophila	fumigant assay	LD_{50} = 57.89 µL/Lair LD_{90} = 86.79 µL/Lair	[21]
		Sitophilus graniarum	fumigant assa	LD_{50} = 103.77 µL/Lair LD_{90} = 184.11 µL/Lair	[21]
		Sitophilus zeamais	fumigant toxicity assay contact toxicity assay	LC_{50} = 17.70 µL/Lair LD_{50} = 25.96 µg/adult	[65]

		Tetranychus urticae	fumigant toxicity assay	LC_{50} = 9.80 µL/L air	[52]
			contact toxicity assay	LC_{50} = 76.97 µL/mL	
			fecundity bioassay	E (%) = 76.83 at 1.0 µL/L air	
		Tribolium castaneum	fumigant assay	LD_{50} = 64.78 µL/Lair	[21]
				LD_{90} = 103.55 µL/Lair	
			repellency bioassay	RI (%) = 82 at 200 µL/L air	
		Bemisia tabaci	fumigant assay	Mortality (%) = 100 at 20 µL/L air	[55]
				LC_{50} = 4.71 µL/L air	
		Ceratitis capitata	contact toxicity assay	LC_{50} = 77.06 µL/mL for eggs	[70]
				LC_{90} = 119.64 µL/mL for eggs	
				LC_{50} = 2.30 µL/mL for larvae	
				LC_{90} = 2.28 µL/mL for larvae	
		Anastrepha fraterculus	fumigant toxicity assay	LC_{50} = 0.16 µL/cm^3 air for eggs	[70]
				LC_{90} = 0.27 µL/cm^3 air for eggs	
				LC_{50} = 34.04 µL/mL for eggs	
				LC_{90} = 80.37 µL/mL for eggs	
			contact toxicity assay	LC_{50} = 0.84 µL/mL for larvae	
				LC_{90} = 23. 93 µL/mL for larvae	
R-(+)-limonene		*Ceratitis capitata*	dietary exposure assays	LC_{50} = 6.20–7.00 µL/g	[54]
		Sitophilus zeamais	contact bioassay	LC_{50} = 49.97 µL/mL	[49]
				LC_{90} = 61.17 µL/mL	
			ingestion bioassay	LC_{50} = 1.53 µL/g	
				LC_{90} = 2.90 µL/g	
			fumigant bioassay	LC_{50} = 40.93 µL/L air	
				LC_{90} = 75.61 µL/L air	
			repellency bioassay	RI (%) = 70 at 40 µL/mL	
S-(-)-limonene		*Ceratitis capitata*	dietary exposure assays	LC_{50} = 6.20–7.00 µL/g	[54]

		*Sitophilus zeamais*	contact bioassay	LC_{50} = 52.39 µL/mL	[49]
				LC_{90} = 62.55 µL/mL	
			ingestion bioassay	LC_{50} = 2.15 µL/g	
				LC_{90}= 4.04 µL/g	
			fumigant bioassay	LC_{50} = 43.97 µL/L air	
				LC_{90} = 70.0 µL/L air	
			repellency bioassay	RI (%) = 65 at 40 µL/mL	
linalool		*Callosobrunchus maculatus*	fumigant toxicity assay	LC_{50} = 2.11 µL/Lair	[65]
			contact tox$_5$ity assay	LD_{50} = 23.45 µg/adult	
		Sitophilus zeamais	fumigant toxicity assay	LC_{50} = 33.25 µL/Lair	[65]
			contact toxicity assay	LD_{50} = 27.33 µg/adult	
		Tetranychus urticae	fumigant toxicity assay	LC_{50}= 1.94 µL/L air	[52]
			contact toxicity assay	LC_{50} = 123.23 µL/mL	
			fecundity bioassay	E (%) = 73.42 at 5.0 µL/L air	
		Ceratitis capitata	dietary exposure assays	LC_{50} = 3.26 - 4.13 µL/g	[54]
linalyl acetate		*Ceratitis capitata*	dietary exposure assays	LC_{50} = 3.26 - 4.13 µL/g	[54]
myrcene		*Ceratitis capitata*	dietary exposure assays	LC_{50} = 9.60 µL/g	[54]
neryl acetate		*Ceratitis capitata*	dietary exposure assays	LC_{50} = 3.26-4.13 µL/g	[54]

α-pinene		*Tetranychus urticae*	fumigant toxicity assay contact toxicity assay fecundity bioassay	LC_{50} = 12.46 µL/L air LC_{50} = 27.87 µL/mL E (%) = 69.85 at 2.0 µL/L air	[52]
β-pinene		*Tetranychus urticae*	fumigant toxicity assay contact toxicity assay fecundity bioassay	LC_{50} = 4.92 µL/L air LC_{50} = 32.71 µL/mL E (%) = 74.45 at 2.0 µL/L air	[52]
γ-terpinene		*Ceratitis capitata*	dietary exposure assays	LC_{50} = 6.20–7.00 µL/g	[54]
terpinen-4-olo		*Ceratitis capitata*	dietary exposure assays	LC_{50} = 3.26-4.13 µL/g	[54]
terpineol		*Callosobrunchus maculatus*	fumigant toxicity assay contact toxicity assay	LC_{50} = 8.79 µL/L air LD_{50} = 17.05 µg/adult	[65]
		Sitophilus zeamais	fumigant toxicity assay contact toxicity assay	LC_{50}= 17.29 µL/L air LD_{50} = 34.41 µg/adult	[65]
α-terpineol		*Tetranychus urticae*	fumigant toxicity assay contact toxicity assay fecundity bioassay	LC_{50} = 2.39 µL/L air LC_{50} = 43.27 µL/mL E (%) = 48.89 at 0.5 µL/L air	[52]

		*Ceratitis capitata*	dietary exposure assays	LC_{50} = 3.26-4.13 µL/g	[54]
terpinolene		*Tetranychus urticae*	fumigant toxicity assay contact toxicity assay fecundity bioassay	LC_{50}= 1.07 µL/L air LC_{50} = 265.06 µL/mL E (%) = 24.53 at 0.4 µL/Lair	[52]
valencene		*Ceratitis capitata*	dietary exposure assays	LC_{50} = 10.40 µL/g	[54]

LC_{50}: lethal concentration that is required to kill 50% of a tested insect

LC_{90}: lethal concentration that is required to kill 90% of a tested insect

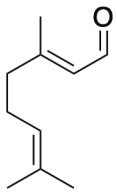
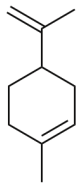
LD_{50}: lethal dose that is required to kill 50% of a tested insect

LD_{90}: lethal dose that is required to kill 90% of a tested insect

R: repellency index

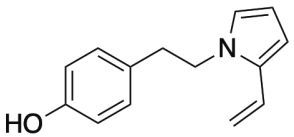
E: reduction in female mite fecundity

Table S 13. Herbicidal activity of pure compounds.

Bioactive compound	Structure	Weeds	Test method	Effect	References
citral		*Avena fatua*	dose-response assay	IC_{50} of seed germination = 0.26 mg/mL Coleoptile growth inhibition (%) = 42 at 0.50 mg/mL Root growth inhibition (%) = 81 at 0.50 mg/mL	[77]
		Echinochloa crus-galli	dose-response assay	IC_{50} of seed germination = 0.93 mg/mL Coleoptile growth inhibition (%) = 59 at 0.75 mg/mL Root growth inhibition (%) = 66 at 0.75 mg/mL	[77]
		Phalaris minor	dose-response assay	IC_{50} of seed germination = 0.13 mg/mL Coleoptile growth inhibition (%) = 100 at 0.50 mg/mL Root growth inhibition (%) = 100 at 0.50 mg/mL	[77]
limonene		*Avena fatua*	dose-response assay	Coleoptile growth inhibition (%) = 17 at 0.50 mg/mL Root growth inhibition (%) = 37 at 0.50 mg/mL	[77]
		Echinochloa crus-galli	dose-response assay	Coleoptile growth inhibition (%) = 13 at 0.50 mg/mL Root growth inhibition (%) = 5 at 0.50 mg/mL	[77]
		Phalaris minor	dose-response assay	Coleoptile growth inhibition (%) = 25 at 0.50 mg/mL Root growth inhibition (%) = 30 at 0.50 mg/mL	[77]

$IC_{50:}$ concentration that is required to inhibit 50% of tested weeds

Table S 14. Antiviral activity of pure compounds.

Bioactive compound	Structure	Virus	Test method	Effect	References
reticin A		*Tobacco mosaic virus*	healf-leaf method	Preventive effect (%) = 73.4 ± 3.3 at 500 μg/mL Inactive effect (%) = 50.9 ± 0.9 at 500 μg/mL Curative effect (%) = 33.7 ± 1.3 at 500 μg/mL	[97]

References

[1] Royal Botanic Gardens, Kew, Plants of the World Online (2025). https://powo.science.kew.org/ (accessed February 6, 2025).

[2] S. Cirmi, C. Bisignano, G. Mandalari, M. Navarra, Anti-infective potential of *Citrus bergamia* Risso et Poiteau (bergamot) derivatives: a systematic review, Phytother. Res. 30 (2016) 1404–1411. https://doi.org/10.1002/ptr.5646.

[3] F. Curk, F. Ollitrault, A. Garcia-Lor, F. Luro, L. Navarro, P. Ollitrault, Phylogenetic origin of limes and lemons revealed by cytoplasmic and nuclear markers, Ann. Bot. 117 (2016) 565–583. https://doi.org/10.1093/aob/mcw005.

[4] F.J.D. Neto, D.C.D.S. Carneiro, F.F. Putti, J.D. Rodrigues, M.A. Tecchio, S. Leonel, M.D.S. Silva, Physiological indexes in seed germination and seedling growth of rangpur lime (*Citrus limonia* L. Osbeck) under plant growth regulators, Agronomy 14 (2024) 2066. https://doi.org/10.3390/agronomy14092066.

[5] A.K. AL-Anbari, N. Kanawapee, T.A. AL-Kazragi, H. AL-Jewari, A. Al-Mashhadani, S. Barusrux, P. Pornpongrungrueng, P. Theerakulpisut, Genetic diversity of *Citrus* (*Rutaceae*) in Iraq based on random amplified polymorphic DNA (RAPD) markers, Afr. J. Agric. Res. 9 (2014) 2012–1019.

[6] H. Mirzaei-Najafgholi, S. Tarighi, M. Golmohammadi, P. Taheri, The effect of *Citrus* essential oils and their constituents on growth of *Xanthomonas citri* subsp. *citri*, Molecules 22 (2017) 591. https://doi.org/10.3390/molecules22040591.

[7] L. Galovičová, P. Borotová, N.L. Vukovic, M. Vukic, S. Kunová, P. Hanus, P.Ł. Kowalczewski, L. Bakay, M. Kačániová, The potential use of *Citrus aurantifolia* L. essential oils for decay control, quality preservation of agricultural products, and anti-insect activity, Agronomy 12 (2022) 735. https://doi.org/10.3390/agronomy12030735.

[8] O.B. Ajayi-Moses, C.O. Ogidi, B.J. Akinyele, Bioactivity of *Citrus* essential oils (CEOs) against microorganisms associated with spoilage of some fruits, Chem. Biol. Technol. Agric. 6 (2019) 22. https://doi.org/10.1186/s40538-019-0160-5.

[9] D. Pouvova, B. Kokoskova, R. Pavela, P. Rysanek, Effectivity of plant essential oils against *Clavibacter michiganensis*, *in vitro*, Zemdirbyste 95491 (2008) 440–446.

[10] A. Pandey, P. Singh, U. Palni, N.N. Tripathi, *In-vitro* antibacterial activities of the essential oils of aromatic plants against *Erwinia herbicola* (Lohnis) and *Pseudomonas putida* (Kris Hamilton), J. Serb. Chem. Soc. 77 (2012) 313–323. https://doi.org/10.2298/JSC110524192P.

[11] M.K. Okla, S.A. Alamri, M.Z.M. Salem, H.M. Ali, S.I. Behiry, R.A. Nasser, I.A. Alaraidh, S.M. Al-Ghtani, W. Soufan, Yield, phytochemical constituents, and antibacterial activity of essential oils from the leaves/twigs, branches, branch wood, and branch bark of sour orange (*Citrus aurantium* L.), Processes 7 (2019) 363. https://doi.org/10.3390/pr7060363.

[12] S. Frassinetti, L. Caltavuturo, M. Cini, C.M. Della Croce, B.E. Maserti, Antibacterial and antioxidant activity of essential oils from *Citrus* spp., J. Essent. Oil Res. 23 (2011) 27–31. https://doi.org/10.1080/10412905.2011.9700427.

[13] M.R. Proto, E. Biondi, D. Baldo, M. Levoni, G. Filippini, M. Modesto, M. Di Vito, F. Bugli, C. Ratti, P. Minardi, P. Mattarelli, Essential oils and hydrolates: potential tools for defense against bacterial plant pathogens, Microorganisms 10 (2022) 702. https://doi.org/10.3390/microorganisms10040702.

[14] P. Van Hung, P.T.L. Chi, N.T.L. Phi, Comparison of antifungal activities of vietnamese *Citrus* essential oils, Nat. Prod. Res. 27 (2013) 506–508. https://doi.org/10.1080/14786419.2012.706293.

[15] N.C. Mbili, U.L. Opara, C.L. Lennox, F.A. Vries, *Citrus* and lemongrass essential oils inhibit *Botrytis cinerea* on 'Golden Delicious', 'Pink Lady' and 'Granny Smith' apples, J. Plant Dis. Prot. 124 (2017) 499–511. https://doi.org/10.1007/s41348-017-0121-9.
[16] E. Bosquez-Molina, E.R. Jesús, S. Bautista-Baños, J.R. Verde-Calvo, J. Morales-López, Inhibitory effect of essential oils against *Colletotrichum gloeosporioides* and *Rhizopus stolonifer* in stored papaya fruit and their possible application in coatings, Postharvest Biol. Technol. 57 (2010) 132–137. https://doi.org/10.1016/j.postharvbio.2010.03.008.
[17] J. Kuate, J. Foko, S.A. Ndindeng, P.M. Jazet-Dongmo, E. Fouré, F. Damesse, Bella-Manga, D. Ducelier, Effect of essential oils from *Citrus* varieties on *in vitro* growth and sporulation of *Phaeoramularia angolensis* causing *Citrus* leaf and fruit spot disease, Eur. J. Plant Pathol. 114 (2006) 151–161. https://doi.org/10.1007/s10658-005-2928-7.
[18] D.L.R. Simas, S.H.B.M. De Amorim, F.R.V. Goulart, C.S. Alviano, D.S. Alviano, A.J.R. Da Silva, *Citrus* species essential oils and their components can inhibit or stimulate fungal growth in fruit, Ind. Crops Prod. 98 (2017) 108–115. https://doi.org/10.1016/j.indcrop.2017.01.026.
[19] K. Rammanee, T. Hongpattarakere, Effects of tropical *Citrus* essential oils on growth, aflatoxin production, and ultrastructure alterations of *Aspergillus flavus* and *Aspergillus parasiticus*, Food Bioprocess Technol. 4 (2011) 1050–1059. https://doi.org/10.1007/s11947-010-0507-1.
[20] P.M.J. Dongmo, L.N. Tatsadjieu, E.T. Sonwa, J. Kuate, P.H.A. Zollo, C. Menut, Essential oils of *Citrus aurantifolia* from Cameroon and their antifungal activity against *Phaeoramularia angolensis*, Afr. J. Agric. Res. 4 (2009) 354–358.
[21] E.B. Bnina, H. Hajlaoui, I. Chaieb, M. Daami-Remadi, M.B. Said, H.B. Jannet, Chemical composition, antimicrobial and insecticidal activities of the tunisian Citrus aurantium essential oils, Czech J. Food Sci. 37 (2019) 81–92. https://doi.org/10.17221/202/2017-CJFS.
[22] W.A.A.A. Elgat, A.M. Kordy, M. Böhm, R. Černý, A. Abdel-Megeed, M.Z.M. Salem, *Eucalyptus camaldulensis*, *Citrus aurantium*, and *Citrus sinensis* essential oils as antifungal activity against *Aspergillus flavus*, *Aspergillus niger*, *Aspergillus terreus*, and *Fusarium culmorum*, Processes 8 (2020) 1003. https://doi.org/10.3390/pr8081003.
[23] M. Soković, L.J.L.D. Van Griensven, Antimicrobial activity of essential oils and their components against the three major pathogens of the cultivated button mushroom, *Agaricus bisporus*, Eur. J. Plant Pathol. 116 (2006) 211–224. https://doi.org/10.1007/s10658-006-9053-0.
[24] A.B. Hsouna, N. Hamdi, N.B. Halima, S. Abdelkafi, Characterization of essential oil from *Citrus aurantium* L. flowers: antimicrobial and antioxidant activities, J. Oleo Sci. 62 (2013) 763–772. https://doi.org/10.5650/jos.62.763.
[25] S. Messgo-Moumene, Y. Li, K. Bachir, Z. Houmani, Z. Bouznad, F. Chemat, Antifungal power of citrus essential oils against potato late blight causative agent, J. Essent. Oil Res. 27 (2015) 169–176. https://doi.org/10.1080/10412905.2014.982877.
[26] E.L.D. Souza, E.D.O. Lima, K.R.D.L. Freire, C.P.D. Sousa, Inhibitory action of some essential oils and phytochemicals on the growth of various moulds isolated from foods, Braz. Arch. Biol. Technol. 48 (2005) 245–250. https://doi.org/10.1590/S1516-89132005000200011.
[27] A. Vitoratos, D. Bilalis, A. Karkanis, A. Efthimiadou, Antifungal activity of plant essential oils against *Botrytis cinerea*, *Penicillium italicum* and *Penicillium digitatum*, Not. Bot. Horti. Agrobot. Cluj. Napoca 41 (2013) 86–92. https://doi.org/10.15835/nbha4118931.
[28] M. Riaz, R. Qadir, M. Tahir Akhtar, M. Misbah Ur Rehman, F. Anwar, R. Eman, M. Fayyaz Ur Rehman, M. Safwan Akram, Chemical characterization, antioxidant, antimicrobial, cytotoxicity and *in silico*

studies of hexane extract and essential oils from *Citrus limon* leaves, Chem. Biodivers. 20 (2023) e202200537. https://doi.org/10.1002/cbdv.202200537.
[29] F. Ammad, O. Moumen, A. Gasem, S. Othmane, K.-N. Hisashi, B. Zebib, O. Merah, The potency of lemon (*Citrus limon* L.) essential oil to control some fungal diseases of grapevine wood, C. R. Biologies 341 (2018) 97–101. https://doi.org/10.1016/j.crvi.2018.01.003.
[30] M. Viuda-Martos, Y. Ruiz-Navajas, J. Fernández-López, J. Pérez-Álvarez, Antifungal activity of lemon (*Citrus lemon* L.), mandarin (*Citrus reticulata* L.), grapefruit (*Citrus paradisi* L.) and orange (*Citrus sinensis* L.) essential oils, Food Control 19 (2008) 1130–1138. https://doi.org/10.1016/j.foodcont.2007.12.003.
[31] G. Dimić, S. Kocić-Tanackov, L. Mojović, J. Pejin, Antifungal activity of lemon essential oil, coriander and cinnamon extracts on foodborne molds in direct contact and the vapor phase: antifungal activity of extracts, J. Food Process. Preserv. 39 (2015) 1778–1787. https://doi.org/10.1111/jfpp.12410.
[32] G. Akarca, R. Sevik, Biological activities of *Citrus limon* L. and *Citrus sinensis* L. peel essential oils, J. Essent. Oil-Bear. Plants 24 (2021) 1415–1427. https://doi.org/10.1080/0972060X.2021.2022000.
[33] P. Singh, R. Shukla, B. Prakash, A. Kumar, S. Singh, P.K. Mishra, N.K. Dubey, Chemical profile, antifungal, antiaflatoxigenic and antioxidant activity of *Citrus maxima* Burm. and *Citrus sinensis* (L.) Osbeck essential oils and their cyclic monoterpene, dl-limonene, Food Chem. Toxicol. 48 (2010) 1734–1740. https://doi.org/10.1016/j.fct.2010.04.001.
[34] M. Chutia, P. Deka Bhuyan, M.G. Pathak, T.C. Sarma, P. Boruah, Antifungal activity and chemical composition of *Citrus reticulata* Blanco essential oil against phytopathogens from North East India, LWT - Food Sci. Technol. 42 (2009) 777–780. https://doi.org/10.1016/j.lwt.2008.09.015.
[35] N. Tao, L. Jia, H. Zhou, Anti-fungal activity of *Citrus reticulata* Blanco essential oil against *Penicillium italicum* and *Penicillium digitatum*, Food Chem. 153 (2014) 265–271. https://doi.org/10.1016/j.foodchem.2013.12.070.
[36] L. Liu, X. Xu, D. Cheng, X. Yao, S. Pan, Structure–activity relationship of *Citrus* polymethoxylated flavones and their inhibitory effects on *Aspergillus niger*, J. Agric. Food Chem. 60 (2012) 4336–4341. https://doi.org/10.1021/jf3012163.
[37] N. Tao, Y. Liu, M. Zhang, Chemical composition and antimicrobial activities of essential oil from the peel of bingtang sweet orange (*Citrus sinensis* Osbeck), Int. J. Food Sci. Technol. 44 (2009) 1281–1285. https://doi.org/10.1111/j.1365-2621.2009.01947.x.
[38] N. Samandari-Najafabadi, P. Taheri, S. Tarighi, Antifungal and antivirulence effects of *Citrus sinensis* essential oil on *Alternaria* pathogens in orange, J. Plant Pathol. 106 (2024) 1153–1171. https://doi.org/10.1007/s42161-024-01638-8.
[39] M.J. Velázquez-Nuñez, R. Avila-Sosa, E. Palou, A. López-Malo, Antifungal activity of orange (*Citrus sinensis* var. Valencia) peel essential oil applied by direct addition or vapor contact, Food Control 31 (2013) 1–4. https://doi.org/10.1016/j.foodcont.2012.09.029.
[40] N. Sharma, A. Tripathi, Effects of *Citrus sinensis* (L.) Osbeck epicarp essential oil on growth and morphogenesis of *Aspergillus niger* (L.) Van Tieghem, Microbiol. Res. 163 (2008) 337–344. https://doi.org/10.1016/j.micres.2006.06.009.
[41] N. Sharma, A. Tripathi, Fungitoxicity of the essential oil of *Citrus sinensis* on post-harvest pathogens, World J. Microbiol. Biotechnol. 22 (2006) 587–593. https://doi.org/10.1007/s11274-005-9075-3.
[42] F.N. Ugwuja, Offor V.N., F.E. Akanwa, Achi N.K., A.K. Onifade, Effects of *Citrus aurantifolia* Linn and *Xylopia aethopica* (Dunal) A. rich extracts on leaf blight disease of taro (Colocasia esculenta L. Schott), J. Trop. Crop Sci. 10 (2023) 17–26. https://doi.org/10.29244/jtcs.10.1.17-26.

[43] R. Kalsoom, M. S. Haider, S. Chohan, Phytochemical analysis and antifungal activity of some medicinal plants against *Alternaria* specie isolated from onion, J. Anim. Plant Sci. 30 (2020) 454–460. https://doi.org/10.36899/JAPS.2020.2.0039.
[44] N. Liu, X. Li, P. Zhao, X. Zhang, O. Qiao, L. Huang, L. Guo, W. Gao, A review of chemical constituents and health-promoting effects of *Citrus* peels, Food Chem. 365 (2021) 130585. https://doi.org/10.1016/j.foodchem.2021.130585.
[45] D.D.G. Alvindia, M.A. Angeles Mangoba, Fungitoxic activities of *Citrus limon* L. peel extracts in controlling anthracnose of mango, J. Plant Pathol. 104 (2022) 939–945. https://doi.org/10.1007/s42161-022-01080-8.
[46] S. Johann, V.L. de Oliveira, M.G. Pizzolatti, J. Schripsema, R. Braz-Filho, A. Branco, A.S. Jr, Antimicrobial activity of wax and hexane extracts from *Citrus* spp. peels, Mem. Inst. Oswaldo Cruz 102 (2007) 681–685.
[47] B. Ashiq, S. Chohan, R. Perveen, M. Abid, M.A. Mehmood, Chemical composition and antifungal potential of medicinal plants against seedborne mycoflora of eggplant (*Solanum melongena* L.), Acta Bot. Croat. 76 (2017) 72–79. https://doi.org/10.1515/botcro-2016-0053.
[48] J.M. Ehiobu, Antifungal activity of *Citrus limon* leaf extracts against fungal pathogens isolated from decaying potato tubers in supermarkets of the Eastern Cape Province, South Africa, Plant Protection 7 (2023) 361–374. https://doi.org/10.33804/pp.007.03.4659.
[49] H.A. Fouad, C.A.G. Da Camara, Chemical composition and bioactivity of peel oils from *Citrus aurantiifolia* and *Citrus reticulata* and enantiomers of their major constituent against *Sitophilus zeamais* (Coleoptera: Curculionidae), J. Stored Prod. Res. 73 (2017) 30–36. https://doi.org/10.1016/j.jspr.2017.06.001.
[50] M. Saad, Chemical composition and biological activities of four *Citrus* essential oils, J. Plant Prot. Pathol. 4 (2013) 767–780. https://doi.org/10.21608/jppp.2013.87481.
[51] L. Asma, Z. Khaoula, T. Wafa, A. Amina, S. Slaheddine, Chemical composition and insecticidal activity of essential oil from *Citrus aurantium*(*Rutaceae*) fruit peels against two greenhouse insects; *Spodoptera littoralis*, Advances in Agriculture, Sciences and Engineering Research 3 (2013) 825–830.
[52] N.C. Ribeiro, C.A.G. Da Camara, J.P.R. Melo, M.M. De Moraes, Acaricidal properties of essential oils from agro-industrial waste products from citric fruit against *Tetranychus urticae*, J. Applied Entomol. 143 (2019) 731–743. https://doi.org/10.1111/jen.12642.
[53] N.U. Visakh, B. Pathrose, M. Chellappan, M.T. Ranjith, P.V. Sindhu, D. Mathew, Chemical characterisation, insecticidal and antioxidant activities of essential oils from four *Citrus* spp. fruit peel waste, Food Biosci. 50 (2022) 102163. https://doi.org/10.1016/j.fbio.2022.102163.
[54] D.P. Papachristos, A.C. Kimbaris, N.T. Papadopoulos, M.G. Polissiou, Toxicity of citrus essential oils against *Ceratitis capitata* (Diptera: Tephritidae) larvae, Ann. Appl. Biol. 155 (2009) 381–389. https://doi.org/10.1111/j.1744-7348.2009.00350.x.
[55] K. Zarrad, A.B. Hamouda, I. Chaieb, A. Laarif, J.M.-B. Jemâa, Chemical composition, fumigant and anti-acetylcholinesterase activity of the tunisian *Citrus aurantium* L. essential oils, Ind. Crops Prod. 76 (2015) 121–127. https://doi.org/10.1016/j.indcrop.2015.06.039.
[56] S.S. Alotaibi, H. Darwish, A.K. Alzahrani, S. Alharthi, A.S. Alghamdi, A.M. Al-Barty, M. Helal, A. Maghrabi, A. Baazeem, H.A. Alamari, A. Noureldeen, Environment-friendly control potential of two *Citrus* essential oils against *Aphis punicae* and *Aphis illinoisensis* (Hemiptera: Aphididae), Agronomy 12 (2022) 2040. https://doi.org/10.3390/agronomy12092040.
[57] M. Sagheer, Z. Ali, M. Yasir, Q. Ali, K. Ali, A. Majid, F.Z.A. Khan, Evaluation if essential oils of different *Citrus* species agaisnt *Trogoderma granarium* (Everts) (Coleoptera: Dermestidae) collected from

vehari and faisalabad districts of Punjab, Pakistan, Pakistan Entomologist 35 (2013) 37–41.
[58] I. Chaieb, K. Zarrad, R. Sellam, W. Tayeb, A.B. Hammouda, A. Laarif, S. Bouhachem, Chemical composition and aphicidal potential of *Citrus aurantium* peel essential oils, Entomol. Gen. 37 (2018) 63–75. https://doi.org/10.1127/entomologia/2017/0317.
[59] H.A. Ahmed, A.A. Nassrallah, M.A. Abdel-Raheem, H.H. Elbehery, Lemon peel essential oil and its nano-formulation to control *Agrotis ipsilon* (Lepidoptera: Noctuidae), Sci. Rep. 13 (2023) 17922. https://doi.org/10.1038/s41598-023-44670-x.
[60] F. Karamaouna, A. Kimbaris, A. Michaelakis, D. Papachristos, M. Polissiou, P. Papatsakona, E. Tsora, Insecticidal activity of plant essential oils against the vine mealybug, *Planococcus ficus*, J. Insect Sci. 13 (2013) 1–13. https://doi.org/10.1673/031.013.14201.
[61] N.E. Papanikolaou, N.G. Kavallieratos, V. Iliopoulos, E. Evergetis, A. Skourti, E.P. Nika, S.A. Haroutounian, Essential oil coating: mediterranean culinary plants as grain protectants against larvae and adults of *Tribolium castaneum* and *Trogoderma granarium*, Insects 13 (2022) 165. https://doi.org/10.3390/insects13020165.
[62] A. Kayahan, Effects of some essential oils (*Citrus limon* and *Citrus sinensis*) against *Aphis fabae* Scopoli (Hemiptera: Aphididae), in: Turkey, 2021: pp. 214–226.
[63] S. Guettal, S. Tine, F. Tine-Djebbar, N. Soltani, Evaluation of *Citrus limonum* (Sapindales: Rutaceae) L. essential oil as protectant against the granary weevil, *Sitophilus granarius* (L.) (Coleoptera: Curculionidae), Allelopathy J. 51 (2020) 79–92. https://doi.org/10.26651/allelo.j/2020-51-1-1292.
[64] M. Esther Ojebode, C. Ojo Olaiya, Efficacy of some plant extracts as storage protectants against *Callosobruchus maculatus*, J. Biotechnol. Biomater. 6 (2016) 1000217. https://doi.org/10.4172/2155-952X.1000217.
[65] A.O. Oyedeji, W.O. Okunowo, A.A. Osuntoki, T.B. Olabode, F. Ayo-folorunso, Insecticidal and biochemical activity of essential oil from *Citrus sinensis* peel and constituents on *Callosobrunchus maculatus* and *Sitophilus zeamais*, Pestic. Biochem. Physiol. 168 (2020) 104643. https://doi.org/10.1016/j.pestbp.2020.104643.
[66] D. Kidane, The Potential of orange (*Citrus sinensis* L.) peel oil as a fumigant and repellent to control maize weevil (*Sitophillus zeamais* Motsch), Journal of Biologically Active Products from Nature 1 (2011) 193–199. https://doi.org/10.1080/22311866.2011.10719086.
[67] E.P. Siskos, M.A. Konstantopoulou, B.E. Mazomenos, M. Jervis, Insecticidal activity of *Citrus aurantium* fruit, leaf, and shoot extracts against adult olive fruit flies (Diptera: Tephritidae), J. Econ. Entomol. 100 (2007) 1215–1220. https://doi.org/10.1093/jee/100.4.1215.
[68] E.P. Siskos, M.A. Konstantopoulou, B.E. Mazomenos, Insecticidal activity of *Citrus aurantium* peel extract against *Bactrocera oleae* and *Ceratitis capitata* adults (Diptera: Tephritidae), J. Applied Entomol. 133 (2009) 108–116. https://doi.org/10.1111/j.1439-0418.2008.01312.x.
[69] M.Z. Majeed, M.I. Nawaz, R.R. Khan, U. Farooq, C.-S. Ma, Insecticidal effect of acetone, ethanol and acqueous extracts of *Azadirachta indica* (A. Juss), *Citrus aurantium* (L.), *Citrus sinensis* (L.) and *Eucalyptus camaldulensis* (Dehnh.) against mealybugs (Hemiptera: Pseudococcidae), Trop. Subtrop. Agroecosyst. 21 (2018) 421–430. https://doi.org/10.56369/tsaes.2489.
[70] M.J. Ruiz, M.L. Juárez, R.A. Alzogaray, F. Arrighi, L. Arroyo, G. Gastaminza, E. Willink, A.D.V. Bardón, T. Vera, Toxic effect of *Citrus* peel constituents on *Anastrepha fraterculus* Wiedemann and *Ceratitis capitata* Wiedemann immature stages, J. Agric. Food Chem. 62 (2014) 10084–10091. https://doi.org/10.1021/jf503063b.
[71] M. Rouhani, M.A. Samih, M. Gorji, B.H. Moradi, Insecticidal effect of plant extracts on common

pistachio psylla, *Agonoscena pistaciae* Burckhardt and Lauterer (Hemiptera: Aphalaridae), Arch. Phytopathol. Plant Prot. 52 (2019) 45–53. https://doi.org/10.1080/03235408.2019.1570589.
[72] Atanda, S.A.; Nwanade, C.F.; Izunwanne, H.O.; Ezenwafor, O.C., Investigation of *Citrus sinensis* (L.) peel insecticidal efficacy on *Sitophilus zeamais*, Acta Velit 1 (2015).
[73] S.H.E. Gayed, A.M.E. Sayed, A.M. Al-Ghonaimy, HPLC-UV fingerprint profile and bioactivity of *Citrus aurantium* var. *deliciosa* fruits: peel and seeds on certain plant-parasitic nematodes, J. Med. Plants Res. 11 (2017) 284–295. https://doi.org/10.5897/JMPR2017.6361.
[74] B.Y. Tsai, Effect of peels of lemon, orange, and grapefruit against *Meloidogyne incognita*, Plant Pathology Bulletin 17 (2008) 195–201.
[75] S. Abolusoro, E. Oyedunmade, T. Olabiyi, Evaluation of sweet orange peel aqueous extract (*Citrus sinensis*) as root–knot nematode suppressant, Agro-Science 9 (2011) 170–175. https://doi.org/10.4314/as.v9i3.65751.
[76] N.B. Izuogu, C. Azubuike, A.S. Hinmikaiye, A. Olarenwaju, Comparative evaluation of powdered and aqueous extract of citrus peels and carbofuran in the management of root- knot nematode on infected cowpea field, Agric. Conspec. Sci. 84 (2019) 173–178.
[77] S.K. Fagodia, H.P. Singh, D.R. Batish, R.K. Kohli, Phytotoxicity and cytotoxicity of *Citrus aurantiifolia* essential oil and its major constituents: limonene and citral, Ind. Crops Prod. 108 (2017) 708–715. https://doi.org/10.1016/j.indcrop.2017.07.005.
[78] S.A. El Sawi, M.E. Ibrahim, K.G. El-Rokiek, S.A.S. El-Din, Allelopathic potential of essential oils isolated from peels of three *Citrus* species, Ann. Agric. Sci. 64 (2019) 89–94. https://doi.org/10.1016/j.aoas.2019.04.003.
[79] A.U. Bozhuyuk, Herbicidal activity and chemical composition of two essential oils on seed germinations and seedling growths of three weed species, J. Essent. Oil-Bear. Plants. 23 (2020) 821–831. https://doi.org/10.1080/0972060X.2020.1828178.
[80] K.G. El-Rokiek, S.A.S. El-Din, S.A. El-Sawi, M.E. Ibrahim, Controlling *Anagallis arvensis* and *Malva parviflora* associated wheat using some essential oils. Using *Citrus sinensis* peel oil, J. Mater. Environ. Sci. 10 (2019) 891–897.
[81] S. Nawanopparatsakul, P. Phuagphong, N. Kitcharoen, Effect of *Citrus* extracts on plant growth inhibition, KKU Sci. J. 40 (2012) 165–172.
[82] H. Kato-Noguchi, Y. Tanaka, Allelopathic potential of *Citrus junos* fruit waste from food processing industry, Bioresour. Technol. 94 (2004) 211–214. https://doi.org/10.1016/j.biortech.2003.12.007.
[83] D. Suwanagul, Allelopathic potential of *Citrus reticulata* peel extract for weed control, Rangsit Journal of Arts and Sciences 6 (2016) 17–21. https://doi.org/10.14456/RJAS.2016.2.
[84] S. Sale, A.I. Abubakar, F. Ja'afar, B. Abubakar, Allelophatic effects of orange peel extract on *Amaranthus hybridus* L. and *Pennisetum glaucum* (L.) R.Br., Jewel Journal of Scientific Research 4 (2019) 96–104.
[85] F. Ugolini, A. Crisci, S. Baronti, G. Cencetti, A. Dal Prà, L. Albanese, M. Michelozzi, F. Zabini, F. Meneguzzo, Effects of orange waste extract produced by hydrodynamic cavitation on the germination of *Chenopodium album* L. and *Lactuca sativa* L., Sustainability 16 (2024) 3039. https://doi.org/10.3390/su16073039.
[86] C. Ramírez-Pelayo, J. Martínez-Quiñones, J. Gil, D. Durango, Coumarins from the peel of citrus grown in Colombia: composition, elicitation and antifungal activity, Heliyon 5 (2019) e01937. https://doi.org/10.1016/j.heliyon.2019.e01937.
[87] C.O. Pérez-Alfonso, D. Martínez-Romero, P.J. Zapata, M. Serrano, D. Valero, S. Castillo, The effects of essential oils carvacrol and thymol on growth of *Penicillium digitatum* and *P. italicum* involved in lemon

decay, Int. J. Food Microbiol. 158 (2012) 101–106. https://doi.org/10.1016/j.ijfoodmicro.2012.07.002.
[88] T. Shimada, T. Endo, H. Fujii, A. Rodríguez, L. Peña, M. Omura, Characterization of three linalool synthase genes from *Citrus unshiu* Marc. and analysis of linalool-mediated resistance against *Xanthomonas citri* subsp. *citri* and *Penicilium italicum* in citrus leaves and fruits, Plant Sci. 229 (2014) 154–166. https://doi.org/10.1016/j.plantsci.2014.09.008.
[89] T. Wang, Q. Li, H. Zhang, J. Chen, Flavonoids from *Citrus reticulata*: Inhibitory activity against pathogenic fungi and biocontrol potential, Physiol. Mol. Plant Pathol. 131 (2024) 102250. https://doi.org/10.1016/j.pmpp.2024.102250.
[90] J.A. Del Río, P. Gómez, A.G. Baidez, M.C. Arcas, J.M. Botía, A. Ortuño, Changes in the levels of polymethoxyflavones and flavanones as part of the defense mechanism of *Citrus sinensis* (cv. Valencia Late) fruits against *Phytophthora citrophthora*, J. Agric. Food Chem. 52 (2004) 1913–1917. https://doi.org/10.1021/jf035038k.
[91] M.P. Salas, G. Céliz, H. Geronazzo, M. Daz, S.L. Resnik, Antifungal activity of natural and enzymatically-modified flavonoids isolated from *Citrus* species, Food Chem. 124 (2011) 1411–1415. https://doi.org/10.1016/j.foodchem.2010.07.100.
[92] A. Ortuño, A. Báidez, P. Gómez, M.C. Arcas, I. Porras, A. García-Lidón, J.A.D. Río, *Citrus paradisi* and *Citrus sinensis* flavonoids: their influence in the defence mechanism against *Penicillium digitatum*, Food Chem. 98 (2006) 351–358. https://doi.org/10.1016/j.foodchem.2005.06.017.
[93] J.S. Dambolena, A.G. López, M.C. Cánepa, M.G. Theumer, J.A. Zygadlo, H.R. Rubinstein, Inhibitory effect of cyclic terpenes (limonene, menthol, menthone and thymol) on *Fusarium verticillioides* MRC 826 growth and fumonisin B1 biosynthesis, Toxicon 51 (2008) 37–44. https://doi.org/10.1016/j.toxicon.2007.07.005.
[94] M.C. Arcas, J.M. Botıa, A.M. Ortuno, J.A.D. Rıo, UV irradiation alters the levels of flavonoids involved in the defence mechanism of *Citrus aurantium* fruits against *Penicillium digitatum*, Eur. J. Plant Pathol. 106 (2000) 617–622.
[95] E. Almada-Ruiz, M.Á. Martínez-Téllez, M.M. Hernández-Álamos, S. Vallejo, E. Primo-Yúfera, I. Vargas-Arispuro, Fungicidal potential of methoxylated flavones from citrus for *in vitro* control of *Colletotrichum gloeosporioides*, causal agent of anthracnose disease in tropical fruits, Pest Manag. Sci. 59 (2003) 1245–1249. https://doi.org/10.1002/ps.747.
[96] S. Sanzani, L. Schena, A. Ippolito, Effectiveness of phenolic compounds against *Citrus* green mould, Molecules 19 (2014) 12500–12508. https://doi.org/10.3390/molecules190812500.
[97] D. Wang, B. Liu, Z. Ma, J. Feng, H. Yan, Reticine A, a new potent natural elicitor: isolation from the fruit peel of *Citrus reticulate* and induction of systemic resistance against *Tobacco mosaic virus* and other plant fungal diseases, Pest Manag. Sci. 77 (2021) 354–364. https://doi.org/10.1002/ps.6025.