Invasive pests in vegetable and fruit crops: examples in the Lesser West Indies and actual risks

Philippe Ryckewaert
Cirad/CAEC
Martinique
Problematic - context

- Regular arrivals of many crop insect pests in French West Indies (Martinique, Guadeloupe) despite their isolation
- Introductions by human activities
- Favorable tropical climate (n generations / year)
- Many direct or indirect damages
- But often strong decrease of populations after many years
Thrips palmi
Thrips palmi
Thrips palmi

- At the end of the 1980’s: South-East Asia + French overseas territories (French Antilles, Guyane, Réunion island, New Caledonia, Tahiti)
- Today in numerous tropical countries as Americas
- Heavy damages mainly on aubergine (eggplant) and cucurbitis
- Chemical control problematic
- Observation of predators (stink bugs...)
- IPM programs effective: natural biological control + prophylaxis + reasoned chemical control
- Rare today
Thrips palmi natural enemies
The whitefly *Bemisia tabaci*
Bemisia tabaci

- Present in the Caribbean since a long time but no damages
- Outbreaks of populations in the 1990’s on many crops: because the arrival of a new biotype (B)
- Virus inoculation (TYLCV…) + honeydew + sooty mold
- Insecticides a few efficient
- Presence of efficient predators and parasitoids
- IPM
- Today only transmitted-virus problems
Bemisia tabaci natural enemies
The asian psyllid *Diaphorina citri*
Specific to Citrus

- Transmit the Huang Long Bing disease (HLB or greening)
- Psyllid discovered in Guadeloupe in 1998 and in 2012 in Martinique.
- HLB detected in 2012 in Guadeloupe and in 2013 in Martinique. Now, *D. citri* and HLB present in all Antilles.
- Introduction of a parasitoid (*Tamarixia radiata*) in Guadeloupe (1999), but observed in 2012 in Martinique.
- High psyllid populations in Guadeloupe (as others countries) with many HLB damages, but not in Martinique.
- Hypothesis: no chemical use in Citrus in Martinique since 2000’s, so biological control is efficient.
Diaphorina citri natural enemies
To define which pests can arrived and installed in our countries: analysis of probabilities that a new pest constitute a risk of economic importance

Probability of entry: studies of pathways for a selected pest:

- countries where the pest is present
- natural dispersion (flight, hurricanes)
- transports (airplanes, boats...), commercial or touristic, controlled or not, quantities of imported host-plants
Pest Risk Analysis (2)

- **Probability of establishment:**
  - Climates where the pest is already present
  - List of host-plant
  - Presence of these climates and host-plants in our countries (surfaces)
  - Possible limitations (chemical use, natural enemies, competition with local species...)

Animal invasive species in the Antilles, 22-24, March 2016, Fort de France
Example: “Prométhée” method with fruit-flies for Martinique

<table>
<thead>
<tr>
<th>Id</th>
<th>Tephritidae</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Bactrocera invadens</em></td>
</tr>
<tr>
<td>2</td>
<td><em>Ceratitis capitata</em></td>
</tr>
<tr>
<td>3</td>
<td><em>Bactrocera zonata</em></td>
</tr>
<tr>
<td>4</td>
<td><em>Anastrepha fraterculus</em></td>
</tr>
<tr>
<td></td>
<td><em>Anastrepha grandis</em></td>
</tr>
<tr>
<td></td>
<td><em>Anastrepha ludens</em></td>
</tr>
<tr>
<td></td>
<td><em>Anastrepha obliqua</em></td>
</tr>
<tr>
<td></td>
<td><em>Anastrepha serpentina</em></td>
</tr>
<tr>
<td></td>
<td><em>Anastrepha striata</em></td>
</tr>
<tr>
<td></td>
<td><em>Anastrepha suspensa</em></td>
</tr>
<tr>
<td></td>
<td><em>Bactrocera dorsalis</em></td>
</tr>
<tr>
<td></td>
<td><em>Ceratitis rosa</em></td>
</tr>
<tr>
<td></td>
<td><em>Toxotrypana curvicauda</em></td>
</tr>
<tr>
<td>5</td>
<td><em>Bactrocera tryoni</em></td>
</tr>
<tr>
<td>6</td>
<td><em>Ceratitis cosyra</em></td>
</tr>
<tr>
<td>7</td>
<td><em>Rhagoletis cerasi</em></td>
</tr>
<tr>
<td>8</td>
<td><em>Bactrocera correcta</em></td>
</tr>
<tr>
<td>9</td>
<td><em>Ceratitis quinaria</em></td>
</tr>
<tr>
<td>10</td>
<td><em>Ceratitis discussa</em></td>
</tr>
<tr>
<td></td>
<td><em>Rhagoletis cingulata</em></td>
</tr>
<tr>
<td></td>
<td><em>Rhagoletis completa</em></td>
</tr>
<tr>
<td></td>
<td><em>Ceratitis rubivora</em></td>
</tr>
<tr>
<td></td>
<td><em>Rhagoletis suavis</em></td>
</tr>
</tbody>
</table>

Maximum importation risks:
- Oranges from Zimbabwe and South Africa (+ Dominican Republic ?)
- Peaches/nectarines from USA
- Citrus from continental Latin America
Favorable conditions in French West Indies

- Tropical climate
- Host-plants generally present all the year
- No efficient natural enemies (or killed by insecticides)
- Small islands (no “buffer” effect ?)
- Important airplane passenger traffic + short duration + few customs controls
- Heavy tonnage of commercial fruits and vegetables (mainly by boat)
- Shuttle and pleasance boats between islands
Conclusions

- In many cases, natural regulations can control new invasive pests if there are no insecticides applications or use of IPM /agro-ecological methods

- Major risks for horticultural crops: fruit-flies, tomato pinworm (*Tuta absoluta*)

- Natural arrivals of some beneficials

- Hypothesis about population decreases: lost of vitality for genetic reasons (low genetic pool, consanguinity)

- Preventive measures: inspections (airports, ports), importation prohibited from some countries, survey, trapping systems, physical or chemical treatments, PRA...
Thanks for your attention