Pest Management Update
Pest Management Update

Bob Curtis
Almond Board of California
Continuing Education Units are available for most sessions.

Please check in at the CEU desk in the East Lobby for details and instructions.
Navel Orangeworm: New materials; renewed focus on spray efficacy

Joel P. Siegel, Research Entomologist, USDA/ARS
Many Players Now

UC: Davis, Riverside
UCCE
CSU: Chico, Fresno
USDA/ARS: Albany, Parlier
Industry Chemical
Industry Mating Disruption
Paramount Farming
PCAs
What I hope to cover:

Review Population Dynamics: Bridge between mummies and new crop nuts

Overwintering carryover, Heat Unit Accumulation

Relationship among neighbors, pressure

New insecticide chemistries: Unadvertised benefits
Mummies

New Crop

New Crop

TIME
Development

Mummies: 1,050 DD

New Almonds: 700 DD

New Pistachios: 500-600 DD
### Almonds: Overwintering

<table>
<thead>
<tr>
<th>Date</th>
<th>Infestation</th>
<th>Nuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEC. 13</td>
<td>29.14%</td>
<td>3,688</td>
</tr>
<tr>
<td>DEC. 20</td>
<td>13.17%</td>
<td>3,819</td>
</tr>
<tr>
<td>JAN. 5</td>
<td>25.34%</td>
<td>2,829</td>
</tr>
<tr>
<td>JAN. 27</td>
<td>17.33%</td>
<td>6,367</td>
</tr>
<tr>
<td>MAR. 3</td>
<td>12.65%</td>
<td>2,165</td>
</tr>
<tr>
<td>Date</td>
<td>Infestation</td>
<td>Nuts</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>MAR 7</td>
<td>12.9%</td>
<td>1,8598</td>
</tr>
<tr>
<td>MAY 31</td>
<td>75.10%</td>
<td>3219</td>
</tr>
<tr>
<td>JUN 7</td>
<td>113.00%</td>
<td>476</td>
</tr>
<tr>
<td>JUN 13</td>
<td>120.00%</td>
<td>371</td>
</tr>
<tr>
<td>JUN 20</td>
<td>98.60%</td>
<td>293</td>
</tr>
</tbody>
</table>
Navel Orangeworm Degree Day Comparisons

- Avg High
- Avg Low
- Avg Intermed
<table>
<thead>
<tr>
<th>Year</th>
<th>Feb 1</th>
<th>June 21</th>
<th>Sept 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>18.8</td>
<td>1,250.6</td>
<td>3,004.1</td>
</tr>
<tr>
<td>2010</td>
<td>13.5</td>
<td>866.9</td>
<td>2,559</td>
</tr>
<tr>
<td>2012</td>
<td>30.0</td>
<td>1,180.5</td>
<td>2,982</td>
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</table>
Adult Activity
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mortality</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0%</td>
<td>132</td>
</tr>
<tr>
<td>Delegate 6.4 oz</td>
<td>88.89%</td>
<td>108</td>
</tr>
<tr>
<td>Delegate 3.2 oz + Intrepid 12.8 oz</td>
<td>49.59%</td>
<td>123</td>
</tr>
<tr>
<td>Altacor 4 oz</td>
<td>16.67%</td>
<td>138</td>
</tr>
</tbody>
</table>
## June 2012

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Time</th>
<th>Mortality</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altacor (4.0 oz)</td>
<td>24</td>
<td>79.63%</td>
<td>108</td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>3.09%</td>
<td>121</td>
</tr>
<tr>
<td>Delegate (6.2 oz)</td>
<td>24</td>
<td>77.48%</td>
<td>48</td>
</tr>
<tr>
<td>Treatment</td>
<td>Hours</td>
<td>Mortality</td>
<td>Adults</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------</td>
<td>------------</td>
<td>--------</td>
</tr>
<tr>
<td>Altacor (3.5oz)</td>
<td>24</td>
<td>32.46%</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>46.67%</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>65.83%</td>
<td>120</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>32.00%</td>
<td>121</td>
</tr>
<tr>
<td>Delegate (6.2 oz)</td>
<td>24</td>
<td>66.67%</td>
<td>123</td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>83.33%</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>72</td>
<td>98.33%</td>
<td>120</td>
</tr>
</tbody>
</table>
Evidence from Production?

YES
Nothing is improved by time
### DAY 1

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mortality</th>
<th>Eggs</th>
<th>Nuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrepid 16 oz</td>
<td>99.78% A</td>
<td>920</td>
<td>92</td>
</tr>
<tr>
<td>Altacor 4 oz</td>
<td>99.80% A</td>
<td>500</td>
<td>50</td>
</tr>
<tr>
<td>Delegate 6.2 oz</td>
<td>99.20% A</td>
<td>250</td>
<td>50</td>
</tr>
</tbody>
</table>

### DAY 14

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mortality</th>
<th>Eggs</th>
<th>Nuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrepid 16 oz</td>
<td>99.25% A</td>
<td>2,000</td>
<td>200</td>
</tr>
<tr>
<td>Altacor 4 oz</td>
<td>97.50% B</td>
<td>2,000</td>
<td>200</td>
</tr>
<tr>
<td>Delegate 6.2 oz</td>
<td>90.85% C</td>
<td>2,000</td>
<td>200</td>
</tr>
</tbody>
</table>
Gallons per Acre Matters

Height vs. Mortality

- Black line: 100 gpa
- Red line: 150 gpa

Mortality:
- 0.7
- 0.75
- 0.8
- 0.85
- 0.9
- 0.95
- 1

Height:
- 6
- 8
- 10
- 12
- 14
- 16
- 18
- 20
THANKS
Orchard Weed Management Update

Brad Hanson
Extension Weed Specialist
UC Davis
T&V weed science program focus

Almond research centers on:

- Weed control efficacy
- Herbicide resistant weeds
- Crop safety and herbicide injury
- Fumigant and non-fumigant alternatives

- **Significant support of the California Almond Board and other commodity groups and industries**
T&V herbicide registrations

Updated annually. Available online - easiest way is to find it is on the UC Weed Science blog.
## CA almond herbicide use

<table>
<thead>
<tr>
<th></th>
<th>Top 10 active ingredients</th>
<th>2009 treated acreage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>glyphosate</td>
<td>1,300,394</td>
</tr>
<tr>
<td>2</td>
<td>oxyfluorfen (Goal, Goaltender)</td>
<td>723,524</td>
</tr>
<tr>
<td>3</td>
<td>glufosinate (Rely)</td>
<td>271,135</td>
</tr>
<tr>
<td>4</td>
<td>paraquat (Gramoxone Inteon)</td>
<td>250,156</td>
</tr>
<tr>
<td>5</td>
<td>pendimethalin (Prowl)</td>
<td>167,689</td>
</tr>
<tr>
<td>6</td>
<td>2,4-D</td>
<td>152,455</td>
</tr>
<tr>
<td>7</td>
<td>oryzalin (Surflan, etc)</td>
<td>99,220</td>
</tr>
<tr>
<td>8</td>
<td>simazine (Princep, etc)</td>
<td>92,220</td>
</tr>
<tr>
<td>9</td>
<td>flumioxazin (Chateau)</td>
<td>90,718</td>
</tr>
<tr>
<td>10</td>
<td>carfentrazone (Shark)</td>
<td>68,360</td>
</tr>
<tr>
<td>11</td>
<td>rimsulfuron (Matrix)</td>
<td>52,577</td>
</tr>
</tbody>
</table>

740,000 A bearing almond (2010)
### Confirmed glyphosate resistance

<table>
<thead>
<tr>
<th>(grouped by genus)</th>
<th>USA</th>
<th>CA</th>
<th>WA</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palmer amaranth and com. waterhemp</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giant and common ragweed</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian fingergrass</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hairy fleabane and horseweed</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Sourgrass</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junglerice</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goosegrass</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild poinsettia</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italian and rigid ryegrass</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Ragweed parthenium</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Buckhorn plantain</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Johnsongrass</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liverseedgrass</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SJV junglerice

Greenhouse dose response
- 0.75 lb ae/A use rate
- Up to 4x
- Photos taken 21 DAT
Other species of concern - goosegrass

Eleusine spp.
- Goosegrass and threespike goosegrass
Other species of concern - pigweeds

e.g. Palmer amaranth
What might we be in for?

Horseweed

Junglerice

Palmer amaranth
2011-12 GR weed training sessions

7 workshops in CA, OR, and WA
• University, Extension, and USDA-ARS presenters

Resulted in a series of UC IPM publications
• *Selection Pressure, Shifting Populations, and Herbicide Resistance and Tolerance*
• *Glyphosate Stewardship: Keeping an Effective Herbicide Effective*
• *Preventing and Managing Glyphosate-Resistant Weeds in Orchards and Vineyards*
• *Managing Glyphosate-Resistant Weeds in Glyphosate-Resistant Crops*

http://www.ipm.ucdavis.edu/IPMPROJECT/glyphosateresistance.html
Herbicide evaluations

Recent focus on residual herbicides
- Several new products
  - Additional MOA for resistance management
- Tank mixes and sequential applications
- Also burn down partner comparisons
Glyphosate + penoxsulam/oxyfluorfen
Weed density 120 DAT

- Untreated
- Glyphosate
- Glyphosate + flumioxazin
- Glyphosate + penoxoxyfluor
- Glyphosate + indaziflam
- Glyphosate + isoxaben
- Glyphosate + simazine

Plants.m^-2

Weed density comparison with different treatments.
Glyphosate vs glufosinate (w/resid)

Glyphosate + saflufenacil + pendimethalin

Glufosinate + pendimethalin
New (er) herbicides

**PRE**
- Indaziflam
- Penoxsulam
- Rimsulfuron
- Isoxaben

**POST**
- Glufosinate
- Saflufenacil
- Pyraflufen
Herbicide injury research

- Addressing Farm Advisor and industry questions
- Training tools for herbicide injury symptoms
Other weed management issues

VOC regulations

• EC formulations of oxyfluorfen

Crop safety of newer herbicides or use patterns

Glufosinate shortfall in 2013 (and 2014?)

What else? Questions? Comments?
T&V weed science team

Brad Hanson - Cooperative Extension Weed Specialist
• Chemical weed control, herbicide resistance, herbicide fate, methyl bromide alts

Lynn Sosnoskie, Ph.D. (Project Scientist)
• Weed biology, ecology and resistance management

Sorkel Kadir, Ph.D. (Visiting Scientist)
• Herbicide fate in plants and soil

Seth Watkins, B.Sc. (Research Technician)
• Orchard and vineyard herbicide efficacy and crop safety evaluations

Marcelo Moretti, M.Sc. (PhD Student)
• Mechanisms of resistance in glyphosate- and paraquat-resistant Conyza, herbicide field performance, control of herbicide resistant biotypes

Andrew (Bob) Johnson, B.Sc. (MS Student)
• Non-fumigant approaches for orchard re-plant issues, herbicide performance

UCCE and industry cooperators
Thanks!

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530 752 8115
http://ucanr.org/brad.hanson

UC Davis Weed Research and Information Center
http://wric.ucdavis.edu/
http://ucanr.org/blogs/UCDWeedScience/

UC Davis Statewide Integrated Pest Management Program
http://www.ipm.ucdavis.edu/
Biology and Management of Almond Diseases

J.E. Adaskaveg
University of California, Riverside
Currently registered and new fungicides for almond production in California
Single-fungicides - Inorganics and Conventional Synthetics

- **Inorganics**
  - Copper, Sulfur
  - Ziram, (Maneb)
  - Captan
  - Bravo, Echo, Equus

- **Dithiocarbamates**
  - Ziram, (Maneb)

- **Phthalimides**
  - Captan

- **Isophthalonitriles**
  - Bravo, Echo, Equus

- **Guanidines**
  - Syllit

- **Sterol inhibitors (DMIs)**
  - Rally, Laredo, Tilt, Indar, Quash, Bumper, Inspire

- **SDHIs**
  - Xemium, Luna Privilege, Fontelis

- **Anilinopyrimidines**
  - Vangard, Scala

- **Benzimidazoles**
  - Topsin-M, T-Methyl

- **Hydroxyanilides**
  - Elevate

- **Dicarboximides**
  - Rovral, Iprodione, Nevada, Meteor

- **Guanidines**
  - Syllit

- **SDHIs**
  - Xemium, Luna Privilege, Fontelis

- **Anilinopyrimidines**
  - Vangard, Scala

- **Polyoxins**
  - Ph-D

**FRAC group**

- **Multi-site mode of action**
- **Single site mode of action**
- **Reduced risk fungicides**

**In development:** picoxystrobin - FG11; several numbered compounds - unassigned to class

**Newly registered:** Fontelis, Luna Sensation, Pending: Syllit, Bravo – new PHI and rate.

**Exempt Status:** Polyoxin-D
Conventional Synthetic Fungicides – Pre-mixtures

Inspire Super

Adament, Quadris Top, Quilt Xcel

Pristine, Luna Sensation, Merivon, Q8Y78

FRAC group
- 3 DMIs
- 7 SDHIs
- 9 Anilinopyrimidines
- 11 Qols

Natural Products and Biocontrols

Regalia, Cerebrocide, Polyoxin-D organic, Actinovate

- Natural products/biocontrols for organic almond production.
- Polyoxin-D received an exempt status!
Update on management of selected diseases of almond
Update on Scab Control –

**Disease Cycle**

- **Overwintering twig lesions**
  - Conidia (asexual stage) production in the spring and throughout season
- **Defoliation and weakening of trees during severe outbreaks**
- **Survival on fallen leaves over winter?**
- **Infection of twigs (<1 year old), fruit, leaves**
- **Development of sexual fruiting bodies**
  - Ascus with ascospores
- **Mature ascoma with asci and ascospores**
- **Sexual stage in California?**
- **Healthy twig**
- **Petal fall treatments**
- **Dormant treatments**

**Treatment Approaches**

- **Healthy twig**
- **Petal fall treatments**
- **Dormant treatments**
**Update on Scab Control** – Dormant treatments to reduce inoculum in the spring

**Bravo WeatherStik**
*cv. Carmel, Butte Co.*

<table>
<thead>
<tr>
<th>Fung. rate</th>
<th>Oil</th>
<th>Timing</th>
<th>April 4</th>
<th>June 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td>-</td>
<td>-</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>4 pt</td>
<td>-</td>
<td>Jan. 2012</td>
<td>bc</td>
<td>ab</td>
</tr>
<tr>
<td>6 pt</td>
<td>-</td>
<td>Jan. 2012</td>
<td>ab</td>
<td>a</td>
</tr>
<tr>
<td>4 pt</td>
<td>+</td>
<td>Jan. 2012</td>
<td>cd</td>
<td>d</td>
</tr>
<tr>
<td>6 pt</td>
<td>+</td>
<td>Jan. 2012</td>
<td>d</td>
<td>b</td>
</tr>
</tbody>
</table>

- The 6-pt rate was more effective than the 4-pt rate.
- In combination with 4% oil, the efficacy of was greatly improved and was extended into late spring.
Update on Scab Control – Dormant treatments to reduce inoculum in the spring

- In October of 2012, Bravo WeatherStik received a Section 2(ee) registration for dormant application between Dec. 1 and Jan. 10, 2013 or before bud swell using the 4-pt rate.
- Full registration is planned through IR-4 to change PHI to 60 days and rate to 6 pts/A.
- Goal:

<table>
<thead>
<tr>
<th>ALMOND - Treatment timing for scab and Alternaria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disease</strong></td>
</tr>
<tr>
<td>Scab</td>
</tr>
<tr>
<td>Scab chlorothalonil</td>
</tr>
<tr>
<td>Alternaria</td>
</tr>
</tbody>
</table>
Update on Scab Control – New Usage

Syngenta

FIFRA Section 2(ee) Recommendation

Date: October 25, 2012

Products: Bravo Weather Stik®
EPA Reg. No. 50534-188-100

Use: For tank mix with agricultural oil for use on almond and additional scab control

States: California

This is a recommendation of FIFRA Section 2(ee) as it relates to the use of Bravo Weather Stik for the control in a tank mixture with agricultural oil on almond at the recommended rates in California.

DIRECTIONS FOR USE

For dormant application from December 1st through January 10th or before bud swell. Apply Bravo Weather Stik at the rate of 4 pints product (64 fluid ounces/100 gal/A - concentrate application) in a tank mixture with 4 gal agricultural oil per acre. For dilute applications, use 1.33 pints product and 1 gal oil/100 gal (maximum of 300 gals/A).
The first in-season scab application has to be timed at beginning of twig lesion sporulation for best efficacy. For most fungicides, programs starting early (A) were more effective than starting later (B).
Update on Scab Control – Summary

- An effective 3-spray program includes dormant and two applications after twig infection sporulation.

- Multi-site fungicides with low resistance potential (chlorothalonil, possibly mancozeb, captan, ziram) should be in rotations with the newer single-site and pre-mix fungicides.

- Syllit is a new scab material and should be used at 32 oz/A.

- **Single-site fungicides should not be applied once disease is developing.**
## Update on Alternaria Leaf Spot Control
### Field trials 2012

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate (/A)</th>
<th>Incid. (%)</th>
<th>Defoliation rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Bravo</td>
<td>4 pts/A</td>
<td>@</td>
<td>@</td>
</tr>
<tr>
<td>Fontelis</td>
<td>14 fl oz</td>
<td>@</td>
<td>@</td>
</tr>
<tr>
<td>Quash + Ph-D*</td>
<td>3.5 oz + 6.2 oz</td>
<td>@</td>
<td>@</td>
</tr>
<tr>
<td>Luna Sensation</td>
<td>5 fl oz</td>
<td>@</td>
<td>@</td>
</tr>
<tr>
<td>Inspire Super + Surf.</td>
<td>20 fl oz</td>
<td>@</td>
<td>@</td>
</tr>
<tr>
<td>Quadris Top</td>
<td>14 fl oz</td>
<td>@</td>
<td>@</td>
</tr>
<tr>
<td>Merivon</td>
<td>6.5 fl oz</td>
<td>@</td>
<td>@</td>
</tr>
<tr>
<td>Syltit</td>
<td>32 oz</td>
<td>---</td>
<td>b</td>
</tr>
<tr>
<td>Bumper</td>
<td>4 fl oz</td>
<td>---</td>
<td>b</td>
</tr>
</tbody>
</table>

### Tank & pre-mixtures

- **Most effective:**
  - Mixtures of FG 19 - Ph-D (polyoxin-D) and FG 3 fungicides (i.e., Inspire, Quash).
  - FG 7 - Fontelis (but high resistance potential when used alone)
  - Pre-mixtures: FG 3/11 - Adament, Quilt Excel, Quadris Top, FG 7/11 - Luna Sensation, Merivon
  - Chlorothalonil: multi-site MOA. Label will be modified for 6 qt/A / 60 days PHI.
Update on Hull Rot Control

- Caused by *Rhizopus stolonifer* or by *Monilinia fructicola*
- Both pathogens infect fruit and cause dieback

- Inoculum of *Rhizopus stolonifer* is omnipresent (soil)
- Inoculum of *Monilinia fructicola* originates from other stone fruits (peaches, cherries) or almond. Blossom blight can be caused by *M. laxa* (North) and *M. fructicola* (South regions).
Hull rot caused by *R. stolonifer* can be managed with early hull split applications of selected fungicides. Typically, 70% reduction with a single application.
Hull rot caused by *M. fructicola* or by both pathogens is managed by late-spring applications. This study will be repeated in 2013 using different fungicides.
Update on Hull Rot Control - Summary

• Knowledge on the management of hull rot is accumulating.

• Fungicide treatments can be effective in reducing hull rot caused by *R. stolonifer* and by *M. fructicola*.
  • For *Rhizopus* hull rot, early hull split applications when susceptibility is high should be done. Fungicides are applied most effectively with NOW applications.
  • For *Monilinia* hull rot, applications should be done earlier (late spring). *This needs further evaluation.*

• For the most effective integrated management of hull rot, hull split should be induced simultaneously with proper water management (i.e., deficit irrigation).
Update on Fungicide Resistance

• **Qols (FRAC 11):**
  • Resistance continues to be widespread in populations of the scab and Alternaria pathogen populations

• **SDHIs (FRAC 7):**
  • Resistance in *Alternaria* spp. at some locations

Cross resistance among sub-groups

<table>
<thead>
<tr>
<th>Cross resistance type</th>
<th>FG 7G (boscalid)</th>
<th>FG 7F (fluxapyroxad, penthiopyrad)</th>
<th>FG 7B (fluopyram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>2</td>
<td>R</td>
<td>MR</td>
<td>S</td>
</tr>
<tr>
<td>3</td>
<td>R</td>
<td>R</td>
<td>MR</td>
</tr>
</tbody>
</table>

S = Sensitive
R = Resistance (EC50 values > 10x of baseline, >1 ppm)
MR = Moderate resistance (EC50 values 3-<10 x of baseline, <1 ppm)

• **APs (FRAC 9):**
  • Resistance found in *Monilinia laxa* at one location in 2012 – first report
<table>
<thead>
<tr>
<th>ALMOND</th>
<th>PEACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>APRICOT</td>
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<tr>
<td>CHERRY</td>
<td>PLUM</td>
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<td>PRUNE</td>
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<tr>
<td>KIWIFRUIT</td>
<td>STRAWBERRY</td>
</tr>
<tr>
<td></td>
<td>WALNUT</td>
</tr>
</tbody>
</table>

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**UC Kearney Agricultural Center**  
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Thank you!

[Signature]
Vertebrate Pest Management: What’s new?

Roger A. Baldwin
Wildlife Pest Management Advisor
UCCE Statewide IPM Program
Field-Use Rodenticides

• 1st gen anticoagulants used extensively.

• As of spring 2011, now restricted use.

• New labels may have implications for perimeter baiting.

• Zinc phosphide still the same.
Structural Rodenticides

- 2nd gen anticoagulants more difficult to obtain but not restricted use.

- Can be used up to 50 feet from structures in bait stations.

- Secondary toxicity risks:
  - 1st generation—limited
    - e.g., 1 of 96 raptors collected exhibited 1st gen exposure
    - e.g., 2 of 30 kit foxes exhibited 1st gen exposure
  - 2nd generation—more likely
    - e.g., 82 of 96 raptors exhibited exposure
    - e.g., 27 of 30 kit foxes exhibited exposure
Structural Rodenticides

• Bromethalin more available now.

• Cholecalciferol is certified organic.

• Research into cholecalciferol + diphacinone for voles is promising.
Aluminum Phosphide Changes

• **Buffer zones extended from 15 to 100 feet.**

• **Application sites now are to be posted.**

• **Fumigation Management Plan is still required.**

• **Contact local Ag Comm. office for details.**
Current Status of Gas Cartridges

- Used for ground squirrel.

- Is not a restricted-use material.

- U.S. EPA moving to expand endangered species delineations.

- This would eliminate its use throughout most of Central Valley.
• Recently legalized in CA.

• Cheetah was ineffective against CA ground squirrels.

• PERC has exhibited varying efficacy for pocket gophers (56%) and Belding’s ground squirrel (76%).

• Not registered as a pesticide.
• Anthraquinone is a post-ingestive repellent currently used for repelling bird consumption of crops such as rice and sunflowers in some states.

• Initial lab trials suggest it could be effective for nut crops.

• Field trials are anticipated in the future to further test this material.
Field-Use Rodenticides

- Recent study showed 0.005% diphacinone grain effective (90%) against roof rats in almonds.

- Must be used during non-bearing season.

- Also highly effective on deer mice (99%), but not currently on label for use in bait stations.
Field-Use Rodenticides

- Vertebrate pest management is getting more complicated and challenging.
- When in doubt, contact local CE office or county Ag Comm. Office for up-to-date information on available control options.