

# 2013 WTFRC APPLE PESTICIDE RESIDUE STUDY



Visible residues of Control (L), Raynox (C), and Eclipse (R) treated fruit

For the third consecutive year, the Washington Tree Fruit Research Commission (WTFRC) conducted a trial to evaluate pesticide residues in 'Gala' at the WSU Sunrise Research Orchard near Rock Island, WA. Fourteen insecticide/acaricides and eight 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. Plots from both protocols were divided for one of three additional factorial treatments: 1.

No sunburn protection (control) 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. 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 no sunburn protectant (control), Raynox (320 oz/a) or Eclipse (3 gal/a) applied at 35 and 14 dbh. 'Gala'/M.9 Nic.29, Rock Island, WA. WTFRC 2013.**

Chemical name	Trade name	Application rate	Application timing(s)	Control fruit	Raynox treated fruit	Eclipse treated fruit	US MRL <sup>1</sup>	Lowest export MRL <sup>1</sup>
		oz per acre	DBH	ppm	ppm	ppm	ppm	ppm
Carbaryl	Carbaryl 4L	96	Petal Fall & 10mm	<0.01	<0.01	<0.01	12	0.01 (UAE)
Penthiopyrad	Fontelis	20	35	0.021	0.026	0.018	0.5	0.5 (many)
Endosulfan*	Thionex 50W	64	35	<0.01	<0.01	<0.01	1	0.05 (UAE)
Methoxyfenozide	Intrepid	16	35	0.19	0.21	0.17	1.5	1.5 (many)
Acetamiprid	Assail 70WP	3.4	35	0.021	0.045	<0.01	1	0.7 (EU)
Flubendiamide	Tourismo	16	35	0.064	0.054	<0.01	1.5	0.8 (many)
Buprofezin	Tourismo	16	35	0.037	0.037	<0.01	3	1 (TAI)
Chlorantranilprole	Altacor	4.5	35	0.031	0.037	<0.01	1.2	0.4 (many)
Diazinon	Diazinon 50W	64	35	<b>0.033</b>	<b>0.032</b>	<0.01	0.5	0.01 (EU)
Imidacloprid	Nuprid 2SC	6	35	<0.01	<0.01	<0.01	0.5	0.5 (many)
Triflumizole	Procure 480SC	14	35	<0.01	<0.01	<0.01	0.5	0.5 (many)
Spirotetramat	Ultor	14	35	<0.01	<0.01	<0.01	0.7	0.7 (many)
Fluopyram	Luna Sensation	5.5	35	0.019	0.020	0.018	0.3	0.3 (MEX)
Trifloxystrobin	Luna Sensation	5.5	35	<0.01	<0.01	<0.01	0.5	0.5 (MEX)
Etoxazole	Zeal	2	35	0.017	0.017	<0.01	0.2	0.07 (many)
Spiridoclofen	Envidor 2SC	18	35	0.047	0.051	<0.01	0.8	0.8 (many)
Spinetoram	Delegate WG	7	35 & 21	<0.01	<0.01	<0.01	0.2	0.05 (many)
Difenoconazole	Inspire Super	12	28	<0.01	<0.01	<0.01	1	0.01 (INDIA)
Cyprodinil	Inspire Super	12	28	<0.01	<0.01	<0.01	1.7	0.05 (many)
Flutriafol	Topguard	10	28	<b>0.027</b>	<b>0.043</b>	<b>0.036</b>	0.4	0.01 (TAI)
Bifenazate	Acramite	16	28	<0.01	<0.01	<0.01	0.75	0.2 (CHINA)
Lambda-cyhalothrin	Warrior II	2.56	28	<0.05	<0.05	<0.05	0.3	0.1 (EU)
Ziram**	Ziram 76DF	96	21	<b>1.23</b>	<b>0.38</b>	<b>0.54</b>	7	0.1 (EU)
Fenpropathrin	Danitol	18	14	<b>0.14</b>	<b>0.13</b>	<b>0.17</b>	5	0.01 (EU)
Pyraclostrobin	Pristine	14	14	0.043	0.035	0.090	1.5	0.5 (many)
Boscalid	Pristine	14	14	0.13	0.15	0.15	3	2 (many)

<sup>1</sup> Major markets for WA apples; 27 Sep 2013. <http://www.nwhort.org/AppleMRLs.html>

\* Endosulfan values reported are sum totals of Endosulfan I, Endosulfan II, and Endosulfan sulfate residues

\*\* Dithiocarbamate residues cannot be directly measured; total Ziram values are estimates based on analysis of the degradation product CS<sub>2</sub>

**\*\*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 with their university extension staff, crop advisors, and warehouses to develop responsible pest control programs.**

## TRIAL DETAILS

- 7<sup>th</sup> 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
- Nearly 2" rain recorded during trial, including 0.73" on August 4 (17 days before harvest) and 1.04" on August 10 (11 DBH)

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 sunburn protectant (control), Raynox (320 oz/a) or Eclipse (3 gal/a) applied at 35 and 14 dbh. 'Gala'/M.9 Nic.29, Rock Island, WA. WTFRC 2013.

Chemical name	Trade name	Application rate	Application timing(s)	Control fruit	Raynox treated fruit	Eclipse treated fruit	US MRL <sup>1</sup>	Lowest export MRL <sup>1</sup>
		oz per acre	DBH	ppm	ppm	ppm	ppm	ppm
Carbaryl	Carbaryl 4L	96	Petal Fall & 10mm	<0.01	<0.01	<0.01	12	0.01 (UAE)
Penthiopyrad	Fontelis	20	35 & 28	0.034	0.029	0.021	0.5	0.5 (many)
Endosulfan*	Thionex 50W	64	35 & 21	<b>0.113</b>	<b>0.096</b>	<b>0.115</b>	1	0.05 (UAE)
Diazinon	Diazinon 50W	64	35 & 21	<b>0.097</b>	<b>0.063</b>	<b>0.120</b>	0.5	0.01 (EU)
Lambda-cyhalothrin	Warrior II	2.56	28 & 21	<0.05	<0.05	<0.05	0.3	0.1 (EU)
Methoxyfenozide	Intrepid	16	28 & 14	0.11	0.12	0.13	1.5	1.5 (many)
Flutriafol	Topguard	12	28 & 14	<b>0.037</b>	<b>0.039</b>	<b>0.031</b>	0.4	0.01 (TAI)
Fenpropathrin	Danitol	21.3	28 & 14	<b>0.21</b>	<b>0.20</b>	<b>0.20</b>	5	0.01 (EU)
Triflumizole	Procure 480SC	16	21 & 14	0.049	0.034	0.041	0.5	0.5 (many)
Difenoconazole	Inspire Super	12	21 & 14	<b>0.042</b>	<b>0.043</b>	<b>0.059</b>	1	0.01 (INDIA)
Cyprodinil	Inspire Super	12	21 & 14	<b>0.08</b>	<b>0.06</b>	<b>0.10</b>	1.7	0.05 (many)
Flubendiamide	Tourismo	17	21 & 14	0.24	0.20	0.28	1.5	0.8 (many)
Buprofezin	Tourismo	17	21 & 14	0.17	0.13	0.18	3	1 (TAI)
Fluopyram	Luna Sensation	5.8	21 & 14	0.072	0.071	0.083	0.3	0.3 (MEX)
Trifloxystrobin	Luna Sensation	5.8	21 & 14	0.032	0.025	0.033	0.5	0.5 (MEX)
Acetamiprid	Assail 70WP	3.4	21 & 8	0.11	0.16	0.11	1	0.7 (EU)
Spirotetramat	Ultror	14	21 & 8	0.13	0.19	0.14	0.7	0.7 (many)
Imidacloprid	Nuprid 2SC	6.4	21 & 8	0.046	0.053	0.038	0.5	0.5 (many)
Etoxazole	Zeal	3	14	<0.01	<0.01	<0.01	0.2	0.07 (many)
Ziram**	Ziram 76DF	128	14	<b>1.37</b>	<b>2.41</b>	<b>1.91</b>	7	0.1 (EU)
Spinetoram	Delegate WG	7	14 & 8	0.043	0.042	0.029	0.2	0.05 (many)
Chlorantraniliprole	Altacor	4.5	14 & 5	0.14	0.17	0.13	1.2	0.4 (many)
Spiridoclofen	Envidor 2SC	18	8	0.29	0.35	0.27	0.8	0.8 (many)
Bifenazate	Acramite	16	8	<b>0.42</b>	<b>0.27</b>	<b>0.43</b>	0.75	0.2 (CHINA)
Pyraclostrobin	Pristine	18.5	8 & 1	0.45	0.37	0.36	1.5	0.5 (many)
Boscalid	Pristine	18.5	8 & 1	0.73	0.83	0.86	3	2 (many)

<sup>1</sup> Major markets for WA apples; 27 Sep 2013. <http://www.nwhort.org/AppleMRLs.html>

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## CONCLUSIONS

No application pattern of any pesticide evaluated produced residues which exceed US tolerances, regardless of use of sunburn protectants. **Standard** application programs of **Diazinon 50W, Topguard, Ziram 76DF, and Danitol** resulted in residues which exceeded MRLs for some conservative foreign markets, as did **aggressive** application programs of **Thionex 50W, Diazinon 50W, Topguard, Danitol, Inspire Super, Ziram 76DF, and Acramite**. Unlike the influence of rain protectants in a 2013 cherry residue study, application of two common sunburn protectants on apple generally did not significantly increase detectable pesticide residues. In fact, residues of several compounds in the industry standard pesticide protocol that were detected in control and Raynox plots were below the levels of quantitation in the Eclipse plot; it is unclear at this point if components of Eclipse interacted with those residues or if this pattern is a one-time anomaly. Results 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](http://www.treefruitresearch.com). For more resources on MRLs, visit the Northwest Horticultural Council website, [www.nwhort.org](http://www.nwhort.org).

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