Weed Control Update for Orchards and Vineyards

Brad Hanson
UC Cooperative Extension
Weed Science Specialist
Weed research and extension

- Continuing focus on orchards and vineyards, but also working in some annual crops
  - Evaluating and managing herbicide resistance
  - Weed biology, invasion, and resistance
  - Chemical weed management
  - Crop safety and herbicide registration research
T&V weed group

- Brad Hanson – CE Specialist
- Lynn Sosnoskie – Project Scientist
- Sarah Morran – Postdoctoral Researcher
- Seth Watkins – Staff Research Associate
- Guy Kyser – Specialist
- Marcelo Moretti – PhD Student
- Caio Brunharo – PhD Student
- Mariano Galla – PhD Student
- Liberty Galvin – MS Student
- Undergrad lab assistants and interns
- USDA-ARS Parlier lab affiliates – fumigant projects
Orchard weed programs

• Typical herbicide application timing in tree nuts
  ▫ Post harvest burndown ~ Oct/Nov
    • Maybe short resid.?
  ▫ Winter PRE/POST tankmix Dec-Jan
  ▫ Spring burndown Mar/Apr
  ▫ Preharvest (whole floor) Jun/Jul/Aug
    • Usually includes a short resid.

*Growers with POST-only programs have more frequent burndown applications, perhaps 2-3 more
Weed management further complicated by HRW

- In orchards, we’ve largely discouraged the POST-only approaches
- HRW management approaches usually involve using multiple MOA herbicides in tankmix, sequence, or both
- More broad spectrum MOA available in PRE herbicide sector, plus are usually mixed with POST partners
# Glyphosate resistance in CA orchards

<table>
<thead>
<tr>
<th>Confirmed</th>
<th>Suspected or questionable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Broadleaves</strong></td>
<td><strong>Broadleaves</strong></td>
</tr>
<tr>
<td>▫ Horseweed (mostly winter)</td>
<td>▫ Palmer amaranth (summer)</td>
</tr>
<tr>
<td>▫ Fleabane (mostly winter)</td>
<td>▫ Lambsquarters (summer)</td>
</tr>
<tr>
<td><strong>Grasses</strong></td>
<td><strong>Grasses</strong></td>
</tr>
<tr>
<td>▫ Ryegrass (fall/winter)</td>
<td>▫ Threespike goosegrass (spring)</td>
</tr>
<tr>
<td>▫ Annual bluegrass (fall/winter)</td>
<td>▫ Feather fingergrass (summer)</td>
</tr>
<tr>
<td>▫ Junglerice (summer)</td>
<td>▫ Windmillgrass (summer)</td>
</tr>
<tr>
<td></td>
<td>▫ Sprangletop (summer)</td>
</tr>
<tr>
<td></td>
<td>▫ Witchgrass (summer)</td>
</tr>
</tbody>
</table>

*Resistance in the world in several other Elusine, Chloris, Leptocloa, Echinocloa, Eragrastis spp.*
Horseweed and hairy fleabane
Annual bluegrass (SJV)
Junglerice
SJV junglerice

Greenhouse dose response
- 0.75 lb ae/A use rate
- Up to 4x
- Photos taken 21 DAT

Moretti and Hanson
Species of concern - goosegrass

- Eleusine spp.
  - Goosegrass and threespike goosegrass
Continuing resistance concerns

- T&V HRW problems mostly glyphosate-related (so far)
  - Some concerns with other MOA
    - Paraquat (C)
    - Glufosinate (S), ACCase inhibs (S), ALS inhibs
- Increasing problems with summer grasses will present additional challenges
  - Also concerns with some summer-annual broadleaf weeds
Management of resistant weeds

- Fewer POST emergence options
  - H. fleabane – glufosinate, glyphosate+saflufenacil, glyphosate+2,4-D, sometimes paraquat
  - Junglerice – regrowth and new germination undermines POST treatment
- Preemergence herbicides
  - best alternative available
- Greater focus on middles?
- Scouting and ID essential
Herbicide updates
Updated annually. Available online - easiest way is to find it is on the UC Weed Science blog.
## Herbicides for <2 yr tree nuts

**PRE**
- EPTC (well-established)
- Chateau (1yr need carton)
- Alion (1yr)
- Trellis
- Broadworks (12 mo)
- Solicam (18 mo)
- Goal
- Prowl
- Surflan
- PindarGT (9 or 15 mo)
- Matrix (1 season)

**POST**
- Shark (not green bark)
- Select (NB only)
- Dri-Clean (1 yr)
- Diquat (NB only)
- Fusilade (NB on some)
- Glyphosate
- Rely (not green bark)
- Gramoxone (not green bark)
- Venue (not green bark)
- Treevix (not green bark)
- Poast

Check current labels – not all products registered on all crops
Major T&amp;V label changes

- Last year, major changes to Alion rate structure, soil type limitations, and irrigation methods
- Rely and other glufosinate herbicides now registered on most stone fruit, most citrus, and olive
- Broadworks (mesotrione) registered on tree nuts, some stonefruit, and citrus
Mesotrione (Broadworks)

- HPPD inhibitor (Group 27)
  - New mode of action for T&V crops
- PRE and POST activity
- Use rate 6 fl oz/A (or 3 oz as a sequential)
- Trees established 12+ months
- 30 day PHI (nuts and stone) 1 d PHI (citrus)
- Primarily broadleaf activity, will need partner for grasses
Recent performance observations
## Alion rates and tankmixes

### 2014 walnut trial near Chico

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate</th>
<th>Annual bluegrass</th>
<th>Shepherds-purse</th>
<th>Hairy fleabane</th>
<th>Overall</th>
<th>Junglerice</th>
<th>Hairy fleabane</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Untreated Check</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Alion</td>
<td>2.5 oz/a</td>
<td>100</td>
<td>100</td>
<td>88</td>
<td>97</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>3</td>
<td>Alion</td>
<td>3.5 oz/a</td>
<td>100</td>
<td>100</td>
<td>88</td>
<td>97</td>
<td>98</td>
<td>92</td>
</tr>
<tr>
<td>4</td>
<td>Alion</td>
<td>5 oz/a</td>
<td>100</td>
<td>100</td>
<td>40</td>
<td>85</td>
<td>99</td>
<td>69</td>
</tr>
<tr>
<td>5</td>
<td>Chateau</td>
<td>10 oz wt/a</td>
<td>100</td>
<td>100</td>
<td>70</td>
<td>94</td>
<td>75</td>
<td>57</td>
</tr>
<tr>
<td>6</td>
<td>Matrix</td>
<td>4 oz wt/a</td>
<td>100</td>
<td>85</td>
<td>83</td>
<td>95</td>
<td>58</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>Pindar GT</td>
<td>2.5 pt/a</td>
<td>92</td>
<td>100</td>
<td>93</td>
<td>97</td>
<td>87</td>
<td>96</td>
</tr>
<tr>
<td>8</td>
<td>Goaltender</td>
<td>4 pt/a</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>9</td>
<td>Alion</td>
<td>5 oz/a</td>
<td>100</td>
<td>100</td>
<td>90</td>
<td>97</td>
<td>100</td>
<td>97</td>
</tr>
<tr>
<td>Chateau</td>
<td>6 oz wt/a</td>
<td>100</td>
<td>100</td>
<td>90</td>
<td>97</td>
<td>100</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>10</td>
<td>Alion</td>
<td>5 oz/a</td>
<td>100</td>
<td>100</td>
<td>93</td>
<td>98</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Matrix</td>
<td>2 oz wt/a</td>
<td>100</td>
<td>100</td>
<td>93</td>
<td>98</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>11</td>
<td>Alion</td>
<td>5 oz/a</td>
<td>100</td>
<td>100</td>
<td>65</td>
<td>95</td>
<td>99</td>
<td>86</td>
</tr>
<tr>
<td>Pindar GT</td>
<td>1.5 pt/a</td>
<td>100</td>
<td>100</td>
<td>65</td>
<td>95</td>
<td>99</td>
<td>86</td>
<td>96</td>
</tr>
<tr>
<td>12</td>
<td>Alion</td>
<td>5 oz/a</td>
<td>100</td>
<td>100</td>
<td>88</td>
<td>97</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td>Goaltender</td>
<td>2 pt/a</td>
<td>100</td>
<td>100</td>
<td>88</td>
<td>97</td>
<td>100</td>
<td>98</td>
<td>97</td>
</tr>
</tbody>
</table>

**LSD (P=0.05)** | 6 | 7 | 31 | 9 | 24 | 34 | 25 |

Almond Alion tankmix trial 128 DAT (Escalon)

Note: 2nd year of trial. Application December 17, 2013 and January 13, 2015
All treatments included glyphosate and glufosinate for burndown in both years.
Note: 2\textsuperscript{nd} year of trial. Application December 17, 2013 and January 21, 2015. In the first year, only glyphosate for burndown. 2\textsuperscript{nd} year had glyphosate and glufosinate for burndown.
Thoughts on sequential PRE approaches

• The relatively new challenges with glyphosate-resistant summer weeds in orchard systems may require some different approaches
• We have a number of herbicides available – can we use them more effectively for summer grasses?
  ▫ Can we do it without minimal increases in herbicide load and cost?
Residual herbicide scenario (1)

PRE tank mixture applied in late fall
1. Herbicide #1 (red line)
2. Herbicide #2 (blue line)

* A tank mix broadens weed control spectrum and can be good for resistance management but does not necessarily affect duration of weed control because degradation rate is largely independent for the two herbicides.

B. Hanson
University of California Weed Science
Residual herbicide scenario (2)

Single application of PRE herbicide applied in late fall
1. “regular” rate (red line)
2. “higher” rate (blue line)

* Weed control duration is largely a function of starting concentration (height) and degradation rate (slope). Higher rates typically result in longer weed control.

B. Hanson
University of California Weed Science
Residual herbicide scenarios (3)

Sequential applications of PRE herbicides
1. Herbicide #1 applied in late fall
2. Herbicide #2 (or repeat of #1) in spring

* A sequential application with another residual herbicide (plus a POST partner) may extend weed control in some cases without significantly increasing total herbicide used.

B. Hanson
University of California Weed Science
Possible shifts to sequential herbicide programs

• Typical herbicide application timing in tree nuts
  ▫ Post harvest burndown ~ Oct/Nov
  ▫ Winter PRE/POST tankmix Dec-Jan
  ▫ Spring burndown Mar/Apr
  ▫ Preharvest (whole floor) Jun/Jul/Aug
What this might look like:

- **Post harvest burndown** no change
- **Winter PRE/POST tankmix** change
  - Keep broad spectrum program
    - Alion, Pindar GT, Chateau, Matrix, etc
  - **Change Prowl/Surfan**
    - Instead of 4 qt, eliminate or reduce to 2-3 qt
- **Spring burndown** change
  - **Add Prowl/Surfan to mix**
    - Apply ~2 qt along with the POST burndown partner
- **Preharvest (whole floor)** no change
Challenges to sequential approaches

- **Cost**
  - May be offsetting for PRE herbicide
  - Application should have a “free ride” in spring

- **Spray passes**
  - Should not result in an extra pass
  - Potential to reduce need for a burndown pass?

- **PRE herbicide incorporation**
  - Biggest challenge.
    - Will need rain or overhead irrigation in incorporate
    - Needs to be sufficiently early in single- or double-line drip-irrigated orchards

- **Management**
  - Will take thoughtful and prescriptive approaches to fine-tuning weed management programs
A few take home messages

- Good burndown programs are essential
- Heavy weed pressure may take several years to clean up
- Herbicide-soil contact is crucial for maximum efficacy
- We have several really good PRE herbicides available in tree nuts if we use them correctly
- May need sequential programs if challenged by both winter and summer weeds
In the news...

- Glyphosate as “probable carcinogen”
- IARC evaluation
  - New interpretation of existing data
  - Other agencies (USEPA, EU) previously interpreted these data differently
- What does this mean for CA ag?
  - Likely to be added to CA Prop 65 list
  - I anticipate relatively little near term impact (ag)*

*may be beneficial that red meat also recently designated as ‘probable carcinogen’
Ultimate objective

- Combine effective weed management with economic and environmental sustainability
  - Control weeds
  - Reduce weed seed set
  - Reduce selection for herbicide resistance
  - Reduce weed control costs
  - Reduce overtreatment