A Look at Imidan in Tart Cherry “Phosmet”

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Imidan & Tart Cherries

• OPs Under Attack:

• What we have learned: FQPA: RAMP Summary

• Pre-Harvest Strategies

• Post-Harvest Strategies

• MRL’s & MOE’s
How AZM, Imidan, Lorsban, etc. / OP’s Work

- Act @ Nerve Junction
- Interrupt Nerve Signals
- Bind Ach-Esterase
- Affect:
  - Respiration, Vision, ...
  - Muscle contraction
  - Rapid Onset, Spasm
Global Green Movement End OP’s?

- Linked to the Consumer Movement
- Global in scope: extending even into 2/3’s world
- Transects demographics of society
- Projected to expand well into the 21st Century
- Strongly affects regulatory policy

How does Society benefit When farms fail?

What happens when Farms Fail?

Greater Pollution
Greater Sprawl
More Pavement
Less Diversity
Less Ecosystem function
More Water Diversion
Less Carbon Sequestration
US Pesticide Policy History at a Glance

1906 FFDCA enacted
1938 Miller Amendment to FFDCA
1947 FIFRA Enacted
1958 Food Additives Amendment to FFDCA
1959 FIFRA Amended
1964 FIFRA Amended
1970 EPA formed
1972 FEPCA Amendment to FIFRA
1973 Endangered Species Act
1974 Transportation Safety Act
1986 Right-To-Know Act
1986 OSHA’s Hazard Communication Standard
1988 FIFRA Amended
1990 Clean Air Act
1992 Montreal Protocol
1996 FQPA amendment to FFDCA and FIFRA
2003 Pesticide Registration Improvement Act
2007 PRIA 2
2008 Farm Bill (significant research provisions for “specialty” crops = food in the diets of ‘at risk’ populations)
2009 6th Circuit Court ruling on pesticides near water NPEDES

Accelerating Add’n of New Legislation
- OP’s Highest Death Rate Insecticides...
- FQPA = Limit Exposure of At Risk People
- Outcome measures: Regulate...
  Food Residues, Workers & Environment
What FQPA Brought the Cherry Industry

**Pre-FQPA**
- Refined IPM System
- Simple OP- Pest Mngt.
- Solid Efficacy = low risk
- > 5 Stable Ecosystems
- Known Enviro Impacts
- OK Economics

**Post FQPA**
- Chaos in Spray Programs
- >> Complexity
- >> Risk of Crop Failure
- High Ecosystem Impacts
- Unknown Enviro Impacts
- Economic Uncertainty
Today, with the GREEN PAC’s & Enviro-Group efforts in DC, US growers are more like the “hunted” than the “green” good guys Despite their record of rapid change!

Most DC Pesticide mandates are imposed ONE SIZE FITS ALL with no remuneration!
Who’s Eating Your Cherries?

Primary Insects
- Plum Curculio
- Cherry Fruit fly
- Leafrollers
- Green Fruitworms
- Borers

Secondary Insects
- Mites
- Aphids
- Scale
- X-Disease Vectors

Honestly GREEN often depends on Invasive Species?
Imidan & Tart Cherries

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Tart Cherry Ramp Report to EPA ‘09

- **Research & Adoption Investments**
  - USDA RAMP GRANT
  - INDUSTRY’S Investment
  - Individual Grower’s = labor, risk, yield loss
  - MSU’S INVESTMENT
  - Total Investment ~ $3M to date...

- **AZM Terminates 2012**
  - GFW, LR, PC, CFF

- **Imidan: OP with MOE, MRL Issues**

- **New Tool’s**
  - Imidaclorpid (2004)
    - GFW, LR, PC, CFF (7d)
  - Thiamethoxam (2006)
    - GFW, LR, PC, CFF (14d)
  - Acetamiprid (2008)
    - GFW, LR, PC, CFF (7d)
  - Spinosyn
    - GFW, LR, PC, CFF (7d)
  - Indoxacarb (2007*)
    - GFW, LR, PC, CFF (14d)
  - Spinetoram (2008)
    - OBLR, CFF? (7d)

- **MRL’s — Codex Issues with new insecticides & Imidan?**

- **Ecological Impacts of the Alternatives?**

- **Economically Sustainable Production:** increasing **25 to 50%** Pesticides?

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**Control: AZM NO failures in 6 years = 0/40**

**RAMP: Failure History = 13/40**

<table>
<thead>
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<th>Year</th>
<th>Total</th>
<th>PC</th>
<th>CFF</th>
<th>Other</th>
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<td>2006</td>
<td>3</td>
<td>2</td>
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<td>2007</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2008</td>
<td>3</td>
<td>2</td>
<td>1</td>
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</tbody>
</table>

5 yrs 13 8 4 Jap Beetle

1- Growing **plum curculio** and **CFF** populations in and around orchards

2- Much, much greater **complexity and cost** to control pests

3- Much **greater risks** on the part of growers = bankruptcies

4- Jeopardize markets Internationally and Nationally... **MRL’s**, Crop Fluctuations
Cherry Fruit Fly

- Higher Populations
- More Sprays in Season?
- Post-Harvest Spray to Reduce Populations the Next Year?
- Genetic Change
Imidan & Tart Cherries

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Curative Activity of Insecticides on Cherry Fruit & Apple Maggot Fly Indicates Some Penetration...

John Wise TNRC

Number of CFF & AM Emerged/Pupae in 50 Infested Fruit

Altacor
Delegate
Actara
Clutch
Calypso
Imidan
UTC

0 10 20 30 40 50 60 70
Control of Cherry Fruit Fly in Tart Cherries

Cherry Fruit Fly Control

Most effective on Adult egg laying

Rimon
Delegate
Alverde
Assail
Altacor
Imidan
Check

# emerged CFF larvae / lb of t. cherries

John Wise TNRC
Plum Curculio Early Season Targets Based on Degree Days

Oviposition

1st instar

2nd instar

3rd instar

4th instar inside fruit

4th instar exits fruit

Pupation & soil case

Summer Adult exits soil

Target eggs & larvae

Adulticide And / Or

Degree Days Base 50°F Accumulated Since Jan 1st

0 200 400 600 800 1000 1200 1400 1600 1800
7 Day Activity on **Adult** Plum Curculio

- **Control**
- **Phosmet**
- **Azinphosmethyl**
- **Indoxacarb**
- **Thiamethoxam**

2002 PC adult bioassay, 7 days post-spray, TNRC (P= .05, LSD)
Curative Activity on Plum Curculio Larvae

Imidan is Weaker on PC Larvae: Penetration

![Graph showing the curative activity of various pesticides on plum curculio larvae.](image)

John Wise TNRC
Imidan & Tart Cherries

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Post Harvest Cherry Fruit Fly May be Necessary

• Time Spray with Post Harvest Disease Control
• Post Harvest Spray will reduce the next year’s population.

Pest Population Size: High

Hi Pop’s result in More Pre & Post Harvest Sprays

Growing Season
Plum Curculio Post Harvest Spray Phenology

- Oviposition
- 1st instar
- 2nd instar
- 3rd instar
- 4th instar inside fruit
- 4th instar exits fruit
- Pupation & soil case
- Summer Adult exits soil

Kill Summer Adults
And / Or
Break Diapause

Both Imidan & Esteem Work Well

Degree Days Base 50°F Accumulated Since Jan 1st
TREND: RAMP Post Harvest Sprays

Predict that post-harvest sprays will increase in Cherry

Mites, CFF & PC

Number of Sprays

- RAMP
- COMP

2006 2007 2008 2009
Imidan & Tart Cherries

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Max Residue Limits

- EPA - No Effect Level - NOEL
- Rule of Thumb:
  - 1 ppm = 1.0 oz in 62,500 lbs
- International: Codex Alimentarius
  - Global Process
  - Sets Max. Residue Limits
- Historically Processor Problem
  - Imidan has problems
    - Japan, S. Korea & EU
EPA Risk = Toxicity x Exposure

Margin of Exposure (MOE) = Threshold below which EPA will not let a compound be used... AZM

MOE > 100 = No Effect Level / dose

Dose = Exposure x Time x Absorption

Body Wt

Imidan has a MOE Challenge in some Orchard use scenarios
Imidan: One of the Last OPs Standing

- Get your pH 5.5 right or forget using it!
- Russets Sweets
- Excellent on Cherry Fruit Fly
- Excellent PC Adults, OK larvae
- Fruit Penetration: < than AZM
- Fits Post Harvest Window...
- MRL Issues in Japan, Korea & Maybe Europe
- Margin of Exposure EPA

- Resistance -OBLR
- May want RM Future
- Likely good on Mineola moth...
- Not likely to flare mites
Number AZM & Phosmet Applied 2004-2009
RAMP Study: Comparison Blocks

# pesticide sprays

Year

2004 2005 2006 2007 2008 2009

AZM sprays
Phosmet sprays
Post-harvest sprays

*Data taken from 9 growers 2004 - 2007, 10 growers 2008-2009
**Post-harvest sprays of AZM and Phosmet only