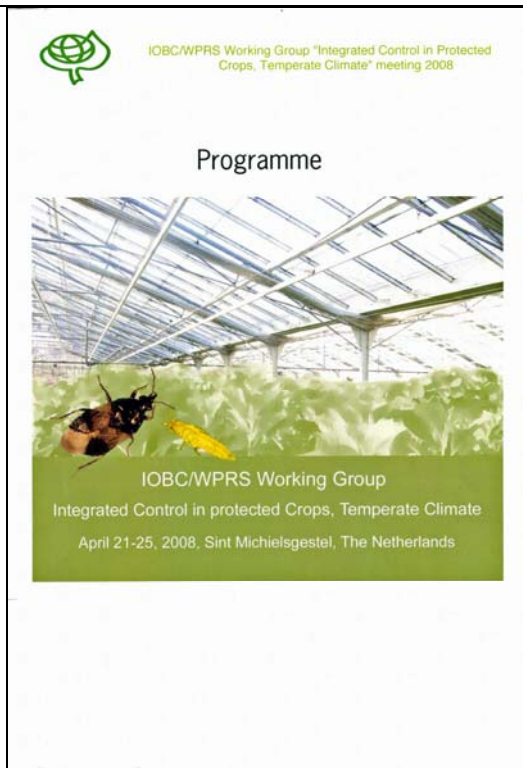


To

Date

Tuesday April 29, 2008

6 pages from Mario Lanthier



The “Greenhouse 2008” workshop was held in late April in The Netherlands and organised by the International Organisation on BioControl.

There were 132 participants, of which 75% came from Europe. There were 13 persons from Canada (4 from B.C.). Persons in attendance were researchers and employees of biocontrol distributors (Koppert, Biobest, etc.).

The IOBC promotes research, development, implementation and training in IPM systems. This working group (one of 20) is “Integrated Control in Protected Crops, Temperate Climate”.

### **General impressions**

*Greenhouse growers make extensive use of IPM (mixing biological + pesticides).*

Step 1: use biological control to keep pest numbers low throughout the crop cycle.

Step 2: use target-specific pesticides to redress an imbalance of prey to predator.

*Greenhouse growers know the cost of the biocontrol program in their crop.*

- IPM cost is between 0.75% and 2% (generally 1%) of the income per m<sup>2</sup> of surface.

- Biocontrol is widely used to control mites, thrips and whiteflies, but not for aphids.

*Greenhouse growers are moving to an “industrial” production system.*

- Production is market-driven (delivery on demand), expansion to year round production.

- For vegetables, there are fewer growers but their operation is a much larger size.

*Greenhouse growers are under pressure to reduce dependence on fossil fuels.*

- There are government requirements to reduce energy use (car gas is C\$2.50 per liter).

- There are technological changes to make better use of space, labour and IPM.

## ***Developments in greenhouse horticultural production systems***

By J.C. Bakker, Wageningen UR university research station, The Netherlands

### *Overview of greenhouse industry.*

- Worldwide: 38,500 ha of greenhouse production, of which 75% is for tomatoes.
- The Netherlands: 10,500 ha of greenhouse production, sales E5.4 billion (X1.6 for C\$).
- The Netherlands: only 1/3 in tomatoes, production costs are lower in Spain and Italy.
- Current expansion is in ornamentals and “niche” markets (berries, herbs and organic).

### *Advances for optimal use of space.*

- Land price is very high: Euro75 to 100 / m<sup>2</sup> (C\$120 to \$160 / m<sup>2</sup> or \$500,000 / acre).
- Now being installed: “walking plant system” of mobile benches or gutters for pot plants and cut flowers, no work aisles, the plant moves to the worker who remains stationary.
- It is required to collect rain water, so new greenhouses are built over the reservoir.

### *Advances for reduction of energy use.*

- In most countries, energy use is 20 to 30% of production cost for vegetables.
- The Netherlands: government requirement to reduce CO<sub>2</sub> emissions 30% by 2020.
- Method #1: more efficient conversion of source energy (energy efficient heaters, etc).
- Method #2: reduce losses to the environment (insulation, thermal screens, etc).
- The Netherlands: 79% of greenhouses are now equipped with thermal screens.
- Objective is to increase insulation at the roof, but screens are mobile and can open.
- Best screens have high insulation value (energy savings 20%), high light transmission.
- New: “Lexan Zigzag roof”, double layer, fire resistant, polycarbonate, UV and IR proof.

### *Advances for optimal use of light.*

- Currently: minimize gutters, wide glass panels (> 1.7 meters), white coated frames.
- International construction norms will prevent further improvements in building design.
- Future: roof materials that improve light transmission yet are energy efficient.
- Required: high visible light / low IR radiation / high insulation value.
- Future: LED-based system to increase energy efficiency / apply specific wave lengths.

### *Advances in controlled greenhouse environment.*

- “Closed greenhouse” concept where all energy is recycled (energy saving of 30%).
- Example: cooling of greenhouse during the summer with evaporative misting, the warm water is captured and stored in underground aquifer, used to heat during winter.

## **Biocontrol programs for specific pests**

Current model is “inundative strategy” (frequent introduction of fixed numbers).

- It allows to forecast costs, keeps pest numbers low, reduces need for monitoring.
- Biocontrol is part of growing program, but market has no tolerance for pest damage.
- The “hot” biocontrol is the mite *A. swirskii*, introduced in 2005, called “a super-hero”.

I constantly asked the question “Why should a greenhouse use biocontrol?”.

- Researchers: pesticide resistance / expensive new pesticides / poor coverage.
- Growers: worker re-entry / flowers are damaged by pesticides / public concerns.

### Biocontrol program for spider mites

- Consensus: the mite *P. persimilis* is highly successful except during very hot weather.
- Standard program: spray Floramite or Envidor to clean-up, then release predators.

### Biocontrol program for thrips

- Consensus: the mite *A. cucumeris* is highly successful. *A. swirskii* is also effective.
- Standard program: first line of defense is *A. cucumeris*, use *Orius* to correct a problem.
- Pesticides: abemectin (product Avid). Limit the use of Success to prevent resistance.

### Biocontrol program for whiteflies

- Consensus: *A. swirskii* is highly successful, unless it feeds on thrips or mites.
- Standard program: preventative releases of *A. swirskii*, or the parasite *Encarsia f.*
- Pesticides: abamectin (Avid), spiromesifen (similar to Envidor). Avoid Admire.
- Other note: eggplant is a trap crop (“magnet” for whiteflies), but must be managed.

### Biocontrol program for aphids

- Consensus: it is difficult to get biocontrol of aphids, the impact takes up to 3 weeks.
- Standard program: spray when seen. Organic growers use soap + wash vegetables.
- Biological: *Aphidoletes* + parasitic wasps. Start early, 10 enemies / m<sup>2</sup>, then weekly.
- Pesticides: pirimicarb (Pirimor, no longer in Canada), Calypso (same family as Tristar).

### Biocontrol program at greenhouses visited during the tour

Site visited	Thrips	Spider mites	Whiteflies	Aphids
Anthura	<i>A. cucumeris</i>	<i>A. cucumeris</i>		Spot spray
Chrysanthemum	<i>A. cucumeris</i>	<i>P. persimilis</i>		Spray
Peppers	<i>A. cucumeris</i>	<i>P. persimilis</i>	<i>Encarsia f.</i>	<i>Aphidius</i> wasp
Raspberries	<i>A. cucumeris</i>	<i>A. californicus</i>	<i>A. swirskii</i>	<i>Aphidoletes</i>
Roses	<i>A. swirskii</i>	<i>P. persimilis</i>	<i>Encarsia f.</i>	Spray
Strawberry	<i>A. cucumeris</i>	<i>P. persimilis</i>	<i>A. swirskii</i>	<i>Aphidius</i> wasp

## OVERVIEW OF GREENHOUSE INDUSTRY



*Above: Street scene in the countryside in the Netherlands. Complete farm regions are now devoted to greenhouse production. Field production is reserved for local markets.*

*Below: Greenhouse-grown strawberries “Koolhass” (total production area is 4 acres). Smaller growers are unable to compete on cost with larger growers for tomatoes and peppers. The reported health benefits generate a growing demand for strawberry, raspberry and currant.*



## EXAMPLES OF MODERNISATION #1



*Above: Greenhouse-grown cut roses “Marjoland” (total production area is 33 acres). The potted plants are placed on a tablet and moved to the working area for crop care. IPM is practiced by 60% of rose growers, cost is Euro1.30/m<sup>2</sup>/year. Income is 120.00/m<sup>2</sup>/year.*

*Below: Greenhouse-grown chrysanthemums “Middelburg” (total production area is 39 acres). High density planting, few walking alleys, predators released on line attached to spray boom. IPM is practiced by most growers. Program: spray at start, then predators, spray pre-harvest.*



## EXAMPLES OF MODERNISATION #2



*Above: Greenhouse-grown red peppers “Bos Kwekerijen” (total production area is 28 acres). A machine measures the weight of each pepper and prepares a mixture of exactly 5.1 kg per box. IPM program: predators for thrips and mites, pesticide for aphids. Cost is Euro0.40 /m<sup>2</sup> /year.*

*Below: University research station Wageningen UR (total research area is 2 acres). The picture shows a site for testing new panels that increase light diffusion but maintain quality. Scientists reported that funding for research is generally becoming more difficult to obtain.*

