Mealybug on citrus

Sean Moore
Other mealybug species that can be found in citrus orchards

*Phenacoccus solanum*

*Phenacoccus solenopsis* = cotton mealybug
Avoiding mealybug repercussions

Sean Moore and Tim Grout
Citrus Research International

During the 2015 growing season multiple reports of mealybug outbreaks on citrus were received from Groenfontein and the Overberg.

Mealybug alert

Sean Moore, Vaughan Hattingh, Elma Carstens

1. Establishment of mealybug colonies may be confused with that of scale and false codling moth. These species are also known to attack citrus in South Africa.

2. Identifying any problematic orchards:
   - Within the last two weeks before harvest, an orchard inspection for mealybug should be conducted. This is conducted in the same way as scouting but due to the critical timing, sampling will be less

Mealybug and South Korea

Vaughan Hattingh, Elma Carstens, Sean Moore
Citrus Research International

Laboratory testing to exclude mealybug species of phytosanitary importance on fruit destined for the South Korean export market

Citrus Research International (CRI) and *Department of Agriculture, Land Reform and Rural Development (DALRRD)

Seven different mealybug species are recorded as pests of citrus in South Africa. These are citrus...
Last season was a very bad mealybug season – Why?

- CBS sprays undermine thrips biocontrol = more sprays for thrips (harder and later into season) = mealybug repercussions
- Reduction in use of OPs, buprofezin and imidacloprid
- Overreliance on and incorrect usage of parasitoid augmentation
- Hyperparasitism
MEALYBUG: NATURAL POPULATION TREND UNDER IPM

% FRUIT INFESTED

NOV  JAN  FEB  MAY
MEALYBUG UNDER NETS: NATURAL POPULATION TREND UNDER IPM
MEALYBUG SPRAY:
WHAT DO YOU WANT TO SEE?

% FRUIT INFESTED

NOV JAN FEB MAY

No mealybug spray
Mealybug spray
MEALYBUG SPRAY:
WHAT COULD YOU SEE?
(Halaron Farm, E.Cape, 1996/97)

% FRUIT INFESTED

NOV  JAN  FEB  MAY

NO SPRAY

PARATHION
Mealybug control: Different spray coverage (volumes) & machines

Dr. Tim Grout, 1992 (CRI)

% Fruit infestation

- Control: 31%
- Janisch Full: 0.4%
- Janisch Medium: 12%
- Cima Full: 14%
- Cima Medium: 25%

Full film @ 12,500 litres/ha  Medium film @ 6,700 litres/ha
Mealybug life-cycle

Total life-cycle = 235 day degrees
= ± 3-6 weeks

Most susceptible to chemical control

= ± 600

Soil?
Preventative vs Corrective treatment
### Citrus mealybug control: Preventative applications October 2004, Evaluation January 2005

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Volume</th>
<th>% Fruit infested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>150 ml</td>
<td>d</td>
</tr>
<tr>
<td>Ultracide</td>
<td>150 ml</td>
<td>a</td>
</tr>
<tr>
<td>Parathion</td>
<td>100 ml</td>
<td>a</td>
</tr>
<tr>
<td>Selecron</td>
<td>50 ml</td>
<td>a</td>
</tr>
<tr>
<td>Tokuthion</td>
<td>50 ml</td>
<td>a</td>
</tr>
<tr>
<td>Folimat</td>
<td>64 g</td>
<td>ab</td>
</tr>
<tr>
<td>Chlorpyrifos</td>
<td>30 g</td>
<td>bc</td>
</tr>
<tr>
<td>Applaud</td>
<td>165 ml</td>
<td>c</td>
</tr>
<tr>
<td>Mevinphos</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ALL TREATMENTS + 18 ml AGRAL 90/hl
Citrus mealybug control: Corrective application February 2004, Evaluated Februarie 2004 (3 weeks)

% Fruit infestation

- Control
- Mevinphos 165 ml+ Agril 90
- Mevinphos 165 ml+ Olie 500 ml
- Methidathion 150 ml + Ag 90
- Chlorpyrifos 64 g + Ag 90
- Buprofezin 30 g + Ag 90
MEALYBUG:
WHY PREVENTATIVE CONTROL IS MORE EFFECTIVE THAN CORRECTIVE CONTROL

• Mealybug cannot be controlled chemically. Therefore, the natural enemy complex must not be disrupted.

• Adequate spray penetration later in the season is impossible.

• (Most effective products may not be sprayed later in the season.)
Recent preventative control trials
Mealybug preventative sprays, Oct (Glengrove, SRV, 2020/21), evaluated Jan, Feb, Mar & Apr
Comparative efficacy of Dursban and Closer for preventative control of mealybug (Avoca, SRV) (Sprayed 14 Oct 2013; evaluated 13 Jan 2014)
Recent corrective control trials
Comparative efficacy of Dursban and Closer for early corrective control of mealybug (Olifants River Estate, Limpopo) (Sprayed 6 Nov 2013; evaluated 13 Nov 2013)
Comparative efficacy of Buprofezin and Closer for **corrective** control of mealybug (Kleinplaas, SRV) (Sprayed 29 Jan; evaluated 11 Mar 2015)

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Buprofezin</th>
<th>Closer</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Fruit infested</td>
<td>56%</td>
<td>56%</td>
<td>53%</td>
</tr>
</tbody>
</table>
Comparative efficacy of Buprofezin and Closer for corrective control of mealybug (Sprayed 26 Mar; evaluated 16 Apr 2019)
Closer:
preventative vs early corrective vs late corrective
Comparative efficacy of various products for **corrective** control of mealybug
(Sprayed 10 Mar; evaluated 24 Mar 2020)
How much value is there in a corrective treatment?
Midsummer corrective decision making
Citrus mealybug control: Application February 2004, Evaluated February 2004 (3 weeks) & April 2004 (8 weeks)

% Fruit infestation

- Control
- Mevinphos 165 ml+ Agril 90
- Mevinphos 165 ml+ Olie 500 ml
- Methidathion 150 ml + Ag 90
- Chlorpyrifos 64 g + Ag 90
- Buprofezin 30 g + Ag 90

3 weeks after spray
8 weeks
Mealybug infestation on Navels (Moedskepvlakte Farm, SRV)

- **Control**
- **Applaud**

<table>
<thead>
<tr>
<th>Month</th>
<th>Control</th>
<th>Applaud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct</td>
<td></td>
<td>2%</td>
</tr>
<tr>
<td>Nov</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>Jan</td>
<td>67%</td>
<td>76%</td>
</tr>
<tr>
<td>Feb</td>
<td>55%</td>
<td>70%</td>
</tr>
<tr>
<td>Mar</td>
<td>45%</td>
<td>40%</td>
</tr>
<tr>
<td>May</td>
<td>8%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Mealybug corrective spray (Silverton Farm, SRV, sprayed Feb 2021), evaluated 7 and 34 DAT.
### Closer vs Tivoli as a corrective?
Non-target effects of Closer and Tivoli

<table>
<thead>
<tr>
<th>Active</th>
<th>Dosage per 100ℓ water</th>
<th>% Corrected Mortality</th>
<th>Overall Impact (IA)</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day 1</td>
<td>Day 7</td>
<td>Day 14</td>
</tr>
<tr>
<td>Sulfoxaflor</td>
<td>12ml</td>
<td>45.7</td>
<td>3.8</td>
<td>-</td>
</tr>
<tr>
<td>Tivoli</td>
<td>40ml + 300ml oil</td>
<td>0</td>
<td>0</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Wayne Mommsen 2021

However, ...
Parasitism and hyperparasitism of mealybug: 2020 vs 2021

- Anagyrus: 49% (2020), 21% (2021)
- Coccidoxenoides: 21% (2020), 51% (2021)
- Chartocerus: 51% (2020), 79% (2021)

Wayne Mommsen
Summary of findings

- Preventative control is far more effective than corrective control.
- Preservation of natural enemies is essential in keeping mealybug under control.
- Tivoli and Closer are effective preventative and corrective treatments for mealybug.
- However, think twice before treating correctively.
- Hyperparasitism may sometimes be a problem.
Recommendations for next season – especially if problems last season

- Well pruned trees
- Plan a double-spray programme: spring and 5-6 weeks later
  - Start with profenofos, prothiofos or buprofezin
  - Followed by buprofezin (MRL permitting), Closer or Tivoli
  - Another option is Tivoli (30-40 ml) in spring – will also control red scale and mites and suppress thrips
  - If a Jan/Feb corrective is necessary, using Tivoli or Closer
- Control ants
- Scout regularly
- If parasitoids are being augmented, start early and structure a soft spray programme
- A mineral oil spray (0.2-0.25%) after colour break can help get rid of sooty mould