Review of risk assessments for products used in Almonds

Comparing assessments of 14 compounds with actual reported use in CDPR’s Pesticide Use Reporting database (PUR), saw the following:

• Typical application rate less than modeled
• Typical total annual use less than modeled
• Typical percent of crop treated less than modeled
• Typical number of applications less than modeled
• Canopy assumptions don’t match biology
• Modeled scenario higher than almond scenario
California Almond Industry

- Spanning 500 miles (804 km)
- 6,800 growers
- 101 handler/processors
- 91% family owned farms

Production
- 100% of U.S. production
- 68% export; 32% domestic
- 80% of worldwide production

Exports by value
- Top California agricultural export
- Top U.S. specialty crop export

Sources:
*USDA National Agricultural Statistics Service, Pacific Region (NASS/PR)
**U.S. Department of Commerce, Foreign Trade Statistics
Research at the Almond Board…

• ...is the foundation for continuous improvements in growing almonds productively, safely, and in a way that is environmentally responsible.

• Through ABC, California's almond community has been investing in research on topics related to almonds' sustainability since 1973 with a total investment of more than $50 million to date.
Export or Domestic: Agriculture Involves Addressing Many Issues..

- FSMA
- Prop 65
- Environmental and Production Issues
- WATER
- Food Safety Legislation
- Labeling and packaging
- Tariff/Non-Tariff Barriers
- Non-Transparent Regulatory System
- Pre-Export Checks
- Import controls
- Pesticide MRLs
- Trade Agreements
- Hazard vs Risk Based Approach

- Established markets: U.S., Canada, UK, France, Germany, Japan
- Emerging markets: China, India, South Korea, Russia
- Exploratory markets: Brazil, Mexico, Middle East, Indonesia
almond lifecycle
Pest Management Needs in Almonds

• Insects
  – Navel Orangeworm (worm damage can lead to aflatoxin contamination), Peach Twig Borer, web-spinning mites, leaf-footed bugs, ants, etc

• Diseases
  – Bloom diseases: brown rot (*Monilinia*), *Anthracnose*, shot hole
  – Summer: *Alternaria*, hull rot

• Weeds
  – Keep irrigation system clear, frost protection, clean floor for harvest

• Vertebrates
  – Ground squirrels, pocket gophers, coyotes, birds, etc

• Post-harvest
  – Storage insects, human pathogens, phytosanitary requirements
Almonds and Risk Assessments
Typical application rate less than modeled
e.g. 2,4-D

Histogram of 2015 2,4-D Application Rates in Almonds

Sources:
*CDPR Pesticide Use Reports
**EPA Risk Assessments
Typical application rate less than modeled e.g. pyriproxyfen
Typical application rate less than modeled

E.g. buprofezin
Typical application rate less than modeled e.g. cyprodonil
Typical application rate less than modeled e.g. clothianidin
Typical application rate less than modeled
e.g. norflurazon
Typical application rate less than modeled
Typical total annual use less than modeled
e.g. copper

- Majority of use during dormancy
- Maximum annual use 18 lbs ai/ ac modeled
Typical application rate less than modeled
Typical total annual use less than modeled
e.g. copper

### Annual Copper Use in Almond Compared to Total Acreage

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Ib ai Applied</th>
<th>Total Acres Treated</th>
<th>Total Acres</th>
<th>% Total Acres Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>438,227</td>
<td>174,565</td>
<td>840,000</td>
<td>21%</td>
</tr>
<tr>
<td>2011</td>
<td>613,829</td>
<td>223,176</td>
<td>855,000</td>
<td>26%</td>
</tr>
<tr>
<td>2012</td>
<td>468,865</td>
<td>198,920</td>
<td>875,000</td>
<td>23%</td>
</tr>
<tr>
<td>2013</td>
<td>607,236</td>
<td>221,506</td>
<td>970,000</td>
<td>23%</td>
</tr>
<tr>
<td>2014</td>
<td>453,787</td>
<td>183,144</td>
<td>1,020,000</td>
<td>18%</td>
</tr>
</tbody>
</table>
Typical percent crop treated less than modeled

- **2,4-D**
  - 200k lbs are estimated as being used annually, but actual use is 100k lbs or less

- **Phosmet**
  - Model estimates 5% crop treated, but less than 1% reported treated 2011-2015
Typical percent crop treated less than modeled
Typical total annual use less than modeled
e.g. chlorpyrifos

### Annual chlorpyrifos use compared to total acres

<table>
<thead>
<tr>
<th></th>
<th>Total lb ai Applied</th>
<th>Total Acres Treated</th>
<th>Total Acres</th>
<th>% Total Acres Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>231,295</td>
<td>128,708</td>
<td>855,000</td>
<td>15%</td>
</tr>
<tr>
<td>2012</td>
<td>194,274</td>
<td>107,904</td>
<td>875,000</td>
<td>12%</td>
</tr>
<tr>
<td>2013</td>
<td>449,189</td>
<td>240,965</td>
<td>930,000</td>
<td>26%</td>
</tr>
<tr>
<td>2014</td>
<td>301,576</td>
<td>162,764</td>
<td>970,000</td>
<td>17%</td>
</tr>
<tr>
<td>2015</td>
<td>311,028</td>
<td>168,837</td>
<td>1,020,000</td>
<td>17%</td>
</tr>
</tbody>
</table>

- Chlorpyrifos
  - 14.5 lbs a.i./ac modeled total annual use, ~2 lbs a.i./ac typical use rate
- Diazonon
  - Less than 1,100 acres treated each year
- Malathion
  - 200 acres treated each year
Critical uses for chlorpyrifos

- Acres treated with several insecticide AIs or AI classes have grown in recent years
- Organophosphate usage has dropped to about 1/3 of its early 1990s level, but leveled off
- Use still important, particularly critical uses, such as treating leaffooted bugs and stink bugs
Typical number of applications less than actual e.g. pyrethroids

<table>
<thead>
<tr>
<th># applications</th>
<th>Bifenthrin</th>
<th>Esfenvalerate</th>
<th>Lambda-cyhalothrin</th>
<th>Permethrin</th>
<th>All Pyrethroids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>%</td>
<td>Count</td>
<td>%</td>
<td>Count</td>
</tr>
<tr>
<td>1</td>
<td>3821</td>
<td>82%</td>
<td>2176</td>
<td>88%</td>
<td>1575</td>
</tr>
<tr>
<td>2</td>
<td>711</td>
<td>15%</td>
<td>261</td>
<td>11%</td>
<td>320</td>
</tr>
<tr>
<td>3</td>
<td>102</td>
<td>2%</td>
<td>25</td>
<td>1%</td>
<td>53</td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>1%</td>
<td>5</td>
<td>0.2%</td>
<td>15</td>
</tr>
<tr>
<td>5+</td>
<td>17</td>
<td>0.4%</td>
<td>2</td>
<td>0.1%</td>
<td>8</td>
</tr>
</tbody>
</table>

- Models assumed multiple treatments, although for these four most-used chemicals, a more typical treatment was only 1X/ year
- Bifenthrin was modeled with three applications, esfenvalerate with four applications, lambda-cyhalothrin with six applications, and permethrin with three applications.
- Even looking at total number of applications of all pyrethroids, two thirds only receive one application, and may not have covered the same portion of the field
Canopy assumptions don’t match biology, and application timing e.g. abamectin

Examples: abamectin

• Abamectin models assume use 20 and 41 days after emergence, which for the almond scenario is January 16
• Estimates of when trees are fully leafed out (COVMAX of 90) should reflect an earlier date of “maturity.” Almond scenario date August 2\textsuperscript{nd}, but almonds are fully leafed out shortly after bloom is finished, typically by March 15\textsuperscript{th}
• Other examples Spinosad, Spinetoram, pyrethroids, clothianidin
Effective local measures

Irrigated Lands Regulatory Program (ILRP)
The Almond Orchard of the Future
Being Prepared to Maintain our Advantage, our Reputation in a Challenging Future

• Anticipated **25% increase** in production by 2020

• Challenges for **agricultural resources** never higher

• Demand must **grow ahead** of supply

• Investments in **global marketing, targeted research** needed
The Farm and Farmer of the Future

**Farmer**
- Open
- Innovative
- Mindful
- Transparent
- Proud
- Successful

**Farm**
- Hyper efficient
- Water use advanced monitoring
- Pollination contributor
- Zero waste
- Zero dust
- Optimal pesticide use
CASP Online: SustainableAlmondGrowing.org

**Self-Assessment Modules**
- Assess your practices while learning about alternative + best practices
- Contribute to telling the almond sustainability story

**Nitrogen Calculator**
- Estimates N need + timing of applications based on yield estimates
- Provides ILRP required N Management Plan

**Irrigation Calculator**
- Performs basic water demand calculations with user-submitted system information and auto-updates from CIMIS
- Provides irrigation schedule and run time
THANK YOU!