Benefits of Biological Control

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REBECA Macrobials Meeting, April 2006
Biological control = use of biota to reduce biota

- Most successful
- Most cost effective
- Environmentally safest

So why not use it on a much larger scale?
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<th>Biological control</th>
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## Chemical and Biological Control compared

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<td>Benefit / cost ratio</td>
<td>2:1</td>
<td>20:1</td>
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<tr>
<td>Risks of resistance</td>
<td>large</td>
<td>small</td>
</tr>
<tr>
<td>Specificity</td>
<td>very small</td>
<td>very large</td>
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<tr>
<td>Harmful side-effects</td>
<td>many</td>
<td>nil/few</td>
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* = data from chemical industry
Where does biological control work?

Everywhere where plants grow: also in natural ecosystems

Without biological control: no green earth!!
Where is biological control active in agriculture?

Natural biological control: all agricultural areas, controls 95% of pests
Release of natural enemies: 10% of agricultural area (3.5 billion hectares)
Natural biological control (NBC) is constantly active in all world ecosystems on 55.5 billion hectares.

Most potential pests in agriculture (95% of 100,000 arthropod species) are under NBC.

All other control methods are targeted at the remaining 5,000 pests.
Where is biological control active?

Classical biological control (CBC): use of exotic natural enemies to control exotic pests

CBC is used on 3.5 billion hectares (10% of land under culture)

CBC has benefit-cost ratio of 20-500 : 1
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When CBC works, it works forever

*Rodolia* controls *Icerya* worldwide for more than 100 years

> 5,000 introductions with 2,000 exotic species made to control pests in 196 countries or islands
Augmentative biological control (ABC): release of mass produced natural enemies (native or exotic) to control pest; commercial

ABC is applied on 16 million hectares (0.05% of land under culture)
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ABC is applied on 16 million hectares (0.05% of land under culture)

ABC has a benefit-cost ratio of 2 - 5 : 1

> 150 species of natural enemies (parasitoids, predators and pathogens) commercially available for ABC
What is the economic value of ecosystem service biological control?

Ecosystem function of natural biological control (NBC):
estimated to have an annual minimum value of 400 billion US$
per year (Costanza et al., 1997)

Ecosystem function of classical biological control (CBC):
no estimate available yet, but also billions

Chemical control (= man) destroys this ecosystem function !!

Value of augmentative biological control (ABC): 280 million US$
Advantages of biological control for farmer and community

Farmer:
1. No exposure of grower and personnel to toxic pesticides
2. Lack of residues on the marketed product
3. Lack of phytotoxic effects, and no premature abortion of flowers and fruit
4. Yield increase
5. Release of natural enemies takes less time and is more pleasant than spraying
6. Release of natural enemies when grower has time, effect permanent
7. Only occasional checks, chemical control requires continuous attention
8. Several pests can only be controlled with natural enemies
9. With biological control no safety period, harvesting is always possible
10. Biological control is permanent: once a good natural enemy - always a good natural enemy
Advantages of biological control for farmer and community

Farmer: 1-10

Community:
1. Biological control is appreciated by the general public
2. Biologically controlled crops get better price
3. Low risk of food, water, soil and air pollution
4. Contribution to sustainable food production
5. Contribution to protection and improvement of biodiversity
Number of commercial biological control products beats that of chemical control
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- Active ingredients chemical
- Species of natural enemies
Wageningen studies (Bouma, Kropff, Rabbinge) show that simply GOOD FARMING will lead to pesticide reductions of 80-95%
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Studies of our group show that within 25 years:

- Pesticide use can be reduced to 0% in several crops.
- Biological control can be applied on a much larger scale (30-40% of all pest control) worldwide.
- In combination with other alternatives (host plant resistance, semiochemicals, cultural methods) pesticides can be replaced up to 100%.

Future of pest management
But biological control only works in greenhouses, isn’t it ???

- No, biological control works in all crops and in all climates
- Each plant has tens to hundreds of pests and diseases
- Each pest has tens to hundreds of natural enemies
- With our science (and art) we select the most effective and safe agents

Biological control cannot always solve all pest and disease problems, therefore a systems approach is needed with other non-chemical methods
Future of pest management

Pest management will become a guiding theme again, instead of being the marginal issue it was during the past 60 years.

Guiding, because methods to prevent or reduce pests influence all agronomic methods from the design of cropping systems to the harvest of crops.

Ecosystem services to biological control:

Better be wise and use them instead of destroying them.
All information in this presentation: see IOBC Internet Book of Biological Control on www.IOBC-Global.org

And we need you as member of IOBC so register at www.IOBC-WPRS.org

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PESTICIDE TREADMILL

Heavy reliance on pesticides

Little emphasis on ecosystem

THERAPEUTICS

Broad spectrum chemicals

Biopesticides & Biological Agents

Shift to use of soft interventions

Lewis, van Lenteren, Phatak & Tumlinson
PNAS, 94, 12243-12248, November 1997
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Little emphasis on ecosystem

Broad spectrum chemicals
Biopesticides & Biological Agents
Shift to use of soft interventions

Shift from reductionist approach to emphasis on understanding multitrophic interactions
Use inherent strengths of ecosystem

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THERAPEUTICS

Broad spectrum chemicals
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Shift to use of soft interventions

Therapeutics as backup

Strong knowledge and emphasis on ecosystem strengths

TOTAL SYSTEMS MANAGEMENT

ECOSYSTEM

Shift from reductionist approach to emphasis on understanding multitrophic interactions
Use inherent strengths of ecosystem

Lewis, van Lenteren, Phatak & Tumlinson
PNAS, 94, 12243-12248, November 1997
Vandaag meer dan 150 soorten natuurlijke vijanden te koop
International Organization for Biological Control of Noxious Animals and Plants- IOBC

Membership open for anyone (individuals, institutes, industry) supporting the mission of IOBC

Working groups can be started/supported within IOBC based on good proposal

Manuscripts for BioControl are welcome (we are increasing number of pages published per year)

For IOBC membership and information about all other issues see: WWW.IOBC-GLOBAL.ORG