Efficacy of drip-applied fungicides and fumigants against *Fusarium* diseases

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Efficacy of drip-applied fungicides and metam-potassium fumigant against:

- Fusarium wilt caused by *Fusarium oxysporum* f. sp. *lycopersici* race 3
- Fusarium stem rot and vine decline caused by *Fusarium falciforme*
Materials evaluated in 2019. *Please note that Miravis and Propulse are not currently registered for use on California tomatoes.*

**Fungicides:**
Applied via buried drip at planting and 3 weeks later
- **Miravis** (Syngenta) – pydiflumetofen (7)
- **Velum** (Bayer) – fluopyram (7)
- **Propulse** (Bayer) – prothioconazole (3) + fluopyram (7)
- **Rhyme** (FMC) – flutriafol (3)

**Fumigant:**
Applied approx. two weeks prior to transplanting
- **K-Pam** (AMVAC) – metam potassium
Management of Fusarium wilt in tomato

Conducted field trials at two sites:

UC Davis, in small plots that were infested with Fusarium wilt

San Joaquin County, in a commercial field near Stockton that was infested with Fusarium wilt

Slide courtesy of Kelley Paugh, UCD
UC Davis Fusarium wilt trial

Miravis and K-Pam (30 gal/A) most effective

Fusarium wilt incidence at end of season

% of plants with vascular discoloration

Untreated  K-Pam, 15 gal/acre  Rhyme  Velum  Propulse

Miravis  K-Pam, 30 gal/acre

Slide courtesy of Kelley Paugh, UCD
UC Davis Fusarium wilt trial

No difference in yields
Low disease pressure

Slide courtesy of Kelley Paugh, UCD
Stockton-area Fusarium wilt trial, 2019

Fusarium wilt at 1 month before harvest

Disease incidence, %

Control | Rhyme | Propulse | Velum | Miravis - high | Miravis - low | K-Pam

Bar chart showing disease incidence for different treatments.
Stockton-area Fusarium wilt trial, 2019

No significant difference in marketable yields
Management of *Fusarium falciforme* in tomato

Fusarium stem rot and vine decline

Causes severe losses

No known management options

Slide courtesy of Kelley Paugh, UCD
Management of *Fusarium falciforme* in tomato

Conducted field trials at three sites:

- UC Davis small plot (fungicides only)
- San Joaquin grower field (K-Pam only)
- Yolo grower field (K-Pam only)

Same application rates and timing as used for Fusarium wilt trials

Slide courtesy of Kelley Paugh, UCD
UC Davis *F. falciforme* trial

Velum was most effective

- **FootRot**
  - Untreated
  - Miravis
  - Propulse
  - Velum

- **CrownRot**
  - Untreated
  - Miravis
  - Propulse
  - Velum

- **StemRot**
  - Untreated
  - Miravis
  - Propulse
  - Velum

Slide courtesy of Kelley Paugh, UCD
No significant effect on yield
Low disease pressure

Slide courtesy of Kelley Paugh, UCD
**Stockton *F. falciforme* trial – non-replicated**

<table>
<thead>
<tr>
<th></th>
<th>Disease incidence</th>
<th>Disease severity</th>
<th>Marketable yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-Jul</td>
<td>15-Jul</td>
<td>31-Jul</td>
</tr>
<tr>
<td><strong>K-Pam treated</strong></td>
<td>0%</td>
<td>0.2%</td>
<td>0.7%</td>
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<tr>
<td><strong>Non-treated</strong></td>
<td>0.13%</td>
<td>1.6%</td>
<td>2.0%</td>
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</table>

7.2 ton difference (15%)
Economics of K-Pam application:
Approx. $10-12 per gal + injection costs if hiring company
So, approx. $400 per acre for fumigation
A yield increase of 7.2 tons is worth approx. $540

In this situation, K-Pam application increased yield enough
to more than cover the cost of application at 30 gal/A.
On-farm application of K-Pam in commercial field infested with *F. falciforme*, Yolo County

courtesy of Kelley Paugh, UCD and Marja Koivunen, AMVAC

2018: Small plot yields with K-Pam 33 gal/A

<table>
<thead>
<tr>
<th>Season</th>
<th>Yield (tons/A)</th>
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<tbody>
<tr>
<td>Fall UTC</td>
<td>52.3</td>
</tr>
<tr>
<td>Fall K-Pam</td>
<td>59.3</td>
</tr>
<tr>
<td>Spring UTC</td>
<td>48.5</td>
</tr>
<tr>
<td>Spring K-Pam</td>
<td>62.2</td>
</tr>
</tbody>
</table>

Yield categories indicated by different letters:
- Fall UTC: bc
- Fall K-Pam: ab
- Spring UTC: c
- Spring K-Pam: a

Yield categories legend:
- green
- marketable

courtesy of Kelley Paugh, UCD and Marja Koivunen, AMVAC
Yolo *F. falciforme* trial

K-Pam at 33 gal/A increased marketable yield by 25%

2018: Small plot yields (tons/A) with K-Pam 33 gal/A

![Graph showing yield comparison with K-Pam treatment across different seasons.]

Yield (tons/A):
- Fall UTC: 52.3 tons
- Fall K-Pam: 59.3 tons
- Spring UTC: 48.5 tons
- Spring K-Pam: 62.2 tons

courtesy of Kelley Paugh, UCD and Marja Koivunen, AMVAC
Yolo *F. falciforme* trial

No significant differences in yield when K-Pam applied at low rate

2019: Small plot yields (tons/A) with K-Pam 10-20 gal/A

courtesy of Kelley Paugh, UCD and Marja Koivunen, AMVAC
Yolo *F. falciforme* trial

No significant differences in disease incidence

2019: Small plot yields (tons/A) with K-Pam 10-20 gal/A

- Untreated: 2.1 tons/A
- K-Pam 10 gal/A: 35.9 tons/A
- K-Pam 15 gal/A: 47.8 tons/A
- K-Pam 20 gal/A: 44.5 tons/A

courtesy of Kelley Paugh, UCD and Marja Koivunen, AMVAC
Effect of K-Pam drip application on processing tomato marketable yield in demo trials 2017-19

Rates are expressed as broadcast equivalents, Yield difference is expressed in comparison to UTC in Tons/A
Efficacy of drip-applied fungicides and fumigants against *Fusarium* diseases

- Preliminary data from first year suggest that Miravis (not registered) may have some benefit against *Fusarium* wilt, while Velum may have some benefit against *Fusarium falciforme*. More studies are needed.

- K-Pam may help reduce severity of both diseases. As always, optimal soil conditions are important for good efficacy.

- Project will continue in 2020 with funding from CTRI, the IR-4 Program, and chemical manufacturers