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

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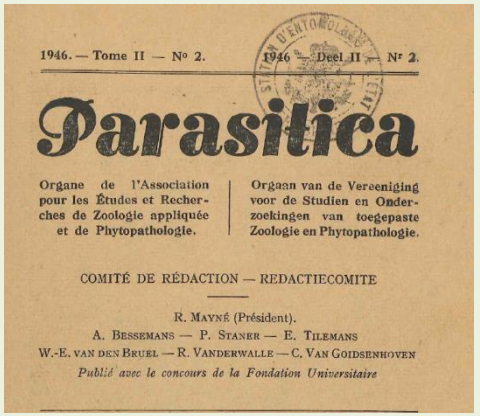
Wallonie

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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Parasitica

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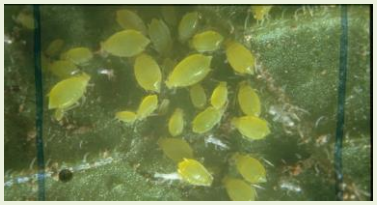
Aphid species found since 1994

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 : Floraison | Localité : Cottenchy (la Chaî) | Date : 12.07.12

Variété: Challenger

4 x 25 feuilles INFÉRIEURES	4 x 25 feuilles SUPÉRIEURES
PUCERONS	
PARASITÉS	
MYCOSÉS	
Œufs CHRYSOPES	
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)

Aphid species	Parasitism rate	Pest status
Aphis nasturtii	3.0%	***
Macrosiphum euphorbiae	10.0%	**
Myzus persicae	36.1%	*
Aulacorthum solani	69.1%	-

Aphid antagonists (2): aphid predators

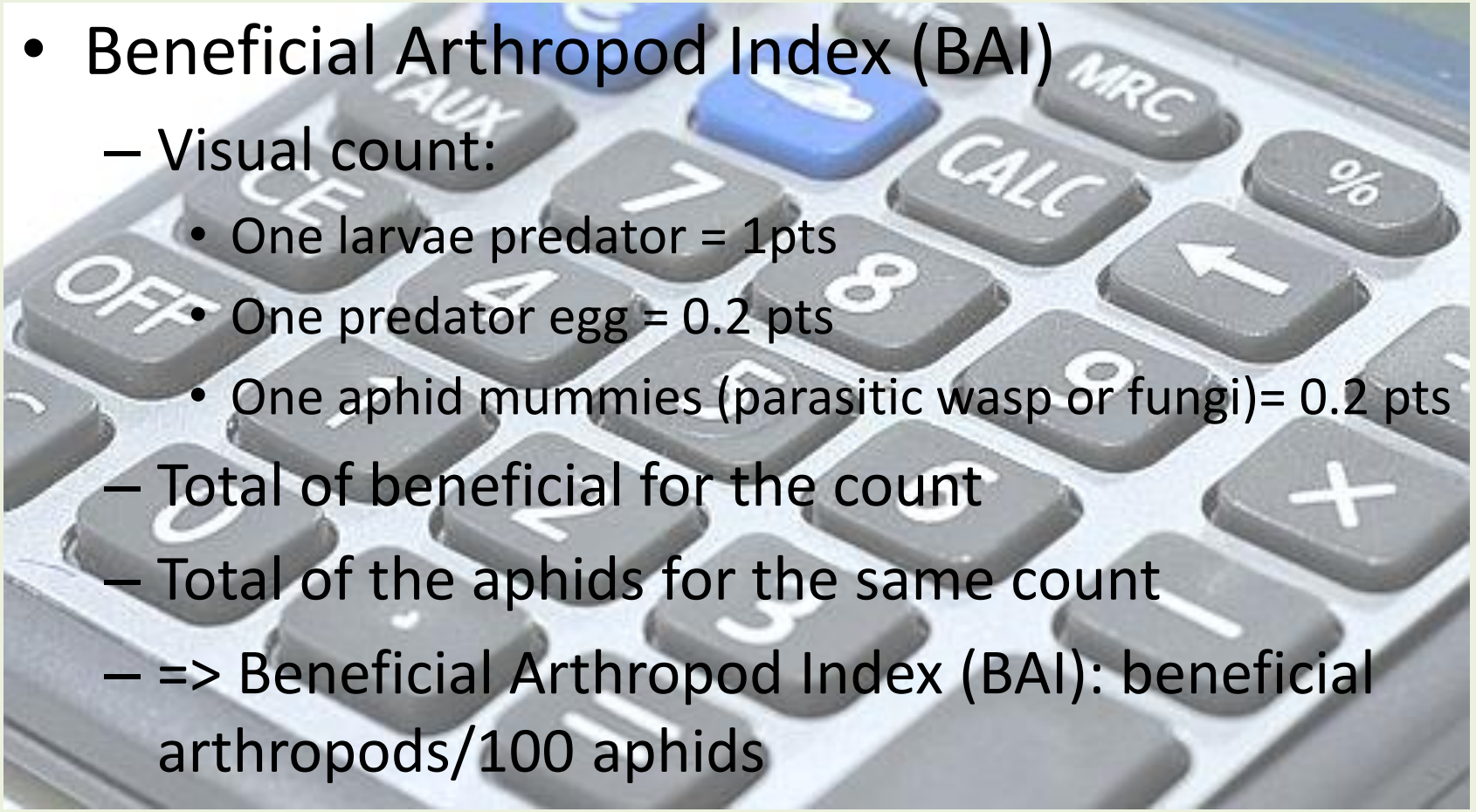
- Larvae of ladybirds, hoverflies and lacewings
- Key beneficial in July, when aphid population are higher
- Same species as other field crops (e.g. wheat, maize):
  - *Coccinella septempuctata, Propylea quatuordecimpunctata*
  - *Episyrphus balteatus*
  - *Chrysoperla carnea*



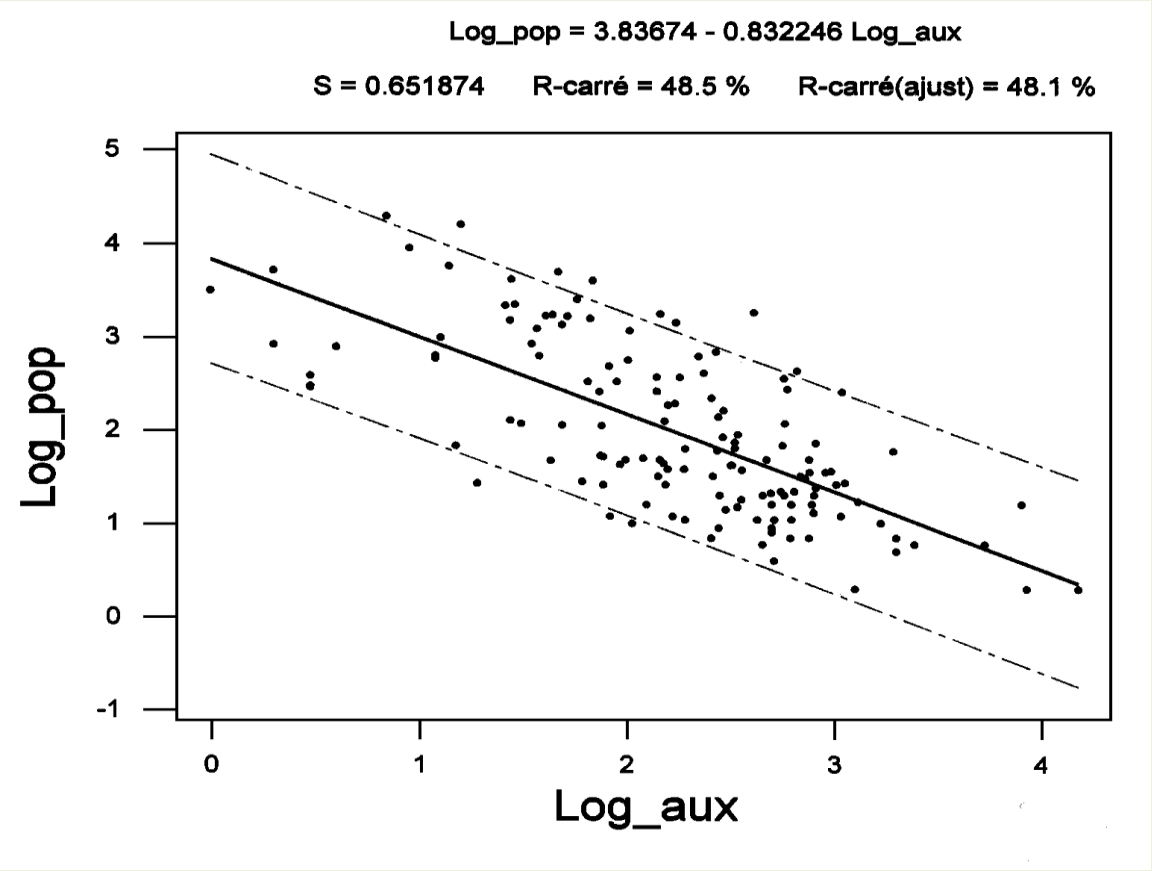




Balance beneficial – pest ?



- 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



(Jansen, 2001)

- 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

x = aphid/leaf at peak					
	x<1	1<x<5	5<x<10	x>10	*total*
1994	0	6	7	**5**	*18*
1995	13	1	0	**0**	*14*
1996	0	7	2	**15**	*24*
1997	7	8	2	**1**	*18*
1998	21	3	0	**1**	*25*
1999	12	1	0	**0**	*13*
2000	8	3	1	**2**	*14*
2001	23	0	0	**0**	*23*
2002	13	0	0	**0**	*13*
2003	9	4	0	**0**	*13*
2004	4	10	0	**0**	*14*
2005	9	5	1	**3**	*18*
2006	9	4	0	**0**	*13*
2007	6	1	0	**0**	*7*
2008	9	0	0	**0**	*9*
2009	3	3	0	**0**	*6*
2010	6	5	1	**0**	*12*
2011	1	4	4	**4**	*13*
2012	7	7	1	**0**	*15*
2013	1	8	3	**2**	*14*
Total	**161**	**80**	**22**	**33**	***296***
	55%	***27%***	***7%***	***11%***	
	89% (~9/10)			***(~1/10)***	

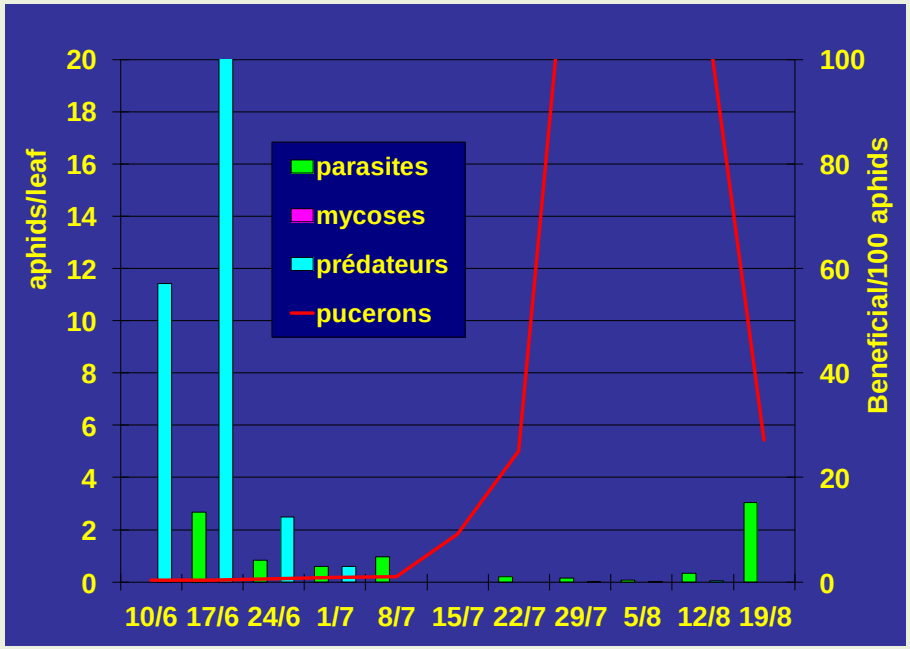
Aphid population at peak (threshold value of 10 aphid/leaf)

-Insecticides required in only about 10% of the fields

- Only 5% if 1994 and 1996 results removed

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

Until the 10th of June No exposure	10th to the 30th of June Key beneficial: Parasitic hymenoptera	1st to the 31th of July Key beneficials: ladybirds and hoverflies	After the 1st of August
Fungicides	**Fungicides**	**Fungicides**	**Fungicides**
AZOXYSTROBINE	AZOXYSTROBINE	AZOXYSTROBINE	AZOXYSTROBINE
BENALAXYL + MANCOZEB	BENALAXYL + MANCOZEB	BENALAXYL + MANCOZEB	BENALAXYL + MANCOZEB
BENTHIAVALICARB + MANCOZEB	BENTHIAVALICARB + MANCOZEB	BENTHIAVALICARB + MANCOZEB	BENTHIAVALICARB + MANCOZEB
BOSCALID + PYRACLOSTROBIN	BOSCALID + PYRACLOSTROBIN	BOSCALID + PYRACLOSTROBIN	BOSCALID + PYRACLOSTROBIN
CHLOROTHALONIL	CHLOROTHALONIL	CHLOROTHALONIL	CHLOROTHALONIL
CHLOROTHALONIL + PROPAMOCARB	CHLOROTHALONIL + PROPAMOCARB	CHLOROTHALONIL + PROPAMOCARB	CHLOROTHALONIL + PROPAMOCARB
COPPER HYDROXIDE**	COPPER HYDROXIDE**	COPPER HYDROXIDE**	COPPER HYDROXIDE**
COPPER OXYCHLORIDE**	COPPER OXYCHLORIDE**	COPPER OXYCHLORIDE**	COPPER OXYCHLORIDE**
COPPER SULFATE**	COPPER SULFATE**	COPPER SULFATE**	COPPER SULFATE**
CYAZOFAMIDE	CYAZOFAMIDE	CYAZOFAMIDE	CYAZOFAMIDE
CYMOXANIL + FAMOXADONE	CYMOXANIL + FAMOXADONE	CYMOXANIL + FAMOXADONE	CYMOXANIL + FAMOXADONE
CYMOXANIL + MANCOZEB	CYMOXANIL + MANCOZEB	CYMOXANIL + MANCOZEB	CYMOXANIL + MANCOZEB
CYMOXANIL + METIRAME	CYMOXANIL + METIRAME	CYMOXANIL + METIRAME	CYMOXANIL + METIRAME
CYMOXANIL + PROPAMOCARB	CYMOXANIL + PROPAMOCARB	CYMOXANIL + PROPAMOCARB	CYMOXANIL + PROPAMOCARB
DIMETHOMORPHE + MANCOZEB	DIMETHOMORPHE + MANCOZEB	DIMETHOMORPHE + MANCOZEB	DIMETHOMORPHE + MANCOZEB
FENAMIDONE + MANCOZEB	FENAMIDONE + MANCOZEB	FENAMIDONE + MANCOZEB	FENAMIDONE + MANCOZEB
FLUAZINAM	FLUAZINAM	FLUAZINAM	FLUAZINAM
FLUOPICOLIDE + PROPAMOCARB	FLUOPICOLIDE + PROPAMOCARB	FLUOPICOLIDE + PROPAMOCARB	FLUOPICOLIDE + PROPAMOCARB
MANCOZEB	MANCOZEB	MANCOZEB	MANCOZEB
MANCOZEB + ZOXAMIDE	MANCOZEB + ZOXAMIDE	MANCOZEB + ZOXAMIDE	MANCOZEB + ZOXAMIDE
MANDIPROPAMIDE	MANDIPROPAMIDE	MANDIPROPAMIDE	MANDIPROPAMIDE
MANEB	MANEB	MANEB	MANEB
METALAXYL-M + FLUAZINAM	METALAXYL-M + FLUAZINAM	METALAXYL-M + FLUAZINAM	METALAXYL-M + FLUAZINAM
METALAXYL-M + MANCOZEBE	METALAXYL-M + MANCOZEBE	METALAXYL-M + MANCOZEBE	METALAXYL-M + MANCOZEBE
Legend	**Insecticides**	**Insecticides**	
Harmless	ACETAMIPRID	ACETAMIPRID	
	ALPHA-CYPERMETHRIN	ALPHA-CYPERMETHRIN	
Slightly harmful	BETA-CYFLUTHRIN	BETA-CYFLUTHRIN	
	CYPERMETHRIN	CYPERMETHRIN	
Moderately harmful	DELTAMETHRIN	DELTAMETHRIN	
	ESFENVALERATE	ESFENVALERATE	
Harmful	FLONICAMID	FLONICAMID	
	LAMBDA -CYHALOTHRIN	LAMBDA -CYHALOTHRIN	
Not registered for this period	LAMBDA -CYHALOTHRIN + PIRIMICARB	LAMBDA -CYHALOTHRIN + PIRIMICARB	
	PIRIMICARB	PIRIMICARB	
****Authorised in Organic Farming**	PYMETROZINE	PYMETROZINE	
	PYRETHRINS + RAPESEED OIL**	PYRETHRINS + RAPESEED OIL**	
	PYRETHRINS + PIPERONYL BUTOXIDE**	PYRETHRINS + PIPERONYL BUTOXIDE**	
	RYNAXYPYR	RYNAXYPYR	
	SPINOSAD**	SPINOSAD**	
	TAU-FLUVALINATE	TAU-FLUVALINATE	
	THIACLOPRID	THIACLOPRID	
	THIAMETHOXAM	THIAMETHOXAM	
	ZETA-CYPERMETHRIN	ZETA-CYPERMETHRIN	

See Poster session (Poster n° 302)

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