

2023 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 seventeen insecticide/acaricides, six fungicides, and one plant growth regulator according to either an "aggressive" protocol intended to generate the highest possible residues while observing label guidelines (maximum rates at minimum retreatment and pre-harvest intervals) or a "standard" protocol following more typical industry use patterns for rates and timings. Fruit samples were collected at commercial maturity on September 7 and delivered the next day to Pacific Agricultural Labs (Sherwood, OR) for chemical residue analysis.



TRIAL DETAILS

- 16th 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
- A total of 1.17 inches of rain fell on the trial block after the initial application of Penncozeb (May 10), with 0.71 inches occurring after August 6 (39 days before harvest)

Measured residues vs. maximum residue levels (MRLs) for **STANDARD** industry apple pesticide programs in 100 water/acre utilizing typical rates, timings, and retreatment intervals. 'Gala'/M.9 Nic.29, Rock Island, WA. WTFRC 2023.

Chemical name	Trade name	Application rate <i>oz per acre</i>	Application timing(s) <i>dbh</i>	Measured residue <i>ppm</i>	US MRL ¹ <i>ppm</i>	India MRL ¹ <i>ppm</i>	Lowest export MRL ¹ <i>ppm</i>
mancozeb	Penncozeb 75DF	128 (8 lbs)	PF (May 10)	<0.49	0.6	3	0.6 (Mex)
ethephon	Ethephon 2SL	32	June 16	<0.1	5	0.01*	0.1 (Can)
flutianil	Gatten	8	35	0.014	0.15	0.01*	0.15 (many)
abamectin	AgriMek SC	4.25	35	<0.01	0.02	0.01*	0.01 (many)
benzovindiflupyr	Aprovia	7	35	0.043	0.2	0.01*	0.2 (many)
pydiflumetofen	Miravis	3.4	35	0.071	0.2	0.01*	0.2 (many)
tolfenpyrad	Bexar	27	35 & 21	0.61	1	0.01*	0.01 (Twn,Tha)
indoxacarb	Avaunt	6	35 & 21	0.15	1	0.01*	0.1 (Can)
flupyradifurone	Sivanto prime	14	35 & 21	0.39	0.7	0.01*	0.5 (Twn)
cyflufenamid	Torino	6.8	30	0.033	0.06	0.01*	0.01 (Tha)
acequinocyl	Kanemite	31	30	<0.025	0.4	0.01*	0.01 (Chn,Tha)
lambda-cyhalothrin	Warrior II	2.56	30	0.036	0.3	0.01*	0.2 (many)
flonicamid	Beleaf 50SG	2.8	30	0.069	0.2	0.01*	0.2 (many)
cyflumetofen	Nealta	13.7	30 & 14	0.23	0.3	0.01*	0.3 (Can,Mex)
sulfoxaflor	Transform	2.75	30 & 14	0.13	0.5	0.01*	0.3 (many)
chlorantraniliprole	Altacor eVo	2.2	30 & 14	0.20	1.2	0.01*	0.4 (many)
cyprodinil	AXIOS Cion	9	30 & 14	<0.01	1.7	0.01*	0.05 (Idn)
ipflufenquin	AXIOS Cion	9	30 & 14	0.041	0.15	0.01*	0.01 (Tha)
afidopyropen	Versys	3.5	30 & 14	<0.05	0.02	0.01*	0.02 (many)
buprofezin	Centaur WDG	34.5	21	0.043	3	0.01*	1 (Twn)
phosmet**	Imidan 70-W**	92	14	1.8	10	0.01*	2 (Twn)
mefentrifluconazole	Cevya	5	14	0.12	1.5	0.01*	0.01 (Tha)
cyclaniliprole	Verdepryn	11	14	0.056	0.3	0.01*	0.2 (many)
cyfluthrin	Baythroid XL	2.8	14	<0.05	0.5	0.01*	0.1 (many)
fenazaquin	Magister	36	14	0.40	0.6	0.2	0.01 (Tha)

¹ Top markets for WA apples with established MRLs; 14 November 2023. <https://nwhort.org/export-manual/>, <https://bcglobal.bryantchristie.com/>

*No tolerance posted; MRL is based on national default value (0.01 ppm in India)

**Imidan 70-W was mixed with a buffering agent to reduce tank pH to 5.5 per standard industry practice

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 **AGGRESSIVE** apple pesticide programs in 100 gal water/acre utilizing maximum labeled rates, and minimum preharvest intervals. 'Gala'/M.9 Nic.29, Rock Island, WA. WTFRC 2023.

Chemical name	Trade name	Application rate	Application timing(s)	Measured residue	US MRL ¹	India MRL ¹	Lowest export MRL ¹
		oz per acre	dbh	ppm	ppm	ppm	ppm
mancozeb	Penncozeb 75DF	128 (8 lbs)	70 (June 29)	1.8	0.6	3	0.6 (Mex)
benzovindiflupyr	Aprovia	7	35	0.034	0.2	0.01*	0.2 (many)
pydiflumetofen	Miravis	3.4	35	0.064	0.2	0.01*	0.2 (many)
acequinocyl	Kanemite	31	35 & 21	0.032	0.4	0.01*	0.01 (Chn,Tha)
abamectin	AgriMek SC	4.25	30	<0.01	0.02	0.01*	0.01 (many)
lambda-cyhalothrin	Warrior II	2.56	30 & 21	0.053	0.3	0.01*	0.2 (many)
flonicamid	Beleaf 50SG	2.8	30 & 21	0.029	0.2	0.01*	0.2 (many)
tolfenpyrad	Bexar	27	30 & 14	0.049	1	0.01*	0.01 (Twn,Tha)
flupyradifurone	Sivanto prime	14	30 & 14	0.18	0.7	0.01*	0.5 (Twn)
indoxacarb	Avaunt	6	21 & 14	0.082	1	0.01*	0.1 (Can)
flutianil	Gatten	8	21 & 14	0.019	0.15	0.01*	0.15 (many)
chlorantranlirole	Altacor eVo	2.2	21	0.11	1.2	0.01*	0.4 (many)
cyflaniliprole	Verdepryn	11	21 & 7	0.11	0.3	0.01*	0.2 (many)
cyflumetofen	Nealta	13.7	21 & 7	0.25	0.3	0.01*	0.3 (Can,Mex)
phosmet**	Imidan 70-W**	92	21 & 7	4.5	10	0.01*	2 (Twn)
cyflufenamid	Torino	6.8	14	0.043	0.06	0.01*	0.01 (Tha)
buprofezin	Centaur WDG	34.5	14	1.1	3	0.01*	1 (Twn)
afidopyropen	Versys	3.5	14 & 7	<0.05	0.02	0.01*	0.02 (many)
ethephon	Ethephon 2SL	48	14 & 7	0.90	5	0.01*	0.1 (Can)
sulfoxaflor	Transform	2.75	14 & 7	0.13	0.5	0.01*	0.3 (many)
cyprodinil	AXIOS Cion	9	14 & 7	<0.01	1.7	0.01*	0.05 (ldn)
ipflufenquin	AXIOS Cion	9	14 & 7	0.052	0.15	0.01*	0.01 (Tha)
fenazaquin	Magister	36	7	0.37	0.6	0.2	0.01 (Tha)
cyfluthrin	Baythroid XL	2.8	7	<0.05	0.5	0.01*	0.1 (many)
mefentrifluconazole	Cevya	5	7 & 1	0.37	1.5	0.01*	0.01 (Tha)

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**Imidan 70-W was mixed with a buffering agent to reduce tank pH to 5.5 per standard industry practice

CONCLUSIONS

With the exception of the mid-summer application of Penncozeb 75DF, no material produced a residue that exceeded the tolerance level set by the US Environmental Protection Agency; mancozeb products are rarely used on apples in WA, and usually applied in the spring. We included Penncozeb 75DF in these apple studies as a proxy for pears, where the use of mancozeb products are more common. No residues of mancozeb could be detected when it was applied at its more typical petal fall timing. Other than the late use of Penncozeb 75DF, these findings are further evidence that apple growers following directions on product labels should expect their fruit to be in full compliance for domestic sales regarding pesticide residues. Several products we tested did produce **residues which exceed Maximum Residue Levels (MRLs)** set in important export markets for Washington apples: **Penncozeb 75DF, Kanemite, Bexar, Avaunt, Imidan 70-W, Torino, Centaur WDG, Ethephon 2SL, AXIOS Cion, Magister, and Cevya**. India has yet to post tolerances for most pesticides used by WA apple growers; in the absence of a posted MRL, the default tolerance in India is 0.01 ppm, essentially meaning that any product which produced a detectable residue would potentially violate India's standards.

Results from this year's study produced no detectable residues of ethephon when applied to promote return bloom (June 16), but did find residue levels which could be problematic for apples to be exported to Canada when Ethephon 2SL was applied 14 & 7 days before harvest. This was the first year we applied ethephon at this preharvest timing and plan to repeat that treatment in 2024.

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.org. 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.



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