How research can improve sustainability of plant protection in apple production: overview of past, present and future.

C. Ioriatti, A. Dorigoni
IOBC-WPRS  WG Integrated Protection of Fruit Crops

www.iobc-wprs.org
Grower: secondary pest control
Consumer: pesticide residues issue

Fungi

Insect virus

Nematods

Forecasting models

Pheromone Mating Disruption

Spray technology
Consumer: pesticide residues issue

Decrease in the MRL exceedance rate

% samples exceeding MRL

Year 1993: 5.6
Year 2013: 0.8
Consumer: pesticide residues issue
Consumer: pesticide residues issue
Environment: research challenge

- Environment Issues
  - Biodiversity erosion
  - Water and soil pollution
  - Greenhouse gas production
  - Bystander pesticide exposition

- Crop needs
  - Invasive pests & emergent diseases
  - Soil fertility
  - Economic sustainability

New orchard architecture
THE TODAY’S SCENARIO OF APPLE INDUSTRY

In the last 30 years, yields have doubled from 35 to 70 tons/ha.

Today the main goal is to increase economic and ecologic sustainability of the apple industry by:

1. Cutting down costs (less input of chemicals and labour)
2. Choosing more environmental benign techniques

Same yield with less input

Can this be achieved by just changing TREE ARCHITECTURE?
STUDYING TREE ARCHITECTURE

Multi-leader FRUIT WALL

TRADITIONAL
TRADITIONAL TREE ARCHITECTURE
(from above)
FRUIT WALL TREE ARCHITECTURE
(from above)

No distinction between “IN” and “OUT”

LESS chemicals and MORE mechanical
Cultural practices improved by a FRUIT WALL

- Mechanical thinning
- Mechanical pruning
- Mech. weed control
- Less PGR’s
- Less spraying volume
- Faster leaf drying
- Reduced drift
- Tunnel sprayers
- Multi-task nets
- SSCD

ECOLOGICAL ADVANTAGES
(physical/mech. tools)
Average treatment number against the main pests and problems in apple growing

<table>
<thead>
<tr>
<th>Problem</th>
<th>N. Treatments</th>
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<tbody>
<tr>
<td>Scab</td>
<td>18</td>
</tr>
<tr>
<td>Cydia pomonella</td>
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</tr>
<tr>
<td>Psylla</td>
<td>2</td>
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<tr>
<td>Aphis</td>
<td>2</td>
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<tr>
<td>thinning</td>
<td>3</td>
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<tr>
<td>growth control</td>
<td>2</td>
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<td>3</td>
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<td>drift</td>
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MECHANICAL THINNING OF FLOWERS

A branch after mechanical thinning
MECHANICAL PRUNING

Pedestrian orchard without use of plant growth regulators
TUNNEL SPRAYERS

Tunnel sprayers on pedestrian multi-leader fruit wall can reduce drift and save up to 40% chemicals.
MUTI-TASK NETS

Anti-rain net

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Untreated Golden D. apples

Control not covered
(99% scab)

Covered by anti-rain net
(3% scab)

2015
Multi-task nets can be effectively combined with tunnel sprayers
USE OF COVER CROPS
Clover sown under trees + mixture of grass species

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FIXED SPRAYING on trellys under the nets opens up new possibilities (spraying m.o., organic compounds)
Pedestrian orchard under multi-task net
Many thanks for your attention