Weed Management in Strawberry with Dominus, Temozad, & Herbicides

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### Collaborators

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- Cheryl Wilen
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- Ian Greene, Ramco Norcal
- Jenny Broome, DSA
- Mike Stangellini, TriCal
- Husein Ajwa
Financial support

- USDA NIFA Methyl Bromide Transitions
  - 2013 -51102-21524
- California Strawberry Commission
- Support from Reiter Affiliated Companies, Driscoll’s, NorCal Ramco, AMVAC, Isagro
- A special thanks to TriCal Inc. & Ajwa Inc. for fumigant application
- Thanks to growers Jose Garcia & Miguel Ramos
Introduction

- Dominus – product description & trial results
- Temozad - trial results
- Herbicides
- Summary
Allyl Isothiocyanate (AITC) is a synthetically produced biopesticide with its origins in a naturally occurring plant defense chemical from the plant family, brassicaceae.

Testing since 2009 – University, USDA, Contract, and Grower Demo’s

Broad-spectrum activity
- Efficacy against
  - Weeds, nematodes, soil fungi and insects
  - Classified by US EPA and CA DPR as a Fumigant
    > Vapor pressure + Bp + Henry’s Constant = “Passive Fumigant”
    > AITC is a naturally occurring plant defense compound provided by ISAGRO USA in a consistent synthetic formulation
Flashpoint is 117°F (47°C)
Boiling point is 304°F (151°C)
Vapors are 3.4 times heavier than air
Does not make its own pressure (The only pressure in the cylinders is nitrogen pressure)
Dominus Details – (from Isagro)

- All crops labelled
- Entry restricted period = 5 days
- Acres allowed per day = unlimited
- Tarp cutting / puncture = 5 days
- Aeration = 2 – 24 hrs
- Planting interval = 10 days after application
- Buffer zone distance 0-25’ all rates, application methods and acres applied
- FMP’s = not required
- Biopesticide status
- Not yet registered in California
### BIOPESTICIDE FOR AGRICULTURAL SOIL TREATMENT USE

**A Broad Spectrum Pre-Plant Soil Biofumigant For The Control Of Certain Soil Borne Fungi, Nematodes, Weeds And Insects**

<table>
<thead>
<tr>
<th>Product</th>
<th>All Crop</th>
<th>Buffer Zone</th>
<th>Applic. Uses</th>
<th>Restricted Use Pesticide</th>
<th>Restricted Entry Interval</th>
<th>Film Type</th>
<th>Acres per Day</th>
<th>Applic Per year</th>
<th>FMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOMINUS</td>
<td>YES</td>
<td>0 –25’</td>
<td>FF, RBS, RBD</td>
<td>NO</td>
<td>5 DAYS</td>
<td>ALL</td>
<td>NO LIMIT</td>
<td>&gt; 1</td>
<td>NO</td>
</tr>
<tr>
<td>Standard-CP, MB, 1,3-D</td>
<td>NO</td>
<td>25 – 300+’</td>
<td>FF, RBS, RBD</td>
<td>YES</td>
<td>5 DAYS</td>
<td>VIF, TIF</td>
<td>40</td>
<td>1</td>
<td>YES</td>
</tr>
</tbody>
</table>

**FF = Flat Fume/Broadcast; RBS = Raised Bed Shank; RBD = Raised Bed Drip**
Strawberry Trial Schedule

- Lab
  - Lab weed dose response Jan. 2014
- Strawberry
  - Salinas October 2013
  - Salinas October 2014 (2 trials)
  - Watsonville October 2014
Weed Viability - Lab

- Dominus dose response study
  - Annual bluegrass
  - Sweet clover
  - Pigweed
  - Sowthistle
  - Yellow nutsedge
- Dominus (IRF135) doses of 0, 10, 25, 50, 100, 150, 250, 500, 750, 1000, 1250, 2500 PPM
- Propagules were exposed 24 h, 50 seed per replicate, 4 replicates per treatment, January 21, 2014
Weed Viability - Lab

- Dominus dose response study LD$_{90}$s
  - Annual bluegrass - 19 PPM – 12 lb/A
  - Sweet clover - 1120 PPM – 698 lb/A
  - Pigweed - 635 PPM – 396 lb/A
  - Sowthistle - 21 PPM – 13 lb/A
  - Yellow nutsedge – 147 PPM – 92 lb/A
Dominus (IRF135) evaluation in strawberry

- Treatments 2012-13
  - Control
  - Pic Clor 60 350 lb/A
  - IRF135 170 lb/A
  - IRF135 225 lbs/A
  - IRF135 340 lbs/A
- 4 replicates per treatment, Oct. 25, 2012
- Weed seed bioassay, local field weeds
Nutsedge viability – IRF135

Ramos 2012-13
Chickweed viability – IRF135

Ramos 2012-13
Purslane viability – IRF135

Ramos 2012-13
Field Weed Control – IRF135

Ramos 2012-13
Early Season Yield from Clear Plastic at Watsonville, CA

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield (g/plant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTC</td>
<td>200</td>
</tr>
<tr>
<td>PicClor 60</td>
<td>350</td>
</tr>
<tr>
<td>350 lbs/ac</td>
<td></td>
</tr>
<tr>
<td>IRF-35</td>
<td>400</td>
</tr>
<tr>
<td>170 lbs/ac</td>
<td></td>
</tr>
<tr>
<td>IRF-35</td>
<td>500</td>
</tr>
<tr>
<td>225 lbs/ac</td>
<td></td>
</tr>
<tr>
<td>IRF-35</td>
<td>600</td>
</tr>
<tr>
<td>340 lbs/ac</td>
<td></td>
</tr>
</tbody>
</table>

* Standard PE Film
Late season collapse, Watsonville, CA - 2013

PicClor-60
350 lbs/ac

Dominus
360 lbs/ac

Dominus
225 lbs/ac
Dominus (IRF135) evaluation in strawberry

- Treatments 2013-14
  - Control
  - Pic Clor 60 350 lb/A
  - IRF135 340 lb/A
  - IRF + Pic 180 + 90 lbs/A (67:33)
  - IRF + Pic 240 + 120 lbs/A (67:33)
- 4 replicates per treatment, Nov 11, 2013
- Weed seed bioassay, local weeds
## Nutsedge viability – IRF135

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Viable %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>90</td>
</tr>
<tr>
<td>Pic Clor 60</td>
<td></td>
</tr>
<tr>
<td>IRF135</td>
<td></td>
</tr>
<tr>
<td>IRF135.Pic.lo</td>
<td></td>
</tr>
<tr>
<td>IRF135.Pic.hi</td>
<td>30</td>
</tr>
</tbody>
</table>

Ramos 2013-14
Weed densities – IRF135

Ramos 2013-14
Strawberry Yield, Watsonville, 2014
Dominus/Chloropicrin (67/33)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Harvest weight (g/treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated control</td>
<td>25,000</td>
</tr>
<tr>
<td>Grower's standard</td>
<td>35,000</td>
</tr>
<tr>
<td>Pic (300 lbs/ac)</td>
<td>60,000</td>
</tr>
<tr>
<td>Low rate (180 lbs/ac)</td>
<td>45,000</td>
</tr>
<tr>
<td>Med rate (270 lbs/ac)</td>
<td>55,000</td>
</tr>
<tr>
<td>High rate (360 lbs/ac)</td>
<td>65,000</td>
</tr>
<tr>
<td>High rate (360 lbs/ac) - 4 drip lines</td>
<td>55,000</td>
</tr>
</tbody>
</table>
Watsonville, 2014

Untreated control

240 lbs Dominus + 120 lbs chloropicrin

160 lbs Dominus + 80 lbs chloropicrin
Summary
Dominus (IRF-135)

- No phytotoxicity or plant injury was observed when planting 10 days after fumigation.

- 360 lbs/ac of Dominus/Chloropicrin (67/33) is required to produce the highest strawberry yields in heavily-infested soils.

- Weed control with Dominus, Dominus+Pic good if rate >350 lbs/A
Dazomet (Temozad) evaluation in strawberry

- **Treatments**
  - Temozad 220, 350, 421 lb/A incorporated
  - Temozad 220, 350, 421 lb/A surface & sprinkled
  - K-Pam 50 GPA
  - Pic Clor 60 29 GPA
  - Control

- 4 replicates per treatment, Sept. 23, 2013
- Weed seed bioassay, local weeds, fruit yield
Weed Control - Temozad

Weed densities

Number /A

TZ_Inc_220  TZ_Inc_350  TZ_Inc_421  TZ_Spk_220  TZ_Spk_350  TZ_Spk_421  Kpam  Pic Clor  Control

Mechanical  Sprinkler
**Fruit Yield - Temozad**

<table>
<thead>
<tr>
<th>Fruit yield G/plant</th>
<th>TZ_Inc_220</th>
<th>TZ_Inc_350</th>
<th>TZ_Inc_421</th>
<th>TZ_Spk_220</th>
<th>TZ_Spk_350</th>
<th>TZ_Spk_421</th>
<th>K-Pam</th>
<th>Pic Clor</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit</td>
<td>B</td>
<td>AB</td>
<td>AB</td>
<td>B</td>
<td>AB</td>
<td>BC</td>
<td>C</td>
<td>A</td>
<td>C</td>
</tr>
</tbody>
</table>

Mechanical Sprinkler

Spence Farm 2013-14
Dazomet (Temozad) summary

- Nutsedge control was better where incorporated
- Control of other weeds was better where surface applied
- Strawberry yields were similar under both application methods
Stinger (clopyralid) I

- Stinger herbicide is already registered on strawberry in several other states
- Can it be applied in-season through the drip tape to selectively kill weeds under plastic?
- Stinger was applied 30 days before and after strawberry transplanting
- Stinger was also evaluated as a mid-winter application by spray and drip chemigation
Stinger (clopyralid) II

- Stinger rates were:
  - Low - 0.17 pints/A
  - High – 0.33 pints/A

- Applied by spray:
  - 30 d pre transplant
  - 30 d post transplant
  - Mid winter

- Applied by drip:
  - 30 d post
  - Mid-winter
Field Weed Control - Stinger

Weed densities

Number / A

Spray

Drip
Strawberry Injury-Stinger

Injury 0 = safe, 10 = dead

Spray

Drip
Strawberry Yield-Stinger

Yield grams/ plant

Yields through 9/27/14
Summary - Stinger

- Stinger is effective on weeds applied under the plastic
- Stinger may be more injurious to strawberry applied under plastic
- No advantage seen for Stinger vs. Chateau
Future directions

- Evaluate lower rates of Stinger under the plastic
- Evaluate Trellis as a potential new herbicide for strawberry