Twenty years of Aphid survey in potatoes in the South of Belgium

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Aphids in potato

- One of the most important economic pest in potato in Belgium
- Known since a long time (Roland, 1946)
  - Confusion of pest status for seed potato and common potato production
- Better definition of pest status
  - Seed potato: Virus transmission => permanent protection
  - Potato for the industry and fresh market: direct yield losses due to feeding activity
    - Depending on the aphid population density, high variation from year to year
    - Threshold value of 10 aphids/full leaf (5 <= 20)
    - Space for IPM and skip systematic and blind use of insecticide
Aphid species found since 1994

**Dangerous**
- *Aphis nasturtii* (+++)
- *Macrosiphum euphorbiae* (++)
- *Myzus persicae* (+)
- *Aphis frangulae* group (+)

**Occasional**
- *Aulacorthum solani*
- *Aphis fabae*
Decision support system

- Established since 1994 to help farmers
- Avoid unnecessary sprays
- Adapt the protection to the situation
  - Two group of Aphid species in term of sensitivity to insecticides
  - Timing of application, one application is enough if correctly positioned
Field observations

• Experience of aphid control in winter wheat, DSS developed in the 70-80’s
  – Aphids and aphid antagonist visual counts
  – Aphid outbreak risk assessment

• Weekly, from mid June to the end of July/Mid-August

• Aphids counted on 200 leaves/field
  – 100 leaves lower part of the plant (Aphis group)
  – 100 leaves upper part of the plant

• Aphid antagonists counted in a same time on the same leaves
  – Aphid mummies (parasitic wasps)
  – Ladybird, hoverfly and lacewings eggs and larvae
Pommes de terre

Stade: Chaine
Localité: Cotinière de Châl
Date: 22.07.12

Variété: Challenger

4 x 25 feuilles INFÉRIEURES

PUCERONS

4 x 25 feuilles SUPÉRIEURES

PARASITÉS

MYCOSÉS

Œufs CHRYSOPE

Larves chrysopes

Œufs COCCINELLES

Larves de coccinelles

Œufs SYRPHES

Larves de syrphes

AUTRES
Aphid antagonists: Parasitic hymenoptera

• Aphidiidae mainly, a few Aphelinidae
• Key beneficial for early aphid infestation (June)
  – Up to 80% parasitism
  – Complete control of low aphid population
  – Help aphid predator if higher population by slowing down aphid development
• Specific study in 2000-2001 (Jansen, 2005)

<table>
<thead>
<tr>
<th>Aphid species</th>
<th>Parasitism rate</th>
<th>Pest status</th>
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<tbody>
<tr>
<td><em>Aphis nasturtii</em></td>
<td>3.0%</td>
<td>***</td>
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<tr>
<td><em>Macrosiphum euphorbiae</em></td>
<td>10.0%</td>
<td>**</td>
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<tr>
<td><em>Myzus persicae</em></td>
<td>36.1%</td>
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<tr>
<td><em>Aulacorthum solani</em></td>
<td>69.1%</td>
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Aphid antagonists (2): aphid predators

• Larvae of ladybirds, hoverflies and lacewings
• Key beneficial in July, when aphid population are higher
• Same species as other field crops (e.g. wheat, maize):
  – *Coccinella septempunctata*, *Propylea quatuordecimpunctata*
  – *Episyrphus balteatus*
  – *Chrysoperla carnea*
Balance beneficial – pest?

• Beneficial Arthropod Index (BAI)
  – Visual count:
    • One larvae predator = 1pts
    • One predator egg = 0.2 pts
    • One aphid mummies (parasitic wasp or fungi)= 0.2 pts
  – Total of beneficial for the count
  – Total of the aphids for the same count
  – => Beneficial Arthropod Index (BAI): beneficial arthropods/100 aphids
• The more beneficial you find, the less aphids you have at peak
• Model, BAI > 2, no aphids > 10/leaf (1994-2000, 149 fields)
• Validation: 2001-2013 (147 fields), no exception, still working....
• 2 larvae of predators or 10 aphid mummies for 100 aphids is enough for biological control
1994-2013 Overview

• 20 year of observation (CRA-W, Carah, Beitem-Kruishoutem)
• 296 fields followed weekly for aphids and aphid antagonists
Aphid population at peak (threshold value of 10 aphid/leaf)

- Insecticides required in only about 10% of the fields
- Only 5% if 1994 and 1996 results removed

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<th>1&lt;x&lt;5</th>
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<td>Total</td>
<td>161</td>
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<td>22</td>
<td>33</td>
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55% 27% 7% 11%
89% (~9/10)
What happens in 1994 and 1996

- High infestation of *Aphis nasturtii*
- Use of insecticides poorly active against this species but highly active against aphid antagonists
- Aphid outbreak
Need for effective compound

• Two groups of aphids, two different control methods
  – *Aphis nasturtii* and *Aphis frangulae*
    • Insecticides as Pymetrozine, Flonicamide, Thiacloprid,…
    • Spray volume of at least 300 l/ha (specific intervention ?)
  – Other aphids
    • Classical insecticides (pyrethroids, pirimicarb,…)
    • Spray volume of 150-200 l/ha (can be applied with fungicides…)
Need for selective compound

Selectivity of Plant Protection Products for beneficial arthropods in Potato - 01.02.2012

<table>
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<tr>
<th>Until the 10th of June</th>
<th>10th to the 30th of June</th>
<th>1st to the 31st of July</th>
<th>After the 1st of August</th>
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**Legend**

- **Harmless**
- **Slightly harmful**
- **Moderately harmful**
- **Harmful**
- **Not registered for this period**

**Authorised in Organic Farming**

See Poster session (Poster n° 302)

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Conclusions

• Aphids are still a pest in potato
  – No insecticide or insecticides every year is not the best solution

• Decision support systems help the farmers to adapt the control to the situation
  – No treatments most of the time
  – Treatment (product, timing of application) adapted to the aphid species and the situation
  – Selective insecticides when possible

• 1 insecticide every 10 years ⇔ systematic and blind use of insecticide (1-3 insecticides/year)
  – About 90% of Insecticide reduction simply by considering aphids AND beneficial arthropods
Conclusions

• More education and communication to fight against popular belief
  – Insecticides can promote pests instead of controlling them
  – “Insurance” or preventive treatment can be worst that no treatment at all
Thank you for your attention