CONTINUNING PROJECT REPORT **YEAR**: 2017

Project Title: Pesticide residues on apple

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Budget 1:
Organization Name: WTFRC **Contract Administrator:** Kathy Coffey
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Year	**2017**
Salaries	3500
Benefits	1000
Wages	1000
Benefits	300
Equipment	200
Supplies	200
Travel	1000
Analytical lab fees	3360
TOTAL	$10,560

Footnotes: Supply costs primarily covered by private industry cooperators
Travel includes costs for hauling spray equipment to trial site and delivery of samples to Portland

NOTE: Budget for informational purposes only; research is funded through WTFRC internal program

2017 WTFRC APPLE PESTICIDE RESIDUE STUDY

Since 2011, the Washington Tree Fruit Research Commission (WTFRC) has conducted annual trials to evaluate pesticide residues on 'Gala' apples. This year, we applied seven insecticide/acaricides and five fungicides with a Rears airblast sprayer according to either an "aggressive" protocol intended to generate the highest possible residues while observing label guidelines (maximum label rates at minimum retreatment and pre-harvest intervals) or a "standard" protocol following more typical industry use patterns for rates and timings. Each treatment protocol was sprayed at both 100 (concentrate) and 200 (dilute) gallons of water per acre with a Rears Pak-Blast sprayer while holding the rate of pesticide per acre constant. Fruit samples were collected at commercial maturity on September 6 and delivered the next day to Pacific Agricultural Labs (Sherwood, OR) for chemical residue analysis.

TRIAL DETAILS

- 10th 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 or 200 gal / acre
- All pesticides applied with 8 oz Regulaid / 100 gal water / acre
- No measurable precipitation recorded during trial except 0.08" of rain on Sept 13 (24 days before harvest)

Measured residues vs. maximum residue levels (MRLs) for uniformly applied STANDARD industry apple pesticide programs in 100 or 200 gal water/acre utilizing typical rates, timings, and retreatment intervals. 'Gala'/M.9 Nic.29, Rock Island, WA. WTFRC 2017.

Chemical name	Trade name	Application rate	Application timing(s)	100 gal/acre	200 gal/acre	US MRL[1]	Lowest export MRL[1]
		oz per acre	*dbh*	*ppm*	*ppm*	*ppm*	*ppm*
Etoxazole	Zeal	2	35	0.019	0.011	0.2	0.07 (many)
Fluxapyroxad	Merivon	5.5	35	0.037	0.020	0.8	0.05 (India)
Pyraclostrobin	Merivon	5.5	35	0.023	0.011	1.5	0.5 (many)
Cyantraniliprole	Exirel	13.5	35 & 21	0.11	0.048	1.5	0.8 (many)
Spinosad	Entrust	3	35 & 21	0.016	0.01	0.2	0.1 (many)
Cyflumetofen	Nealta	13.7	35 & 21	0.01	<0.01	0.3	0.3 (CAN, MEX)
Novaluron	Rimon	32	35 & 21	0.35	0.18	3	2 (CAN, TAI)
Difenoconazole	Inspire Super	12	28	0.018	0.012	5	0.5 (China)
Cyprodinil	Inspire Super	12	28	0.040	0.022	1.7	0.05 (INDO)
Flutriafol	Topguard	10	28	0.027	0.019	0.4	0.2 (Hong Kong)
Bifenazate	Acramite	16	28	0.027	0.012	0.7	0.2 (China)
Ziram*	Ziram 76DF	96	21	<0.1	<0.1	7	2.5 (Taiwan)
Fenpropathrin	Danitol	18	14	**0.21**	**0.12**	5	0.01 (SAU, UAE)
Thiophanate-methyl**	Topsin 4.5FL	16	14	0.074	0.047	2	2 (Mexico)

[1] Top markets for WA apples with established MRLs; 3 October 2017. 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 CS_2

** Thiophanate-methyl values reported are sum totals of thiophanate-methyl and carbenzadim 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 any insect, acarid, or fungal pest, or a guarantee of similar results regarding residues for any user. Apple growers should consult their extension team members, crop advisors, and warehouses to develop responsible pest control programs.

Measured residues vs. maximum residue levels (MRLs) for uniformly applied AGGRESSIVE industry apple pesticide programs in 100 or 200 gal water/acre utilizing maximum labeled rates, and minimum preharvest and retreatment intervals. 'Gala'/M.9 Nic.29, Rock Island, WA. WTFRC 2017.

Chemical name	Trade name	Application rate	Application timing(s)	100 gal/acre	200 gal/acre	US MRL[1]	Lowest export MRL[1]
		oz per acre	*dbh*	*ppm*	*ppm*	*ppm*	*ppm*
Fenpropathrin	Danitol	21.3	28 & 14	**0.54**	**0.31**	5	0.01 (SAU, UAE)
Novaluron	Rimon	50	28 & 14	0.46	0.44	3	2 (CAN, TAI)
Difenoconazole	Inspire Super	12	21 & 14	0.068	0.030	5	0.5 (China)
Cyprodinil	Inspire Super	12	21 & 14	**0.15**	**0.064**	1.7	0.05 (Indonesia)
Flutriafol	Topguard	13	21 & 14	0.11	0.051	0.4	0.2 (Hong Kong)
Cyflumetofen	Nealta	13.7	21 & 7	0.063	0.036	0.3	0.3 (CAN, MEX)
Spinosad	Entrust	3	21 & 7	0.055	0.033	0.2	0.1 (many)
Etoxazole	Zeal	3	14	0.050	0.026	0.2	0.07 (many)
Ziram*	Ziram 76DF	128	14	**2.6**	0.64	7	2.5 (Taiwan)
Cyantraniliprole	Exirel	20.5	14 & 5	0.25	0.10	1.5	0.8 (many)
Bifenazate	Acramite	16	7	0.06	0.022	0.7	0.2 (China)
Fluxapyroxad	Merivon	5.5	7 & 1	**0.095**	**0.055**	0.8	0.05 (India)
Pyraclostrobin	Merivon	5.5	7 & 1	0.089	0.050	1.5	0.5 (many)
Thiophanate-methyl**	Topsin 4.5FL	20	7 & 1	0.40	0.17	2	2 (Mexico)

[1] Top markets for WA apples with established MRLs; 3 October 2017. http://www.nwhort.org/AppleMRLs.html, https://www.globalmrl.com/

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CONCLUSIONS

We found no residue level for any pesticide in 2017 that was close to tolerances set by the US Environmental Protection Agency; this result has been consistent throughout seven years of trials and clearly affirms that residues produced by any grower following label instructions should be fully compliant for domestic markets. Several products we tested produced **residues which exceed Maximum Residue Levels** (MRLs) set in important export markets for Washington apples including **Danitol, Inspire Super, Ziram, and Merivon**. These findings generally have less to do with risk associated with any of these products than the fact that some foreign markets have established very low tolerances for those particular active ingredients.

In our first year of comparing effects of concentrate vs. dilute spraying (100 vs. 200 gal/acre) of the same rate per acre of pesticides, the results indicate that concentrate applications generally produce higher residues, perhaps because extra water in the spray mix encouraged excessive rinsing and/or runoff of pesticides from fruit surfaces. This trend may not have been as clear in older, denser orchard canopies where additional water volume may be needed to provide adequate spray coverage. In contrast, preliminary results in a 2016 cherry study showed that dilute applications (400 gal/acre) tended to produce slightly higher residues than concentrated applications (200 gal/acre) in large, open-center Bing/Mazzard trees with dense canopy structures. Further study is warranted in both cases before drawing firm conclusions regarding carrier volume effects on pesticide residue levels.

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. We encourage growers and consultants to stay abreast of current information on international MRLs, which often change in response to trade negotiations and/or political developments. For more information, visit the Northwest Horticultural Council website, www.nwhort.org.

WASHINGTON TREE FRUIT RESEARCH COMMISSION

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