

2017-2018 FLORIDA CITRUS PRODUCTION GUIDE: Fresh Fruit Pesticide Residue Limits¹

M.A. Ritenour²

Current production practices often include the use of various pre- and postharvest chemicals, many of which are pesticides. To be used, these materials must be labeled for use on citrus and used only according to label instructions. Chemical residues on the fruit after harvest are a concern to regulators and the public alike because of their potential negative health effects. Therefore, the U.S. and other countries set maximum residue limits (MRLs) on fresh produce for various chemicals. It is unlikely for United States MRLs to be exceeded when label instructions are followed. However, when importing countries' MRLs are lower than U.S. MRLs, then use of these pesticides usually must be modified or discontinued to keep from exceeding the country's tolerances. In addition, individual buyers may set their own, more restrictive standards. Similar to buyer-imposed food safety standards, buyer-imposed MRL standards, especially from large buyers, can significantly impact how pesticides are used in the field and packing facility.

Table 1 list the MRLs (in part-per-million) for various chemicals used on fresh Florida citrus for the U.S., CODEX, and important export countries. The limit of detection for chemical residues on citrus fruit is often around 0.01 ppm, depending on the testing laboratory and chemical of interest. When no tolerance is stated, any detectable residue will violate tolerances. Violations may lead to rejected loads of product, restrictions on future shipments, and even increased requirements for the entire industry to a given market. Because MRLs change frequently, see the Global MRL Database (<https://www.globalmrl.com>) or the University of Florida's Postharvest Resources Website (<http://irrec.ifas.ufl.edu/postharvest>) for the most current information and links to MRL databases for select countries. Table 1 and the websites are intended as an initial reference source and no guarantee is made to their accuracy. Always verify these values with other knowledgeable sources within specific markets of interest.

TABLE 1. Maximum Residue Limits (MRLs) in part-per-million (ppm), by country. Abbreviations: grapefruit (G), orange (O), tangerine (T), lemon (L). Materials EXEMPT from US tolerances or only labeled for application to NONBEARING trees are NOT included.

Chemical Name	Trade Names (Examples only, not inclusive)	U.S. Citrus	Canada Citrus	CODEX Citrus	EU (G & O only)	Japan (G & O only)	Taiwan (G & O only)	Korea (G & O only)
2,4-D (2, 4-Dichlorophenoxyacetic acid)	Citrus Fix, Hivol	3	2	1	1	2	2	0.15
Abamectin	Agri-Mek, Clinch, Zephyr, ABBA, Epi-mek, Reaper	0.02	0.02	0.02	0.015	0.01 (0.1 proposed)	0.01	0.02
Acequinocyl	Kanemite	0.35	0.35		0.2 (G); 0.4 (O)	2	0.2	1

¹ This document is HS-1124, one of a series of the Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Date revised: May 2017. For a copy of this handbook, request information on its purchase at your county extension office.

² M.A. Ritenour, associate professor, Horticultural Sciences Department, Indian River REC, Ft. Pierce, Florida; Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

The use of trade names in this publication is solely for the purpose of providing specific information. It is not a guarantee or warranty of the products named, and does not signify that they are approved to the exclusion of others of suitable composition.

The Institute of Food and Agricultural Sciences is an equal opportunity/affirmative action employer authorized to provide research, educational information and other services only to individuals and institutions that function without regard to race color, sex, age, handicap, or national origin. For information on obtaining other extension publications, contact your county Cooperative Extension Service office.

Florida Cooperative Extension Service / Institute of Food and Agricultural Sciences / University of Florida / Larry Arrington, Dean

Copyright Information

This document is copyrighted by the University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS) for the people of the State of Florida. UF/IFAS retains all rights under all conventions, but permits free reproduction by all agents and offices of the Cooperative Extension Service and the people of the State of Florida. Permission is granted to others to use these materials in part or in full for educational purposes, provided that full credit is given to the UF/IFAS, citing the publication, its source, and date of publication.

TABLE 1. Maximum Residue Limits (MRLs) in part-per-million (ppm), by country. Abbreviations: grapefruit (G), orange (O), tangerine (T), lemon (L). Materials EXEMPT from US tolerances or only labeled for application to NONBEARING trees are NOT included.

Chemical Name	Trade Names (Examples only, not inclusive)	U.S. Citrus	Canada Citrus	CODEX Citrus	EU (G & O only)	Japan (G & O only)	Taiwan (G & O only)	Korea (G & O only)
CONTINUED TABLE								
Acetamiprid	Assail	1	0.5	1	0.9	2	0.5	0.5
Acibenzolar-S-methyl	Actigard	0.02			0.01			0.2
Azoxystrobin	Abound, Graduate A+	15	15	15	15	10	10	10
Beta-cyfluthrin	Baythroid XL	0.2		0.3	0.02	2	0.3	2
Bifenthrin	Brigade, Capture, Telstar, Fanfare	0.05		0.05	0.1 (0.01 proposed)	2	0.5	0.5
Boscalid	A component of Pristine	2	3	2	2	10	5	2
Bromacil	Bromo, Hyvar	0.1				0.1	0.5	0.1
Buprofezin	Applaud, Centaur	2.5	4 (O, T)	1	1	3 (G), 2 (O)	0.5	0.5
Carbaryl	Sevin	10	10	15	0.01	7	1	7
Carfentrazone-ethyl	Aim	0.1			0.01 (0.1 proposed)	0.1	0.1	0.1
Chlorantraniliprole	Altacor, part of Voliam-Flexi	1.4	0.7	0.7	0.7	0.5	0.5	1
Chlorpyrifos	Lorsban, Nufos	1	1	1	0.3	1	1	1
Ciothianidin	Belay	0.07 (FL Sect. 18)		0.07	0.06	2	1	1
Cryolite	Kryocide	7					7	
Cyfluthrin	Baythroid	0.2		0.3	0.02	2	0.3	2
Difenoconazole	A component of Quadris Top	0.6	0.8	0.6	0.6	0.6	0.6	0.6
Diflubenzuron	Micromite	3		0.5	1 (proposed limit to non-edible crops)	3	1	3
Dimethoate	Dimethoate, Cygon	2	1.5	5	0.02	2	2	2
Diuron	Diuron, Direx, Karmex	0.05, 0.5 (L)	1		0.01	0.8 (G), 0.05 (O)	0.05 (G), 0.2 (O)	1
EPTC (S-Ethyl dipropylthiocarbamate)	Eptam	0.1			0.01	0.1		
Fenbuconazole	Enable	1	1	0.5 (G, O, T), 1 (L)	1	1	0.01	0.5
Fenbutatin Oxide	Vendex	20	2	5	5	5	2	5
Fenpropathrin	Danitol	2	2	2	2	5	0.5	2
Fenpyroximate	Portal	0.5	0.5	0.5	0.5	1	0.5	0.5
Ferbam	Ferbam	4		10 (T), 2 (O)		2	2	5 (G), 2 (O)
Flazasulfuron		0.01			0.01	0.1	0.2	
Fluazifop-P-butyl	Fusilade	0.03	0.03		0.01	0.1 (0.05 proposed)	0.01	
Fludioxonil	Graduate, Graduate A+	10	10	10	10	10	5 (7 proposed)	10
Flumioxazin	Chateau	0.02			0.02	0.1		0.1
Flupyradifurone	Sivanto	3	3		0.01	3	1	0.3
Formetanate Hydrochloride		1.5 (G, O), 0.03 (T), 0.6 (L)	0.4 (G), 0.9 (O), 0.03 (T), 0.09 (L)		0.01	2	1.5	
Fosetyl-aluminum	Aliette	5	9		75	150	10	0.05
Glufosinate-ammonium		0.15	0.1	0.05	0.05	0.2	0.1	0.05
Glyphosate	Roundup, Durango, Touchdown, & others	0.5			0.1 (G) 0.5 (O)	0.5	0.1	0.5
Hexythiazox	Savey	0.6	0.5	0.5	1	2	1	0.5
Hydrogen cyanide		50				50		5
Imazalil	Freshgard 700,	10	5	5	5	5	5	5

TABLE 1. Maximum Residue Limits (MRLs) in part-per-million (ppm), by country. Abbreviations: grapefruit (G), orange (O), tangerine (T), lemon (L). Materials EXEMPT from US tolerances or only labeled for application to NONBEARING trees are NOT included.

Chemical Name	Trade Names (Examples only, not inclusive)	U.S. Citrus	Canada Citrus	CODEX Citrus	EU (G & O only)	Japan (G & O only)	Taiwan (G & O only)	Korea (G & O only)
CONTINUED TABLE								
Imidacloprid	Admire, Alias, Provado, Couraze, Nuprid, Pasada, Widow	0.7	1 (proposed phase out)	1	1	0.7	1	0.7
Indaziflam	Alion	0.01	0.01					0.05
Malathion	Malathion, Atrapa, Fyfanon	8		7	2	7	2	0.5
Metalaxyl-M, Mefenoxam	Ridomil Gold, Subdue, UltraFlourish	1	5	5	0.7	0.7	0.5	
Metaldehyde	OR-Cal Slug & Snail Bait	0.26			0.05	0.7		0.05
Methomyl		2	1	1	0.01	10	1	1
Methoxyfenozide	Intrepid 2F	3	10	2	2	3	2	3
Methyl bromide		30		30	30	30		30
NAA (1-naphthaleneacetic acid)	Fruit Fix	0.1 (O & T)			0.06	5 (O)		
Naled	Dibrom	3	3			0.2		
Norflurazon	Solicam	0.2				0.2	0.2	0.1
Oryzalin	Oryzalin, Surflan	0.05			0.01	0.08 (proposed deletion)		0.05
Oxamyl	Vydate	3		5	0.01	5	0.5 (G), 1 (O)	5
Oxytetracycline		0.4				0.2		
Paraquat Dichloride	Paraquat, Gramoxone, Boa	0.05		0.02	0.02	0.05	0.2	0.05
Pendimethalin	Prowl, Pendimax	0.1			0.05	0.05	0.01	0.05
Phosmet	Imidan	5		3	0.5	5	1	0.05
Phosphine		0.01	0.01		0.01	0.01		0.01
Piperonyl Butoxide	Evergreen EC	8 (O)	8 (O)	5		5	5	0.05
Propargite	Comite, Omite	5 (G, L), 10 (O)	5	3	0.01	3	5	5
Propiconazole	Banner, Bumper, Tilt, Orbit, PropiMax	8	8	9 (O)	5 (G) 9 (O)	0.05	4	8
Pyraclostrobin	Headline	2	2	2	1 (G) 2 (O)	2	1	2
Pyrethrins	Pyrelin (+ Rotenone), Evergreen (+ Piperonyl Butoxide)	1 (O)	1 (O)	0.05	1	1 (O)	0.05	1 (O)
Pyridaben	Nexter	0.9	0.9		0.5	1	2	2
Pyrimethanil	Penbotec	10	10	7	8	10	7	7
Pyriproxyfen	Distance, Esteem, Knack	0.5	0.5	0.5	0.6	0.5	0.3 (G), 0.5 (O)	0.01
Rimsulfuron		0.01			0.01			
Saflufenacil	Treevix, Kixor	0.03	0.03	0.01	0.03	0.03	0.03	0.03
Sethoxydim	Poast Plus	0.5			0.1	1		1
Simazine	Simazine, Princep, Sim-Trol	0.25 (G, O, L)			0.01	0.2	0.01	0.25
SOPP (2 Phenylphenol, O-phenylphenol, OPP)	FreshGard 5	10	10	10	5	10	10	10
Spinetoram	Delegate	0.3	0.3	0.07 (O)	0.2	0.7	0.2	0.05
Spinosad	Entrust, Naturalyte, Justice, Spintor	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Spirodiclofen	Envidor	0.5	0.5	0.4	0.5	2	0.5	0.4
Spirotetramat	Movento	0.6	0.6	0.5	1	1	0.5	0.5
Streptomycin	FireWall	0.15 (G) 2 (O, T, L) (Section 18)				0.02		

TABLE 1. Maximum Residue Limits (MRLs) in part-per-million (ppm), by country. Abbreviations: grapefruit (G), orange (O), tangerine (T), lemon (L). Materials EXEMPT from US tolerances or only labeled for application to NONBEARING trees are NOT included.

Chemical Name	Trade Names (Examples only, not inclusive)	U.S. Citrus	Canada Citrus	CODEX Citrus	EU (G & O only)	Japan (G & O only)	Taiwan (G & O only)	Korea (G & O only)
CONTINUED TABLE								
Sulfentrazone		0.15				0.05		
Sulfoxaflor	Closer	0.7	0.7	0.15 (G) 0.8 (O, T) 0.4 (L)	0.15 (G) 0.8 (O)	(2 proposed)	0.7	0.3 (G) 0.7 (O)
Tebufenozide		0.8		2	2	2	1.5	1
Teflubenzuron		0.6 (O) 0.8 (L)	0.8 (O)		0.01	1	0.01	0.7
Thiabendazole (TBZ)	Freshgard 598, Alumni	10	10	7	5	10	10	10
Thiamethoxam	Actara, Platinum, part of VoliamFlexi	0.4	0.4	0.5	0.15	1	0.4 (G) 1 (O)	1
Tolfenpyrad	APTA	1.5	1.5			3	0.5	
Trifloxystrobin	Gem	0.6	0.6	0.5	0.5	3	0.5	0.5
Trifluralin	Trifluralin, Treflan, Trilin	0.05			0.01	0.05	0.05	0.05
zeta-cypermethrin	Mustang	0.35	1	0.3, 0.5 (G)	2	2	2	2
	Tolerance for unlisted materials=>	None	0.1	None	0.01	0.01	None	None