WILBUR-ELLIS®

Development of an MRL-Compliant IPM Program for Cherry

Dr. John E. Dunley
Wilbur-Ellis Company
Wenatchee, WA

AGRIBUSINESS DIVISION

WILBUR-ELLIS®

Why are MRLs important to WA tree fruit?

- Washington exports greater than 1/3 of their respective crops

WILBUR-ELLIS®

Cherry MRLs: Exports are very important

- **Percent of Northwest crop exported:**
- 2013 32%
  2012 35%
  2011 31%
  2010 28%
  2009 28%
  2008 28%
  2007 28%

WILBUR-ELLIS®

Cherry exports are valuable

- **Dollar Value of Cherry Crop:**

Year	Total	Export
2013	$670,914,353	$211,904,418
2012	$759,505,935	$283,254,304
2011	$783,013,504	$257,098,218
2010	$572,624,738	$178,367,963
2009	$541,494,490	$159,458,538
2008	$436,388,970	$127,847,518
2007	$409,261,878	$171,059,820

WILBUR-ELLIS®

Percentage of apple and crop exported

- Apple
  - 2012/13 33%
    2011/12 34%
    2010/11 34%
    2009/10 32%
    2008/09 33%
    2007/08 30%
    2006/07 30%
- Pear
  - 2012/13 35%
    2011/12 37%

Apple and Pear MRLs

- Not as much of a problem relative to cherry
  - Programs are less ‘last minute’
    - Cherry mildew
    - SWD
    - CFF
  - Stored fruit
    - Residue decays
  - Can be tested before sent to market
  - Easier to segregate fruit
    - Keep fruit domestic

WILBUR-ELLIS®

Problems with MRLs and IPM

- Fruit quality is primary goal
  - Warehouses, growers, varieties, pests differ
- Export markets are varied
  - MRLs
  - Market timing
- MRLs change each year
  - For cherry:
    - 2014: 22 significant changes
    - 2015: 18 significant changes

WILBUR-ELLIS®

Cherry MRL IPM Program

- Initiated following 2010 season
  - Several warehouses had difficulty dealing with 'new' MRL issues and exports
- Crop consultants generally had no idea what MRLs were
  - Or how to deal with them
- Growers were, in general, totally unaware
- But trouble was brewing on the horizon

WILBUR-ELLIS®

Cherry MRL IPM Program

- Pest problems
  - Spotted wing drosophila introduction
  - Cherry powdery mildew
  - (Cherry fruit fly)
- All three of these pests become most problematic near harvest
  - Residues

WILBUR-ELLIS®

Our approach

- Collect information
  - Foreign labels
  - Foreign IPM manuals
  - Warehouse residue data
- Manufacturers
  - Residue trial data

Confidor 200 SC

CAUTION
KEEP OUT OF REACH OF CHILDREN
READ SAFETY DIRECTIONS BEFORE OPENING OR USING

Confidor® 200 SC

INSECTICIDE

Active Constituent: 200 g/L IMIDACLOPRID

GROUP 4A INSECTICIDE

For the control of various insect pests of cotton, fruit, vegetables and ornamentals as specified in the DIRECTIONS FOR USE table

GENERAL INSTRUCTIONS
Insecticide Resistance Warning
For insecticide resistance management, Confidor is a Group 4A insecticide. Some naturally occurring insect biotypes resistant to Confidor and other Group 4A insecticides may exist through normal genetic variability in any insect population. The resistant individuals can eventually dominate the insect population if Confidor and other Group 4A insecticides are used repeatedly. The effectiveness of Confidor on resistant individuals could be significantly reduced. Since occurrence of resistant individuals is difficult to detect prior to use, Bayer CropScience accepts no liability for any losses that may result from the failure of Confidor to control resistant insects. Confidor may be subject to specific resistance management strategies. For further information contact your local supplier, Bayer CropScience representative or local agricultural department agronomist.

Resistance Management Strategies
Cotton aphid in cotton
Observe the cotton industry Insecticide Resistance Management Strategy (IRMS).
Aphids, whitefly and melon thrips in various crops (foliar sprays)
Do not apply Confidor (or other group 4A insecticides) in consecutive sprays within and between seasons. Rotate with registered insecticides from other mode of action groups.
Confined environments such as glasshouses:
Annuals - Do not apply more than one spray of Confidor (or other group 4A insecticides) to any one crop.

Stone fruit	Green peach aphid, black peach aphid	**Dilute spraying** 25 mL/100 L **Concentrate spraying** Refer to the Application section	21 days	Apply at first sign of aphid infestation. Apply as a full cover spray, ensuring thorough coverage. Apply by dilute or concentrate spraying equipment. Apply the same total amount of product to the target crop whether applying this product by dilute or concentrate spraying methods. Do not use in equipment that requires rates greater than 125 mL/100 L of water (i.e. greater than 5 X concentrate).

WILBUR-ELLIS®

Putting the information together

- First step:
  - Provide guidance to field staff in product choice
  - The Kaleidoscope

Kaleidoscope (old data, do not use)

Cherry Residue Lim			most restrictive	U.S. Mexico	Australia	Taiwan	E.U.	Korea	Japan	Codex Ho Kong Thailand	Canada	Singapore will defer Codex
Chemical	Common Name	Pesticide	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Pyraclostrobin	Cabrio/Pristine	Fungicide	0.7	2.5	2.5	1	3	3	2	3	0.7	3
Tebuconazole	Elite	Fungicide	2	5	5	2	5	5	5	4	3	4
Penthiopyrad	Fontelis	Fungicide	ND	1	5		4	1	5	4	4	4
Trifloxystrobin	Gem	Fungicide	1	2	2	3	1	2	3	3	2	3
Fluopyram	Luna	Fungicide	ND	0.6			1.5	1	5	0.7	1.5	0.7
Propicanozole	Tilt	Fungicide	0.05	4	2	1	0.05	1	1		1	
Fluxapyroxad	Merivon	Fungicide	ND	2	2		0.01				2	
Boscalid	Pristine	Fungicide	1	3.5	1.7	1.7	4	1	3	3	1.7	3
Triflumizole	Procure	Fungicide	1	1.5	1.5	1	1.5	0.2	3		1.5	
Quinoxyfen	Quintec	Fungicide	0.3	0.7	0.7	0.4	0.3	0.4	0.4	0.4	0.3	0.4
Myclobutanil	Rally	Fungicide	1	5	5	1	1	1	1	2	1	2
Thiophanate Methyl	Topsin-M	Fungicide	0.3	20	10	3	0.3	0.2	3	10	5	10
Buprofezin	Centaur	Insecticide	ND	1.9	1.9		2	2	1.9	2		2
Pyriproxyfen	Esteem	Insecticide	ND	1	1	0.5	1	0.2	1			
Thiamethoxam	Actara/Voliam Flex	Insecticide	0.5	0.5	0.5	0.5	1	1	5	1	0.5	1
Permethrin	Ambush	Insecticide	ND	4	4	2	0.05	5	5	2		2
Flonicamid	Beleaf	Insecticide	ND	0.6	0.6		0.3	1	0.6		0.6	
Spinetoram	Delegate	Insecticide	ND	0.2	0.2	0.2	0.2	0.1	0.5		0.2	
Imidacloprid	Provado	Insecticide	0.5	3	0.5	0.5	0.5	0.5	2	0.5	3	0.5
Cyfluthrin	Renounce/Baythroid	Insecticide	ND	0.3	0.3		0.2	1	1			
Spinosad	Success	Insecticide	0.05	0.2	1	0.2	1	0.05	0.2	0.2	0.2	0.2
Endosulfan	Thiodan	Insecticide	ND	2		0.5	0.05	0.1	1		2	2
Spirotetramat	Ultor	Insecticide	ND	4.5	4.5	3	3		3	3	4.5	3
Lambda Cyhalothrin	Warrior	Insecticide	0.3	0.5	0.5	0.4	0.3	0.5	0.5	0.3	0.5	0.3
zeta-cypermethrin	Mustang Max	Insecticide	ND	1	1	2	2	1	2	2		2
Acetamiprid	Assail	Insecticide	0.5	1.2	1	1	0.5	1.5	2	1.5	1.2	1.5
Azinphos-methyl	Guthion	Insecticide	0.05	2	2	2	0.05	1	2	2	1	1
Chlorantraniliprole	Voliam Flexi/Altacor	Insecticide	1	2	1	1	1	1	1	1	2.5	1
Abamectin	AgriMek	Insecticide	ND	0.09		0.2	0.01	0.05	0.02			
Fenpropathrin	Danitol	Insecticide	0.01	5	5	5	0.01	5	5		5	
Dimethoate	Dimethoate	Insecticide	ND	2	0.2		0.2	2	2	2	2	2
Malathion	Malathion	Insecticide	0.02	8	2	0.5	0.02	0.5	6		6	
Carbaryl	Sevin	Insecticide	0.05	10	5	1	0.01	1	10		10	10
Verify date with NHC and FAS			12-Jan-14	12-Jan-14	12-Jan-14	12-Jan-14	12-Jan-14	12-Jan-14	12-Jan-14	12-Jan-14	12-Jan-14	12-Jan-14

WILBUR-ELLIS®
AGRIBUSINESS DIVISION
Ideas to Grow With®

WILBUR-ELLIS®

Putting the information together

- First step: Kaleidoscope
  - Gives guidance to MRL-friendly products
  - Top ten export markets
  - Does not provide information when product use timing is questionable
- Second step: MRL Risk Matrix
  - Using residue decay predictions
  - More specific guidance for preharvest timing

WILBUR-ELLIS®

MRL Risk Matrix

Wilbur-Ellis Co.	Fungicide MRL risk matrix for cherry	4-Feb-13
	x = illegal by PHI	
	1 = good, lowest risk, following just label information, US tolerance, and decline, very low risk of	
	2 = good, some risk, following interpretation of MRL, limited risk of over the limit detection	
	3 = okay, more risk, interpretation of MRL and residue data, some chance of over the limit detecti	
	4 = not good, higher risk, moderate probability of over the limit detection	
	5= bad, high risk, high probability of over the limit detection	

All risk and results associated with the information or use of the information presented herein is completely assumed by the user
make or give any warranties (express or implied), guarantees, or agreements of any kind or character as to the accuracy of the infor
effects of its use. Wilbur-Ellis Company cannot and shall not, in any way, be responsible for the shipment or value of crops export
fruit do not comply to maximum residue levels, as defined by those markets. Wilbur-Ellis does not guarantee the accuracy of the in
nor does any agent of this company have the authority to warrant or guarantee the accuracy or use of the informat

Fungicides (old data)

- Old Examples

Gem / Flint	MRL ppm	2	3	1	2	2	3	2←	3←
trifloxystrobin	PHI (d)	U.S.	Codex/HK/Thai	EU/UK	Australia	Canada	Japan	Korea	Taiwan
	1	1	1	2	1	1	1	1	1
label PHI	3	1	1	2	1	1	1	1	1
1	7	1	1	1	1	1	1	1	1
	14	1	1	1	1	1	1	1	1
	21	1	1	1	1	1	1	1	1
	28	1	1	1	1	1	1	1	1
	>30	1	1	1	1	1	1	1	1

Quintec	MRL ppm	0.7	0.4	0.3	0.7	0.3	0.4	0.4	0.4
quinoxyfen	PHI (d)	U.S.	Codex/HK/Thai	EU/UK	Australia	Canada	Japan	Korea	Taiwan
	1	x	x	x	x	x	x	x	x
label PHI	3	x	x	x	x	x	x	x	x
7	7	1	2	2	1	2	2	2	2
	14	1	1	1	1	1	1	1	1
	21	1	1	1	1	1	1	1	1
	28	1	1	1	1	1	1	1	1
	>30	1	1	1	1	1	1	1	1

Elite	MRL ppm	5	4	5	5	3	5	4	2←
tebuconazole	PHI (d)	U.S.	Codex/HK/Thai	EU/UK	Australia	Canada	Japan	Korea	Taiwan
	1	1	2	1	1	2	1	2	3
label PHI	3	1	2	1	1	2	1	2	3
0	7	1	1	1	1	1	1	1	2
	14	1	1	1	1	1	1	1	1
	21	1	1	1	1	1	1	1	1
	28	1	1	1	1	1	1	1	1
	>30	1	1	1	1	1	1	1	1

Example Fungicides (old data)

- Examples

Orbit	MRL ppm	4		0.05	2	1	1	1	1
propiconazole	PHI (d)	U.S.	Codex/HK/Thai	EU/UK	Australia	Canada	Japan	Korea	Taiwan
	1	1	5	5	1	1	1	1	1
label PHI	3	1	5	5	1	1	1	1	1
0	7	1	4	4	1	1	1	1	1
	14	1	4	4	1	1	1	1	1
	21	1	3	3	1	1	1	1	1
	28	1	3	2	1	1	1	1	1
	>30	1	2	2	1	1	1	1	1

Rally	MRL ppm	5	2	1	5	1	2	1	1←
myclobutanil	PHI (d)	U.S.	Codex/HK/Thai	EU/UK	Australia	Canada	Japan	Korea	Taiwan
	1	1	3	4	1	4	3	4	4
label PHI	3	1	2	4	1	4	2	4	4
0	7	1	2	3	1	3	2	3	4
	14	1	1	3	1	3	1	3	3
	21	1	1	2	1	2	1	2	2
	28	1	1	1	1	1	1	1	1
	>30	1	1	1	1	1	1	1	1

WILBUR-ELLIS®

Example Insecticides (old data)

- Examples

Success	MRL ppm	0.2	0.2	1	1	0.2	0.2	0.05	0.2
spinosad	PHI (d)	U.S.	Codex/HK/Thai	EU/UK	Australia	Canada	Japan	Korea	Taiwan
	1	x	x	x	x	x	x	x	x
label PHI	3	1	1	1	1	1	1	3	1
7	7	1	1	1	1	1	1	2	1
SLN PHI	14	1	1	1	1	1	1	1	1
3	21	1	1	1	1	1	1	1	1
	28	1	1	1	1	1	1	1	1
	>30	1	1	1	1	1	1	1	1
Warrior	MRL ppm	0.5	0.3	0.3	0.5	0.5	0.5	0.5	0.4
lambda-cyhalothrin	PHI (d)	U.S.	Codex/HK/Thai	EU/UK	Australia	Canada	Japan	Korea	Taiwan
	1	x	x	x	x	x	x	x	x
label PHI	3	x	x	x	x	x	x	x	x
14	7	x	x	x	x	x	x	x	x
	14	1	2	2	1	1	1	1	1
	21	1	1	1	1	1	1	1	1
	28	1	1	1	1	1	1	1	1
	>30	1	1	1	1	1	1	1	1

Example Insecticides (old data)

- Examples

Delegate	MRL ppm	0.2		0.2	0.2	0.2		0.1	0.2
spinetoram	PHI (d)	U.S.	Codex/HK/Thai	EU/UK	Australia	Canada	Japan	Korea	Taiwan
	1	x	x	x	x	x	x	x	x
label PHI	3	x	x	x	x	x	x	x	x
7	7	1	5	1	1	1	5	2	1
	14	1	3	1	1	1	3	1	1
	21	1	1	1	1	1	1	1	1
	28	1	1	1	1	1	1	1	1
	>30	1	1	1	1	1	1	1	1

Provado	MRL ppm	3	0.5	0.5	0.5	3	2	0.5	0.5
imidacloprid	PHI (d)	U.S.	Codex/HK/Thai	EU/UK	Australia	Canada	Japan	Korea	Taiwan
	1	x	x	x	x	x	x	x	x
label PHI	3	x	x	x	x	x	x	x	x
7	7	1	4	4	4	1	1	4	4
	14	1	2	2	2	1	1	2	2
	21	1	2	2	2	1	1	2	2
	28	1	1	1	1	1	1	1	1
	>30	1	1	1	1	1	1	1	1

65 Day Cherry Program

WILBUR-ELLIS®

Days After Ful	Timing	Days Before	Fungicide (oz/PHI)	Insecticide (oz/PHI
0	Bloom	65	Tilt (4/PHI 0)	
4	Petal fall	60	Rally (6/PHI 0)	
25	Shuck fall	40	Pristine (14.5/PHI 0)	
32	SF +7d	33	Pristine (14.5/PHI 0)	Imidacloprid (6/PH
39	Straw	26	Quintec (7/PHI 7)	Delegate (6 /PHI 7)
49	Blush	16	Quintec (7/PHI 7)	Lambda-cy (2.56/P
56	7 DAPT	9	Gem (3.8/PHI 1)	Success (6/ PHI 7)
62	6 DAPT	3	Procure (12/PHI 1)	Entrust SC(6/PHI 3
65	Harvest	0	Procure (12/PHI 1)	
66	Harvest+1 D			GF-120 (20/PHI 0)

90 + Day Cherry Program

WILBUR-ELLIS®

After Ful Bloom	Timing	Before Harvest	Fungicide (oz/PHI)	Insecticide (oz/PHI
0	Bloom	90	Topguard (14/PHI 7)	
4	Petal fall	86	Rally (6/PHI 0)	
25	Shuck fall	65	Fontelis (20/PHI 0)	
32	SF +7d	58	Luna Sensation (5.6/PHI 1)	
39	Straw	51	Quintec (7/PHI 7)	Imidacloprid (6/PH
49	Blush	41	Quintec (7/PHI 7)	Delegate (6 /PHI 7)
56	7 DAPT	34	Gem (3.8/PHI 1)	Imidacloprid (6/PH
62	6 DAPT	27	Procure (12/PHI 1)	Delegate (6 /PHI 7)
69	7 DAPT	21	Procure (12/PHI 1)	lambda-cy(2.56/PH
76	7 DAPT	14	Pristine (14.5/PHI 0)	Delegate (6 /PHI 7)
83	7 DAPT	7	Pristine (14.5/PHI 0)	Entrust SC(6/PHI 3
89	1 DBH	1	Gem (3.8/PHI 1)	
90	Harvest	0		GF-120 (20/PHI 0)

WILBUR-ELLIS®

Cherry MRL IPM Program

- In five seasons
  - Cherry IPM program has not had any detections
    - Warehouse samples
    - Overseas
- Warehouses
  - Some still have DO NOT USE lists
  - Many use Recommended Programs
- Getting better / easier each year

WILBUR-ELLIS®

Quick note about potato

- About 3 years behind cherry
- Do Not Spray lists from processors dominate
- Prevent implementation of new tools
  - Make field research difficult
- The other side of the coin

WILBUR-ELLIS®

Conclusion

- MRLs have become important
  - Growers and warehouses are learning to deal with them better
- Potato
  - Work is beginning, difficult situation
  - Risk mitigation will be more challenging
- Blueberries
  - Another project just starting