**Greenhouse pest control: a systems approach**

Dr. Rose Buitenhuis  
Biological Controls – Putting it all together for success  
Vernon, CT, July 31, 2014

---

**Definition IPM (UMass Extension)**

It is generally accepted that IPM is a systems approach to pest management, based on:

- accurate pest identification and monitoring,
- use of economic and/or aesthetic thresholds,
- and use of all suitable control measures (including chemical, cultural, and biological controls).

This is accomplished in an ecologically compatible manner, maintaining pest population levels below those causing economically significant injury.

If no effective non-pesticide control measures are available, a key IPM tenet is that selected pesticides should result in the lowest possible risk to health or the environment.

---

**Survey: reasons for not using biocontrol**

N=61, Grygorczyk et al, 2014

- Lack of expertise  
- High cost  
- Adequate, non-chemical control methods  
- Lack of BCA availability  
- No perceived pest issue  
- Lack of BCA efficacy  
- Performance issues  
- Availability of synthetic pesticides  
- Consumer perception  
- Perceived regulatory issues

---

**Pesticide paradigm**

Using pesticides was easy

A single BCA rarely provides satisfactory control.

Strategic selection of several BCAs, combined with innovative approaches to enhance their effectiveness.

Most effective and economical solution

Example: thrips IPM

- Nematodes, Botanigard
- Predatory mites
- Orius banker plants
- Trap plants/mass trapping/lures

---

**Paradigm shift**

Biocontrol-based IPM is:

- Preventative, use of thresholds

But more importantly:

- Redesigning the production ecosystem to address underlying weaknesses that have allowed organisms to reach pest status

Fixing a situation that is inherently flawed takes a lot of effort (and money)
Systems approach to IPM

Pest management strategy where the influence of all factors affecting pest abundance is considered to create a system that is inherently resistant to many pests and thus requires fewer or no treatment with conventional pesticides (Lewis et al. 1997; Bale et al. 2008).

Greenhouse production ideal place to apply systems approach:
- High value crops
- Many alternative pest management strategies
- Extension network and consultants

IPM triangle – disease triangle

Plant factors – plant breeding

Kos et al., 2014. Entomologia Experimentalis et Applicata 151: 198-208

Plant factors – induced resistance

Pineda et al., 2010. Trends in Plant Science 15: 507-514

Plant factors – crop management

Reducing fertilizer can reduce pest abundance. Fertilizer type affects % parasitism through changes in host suitability

Kos et al., 2014. Entomologia Experimentalis et Applicata 151: 198-208
Plant factors – crop management

PGR can reduce aphid abundance
...but can also reduce aphid parasitism through direct toxic effects and effects on parasitoid host location


Environmental factors – physical control

Exclusion
Sanitation / clean up post harvest

IPM starts before the plants arrive in the greenhouse

Seed treatments
Pest control practices at stock plant producer / propagator
Cutting dips

Environmental factors – climate

Temperature, humidity, light intensity, wavelength, photoperiod

Environmental factors - climate

Temperature, humidity, light intensity, wavelength, photoperiod
New technologies / energy savings

Control agents – augmentative biocontrol

Biocontrol agents are not expected to establish (much).

Apparent competition: How are whiteflies and thrips connected?

Because more predators

Only whitefly control when thrips present

Intra-guild predation: something is preying on the predator

Systems approach to IPM

Right Plant
Right Environment
Effective Pest control

Control agents – establishment biocontrol ecosystem

Poor establishment of BCAs can be enhanced by providing additional resources (e.g. supplemental food / banker plants)

Apparent competition:
How are whiteflies and thrips connected?

Because more predators

Only whitefly control when thrips present

Intra-guild predation: something is preying on the predator
Control agents – chemical control

Back-up rather than primary line of defense
- Better resistance management
- Compatibility within the IPM system

Compatibility of biocontrol and pesticides

Systems approach to IPM

Questions?