

2015 WTFRC APPLE PESTICIDE RESIDUE STUDY



Visible residues of fruit treated with overhead cooling (L), Raynox (C), and Eclipse (R) at harvest

For the fifth consecutive year, the Washington Tree Fruit Research Commission (WTFRC) conducted a trial to evaluate pesticide residues on 'Gala' apples. Fourteen insecticide/acaricides and nine fungicides were applied using a Rears airblast sprayer according to either an "aggressive" (maximum label rates at minimum retreatment and pre-harvest intervals) or "standard" (typical industry rates and timings) protocol. Products evaluated for the first time in 2015 included Nealta, Exirel, Merivon, Vivando, and Entrust. Plots from both protocols were divided for one of three additional factorial treatments: 1. Overhead cooling 2. Raynox (Pace Intl.), a waxy sunburn protectant or 3. Eclipse (D & M Chem), a calcium carbonate and boron fertilizer with sunburn protective properties. Raynox and Eclipse were applied according to their respective label specifications. One plot also received the aggressive spray protocol with no additional treatment (control). Fruit samples were delivered the day after harvest to Pacific Agricultural Labs (Portland, OR) for chemical analysis.

Measured residues vs. maximum residue levels (MRLs) for uniformly applied **STANDARD** industry pesticide programs utilizing typical rates, timings, and retreatment intervals on apples with overhead cooling (OHC), Raynox (320 oz/a) or Eclipse (3 gal/a) applied at 35 and 14 days before harvest (dbh). 'Gala'/M.9 Nic.29, Rock Island, WA. WTFRC 2015.

Chemical name	Trade name	Application rate	Application timing(s)	OHC fruit	Raynox treated fruit	Eclipse treated fruit	US MRL ¹	Lowest export MRL ¹
		oz per acre	dbh	ppm	ppm	ppm	ppm	ppm
Penthiopyrad	Fontelis	20	35	<0.01	0.012	<0.01	0.5	0.4 (many)
Flubendiamide	Tourismo	16	35	<0.02	<0.02	<0.02	1.5	0.8 (many)
Buprofezin	Tourismo	16	35	<0.01	<0.01	<0.01	3	1 (Taiwan)
Spirotetramat	Ultor	14	35	<0.01	<0.01	<0.01	0.7	0.7 (many)
Fluopyram	Luna Sensation	5.5	35	<0.01	0.011	<0.01	0.3	0.3 (CAN,MEX)
Trifloxystrobin	Luna Sensation	5.5	35	<0.01	<0.01	<0.01	0.5	0.5 (CAN,MEX)
Etoxazole	Zeal	2	35	0.011	0.011	<0.01	0.2	0.07 (many)
Spirodiclofen	Envidor 2SC	18	35	0.017	0.016	0.016	0.8	0.8 (many)
Myclobutanil	Rally 40WSP	10	35	0.013	0.014	0.015	0.5	0.5 (many)
Emamectin benzoate	Proclaim	4.8	35	<0.01	<0.01	<0.01	0.025	0.02 (many)
Metrafenone	Vivando	15.4	35	<0.01	<0.01	<0.01	1.5	0.01 (Taiwan)
Fluxapyroxad	Merivon	5.5	35	0.012	0.017	0.013	0.8	0.8 (CAN,MEX)
Pyraclostrobin	Merivon	5.5	35	<0.01	0.011	<0.01	1.5	0.5 (many)
Cyantraniliprole	Exirel	13.5	35 & 21	0.032	0.030	0.024	1.5	0.8 (many)
Spinosad	Entrust	3	35 & 21	0.019	0.026	0.014	0.2	0.1 (many)
Cyflumetofen	Nalta	13.7	35 & 21	0.015	0.010	0.010	0.3	0.3 (CAN,MEX)
Difenoconazole	Inspire Super	12	28	<0.01	<0.01	<0.01	5	0.01 (India)
Cyprodinil	Inspire Super	12	28	<0.01	<0.01	<0.01	1.7	0.05 (Vietnam)
Flutriafol	Topguard	10	28	0.012	0.011	<0.01	0.4	0.2 (Hong Kong)
Bifenazate	Acramite	16	28	0.015	0.028	0.015	0.7	0.2 (China)
Lambda-cyhalothrin	Warrior II	2.56	28	<0.05	<0.05	<0.05	0.3	0.2 (many)
Hexythiazox	Onager	20	28	0.014	0.016	0.013	0.4	0.4 (many)
Pyridaben	Nexter	6.6	28	0.022	0.023	0.015	0.5	0.5 (many)
Ziram*	Ziram 76DF	96	21	0.130	<0.1	<0.1	7	2.5 (Taiwan)
Fenpropathrin	Danitol	18	14	0.020	0.043	0.030	5	0.5 (Taiwan)
Thiophanate-methyl**	Topsin 4.5FL	16	14	<0.01	0.032	0.015	2	3 (many)

¹ Top markets for WA apples; 17 Sep 2015. <http://www.nwhort.org/AppleMRLs.html>, <https://www.globalmrl.com/>

* Dithiocarbamate residues cannot be directly measured; total Ziram values are estimates based on analysis of the degradation product CS₂

** Thiophanate-methyl values reported are sum totals of thiophanate-methyl and carbendazim residues

Results of this lone unreplicated trial are shared for informational purposes only and should not be construed as endorsements of any product, reflections of their efficacy against sunburn, any insect, acarid, or fungal pest, or a guarantee of similar results regarding residues for any user. Apple growers should consult their university extension staff, crop advisors, and warehouses to develop responsible pest control programs.

TRIAL DETAILS

- 8th leaf 'Pacific' Gala / M.9 Nic.29 trained to central leader/spindle on 3' x 10' spacing
- 2 x 25 gal Rears Pak-Blast sprayer calibrated to 100 gal / acre
- All pesticides applied with 8 oz Regulaid / 100 gal water / acre
- No precipitation recorded on site during trial
- Overhead cooling settings: 15 min. on/15 min. off from noon to 6PM from start of trial (July 16) to harvest (Aug 19) at a rate of 0.11"/hour for an approx. total of 11" of water applied throughout the study

Measured residues vs. maximum residue levels (MRLs) for uniformly applied **AGGRESSIVE** pesticide programs utilizing maximum rates, and minimum preharvest and retreatment intervals on apples with no additional treatment (Control), overhead cooling (OHC), Raynox (320 oz/a) or Eclipse (3 gal/a) applied at 35 and 14 dbh. 'Gala'/M.9 Nic.29, Rock Island, WA. WTFRC 2015.

Chemical name	Trade name	Application rate	Application timing(s)	Control fruit	OHC fruit	Raynox treated fruit	Eclipse treated fruit	US MRL ¹	Lowest export MRL ¹
		oz per acre	dbh	ppm	ppm	ppm	ppm	ppm	ppm
Penthiopyrad	Fontelis	20	35 & 28	0.015	<0.01	0.011	<0.01	0.5	0.4 (many)
Hexythiazox	Onager	24	28	0.020	0.014	0.016	0.013	0.4	0.4 (many)
Pyridaben	Nexter	10.67	28	0.041	0.034	0.029	0.029	0.5	0.5 (many)
Lambda-cyhalothrin	Warrior II	2.56	28 & 21	<0.05	<0.05	<0.05	<0.05	0.3	0.2 (many)
Flutriafol	Topguard	12	28 & 14	0.023	0.023	0.019	0.015	0.4	0.2 (Hong Kong)
Fenpropathrin	Danitol	21.3	28 & 14	0.120	0.120	0.120	0.074	5	0.5 (Taiwan)
Difenoconazole	Inspire Super	12	21 & 14	<0.01	<0.01	<0.01	<0.01	5	0.01 (India)
Cyprodinil	Inspire Super	12	21 & 14	<0.01	<0.01	<0.01	<0.01	1.7	0.05 (Vietnam)
Flubendiamide	Tourismo	17	21 & 14	0.057	0.059	0.042	0.040	1.5	0.8 (many)
Buprofezin	Tourismo	17	21 & 14	0.024	0.027	0.025	0.014	3	1 (Taiwan)
Fluopyram	Luna Sensation	5.8	21 & 14	0.010	0.012	<0.01	<0.01	0.3	0.3 (CAN,MEX)
Trifloxystrobin	Luna Sensation	5.8	21 & 14	<0.01	<0.01	<0.01	<0.01	0.5	0.5 (CAN, MEX)
Emamectin benzoate	Proclaim	4.8	21 & 14	<0.01	<0.01	<0.01	<0.01	0.025	0.02 (many)
Myclobutanil	Rally 40WSP	10	21 & 14	0.032	0.029	0.024	0.018	0.5	0.5 (many)
Spirotetramat	Ultor	14	21 & 7	0.038	0.022	0.024	0.022	0.7	0.7 (many)
Cyflumetofen	Nealta	13.7	21 & 7	0.037	0.026	0.027	0.016	0.3	0.3 (CAN,MEX)
Spinosad	Entrust	3	21 & 7	0.035	0.031	0.048	0.022	0.2	0.1 (many)
Etoazole	Zeal	3	14	0.016	0.020	0.020	0.012	0.2	0.07 (many)
Ziram*	Ziram 76DF	128	14	<0.1	0.120	<0.1	<0.1	7	2.5 (Taiwan)
Metrafenone	Vivando	15.4	14 & 7	<0.01	<0.01	<0.01	<0.01	1.5	0.01 (Taiwan)
Cyantraniliprole	Exirel	20.5	14 & 5	0.032	0.040	0.035	0.027	1.5	0.8 (many)
Spirodiclofen	Envidor 2SC	18	7	0.065	0.047	0.058	0.033	0.8	0.8 (many)
Bifenazate	Acramite	16	7	0.029	0.018	0.033	0.030	0.7	0.2 (China)
Thiophanate-methyl**	Topsin 4.5FL	20	7 & 1	0.099	0.082	0.111	0.100	2	3 (many)
Pyraclostrobin	Merivon	5.5	7 & 1	0.053	0.036	0.050	0.036	1.5	0.5 (many)
Fluxapyroxad	Merivon	5.5	7 & 1	0.056	0.043	0.057	0.040	0.8	0.8 (CAN,MEX)

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** Thiophanate-methyl values reported are sum totals of thiophanate-methyl and carbenzadim residues

CONCLUSIONS

As expected, residues measured for all pesticides were well beneath EPA tolerances for domestic fruit, but for the first time in 5 years, **no residues were found in excess of any MRL for a major export market** for WA apples. Credit for this result lies in both the continued relaxation and standardization of MRLs in several foreign markets which formerly held more stringent standards as well as the incidence of lighter residues (relative to previous findings) for many products, particularly fungicides. While our study experienced normal wind conditions and no rainfall this year, intense heat and sunshine throughout the trial may have accelerated the UV degradation of sensitive chemistries this year, producing lesser residue levels. As in previous studies, the application of Raynox, Eclipse, or overhead cooling did not significantly affect pesticide residues. Reports from previous pesticide residue studies on apple and cherry which provide a broader context for these results are available on the WTFRC website at www.treefruitresearch.com. For more resources on MRLs, visit the Northwest Horticultural Council website, www.nwhort.org.

For more information, contact Tory Schmidt (509) 669-3903 or email tory@treefruitresearch.com

