Sprayer Tech for Fruit Culture
Bay Area Fruit School
WREC
February 20, 2013

R. David Myers
Principal Agent, Agriculture
New Fruit Team Project
Streuobstwiese – Meadow Orchard

Streuobstwiese in Baden-Württemberg, Germany
Meadow Orchard: Streuobstwiese
A Sustainable Commercial Fruit Production Approach
Southern Maryland Fruit Team
Dave Myers, Herb Reed, Ben Beals, Joe Ficke & Chris Walsh
University of Maryland Extension
CMREC, Upper Marlboro Research Farm
2011

Streuobstwiese is a German word that means a meadow with scattered fruit trees or fruit trees that are planted in a field.

Fruit & Nut Trees:
1) Breda Medlar
2) Lodi Apple
3) Brown Turkey Fig
4) Moon Glow European Pear
5) Hosoi & Shinko Asian Pear
6) Montmorency Tart Cherry
7) Eastern Seedling & Collins PawPaw
8) American Persimmon
9) Fuyo Oriental Persimmon
10) Blue Damson Plum
11) Japanese Heartnut
12) American Filbert

Experimental Design:
- 3 Randomized Reps: 2 Trees/Rep, 14 Tree Varieties, 72 Total Tree Plots.
- Orchard Density: 18' Between Row Spacing X 15' In Row Spacing.
- Training Systems: Traditional

Protocol:
- Organic and soft pesticide canopy evaluations, with conventional orchard floor management utilizing herbicides and fertilizers.
- Tree growth, disease and yield assessments will determine viability.
Meadow Orchard 2011
CMREC, Upper Marlboro

Protocol:
Organic and soft pesticide canopy evaluations, with conventional orchard floor management utilizing herbicides and fertilizers.

Tree growth, disease and yield assessments will determine viability.
New Meadow Bush & Hops Yard
2013 CMREC, Upper Marlboro
Apple Rootstock
Fireblight Susceptibility

- **M9 Bud9**
  - Highly Susceptible

- **M26**
  - Highly Susceptible

- **EMLA 7**
  - Susceptible

- **EMLA 106**
  - Tolerant

- **EMLA 111 Bud 118**
  - Tolerant

- **G16**
  - Tolerant

- **G30**
  - Tolerant
High-Density Apple Variety Fire Blight Resistance Trial on Dwarfing Rootstocks

- Fire blight susceptibility apple varieties on two dwarfing rootstocks: fireblight susceptible M9/Bud 9, to fire blight resistant Geneva 16.

- The varieties included in the trial are Royal Court, Macoun, Ginger Gold, Pioneer Mac, and Honeycrisp, (Crown Empire and Gala replacement trees)
Thank You!

ACN

University of Maryland Extension
Solutions in your community
Blossom Blight
Trauma Blight
Graft Union Necrosis GUN verses Graft Incompatibility GI
GUN Tree Loss Weak and Fireblight Death

August 10, 2012

LSD – 24.05
P – 0.0326
2013 Multi-Tree & Small Fruit Cover Spray Program

Multi-Small Fruit Plantings
RM 65-110 Vineyard Sprayer

RM 25 Utility w/ 5 Nozzle Boom

Air Blast Sprayers

ATV Sprayers
Tell me more about herbicides!
BASF Ag Products
Prowl® H2O, EPA Reg No. 241-418
Available PDF files for Viewing:
Specimen Label, NVA 2008-04-195-0353

BEARING AND NONBEARING GRAPE

Prowl H2O may be only applied by ground, chemigation, or flood, flooded basin and gravity flow irrigation systems.

Use Methods, Timings and Rates
With a single application, uniformly apply Prowl H2O in bearing grape vineyards up to 6.3 quarts per acre depending on the grower’s weed control program, level of weed infestation, and desired use strategy (see chart following).

Prowl H2O Use Rate per Acre

<table>
<thead>
<tr>
<th></th>
<th>Low Use Rate</th>
<th>High Use Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.2 quarts</td>
<td>6.3 quarts</td>
</tr>
</tbody>
</table>

Prowl H2O may be applied anytime after fall harvest, during winter dormancy, and in the spring.
Spraying Equipment

- Understanding Sprayer Plumbing.
- Agitation & Bypass.
- Nozzle Tip Selection.
- Boom Height & Target.
- Boom Pressure Gauge.

Why is the spray pressure always more at the pump gauge then at the boom gauge?
Spray Application

• Chemical Mixing Sequence: Surfactant-WP-DF-EC-L-Fertilizer.
• Sprayer Calibration: Ground Speed X Pressure X Nozzle Output.
• Calibrate When a Product or Sprayer Component Changes.

A farmer discovers a leak while spraying – What should he do?
Special Sprayer Maintenance

- Flush & Rinse Sprayer as Required by Products.
- Check Nozzle Output Uniformity.
- Clean & Lubricate Pump and Other Components.
- Inspect for Leaks.
- Winterize.

What procedure insures thorough rinsing of a sprayer?
FIGURE 4. TREE-ROW-VOLUME DETERMINATION IN APPLE ORCHARDS

EXAMPLE

Gallons/acre for full dilute
Percent of material, rate/acre
50  100  150  200  250  300  350  400  450
25%  37.5%  59%  62.5%  75%  87.5%  100%  112.5%

DISTANCE BETWEEN
18  24  28  31  34  36  38  40
Spray Program for Multi-Tree Fruit Orchards

Many local orchards are composed of multi-fruit combinations producing for fresh market apples, peaches, pears, plums, nectarines, and cherries. Aggressive fruit tree spray programs are required to achieve high quality fruit. These multi-fruit orchards create many spray management challenges for the achievement of good pest control in accordance to label guidelines. Therefore, the following multi-fruit orchard spray program for the control of major tree pests and diseases may offer some assistance:

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Rate</th>
<th>Insecticides</th>
<th>Rate</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 15</td>
<td>2nd Cover Spray</td>
<td>2.0 lb</td>
<td>Captafol 50W</td>
<td>2.0 lb</td>
<td>General Protection</td>
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<tr>
<td></td>
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<td>[-]</td>
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<tr>
<td>June 1</td>
<td>3rd Cover Spray</td>
<td>2.0 lb</td>
<td>Topazz-HF 72W</td>
<td>2.0 lb</td>
<td>Imazalil 70W</td>
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</tr>
<tr>
<td>July 1</td>
<td>5th Cover Spray</td>
<td>2.0 lb</td>
<td>Early Peach Harvest</td>
<td>2.0 lb</td>
<td>Captafol 50W</td>
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<tr>
<td>August 1</td>
<td>8th Cover Spray</td>
<td>2.0 lb</td>
<td>Late Peach Harvest</td>
<td>2.0 lb</td>
<td>Captafol 50W</td>
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</tr>
<tr>
<td>September 1</td>
<td>9th Cover Spray</td>
<td>2.0 lb</td>
<td>Apples and Pears Only</td>
<td>2.0 lb</td>
<td>Captafol 50W</td>
</tr>
</tbody>
</table>

**Multi-Fruit Spray Calendar**

March 15 - Dormant Spray
April 5 - Peach Bloom
April 25 - Peach Shuck Split
May 5 - 1st Cover Spray

*Important Note: The calendar spray dates given are an average estimate for Anne Arundel and Prince George’s County, Maryland. Be sure to adjust your spray schedule application dates accordingly. The above recommendations very closely reflect the current spray program utilized at the University of Maryland Research and Extension Center, Upper Marlboro Facility for its research orchards. Remember to always “Read the Label”.

R. David Moyer
Research Extension Agent, Agriculture
Starkcrimson

DESCRIPTION: Lighter from deep wine red to claret when ripe and yields slight to gentle productivity.

USES: (STORAGE): Up to 2 months at 32-35°F.
Key Pest Problems of Cherry, Peach, Nectarine, & Plum:

Diseases:
- Peach Leaf Curl
- Brown Rot
- Peach Scab
- Cherry Leaf Spot
- Rusty Spot
- Plum Black Knot
- Peach Canker (Cytospora)

### Table 12: Seasonal Activity of Peach Diseases

<table>
<thead>
<tr>
<th></th>
<th>Cytospora canker</th>
<th>brown rot blossoms &amp; twigs</th>
<th>fruit</th>
<th>scab fruit</th>
<th>scab shoots</th>
<th>rusty spot and powdery mildew</th>
<th>Rhizopus rot</th>
<th>bacterial spot</th>
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</thead>
<tbody>
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<td>pink</td>
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<td>bloom</td>
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<td>petal fall</td>
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<td>stuck split</td>
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<td>*</td>
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<td>1st-3rd covers</td>
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<td>S</td>
<td>S</td>
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<td>4th-6th covers</td>
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<td>preharvest</td>
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<td>harvest</td>
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<td>after harvest</td>
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<td>fall</td>
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</tbody>
</table>

*Note: Dates for development of diseases may vary by several weeks from year to year.*
Key Pest Problems of Cherry, Peach, Nectarine, & Plum:

Insects: Scale, Plant Bugs, Stink Bugs, Aphids, Plum Curculio, Oriental Fruit Moth, Japanese Beetle, Peach Tree Borers
Spray Drift Affects Sensitive Crops
Evidence of damage (leaf curling, lesions) in our trials with ornamentals bordering treated lawns

<table>
<thead>
<tr>
<th></th>
<th>12h</th>
<th>24h</th>
<th>48h</th>
<th>72h</th>
<th>1 week</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>-</td>
<td>-</td>
<td>-/+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Dicamba</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>MCPP</td>
<td>-</td>
<td>-</td>
<td>/+</td>
<td>+</td>
<td>++</td>
</tr>
</tbody>
</table>

Cases where 2,4-D, MCPP, or dicamba were detected when sampled after report of overspray/drift damage: 2 of 17

Angus Murphy, PSLA
Sample collection: Dislodgeable residues (DR) improves detection, simplifies preparation steps by eliminating endogenous plant compounds

DR sample preparation: extraction with CMW -> solvent evaporation -> analysis
Whole tissues: extraction with MW -> SPE purification -> solvent evaporation -> analysis

Detection limits: extraction vs. dislodgeable residues

<table>
<thead>
<tr>
<th></th>
<th>12h</th>
<th>24h</th>
<th>48h</th>
<th>72h</th>
<th>1 week</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>E+,DR+</td>
<td>E+,DR+</td>
<td>E+,DR+</td>
<td>E-,DR+</td>
<td>-,-</td>
</tr>
<tr>
<td>Dicamba</td>
<td>E+,DR+</td>
<td>E+,DR+</td>
<td>E-,DR+</td>
<td>-,-</td>
<td>-,-</td>
</tr>
<tr>
<td>MCPP</td>
<td>E+,DR+</td>
<td>E+,DR+</td>
<td>E+,DR+</td>
<td>E-,DR+</td>
<td></td>
</tr>
</tbody>
</table>

Comparison of dislodgeable residue recovery to cloth traps (dislodgeable residues as percentage of trap recovery)

<table>
<thead>
<tr>
<th></th>
<th>12h</th>
<th>24h</th>
<th>48h</th>
<th>72h</th>
<th>1 week</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-D</td>
<td>96%</td>
<td>81%</td>
<td>24%</td>
<td>11%</td>
<td>ND</td>
</tr>
<tr>
<td>Dicamba</td>
<td>81%</td>
<td>68%</td>
<td>17%</td>
<td>nd</td>
<td>ND</td>
</tr>
<tr>
<td>MCPP</td>
<td>98%</td>
<td>93%</td>
<td>22%</td>
<td>18%</td>
<td>ND</td>
</tr>
</tbody>
</table>

Angus Murphy, PSLA
Herbicide Drift Potential

✓ All herbicides are subject to particle drift.

✓ Vapor drift potential varies by each herbicide's vapor potential.

✓ Droplet size controls both types of drift.

✓ Wind, temperature and humidity affects drift severity.
Distance Water Droplet Drifts While Falling 3ft in a 5mph wind

<table>
<thead>
<tr>
<th>Size</th>
<th>Microns</th>
<th>Drift Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Coarse</td>
<td>600</td>
<td>0.3</td>
</tr>
<tr>
<td>Coarse</td>
<td>500</td>
<td>0.4</td>
</tr>
<tr>
<td>Medium-Coarse</td>
<td>400</td>
<td>0.7</td>
</tr>
<tr>
<td>Fine</td>
<td>200</td>
<td>5.5</td>
</tr>
<tr>
<td>Very Fine</td>
<td>100</td>
<td>26.0</td>
</tr>
<tr>
<td>Ultra Fine</td>
<td>50</td>
<td>88.0</td>
</tr>
</tbody>
</table>

Note: Spray particles under 50 microns in diameter may remain suspended in the air indefinitely or until they evaporate.

Comparison of Micron Sizes (approximate)

- 2000μm • #2 Pencil lead
- 850μm • paper clip
- 420μm • staple
- 300μm • toothbrush bristle
- 150μm • sewing thread
- 100μm • human hair
VMD of TP8004VS at 40 psi ≈ 335 microns

% Driftable Fines at 40 psi:
- TP8004 = 5%
- TP11004 = 14%

ASAE Classification at 40 psi - Medium
Drift Reduction Nozzle Technology

Pre-orifice to create pressure drop, turbulence to slow liquid velocity

Venturi effect to produce air-induced, larger droplets
Turbo TeeJet® flat spray tip

VMD of TT11004VP at 40 psi ≈ 420 microns

% Driftable Fines at 40 psi: TT11004 = < 2%
(<150 Microns)

ASAE Classification at 40 psi - Coarse
AI TeeJet™

Excellent for Systemic Herbicide

30-90 psi
Did You Get?
Vegetable & Fruit Headline News!

Vegetable & Fruit Headline News

2011
Issue #1 - April 14, 2011
Issue #2 - April 28, 2011
Issue #3 - May 12, 2011
Issue #4 - May 26, 2011
Issue #5 - June 9, 2011
Issue #6 - June 30, 2011
Issue #7 - July 14, 2011
Issue #8 - July 28, 2011
Issue #9 - August 18, 2011
Issue #10 - September 8, 2011
Issue #11 - Winter 2011-2012

Field Observations from Southern Maryland
By: Dave Burke
Extension Educator & CDP, Agricultural St. James County, MD
Deltacapital

Farmers are busy laying plastic, mulching and getting one
major crop in the ground. Early winter veered from
plowing a field to be behind several years given the
cold weather. Fortunately high tunnel are getting
the first fruit and vegetables in the fall this year.
Two major pest problems to report.

Spring Observations from:
WVREC
By: Michael Nizam
Horticultural Crop Programs Manager
April 12, 2011

Harsh condition today;
Natures grower fungicide for growers in
Eastern South Dakota as a good
disease management tool. Always test to
understand the products library
that also to help Natures grower
disease management protocol
programs

Apples & Peach Tree
Apples are in full bloom
Our "Fruit	" program is only available by call for Fruit	
groups. Call us at (410) 555-5555 to learn more about our Fruit	
programs. Please call us at (410) 555-5555 for more information.
Spring is the time to plan your spring projects.请参考我们的网站：
http://www.marylandextension.com

Did you miss us last year? We are here to offer you a
7-day head start on your garden plans. We are
offering a variety of programs to help you

2011-2012 vegetable & fruit headline news
Thank You!
Any Questions?

R. David Myers
Principal Agent
myersrd@umd.edu
**Herbicide Mode of Action & Classification**

- **Cell Membrane Disrupters**
  - Bipyridiliums [22]

**Paraquat: Gramoxone Inteon®**

- Directed Spray, Restricted Use - Danger
- ✓ Post-emergence with no soil activity or uptake
- ✓ Non-selective
- ✓ Contact herbicide: rapid foliar absorption with some translocation
- ✓ Use with a non-ionic surfactant (NIS)
Herbicide Mode of Action & Classification

• Cell Membrane Disrupters

Nonanionic acid

Pelargonic Acid: Scythe® [27]

Directed spray (Organic Label)

✓ Post-emergence with no soil activity or uptake.
✓ Non-selective.
✓ Contact herbicide: rapid foliar absorption, non-systemic.
✓ 75-200 gals/acre spray solution of 5%-10% Scythe®.

10-gallon spray mixtures:

5% Solution – 2.0 qts. Scythe® + 9.5 gals. water.
7% Solution – 2.75 qts. Scythe® + 9.3 gals. water.
10% Solution – 4.0 qts. Scythe® + 9.0 gals. water.
Herbicide Mode of Action & Classification

- Aromatic Amino-Acid 5 Enolpyruvyl-Shikimate-3-Phosphate Synthase (EPSP) Inhibitors

Organophosphorus [9]

Glyphosate: Roundup Weather Max® 7+ Roundup formulations or Touchdown ® or Credit® or Rattler® [9] Shielded Spray Only!

- Post-emergence with no soil activity or uptake.
- Non-selective.
- Contact systemic herbicide: foliar absorption with translocation.
- Do not use with a surfactant – see label.
- Avoid trunk, fruit, branch & bud contact.
Herbicide Mode of Action & Classification

- Glutamine Synthesis Inhibitor
- Organophosphorus

**Glufosinate: Rely® [10]**

Skin contact may be fatal – Lower dermal LD\(_{50}\) then oral LD\(_{50}\).

- Post-emergence with no soil activity or uptake.
- Non-selective.
- Contact herbicide: foliar absorption with limited translocation.
- Use with a surfactant – see label.
- Avoid fruit, branch & bud contact.
- Degrades rapidly in the soil, 7-days by soil microbes.
Herbicide Mode of Action & Classification

• Meristematic Root Inhibitors: Inhibition of Cell Division and Elongation of Roots
  Dinitroanalines [3]

  Pendimethalin: Pendimax® or Prowl® New H2O formulation
  60 day PHI

  Oryzalin: Surflan® A.S.
  0 day PHI

  Trifluralin: Treflan® or Trilin®
  ✓ Pre-emergence with 1-3 months of soil activity
  ✓ Does not leach – forms a herbicide barrier in clay soils
  ✓ Apply before rainfall or shallowly incorporate
  ✓ Controls grasses & small seeded broadleaves
  ✓ Not translocated in plants
Herbicide Mode of Action & Classification

- Cellulose Biosynthesis Inhibitor: Acts Primarily at Actively Dividing Meristems – Roots Tips & Growing Points

Benzonitrile [20]
Dichlobenil: Casoron®4G

- Pre-emergence with 2-6 months of soil activity
- Controls broadleaves & grasses equally
- Very little leaching – high vapor potential
- Absorbed primarily through the roots translocated readily via the xylem – rapid growth inhibition
- Apply before rainfall or shallowly incorporate
Herbicide Mode of Action & Classification

• Mobile Photosynthetic Inhibitors
  
  Ureas
  Diuron: Karmex® or Diuron® [7]

  Uracils
  Terbacil: Sinbar® [5]

✓ Pre and Post-emergence with 4-12 months of soil activity
✓ Controls broadleaves & grasses
✓ Absorbed primarily through the roots translocated readily via the xylem
✓ Some foliar uptake
✓ 1-3 year established vineyards & Orchards
  - Consult label
Herbicide Mode of Action & Classification

- **Meristematic Shoot Inhibitors: Strong Inhibitor of Mitosis - Cell Division**

  **Chloracetamides or Amides** [15]
  
  **Napropamide: Devrinol®**
  **Safe for all fruit!**

  **Pronamide: Kerb®**
  
  **Apply post harvest to 1-year old vineyards & orchards**
  
  ✓ Pre & Post-emergence with 1-3 months of soil activity
  ✓ Very little leaching – forms a herbicide barrier in clay soils
  ✓ Apply before rainfall or shallowly incorporate
  ✓ Controls primarily grasses & small seeded broadleaves
  ✓ Absorbed primarily by the roots and readily translocated via the xylem
Herbicide Mode of Action & Classification

• Mobile Photosynthetic Inhibitors

**Triazines [5]**

Metribuzine: Sencor ® *(Peaches Only)*

Simazine: Princep®

3-year old vineyards & established orchards

✓ Pre and Post-emergence with 2-6 months of soil activity

✓ Controls broadleaves & grasses

✓ Absorbed primarily through the roots translocated readily via the xylem

✓ Some foliar uptake

✓ Avoid application on high pH soils above 6.8

✓ *Half low rate!*
Herbicide Mode of Action & Classification

• Carotenoid Synthesis Inhibitors

Pyridazinone

Norflurazon: Solicam® [12]

2-year established vineyards & Orchards.

✓ Preemergence with 1-6 months of soil activity

✓ Controls grasses, sedges and many broadleaves

✓ Absorbed primarily through the roots translocated readily via the xylem

✓ Half low rate – Dormant or in fall post harvest
Herbicide Mode of Action & Classification

- PPG or Protox Inhibitor Diphenylethers [14]
  Oxyfluorfen: Goal® or Galigan® or Fire Power®
  ✓ Pre & Post-emergence with 1 month of soil activity or uptake.
  ✓ Controls broadleaves, assists in grass control preemergence.
  ✓ Contact herbicide: Foliar with shoot & some root uptake from the soil – non mobile in plant.
  ✓ Use with a non-ionic surfactant (NIS).
  ✓ Dormant applications only.
Herbicide Mode of Action & Classification

• PPG or Protox Inhibitor
  
  **N-Phenylphenolphthalimides [14]**

**Flumioxazin: Chateau®**

1-year established & 60-day PHI.

✓ Pre & Post-emergence with 1 month of soil activity or uptake.

✓ Controls broadleaves, assists in grass control preemergence.

✓ Contact herbicide: Foliar with shoot & some root uptake from the soil – non mobile in plant.

✓ Use with a non-ionic surfactant (NIS).

✓ Hooded sprayer unless dormant.
Herbicide Mode of Action & Classification

- PPG or Protox Inhibitor
  - Triazalone [14]
  - Carfentrazone-ethyl: Aim® or Shark®

Vineyard & orchards 3-day PHI

✓ Post-emergence with no soil activity or uptake, rapid microbial breakdown.
✓ Selective broadleaf control
✓ Contact herbicide: Rapid foliar absorption with leaf translocation (15-minutes).
✓ Use with a non-ionic surfactant (NIS).
✓ Apply with a hooded sprayer
Herbicide Mode of Action & Classification

- PPG or Protox Inhibitor
  - Triazalone [14]
  - Saflufenacil : Treevix®

**Apples & pears only, 0-day PHI**

- Post-emergence weed control with root activity and seasonal persistence.
- Burndown broadleaf control.
- Contact herbicide: Rapid foliar absorption with leaf translocation (15-minutes).
- Use with MSO, AMS or UAN.
- Avoid contact with fruit & foliage & follow label drift management guidelines
Herbicide Mode of Action & Classification

- Amino-Acid Acetolactate Synthase (ALS) Inhibitors

Sulfonyl-Ureas (SU’s) [2]

Rimsulfuron: Matrix®

1-year established vineyards & orchards
14-day PHI

✓ Pre and Post control of selected grasses & broadleaves
✓ 4.0 ounces/acre - 1 application per year
✓ 2-3 month activity crop rotation restrictions.
✓ Bioassay Required.
Herbicide Mode of Action & Classification

• Cellulose Biosynthesis Inhibitors
  Triazolocarboxamides [29]
  Indfaziflam: Alion®

3-year established orchards 14-day PHI

✓ Preemergence control of selected grasses & broadleaves
✓ 1.0 ounces/acre application 3.0 ounces per year maximum.
✓ 2-year crop rotation restriction.
✓ Apply to bare soil surface not in proximity to water.
✓ Toxic to fish.
✓ Avoid green trunk, fruit, branch & root contact.
Herbicide Mode of Action & Classification

- Lipid Synthesis Inhibitor: Inhibits Acetyl-CoA Carboxylase

Cyclohexandiones [1]

Sethoxydim: Poast®

Bearing Orchards & vineyards. 14-50 day PHI.

✓ Post-emergence with no soil activity or uptake
✓ Controls grasses only
✓ Primarily leaf uptake – rapidly translocates to growing points
✓ Use with crop oil concentrate (COC)