Pesticide Dose in persimmon orchards: Bases for adjustment

Chueca P., Vicent A., Pérez-Hedo M., Beitia F., Urbaneja A., Garcerá C.

14th Workshop on Spray Application in Fruit Growing

Hasselt, 10 May 2017

Instituto Valenciano de Investigaciones Agrarias (IVIA)
Persimmon crop

- World production: 4.500.000 tn
- Spain producer: 4th worldwide, 1st Europe: 160.000 tn
- C. Valenciana: 90% - 14.000 ha (D. kaki cv. Rojo Brillante)

Source: Perucho, 2015
Pesticide applications in persimmon

- Deciduous tree with vigorous growth
- Vase training system and isolated trees
- Air-blast sprayer
- Volume rate $\approx 1200-3000$ l/ha (citrus)
Efficiency of pesticide applications in persimmon

HOW MUCH?

VEGETATION

VEGETATION
Objectives

- Adjust the **spray volume** to the **canopy characteristics** of persimmon to optimize pesticide applications.

- Characterize the **canopy** along the season.

- Study the effect of **spray volume** on the **spray distribution** on the canopy.

- Study the effect of **spray volume** on the **efficacy** of applications: circular leaf spot *Mycosphaerella nawae/melybug complex* (*P. citri* and *P. viburni*).
Materials & Methods: Orchards

- Trial location: Commercial orchards
  - L’Alcudia (Valencia)
  - *Dyaspiros kaki* cv. Rojo Brillante

ORCHARD 1

ORCHARD 2

Orchard layout 5.5 x 4.2

Orchard layout 5 x 5
### 2015

<table>
<thead>
<tr>
<th>#</th>
<th>Date</th>
<th>BBCH</th>
<th>Spray volume (L/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conventional</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ortch 1</td>
</tr>
<tr>
<td>1st</td>
<td>30/04-05/05</td>
<td>67</td>
<td>1300</td>
</tr>
<tr>
<td>2nd</td>
<td>28/05-04/06</td>
<td>73</td>
<td>1300</td>
</tr>
<tr>
<td>3rd</td>
<td>18-25/09</td>
<td>87</td>
<td>2500</td>
</tr>
</tbody>
</table>

### 2016

<table>
<thead>
<tr>
<th>#</th>
<th>Date</th>
<th>BBCH</th>
<th>Spray volume (L/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conventional</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ortch 1</td>
</tr>
<tr>
<td>1st</td>
<td>23-24/05</td>
<td>73</td>
<td>1300</td>
</tr>
<tr>
<td>2nd</td>
<td>16/06</td>
<td>75</td>
<td>1300</td>
</tr>
<tr>
<td>3rd</td>
<td>02-03/08</td>
<td>79</td>
<td>2500</td>
</tr>
</tbody>
</table>
Materials & Methods

- Applications in different phenological stages
  - Nozzles: Conventional disc and core
  - Pressure: 10 bar
  - Speed: 3.4-3.7 km/h
  - Airflow: 34 m/s; 86,000 m3/h
Characterization of the canopy along the season

- Canopy volume (m³/tree)

- Foliar density (m² leaves/m³ canopy)

Canopy volume = Half ellipsoid

90% occupied by leaves

12 m² leaves/m³ canopy

m² leaves/m³ canopy = f(% occupied by leaves)
Characterization of the canopy along the season

- Canopy volume (m³/tree)
- Foliar density (m² leaves/m³ canopy)

Canopy volume = Half ellipsoid

Canopy height

Ø across the row

Ø along the row

Canopy volume = f(% occupied by leaves)
Study of spray distribution on the canopy

- Coverage on water sensitive paper

- Percentage coverage

- Advance of the sprayer

- %Coverage
Assessment of efficacy against *Mycosphaerela Nawae*

- 2016 at harvest time
- Leaves in 20 shoots according to the rating scale:
  - 0 = no lesions observed
  - 1 = less than 10 leaf spots
  - 2 = 10-20 leaf spots
  - 3 = more than 20 leaf spots
  - 4 = defoliated (number of nodes without leaves)
Assessment of efficacy against Melybugs complex

- 2016 Before and after treatments
- Number of melybug/fruit in 10 fruits/tree in 10 trees/treatment
Results: Characterization of the canopy

**ORCHARD 1**
- APRIL: 8 m³, 2.7 m²/m³, 13 AD
- SEPTEMBER: 10 m³, 4.3 m²/m³, 17

**ORCHARD 2**
- APRIL: 8 m³, 4 m²/m³, 13
- SEPTEMBER: 10 m³, 3.8 m²/m³, 18
Results: Spray distribution on the canopy

2015

%COVERAGE

0 10 20 30 40 50 60 70 80 90 100

ORCHARD 1

2015 - 1st 1300 L/ha 790 L/ha
2015 - 2nd 1300 L/ha 790 L/ha
2015 - 3rd 790 L/ha

ORCHARD 2

2015 - 1st 1500 L/ha
2015 - 2nd 950 L/ha
2015 - 3rd 950 L/ha

Conventional
60%CV

1300 L/ha
790 L/ha
1300 L/ha
790 L/ha
790 L/ha
1500 L/ha
950 L/ha
1500 L/ha
950 L/ha
950 L/ha

Results: Spray distribution on the canopy

2016

% COVERAGE

ORCHARD 1

2016 - 2nd

1300 L/ha

1000 L/ha

790 L/ha

2016 - 3rd

2500 L/ha

2000 L/ha

1500 L/ha

ORCHARD 2

2016 - 2nd

1500 L/ha

1200 L/ha

950 L/ha

2016 - 3rd

3000 L/ha

2300 L/ha

1800 L/ha

CONVENTIONAL

80%CV

60%CV
Results: Spray distribution on the canopy

Example: Orchard 1-2016

- No differences of coverage between upperside and underside leaves
Results: efficacy against *Mycosphaerela Nawae*

**2016**

<table>
<thead>
<tr>
<th></th>
<th>CONV</th>
<th>60% CV</th>
<th>80% CV</th>
<th>CONV</th>
<th>60% CV</th>
<th>80% CV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ORCHARD 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No leaves/20 shoots</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ORCHARD 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- Red: Fallen leaves
- Green: Without infection
- Yellow: <10 spots
- Purple: 10-20 spots/leaf
- Blue: >20 spots/leaf
Results: efficacy against melybugs complex

![Graph showing the percentage of infested fruits with melybugs before and after treatment in two orchards (ORCHARD 1 and ORCHARD 2). The graph compares different treatments: 60%cv, 80%CV, and CONV. Before treatment, the percentage of infested fruits is lower than after treatment.]
Results: efficacy against melybugs complex

Orchard 1

(\( F = 0.235; \) df = 2, 29; \( P = 0.791 \))

Orchard 2

(\( F = 0.169; \) df = 2, 29; \( P = 0.598 \))
Conclusions

- Canopy volume and foliar density increase along the season, and this causes that coverage decrease between treatments applied along the season.

- Spray distribution in the canopy is homogeneous without differences between heights, widths, depths and leaves sides.

- Reduction of spray volume produced a reduction of coverage but it did not affect the biological efficacy of pesticide applications against *Mycosphaerella nawai* and melybug complex.

- Reduction of spray volume improved the efficiency, and induced cost savings and a reduction of environmental pesticide exposure.
Thank you very much for your attention

chueca_pat@gva.es

Instituto Valenciano de Investigaciones Agrarias (IVIA)