

MRLs: A Key Ingredient in MI Cherry Growers' Survival

Mark Whalon

Dept. of Entomology, MSU

NW Hort Folks, Growers, Colleagues, Students

John Wise, Nikki Rothwell, Larry Gut, Julianna Wilson, Bill Klein, Chris Vandervoort, Rosemary Bolton, Karen Powers, Kelly Kobberstad, Heather Leach, Blake Showers

Talk Outline

- **Difficulties with MRL compliance**
- **Consequences of MRL violation**
- **Residue degradation of 2014 key pesticides**
- **Residues: after-processing**
- **Conclusions**

MRL Compliance

- Today, only roadside Mkts. get-by w/out MRL scrutiny
- US Box Stores often do their own MRL testing (contractors)
- Exported fruit is randomly selected at foreign ports for residue analysis more and more...
- MRLs vary! Newer Materials country by country are not harmonized, sometimes for years!
 - US pesticide labels may not relate to US or Internat. MRL's!
 - Many times: US MRLs are much more lenient than others

Consequences of Violating MRLs

	Organization	Policy
E.U.	Each member country has their own.	The shipment is destroyed. If the violation poses a health risk, the supplier may be unable to export to the EU. If the violation occurs among other shipments from the same country, the EU may restrict imports from the country.
Australia	Australian Quarantine and Inspection Service	There are four options available on a case-by-case basis: treatment of food, re-export, destruction, or downgrading of food. If determined to be a health risk, it is not allowed into the market.
Canada	Canadian Food Inspection Agency	Five other shipments of the product are tested, and if all comply, no other restrictions are made. If a violation occurs among these five, the product is removed from the market and international regulatory action is pursued.
Japan	Japanese Customs along with The Ministry of Health, Labor and Welfare	Inspection is increased to 30% on the total commodity from the shipper's country. A second violation increases surveillance to 100%, and a hold is placed on all similar commodities from the same country. Increased surveillance stops once 60 samples comply with MRLs.
Korea	Korean Food and Drug Administration (KFDA)	The shipment may either be returned, destroyed, or used for other purposes. The following shipment of the same commodity by the same source is tested and KFDA determines if more testing is required.
Mexico	Federal Commission for the Protection against Sanitary Risks	Product would be refused or destroyed. The producer's practices would be monitored to determine the cause of violation
Taiwan	Bureau of Standards, Meteorology and Inspection	Inspection is increased to 20-50% for the commodity/country. If another violation occurs, inspection increases to 100%. If a third violation occurs, a plan of improvement is required, and if not satisfactory, suspension of the commodity may occur.
U.S.	Food and Drug Administration	The shipment is removed and the supplier/country may have increased inspections .

After MRL Violation Detected

How Can the Cherry Industry Reduce the Risk of MRL Violations?

- **Weather, chemical properties, and fruit handling all effect pesticide residue degradation**
 - Sunlight and heat normally = degradation
 - Any Systemic Insecticide close-to-harvest = danger...
- **If growers know the time-process of degradation, you can predict MRL risks...**

Pesticide Residues Factors

Product, Tank & Field Issues

- Chemistry's Characteristics
- Formulation Characteristics
- Rate (dosage), PHI's, Adjuvant
- Spray Equipment, Speed, etc.
- Mixture(s)
- Water pH, salinity, etc.
- Proximity to harvest
- Weather-
 Wind/Rain/Temp/Dew
- Orchard Characteristics

Handling/Process/Storage/Mkt

- Harvest & Handling
- Cooling Pad & Handling
- Cooling-Tank Time / Trans.
- Processor Handling
- Processing Procedures
- Holding & Storage
- Market Behavior
- Domestic / International

Insecticides Chosen for 2014 Cherry Studies

Trade Name	Active Ingredient	Manufacturer	PHI (days)	US MRL	Lowest Foreign MRL	Disparity Index*	Rate per Acre
Altacor 35WG	chlorantraniliprole	DuPont	10	2	1	2	4.5 oz..
Danitol 2.4 EC	fenpropathrin	Valent	3	5	0.01	500	21 1/3 FL oz.
Delegate 25WG	spinetoram	Dow AgroSciences	7	0.2	0.05	4	7 oz.
Exirel .83 SE	cyantraniliprole	DuPont	3	6	0.1	60	20.5 FL oz.
Imidan 70 WP	phosmet	Gowan	7	10	0.05	200	2.125 lb.

Insecticides were chosen based upon:

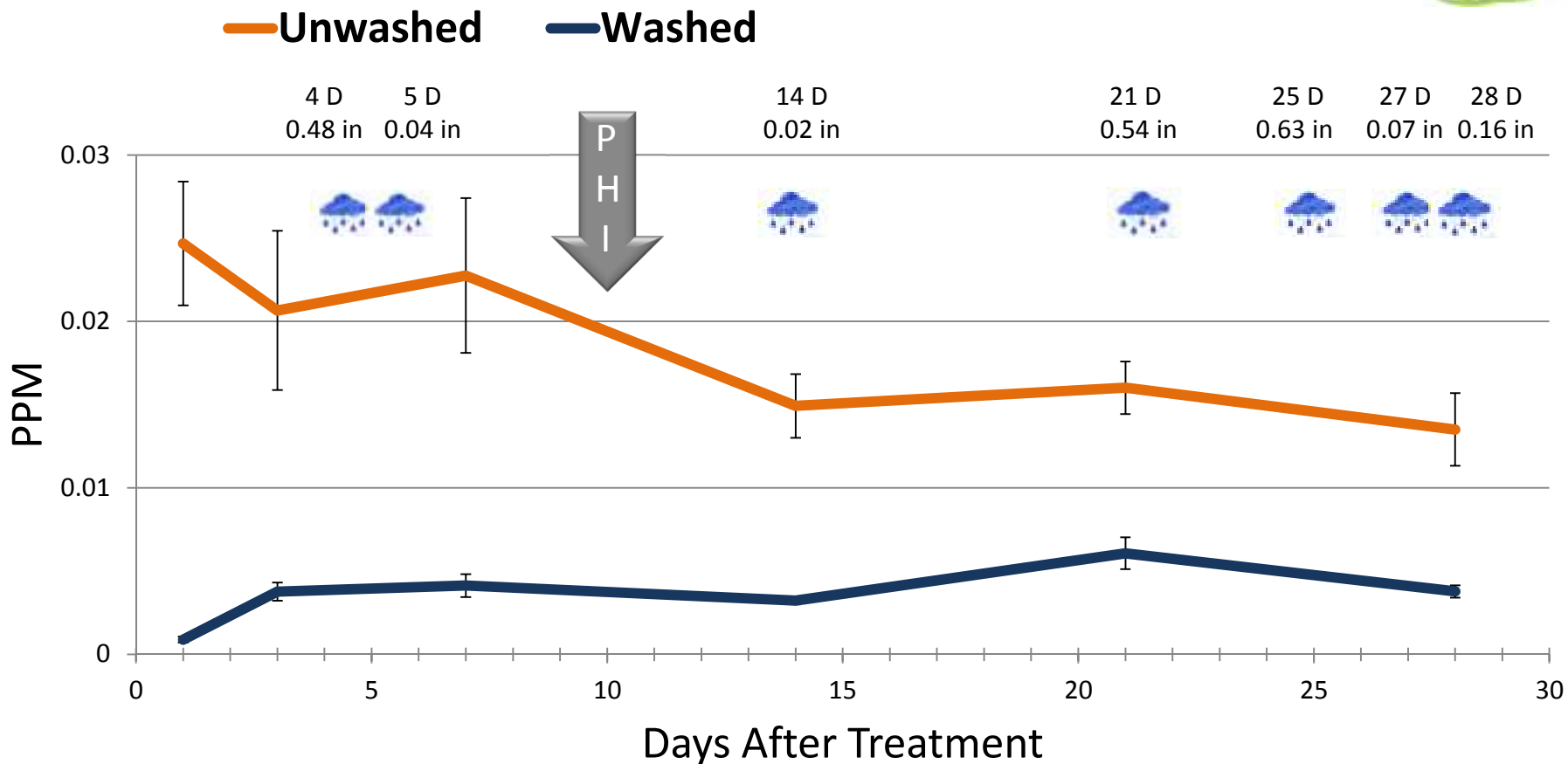
- 1.Their global MRL-disparity-index (US ppm/lowest export ppm)
- 2.Common use by growers
- 3.Efficacy against the invasive species SWD and BMSB

*Disparity index = US MRL/ lowest foreign MRL

2014: Better MRL Studies

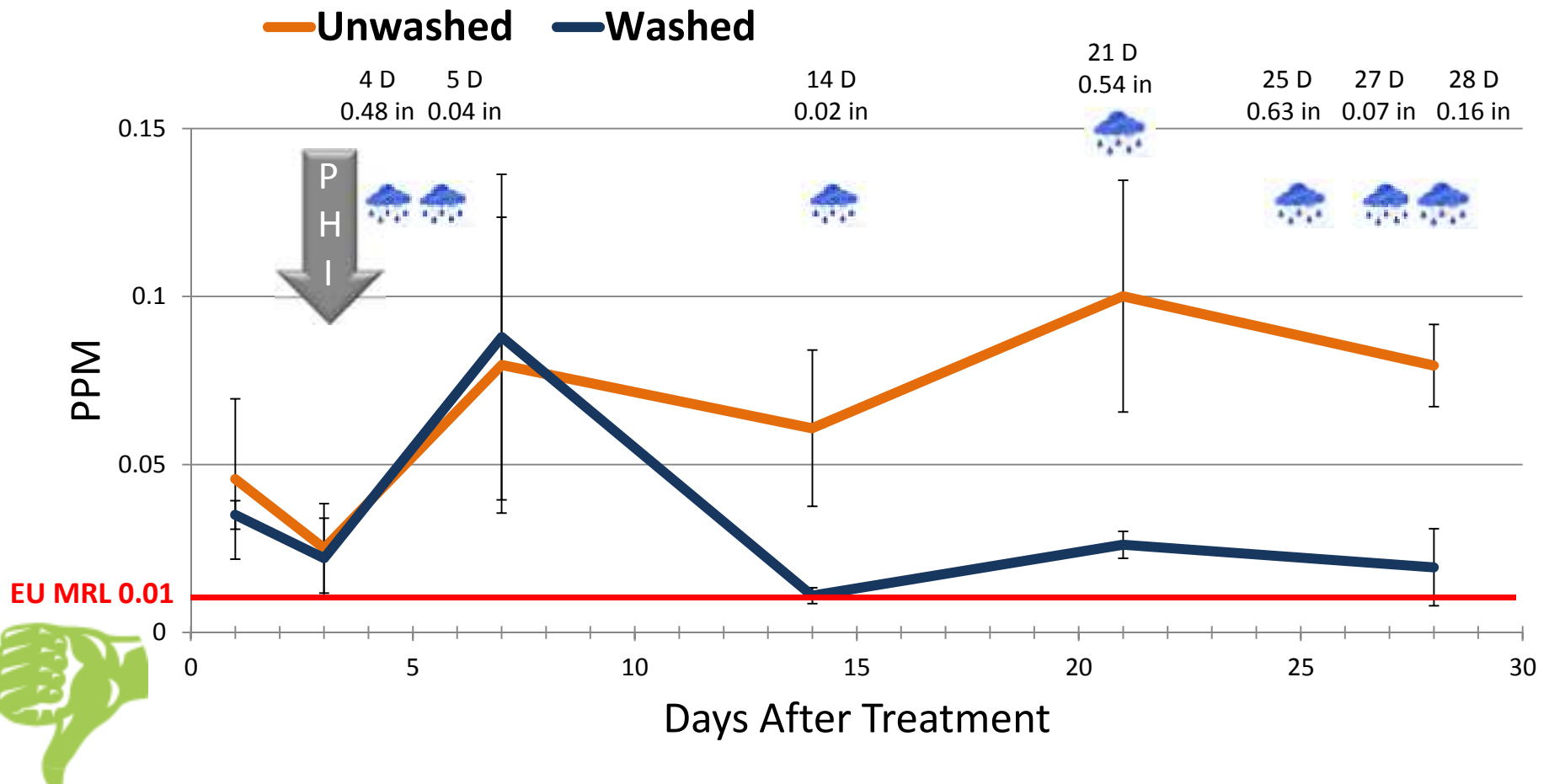
- **Field Reality:** Closest-to-Real-Field Conditions
- **Standard Field Pesticide Application**
- **Dry Harvest Vs Cooling Pad...**
- Experiment as “**Close as Possible**” to Processing
- Sufficient Grant \$\$\$ for at least 5 replicates
- At least **5 Time-Decay Samples** to Construct a **Real-as-Possible** Decay Curve for Each Pesticide
- Higher Priority **Residue Analysis** In-Lab
 - Data analysis = 6-9 weeks (no degradation in-situ...)

Altacor (Chlorantraniliprole) Residue Degradation



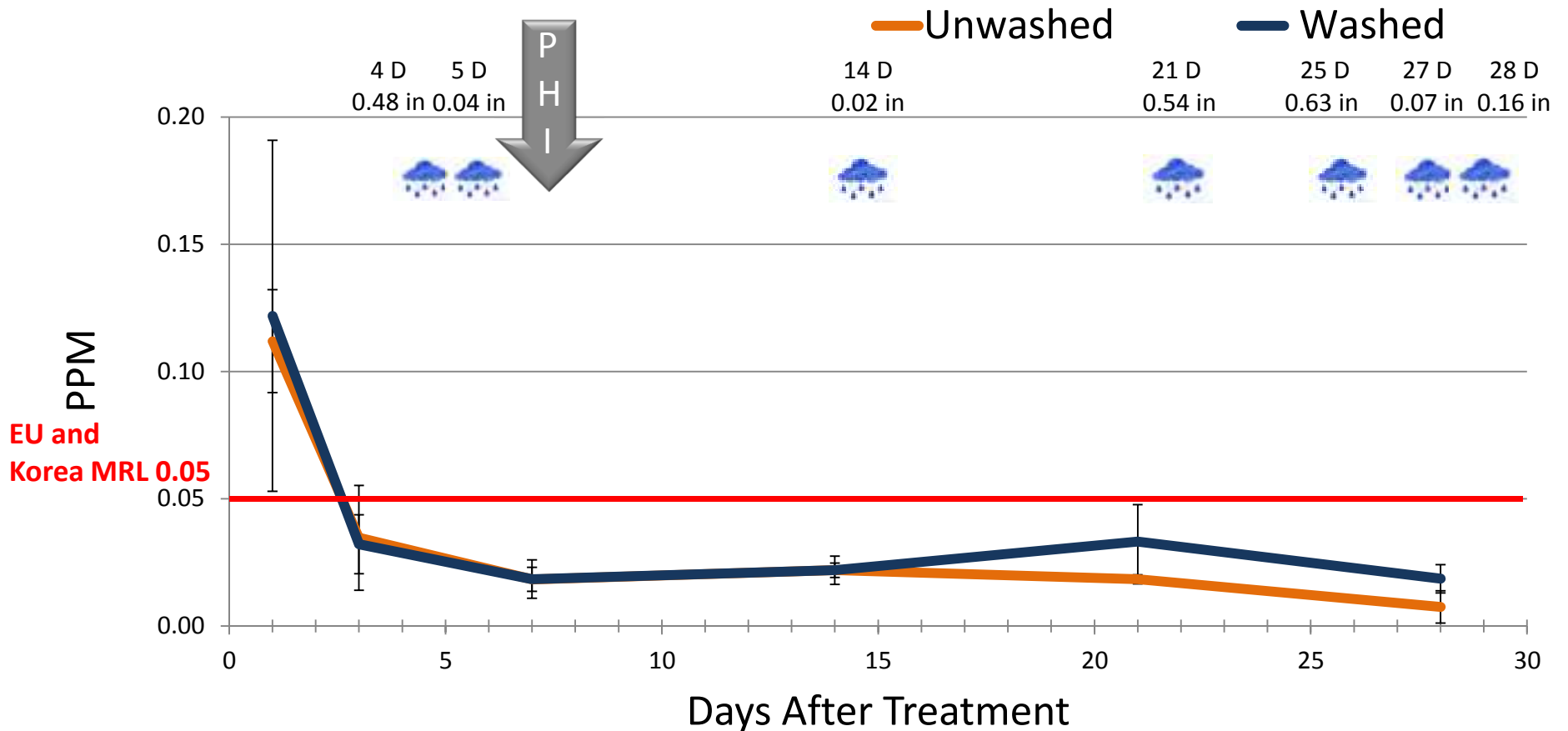
Active Ingredient	Trade Name	PHI	US MRL	Codex MRL	EU MRL	Australia MRL	Canada MRL	Japan MRL	Korea MRL	Mexico MRL	Taiwan MRL	Disparity Index
Chlorantraniliprole	Altacor	10	2	1	1	1	2.5	1	1	2	1	2.00

Danitol (Fenpropathrin) Residue Degradation



Active Ingredient	Trade Name	PHI	US MRL	Codex MRL	EU MRL	Australia MRL	Canada MRL	Japan MRL	Korea MRL	Mexico MRL	Taiwan MRL	Disparity Index
Fenpropathrin	Danitol	3	5	-	0.01	5	5	5	5	5	5	500

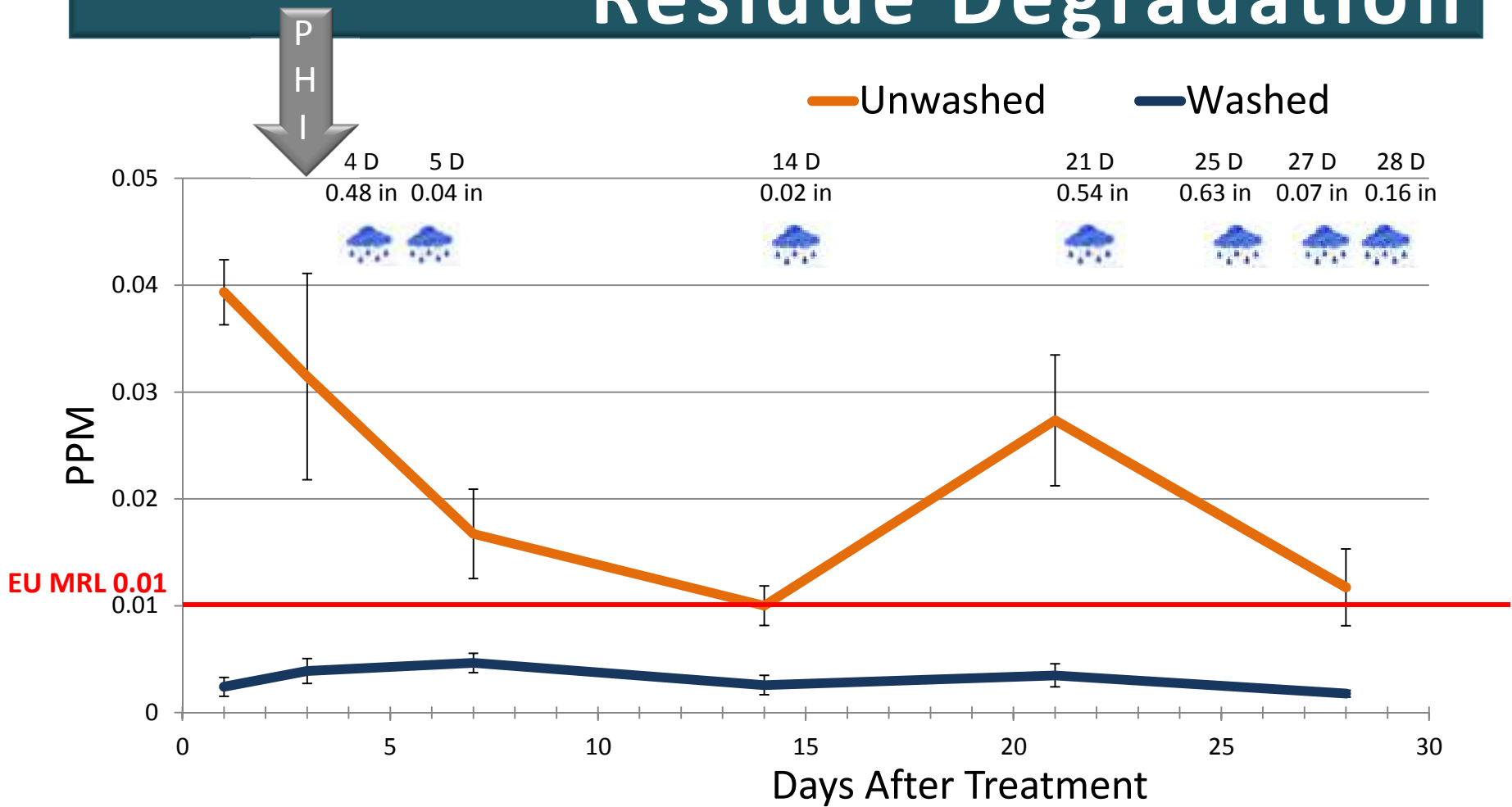
Delegate (Spinetoram) Residue Degradation



Active Ingredient	Trade Name	PHI	US MRL	Codex MRL	EU MRL	Australia MRL	Canada MRL	Japan MRL	Korea MRL	Mexico MRL	Taiwan MRL	Disparity Index
Spinetoram	Delegate	7	0.2	-	0.05	0.2	0.2	0.5	0.05	0.2	0.2	4.00

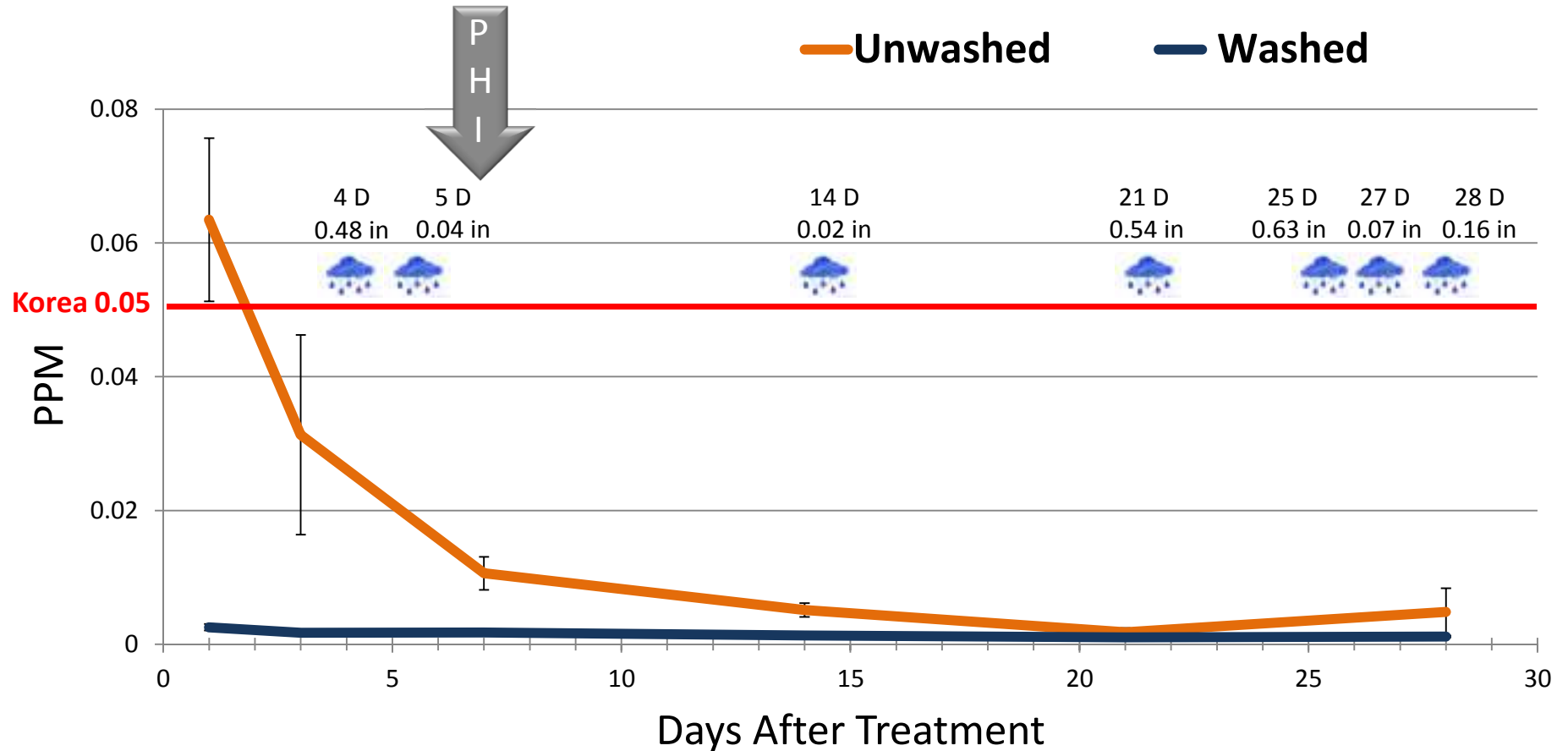


Exirel (Cyantraniliprole) Residue Degradation



Active Ingredient	Trade Name	PHI	US MRL	Codex MRL	EU MRL	Australia MRL	Canada MRL	Japan MRL	Korea MRL	Mexico MRL	Taiwan MRL	Disparity Index
Cyantraniliprole	Exirel	3	6	6	0.01	0.05	6	6	6	6	-	600

Imidan (Phosmet) Residue Degradation



Active Ingredient	Trade Name	PHI	US MRL	Codex MRL	EU MRL	Australia MRL	Canada MRL	Japan MRL	Korea MRL	Mexico MRL	Taiwan MRL	Disparity Index
Phosmet	Imidan	7	10	-	1	1	7	0.1	0.05	10	2	200

PHI Chart From 2014 Cherry Study

	Altacor Chlorantraniliprole			Danitol Fenpropathrin			Delegate Spinetoram			Exirel Cyantraniliprole			Imidan Phosmet		
	PHI	PHI	MRL	PHI	PHI	MRL	PHI	PHI	MRL	PHI	PHI	MRL	PHI	PHI	MRL
	Washed	Unwashed		Washed	Unwashed		Washed	Unwashed		Washed	Unwashed		Washed	Unwashed	
U.S.	14	14	2	14	14	5	7	7	0.2	3	3	6	7	7	10
E.U.	14	14	1	>28	>28	0.01	7	7	0.05	3	>28	0.01*	7	7	1
Australia	14	14	1	14	14	5	7	7	0.2	3	3	0.05	7	7	1
Canada	14	14	2.5	14	14	5	7	7	0.2	3	3	6	7	7	7
Japan	14	14	1	14	14	5	7	7	0.5	3	3	6	7	7	0.1
Korea	14	14	1	14	14	5	7	7	0.05	3	3	6	7	7	0.05
Mexico	14	14	2	14	14	5	7	7	0.2	3	3	6	7	7	10
Taiwan	14	14	1	14	14	5	7	7	0.2	>28	>28	-**	7	7	2

MRLs as of 1-5-2015 in ppm

Greater than established U.S. PHI

***EU has default MRL of 0.01**

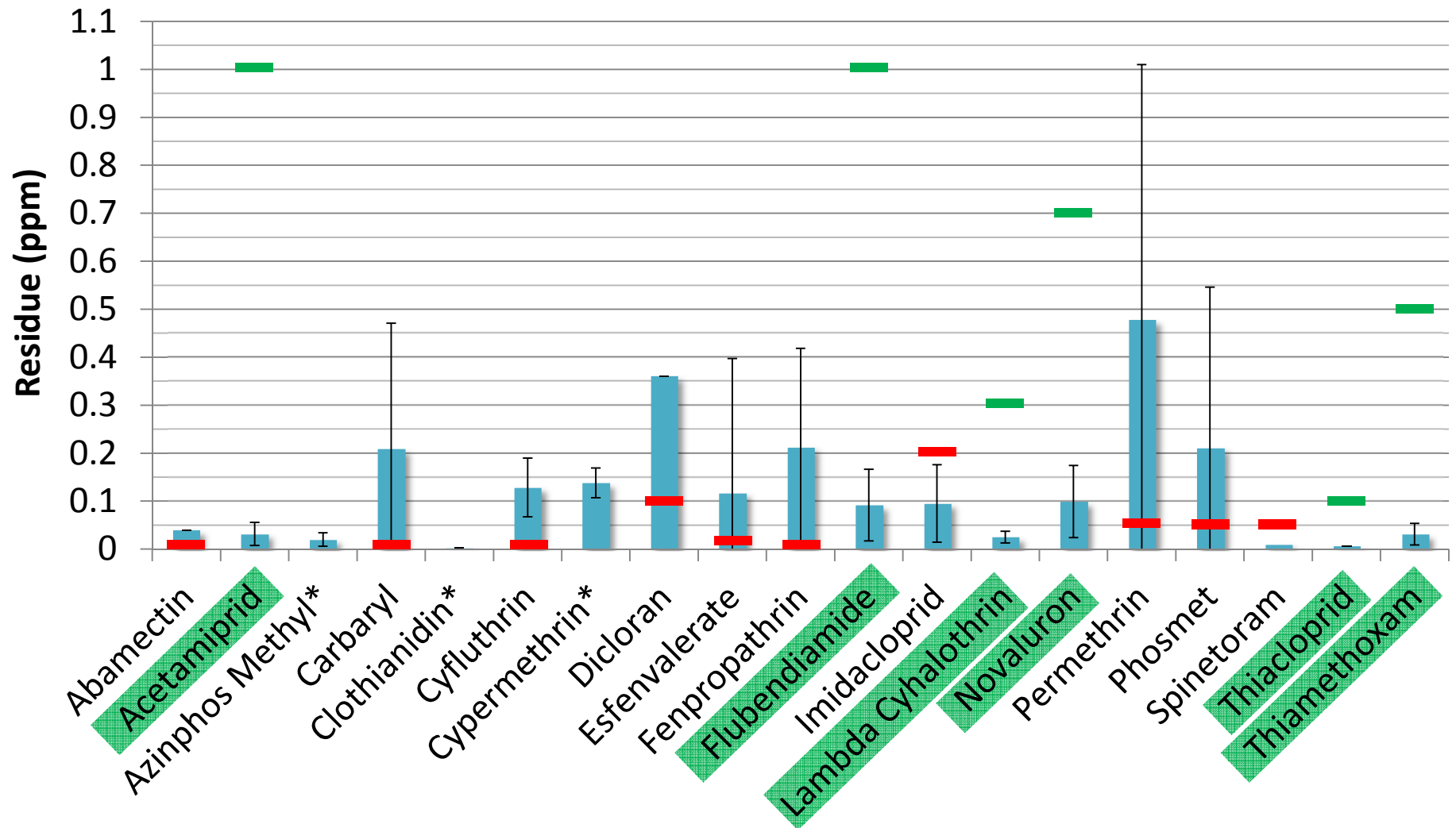
****When there is no established MRL, assume no detectable residues are allowed**

Residues Post Processing

- A majority of MI's cherries are processed
- How does processing affect residue degradation?
- Processed cherry residues have been received from different processing companies in MI
- The data summarized from residue reports from 2009 to 2014
 - Note that some chemicals detected are no longer registered for use in cherries.
- The following data include residues from multiple processing procedures...

Data were provided by 4 anonymous cherry processors...their contributions are greatly appreciated and truly exceptional! They are outstanding cooperators...!!!

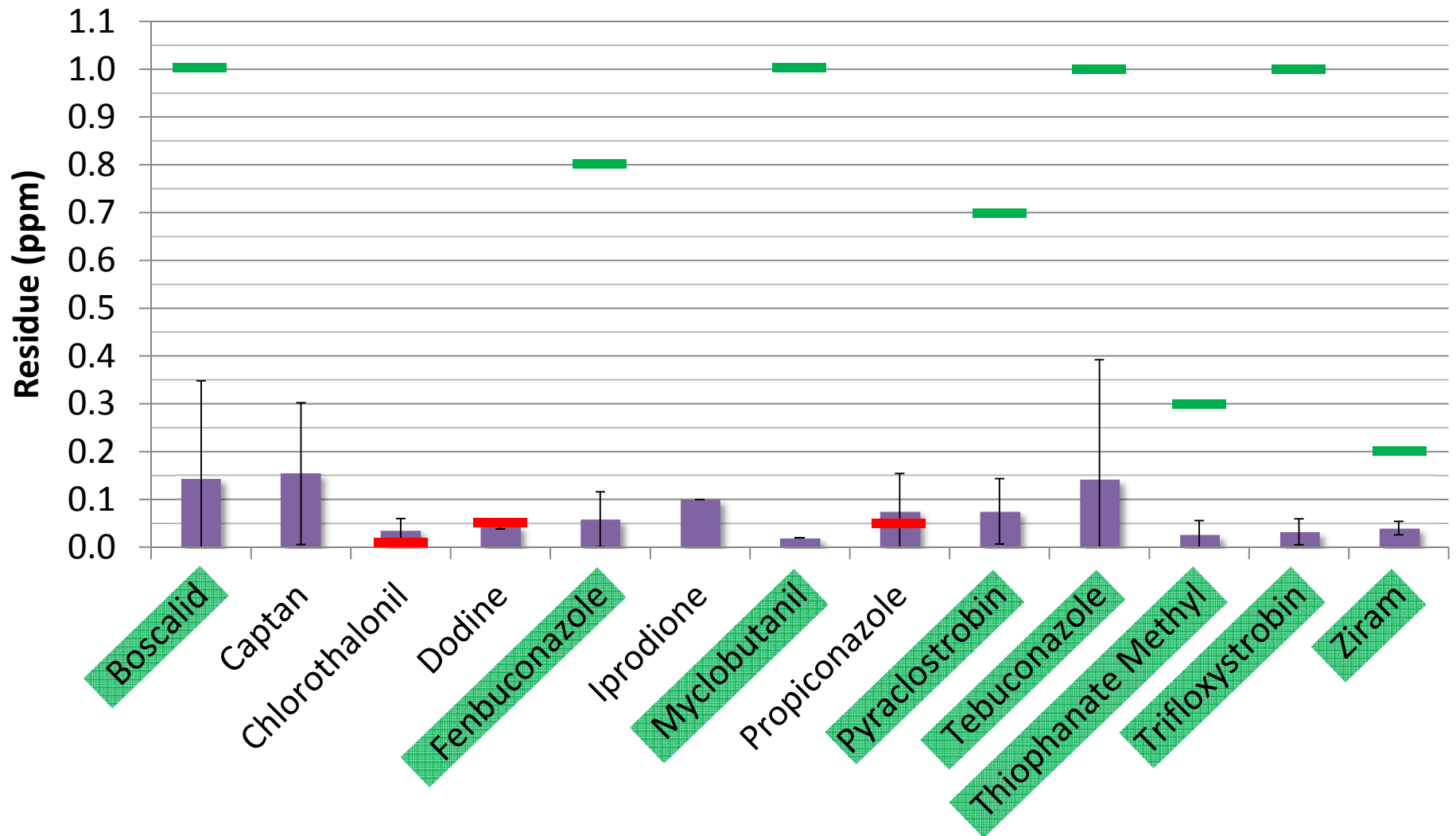
Average Insecticide Residue



The **red** lines represent the lowest foreign MRL for each chemical. The **green** lines denote that the processor's data showed no risk of MRL violations. The red lines denote that there are risks of MRL violations.

*mrlatabase.com does not have any listed MRLs for Azinphos-Methyl, Clothianidin, or Cypermethrin on cherries

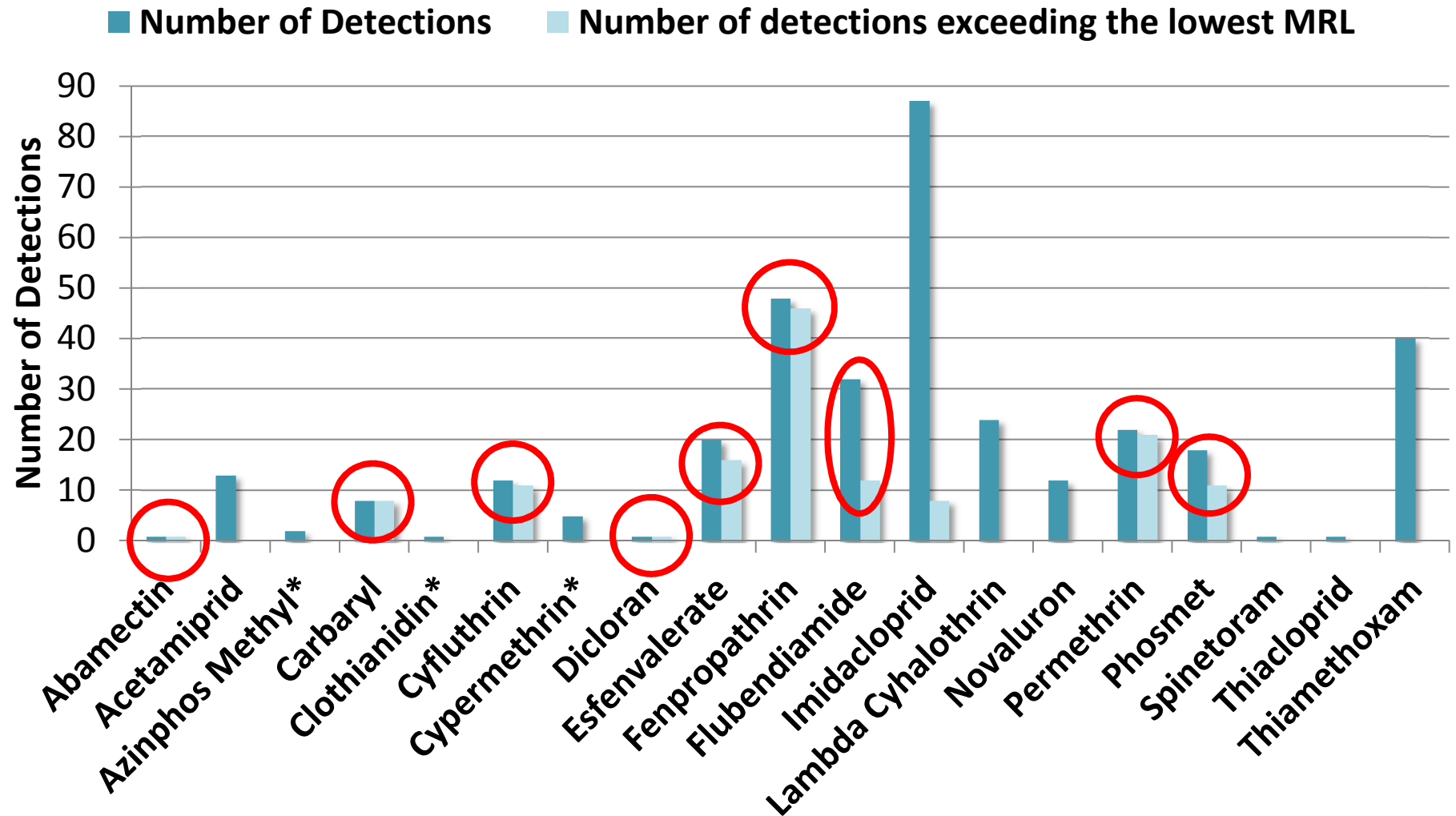
Average Fungicide Residue



The **green** and **red** lines represent the lowest foreign MRL for each chemical. The green lines denote that the processor data showed no risk of MRL violations. The red lines denote that there are risks of MRL violations.

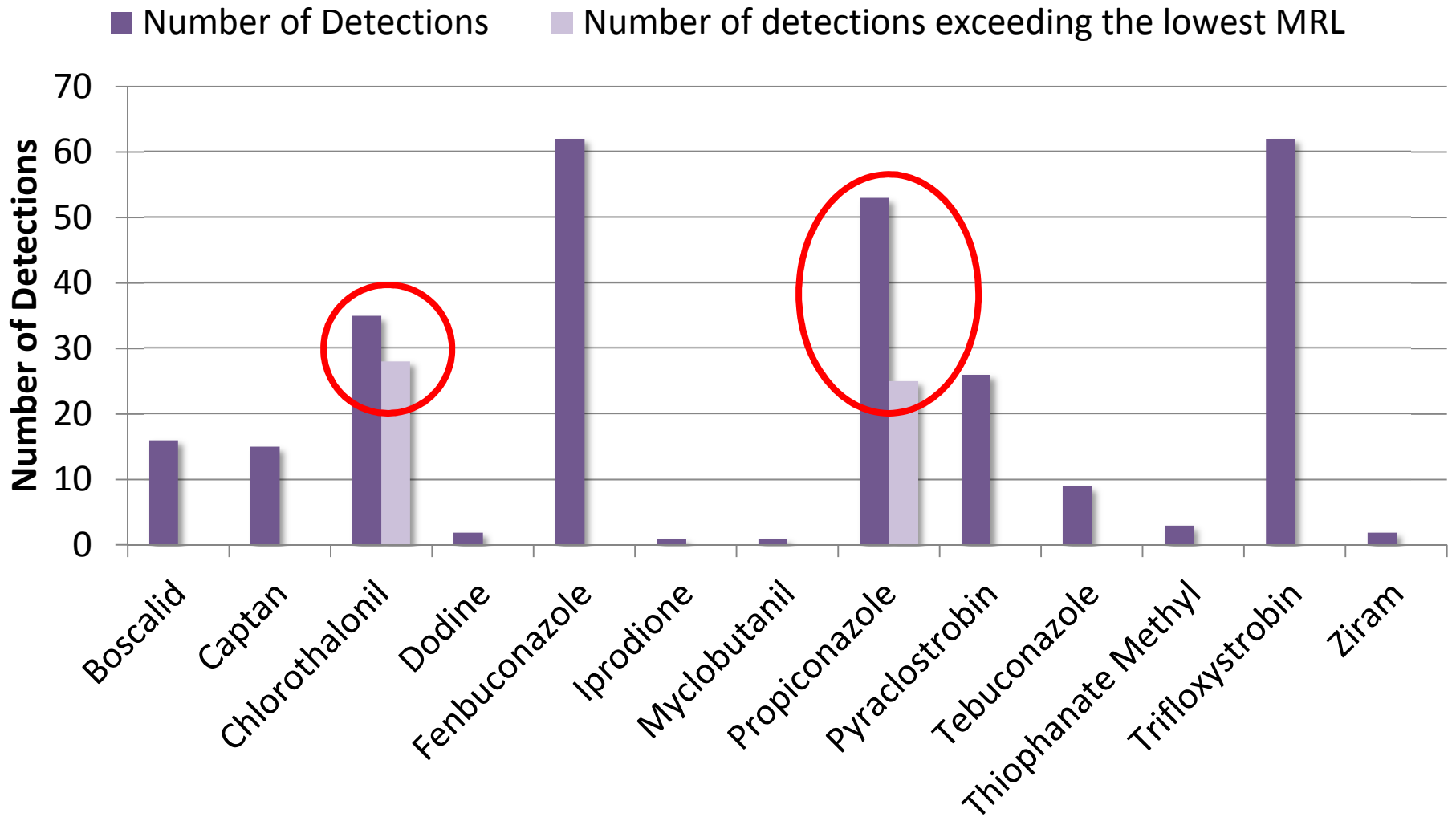
The chart below reports the number of times each pesticide was detected in processed tart cherries. The **darker bars** show the number of detections per pesticide, and the **lighter bars** show the number of detections that exceeded the lowest MRL.

Insecticides



*mrlatabase.com does not have any listed MRLs for Azinphos-Methyl, Clothianidin, or Cypermethrin on cherries

Fungicides



2009-2014 Processor Data Potential MRL Violations

- The residue amounts from the processor data were compared to 7 countries' MRLs that MI cherries are often exported to. When the residue was higher than the MRL of that country, it was labeled a potential MRL violation.
- Countries without established MRLs for particular materials are assumed to have a no tolerance for that material: any detected residue would be considered a potential violation.
- Chlorothalonil, Esfenvalerate, Fenpropathrin and Permethrin were most often found above their MRLs
- EU MRLs had the highest number of MRL violations, followed by Taiwan, Korea, and Canada.

	Material	Number of Potential Violations
Potential Violation of Established MRLs	Carbaryl	7
	Dicloran	1
	Phosmet	19
	Esfenvalerate	20
	Permethrin	36
	Propiconazole	9
	Fenpropathrin	9
	Chlorothalonil	38
Violations of Non-Established MRLs*	Cyfluthrin	21
	Esfenvalerate	17
Total Potential Violations	Novaluron	24
	Carbaryl	7
	Phosmet	19
	Esfenvalerate	37
	Permethrin	36
	Propiconazole	9
	Fenpropathrin	9
	Chlorothalonil	38
Total Potential Violations per Country	Cyfluthrin	21
	Novaluron	24
	US	0
	EU	82
	Australia	14
Total Potential Violations per Country	Canada	28
	Japan	5
	Korea	28
	Mexico	0
	Taiwan	43
	Total	200

*Korea does not have an established MRL for Esfenvalerate

*Both Taiwan and Australia do not have established MRLs for Novaluron