Demand *vs* supply in biocontrol

Disturbance of natural balance?

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trends in biocontrol

- accidental discoveries / observations ➔ systematic search
- primitive ➔ advanced production / handling
- availability questionable, waiting periods ➔ dependable supply
- fruiting vegetables ➔ (semi) protected, floriculture, nursery stock, small fruits
- plant protectionists ➔ market chains
- careful evaluation by independent advisors ➔ "turbo language" of commercial advisors
- technical journals critical / sceptical ➔ positive beforehand
- "natural" expansion, slow ➔ hurry
- extensive efficacy research ➔ on-farm trials
- supply ➔ demand driven

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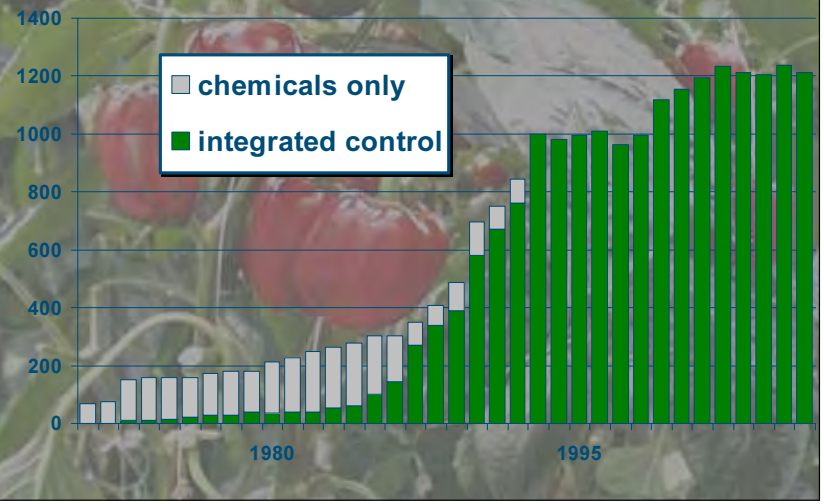
acreage of sweet pepper glasshouses in The Netherlands (ha)



increasing demand

- more crops / varieties
  - cut flowers
  - potplants
  - (semi) protected crops
  - nursery stock
  - small fruits
- more pests
  - mealybugs & scale insects
  - leathery thrips species
  - invasive species
- different growing systems, innovations
- different climate conditions (temp., RH, light, CO_2)

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concerns

- (production volume)
- (batch quality)
- costs
- NARROW ASSORTMENT

CONDITIONS in ORNAMENTALS

- temperature
  - propagation Phalaenopsis 28 °C
  - soil temp. Freesia 15 °C
  - Fatsia 14 °C
- air humidity
  - misting
  - dehumification
- light
  - assimilation lamps
  - LED's
  - shadow plants
  - photoperiod
- seasonal
- geographical

Anton van der Linden:

" No ornithologist in his right mind would consider …

… to introduce woodpeckers on a grassland … "

" … or lapwings in a forest …

… but in biocontrol we try this all the time ! "

Important biocontrol agents (pred., paras.)

SPECIES	CATEGORY	TARGET	
Encarsia formosa	hym. parasitoid	whitefly	1926
Phytoseiulus persimilis	predatory mite	spider mite	1968
Aphidoletes aphidimyza	predatory midge	aphids	1978
Dacnusa sibirica ⊛	hym. parasitoid	leafminers	1981
Aphidius sp. ⊛	hym. parasitoid	aphids	1983
Diglyphus isaea ⊛	hym. parasitoid	leafminers	1984
Amblyseius cucumeris	predatory mite	thrips	1986
Amblyseius californicus	predatory mite	spider mite	1990
Orius sp.	predatory bug	thrips	1993
Macrolophus caliginosus	predatory bug	whiteflies	1994
Hypoaspis sp.	predatory mite	fungus gnats	1996
Typhlodromips swirskii	predatory mite	thrips, whiteflies	2005
Amblyseius andersoni	predatory mite	spider mite, thrips	2006

⊛ likely to occur spontaneously

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Registration IPM insecticides / acaricides NL

hydrocyanic acid	Calcid	70's
pirimicarb	Pirimor	70's
fenbutatinoxid	Torque	70's
tetrachlorvinpho	Gardona	1988
teflubenzuron	Nomolt	1988
hexythiazox	Nissorun	1989
cyromazine	Trigard	1992
clofentezin	Apollo	1993
imidacloprid	Admire	1995
avermectine	Vertimec	1995
pyriproxyfen	Admiral	1997
kresoxim-methyl	Kenbyo	1997
tebufenpyrad	Masai	1997
milbemectine	Milbeknock	2002
indoxacarb	Steward	2002

thiacloprid	Calypso	2003
spirodiclofen	Envidor	2003
bifenazaat	Floramite	2003
pymetrozine	Plenum	2003
spiromesifen	Oberon	2004
spinosad	Tracer	2004
thiamethoxam	Actara	2005
methoxyfenozide	Runner	2005
acetamiprid	Gazelle	2006
lufenuron	Match	2006
acequinocyl	Cantack	2007
flonicamid	Teppeki	2008
etoxazool	Borneo	2009
emamectine	Proclaim	2009
pyridabyl	Pleo	2011

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CONTROVERSY CHEMICALS ⇔ BIOLOGICALS

- selective pesticides allowed the introduction of natural enemies
- selective insecticides mask the weaknesses of biocontrol products
- selective insectides compete with augmentative biocontrol
  - either … or
  - combined with inoculative introduction
  - combined with natural control
- abandoning broad spectrum pesticides ⇨ secondary pests ⇨ more market for biocontrol

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Echinothrips americanus

adult

pupa

(lack of) innovation in biocontrol

- products of nature, not patentable
- specific mode of action, small market niche
- producers are small companies, limited R&D resources
- covering maximal market with minimum # products
- emphasis on production costs
- fierce competition on price
- privatising of independent research & extension
- public / cooperative funds shrinking

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DEMAND >> SUPPLY

- commercial vacuum
- premature introduction of new products
- recommended against non-preference targets
- recommended under sub-optimal conditions
- based on unrealistic laboratory experiments…
- …or on inconclusive on-farm trials
- selective reporting
- “significant” rather than “sufficient” effects
- “historical evidence” rather than “reproducability”
- efficacy standards too low for professional horticulture
- pest absence claimed as efficacy of the product
- ➔ confusing growers, eventually abandoning IPM

ON-FARM TRIALS, WHY?

- saving costs
- mistrust of laboratory research
- SPEEDING-UP COMMERCIALISATION

ON-FARM TRIALS, WHY NOT?

- uncomparable plots
- replicates
  - too few
  - pseudo-rep’s
- TOO LOW PEST DENSITY
- interference with chemicals
- lack of expert knowledge
  - CROP > PEST > ANTAGONIST
- evaluation by producer
- inconclusive results, false positives
- negative results ignored or excused for

- grower’s satisfaction = product’s efficacy ?

What do we need ?

- SEARCH FOR NEW PEST ANTAGONISTS
  - in nature
  - in agricultural ecosystems
  - in the area of pest origine
- PRODUCTS FOR SHORT-TERM INTERFERENCE
  - nematodes
  - microbials
  - botanicals
- CONFIRMING EFFICACY IN FIELD EXPERIMENTS
  - adequate monitoring …
  - … of both pest and antagonist

Does investing in biocontrol agents pay ?

- urgent and increasing demand
- quick dissemination worldwide
- relative simple registration procedure (arthropods)
- well-educated growers (handling complicated strategies)
- high prices of modern pesticides

- well-educated growers (no market for “snake oils”)
- high efficacy demands
- niche products
- not patentable (innovators ⇔ fast followers)

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CONCLUSIONS

- biocontrol has acquired a regular, but modest position in high value crops
- advertising the merits and eliminating the shortcomings of biocontrol is more effective than disparaging chemicals
- synthetic …… living creatures
- all plant protection products have to cope with increasing standards for efficacy, health and environment
- biocontrol in floriculture requires a wider variation of natural enemies

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Thank you for your attention

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