Maximum Residue Limits in Michigan Apples and Cherries

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Introduction

Maximum residue limits (MRLs) have become a significant threat to the growth of Michigan apple and cherry industries. Residue standards, placed by both domestic companies and international markets, are pressuring growers to produce fruit with little-to-no detectable pesticide residues while still maintaining consumer quality.

Meanwhile, growers must also battle new late-season, invasive species: the Spotted-Wing Drosophila. (SWD) and the Brown Marmorated Stink Bug (BMSB). Currently, to produce consumer quality fruit under these circumstances, growers must apply long-lasting pesticides to protect their fruit up to harvest, putting them at risk for exceeding MRLs.

In order to safely and successfully export and expand the industry, growers need to know when to apply key late-season pesticides in order to comply with MRLs. To this end, we are studying the residue decline of pesticides commonly used by growers late-season, with a known efficacy against SWD or BMSB, and a large disparity index (US MRL/lowest foreign MRL). Knowing the in field residue degradation will allow us to determine the appropriate time to apply each pesticide so that it may degrade to the appropriate levels by harvest. With this knowledge, growers will be able to confidently make pesticide applications near harvest with little risk of MRL violation.

2014 Cherry Methods

- Plot design: A group of three cherry trees were treated with only one pesticide. Each pesticide treatment was replicated 3 times in a random design. Each rep was separated by at least one buffer row.
- All insecticides were applied on the same day a few weeks before the ideal harvest date.
- Cherries were sampled at 1, 3, 7, 14, 21, and 28 days post treatment.
- Half of the samples were rinsed for 2 hours to mimic conditions performed by growers to cool cherries.
- All samples were pitted then frozen until analysis could be performed.
- Analysis of pesticide residues will be performed by high-performance liquid chromatography (HPLC).

2014 Apple Methods

- Plot design: A group of three apple trees will be treated with only one pesticide. Each pesticide treatment will be replicated 3 times in a random design. Each rep will be separated by at least one buffer row.
- All insecticides will be applied on the same day a few weeks before the ideal harvest date.
- Apples will be sampled at 1, 3, 7, 14, 21, and 28 days post treatment.
- Wedges from each apple sampled will be taken and then frozen until analysis can be performed.
- Analysis of pesticide residues will be performed by HPLC.

Apples Insecticides for Study

Trade Name	Active Ingredient	Manufacturer	REI (hrs)	PHI (days)	US MRL (ppm)	Lowest Foreign MRL (ppm)	Disparity Index	Rate of Application
Actara 25 WG	thiamethoxam	Syngenta	12	14	0.2	0.02	10	2.75 oz/A
Assail 30 SG	acetamiprid	United Phosphorous	12	7	1	0.1	10	8 oz/A
Danitol 2.4 EC	fenpropathrin	Valent	24	14	5	0.01	500	21 1/3 fl oz/A
Exirel .83 SE	cyantraniliprole	Dupont	12	3	1.5	0.01	150	20.5 fl oz/A
Imidan 70 WP	phosmet	Gowan	7	7	10	0.05	200	3 lb/A
Lannate 90 SP	methomyl	Dupont	72	14	1	0.02	50	1 lb/A

Cherry Insecticides for Study

Trade Name	Active Ingredient	Manufacturer	REI (hrs)	PHI (days)	US MRL (ppm)	Lowest Foreign MRL (ppm)	Disparity Index	Rate of Application
Altacor 35WG	chlorantraniliprole	Dupont	4	10	2	1	2	4.5 oz/A
Danitol 2.4 EC	fenpropathrin	Valent	24	3	5	0.01	500	21 1/3 fl oz/A
Delegate 25 WG	spinetoram	Dow AgroSciences	4	7	0.2	0.1	2	7 oz/A
Exirel .83 SE	cyantraniliprole	Dupont	12	3	6	0.1	60	20.5 fl oz/A
Imidan 70 WP	phosmet	Gowan	3	7	10	0.05	200	2.125 lb/A

Pictures taken from the 2014 cherry sampling. Starting from the left: 1) The flagged, 3-tree plot design. 2) Cherries collected from shaking the tree. Cherries were also collected by hand with the aid of ladders. 3) Cherries being rinsed in 5 gallon buckets at 10 gal/min. 4) Pitting the cherries.

Michigan Cherry Pre-Harvest Intervals for Foreign MRLs

	Altacor Chlorantraniliprole		Assail Acetamiprid		Delegate Spinetoram		Imidan Phosmet		Mustang Max Zeta-cypermethrin	
	PHI	MRL	PHI	MRL	PHI	MRL	PHI	MRL	PHI	MRL
U.S.	10	2	7	1.2	7	0.2	7	10	14	1
Codex	10	1	7	1.5	7	-	7	-	14	2
E.U.	10	1	7	1.5	7	0.2	7	1	14	2
Australia	10	1	7	1	7	0.2	7	1	14	1
Canada	10	2.5	7	1.2	7	0.2	7	7	14	0.1*
Japan	10	1	7	2	7	0.5	7	0.1	14	2
Korea	10	1	7	1.5	7	0.1	7	0.05	14	1
Mexico	10	2	7	1.2	7	0.2	7	10	14	1
Taiwan	10	1	7	1	7	0.2	7	2	14	2

From 2013 data
MRLs as of 8-21-2014
Greater than established U.S. PHI
*Canada's default is 0.1 ppm

Michigan Apple Pre-Harvest Intervals for Foreign MRLs

	Actara Thiamethoxam		Assail Acetamiprid		Danitol Fenpropathrin		Imidan Phosmet		Lannate Methomyl		Mustang Max Zeta-cypermethrin	
	PHI	MRL	PHI	MRL	PHI	MRL	PHI	MRL	PHI	MRL	PHI	MRL
U.S.	14	0.2	14	1	14	5	7	10	28	1	14	2
Codex	14	0.3	14	0.8	14	5	7	10	28	0.3	21	0.7
E.U.	14	0.5	14	0.8	21	0.01	7	0.2	>28	0.02	21	1
Australia	14	-*	>21	-*	21	-*	7	1	28	1	21	1
Canada	14	0.2	14	1	14	5	7	10	28	0.5	21	1
Japan	14	0.3	14	2	14	5	7	10	14	3	14	2
Korea	14	0.5	14	0.3	14	5	14	0.05	14	2	14	2
Mexico	14	0.2	14	1	14	5	7	10	28	1	14	2
Taiwan	14	0.2	14	1	14	0.5	7	2	28	0.5	14	2

From 2013 data
MRLs as of 8-21-2014 and in ppm
Greater than established U.S. PHI
*Australia does not have an established MRL for the active ingredient

Discussion

Although we do not have this year's samples analyzed yet, our preliminary study from last year has shown that many insecticides do not comply with foreign MRLs at harvest (see PHI charts above). Last year's apple residue data showed that there may even be some pesticides which do not comply with US MRLs at harvest.

Weather is a strong factor in residue degradation. This year, cherry residues were exposed to almost 2 inches of rain throughout the entire study. Last year, our cherry study only experienced about 1.5 inches of rain and high temperatures commonly over 85°F. Although this year's study was cooler, which could result in less degradation, rain can easily wash much of the residues away. This will make for an interesting comparison to last year's data.

Future work with MRLs will include study of fungicide degradation, as well as a look into residue degradation throughout processing.

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If you would like any copies of complete MRL lists or the PHI charts above please contact Rosemary Bolton at jarembar@msu.edu