



Twenty five years of mass production  
of *Phytoseiulus persimilis*:  
A "bug farm" or an industry?

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AMRQC Vienna, 2010

2000



2005



2010

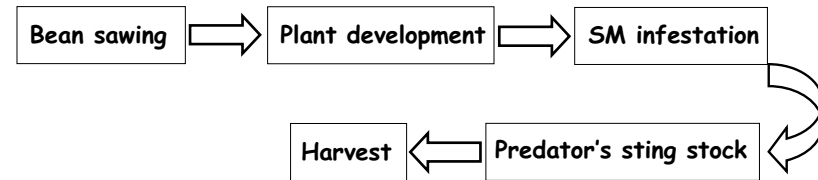




## "Traditional" tri-trophic system



## *P. persimilis* mass production scheme under greenhouse conditions



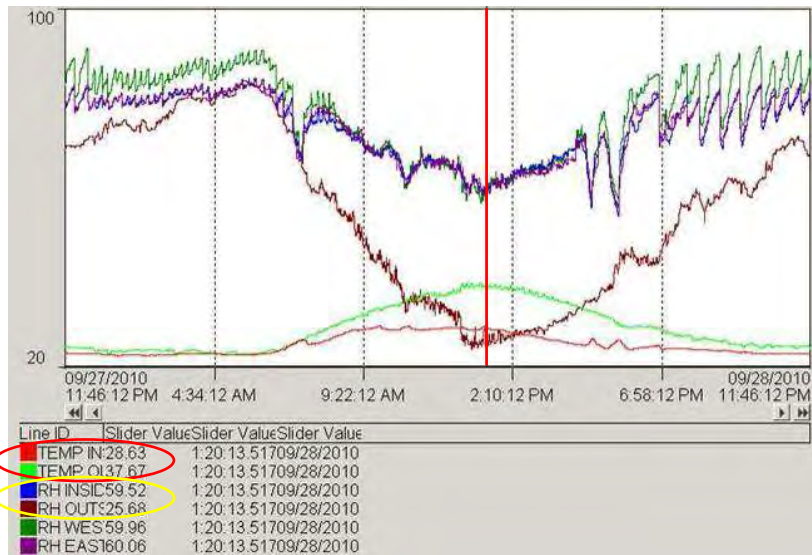
*P. persimilis* bulk after harvest



## "Bug Farm" vs. Industry (degree of control)

Parameter	Bug Farm	Industry
Temperature	++	+++
RH	++	+++

Typical evolution of temperature and RH in and out a *P. Persimilis* mass production greenhouse unit



"Bug Farm" vs. Industry  
(degree of control)

Parameter	Bug Farm	Industry
Temperature	++	+++
RH	++	+++
Light	++	++



"Bug Farm" vs. Industry  
(degree of control)  
Light

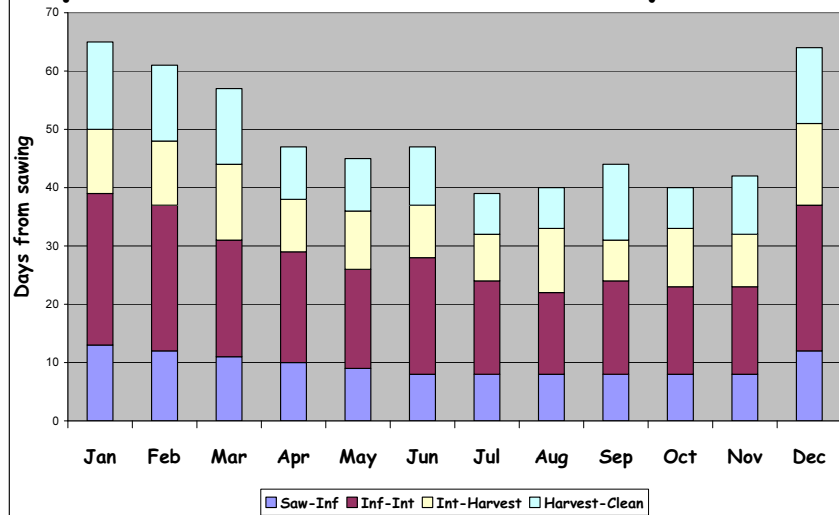
- In "bug farm": natural light, natural day-length, shading nets, thermal screens
- In industry: artificial light, pre-set day-length



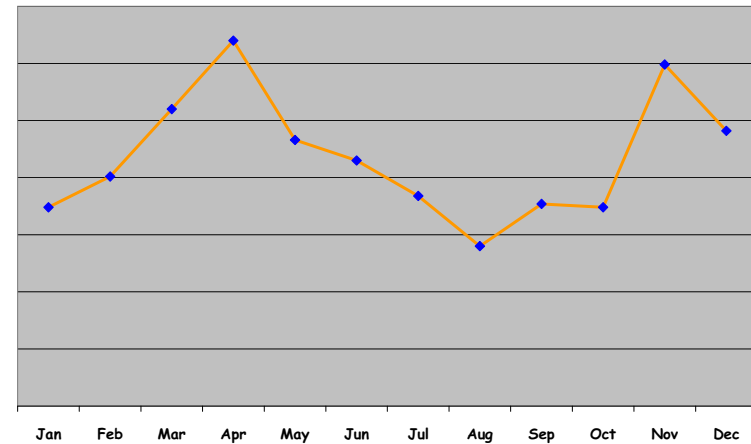
"Bug Farm" vs. Industry  
(degree of control)

Parameter	Bug Farm	Industry
Temperature	++	+++
RH	++	+++
Light	++	++
Seasonality	+	+++

## Schedule of *P. persimilis* production scheme (Monthly, 2009)



## Maximum *P. persimilis* monthly yield (gr. of bulk material). Annual pattern - 5 years



## "Bug Farm" vs. Industry (degree of control)

Parameter	Bug Farm	Industry
Temperature	++	+++
RH	++	+++
Light	++	++
Seasonality	+	+++
Prey	+	+++



## "Bug Farm" vs. Industry (degree of control) Prey

- In "bug farm", spider mite infestation may be insufficient or may go out of hand
- In industry, supply of spider mites can be kept constant in quantity and time



## "Bug Farm" vs. Industry (degree of control)

Parameter	Bug Farm	Industry
Temperature	++	+++
RH	++	+++
Light	++	++
Seasonality	+	+++
Prey	+	+++
Demography	++	+++



## "Bug Farm" vs. Industry (degree of control) Demography

- In "bug farm", the daily rate of reproduction ( $\lambda$ ) and age distribution of the prey and predator are relatively hard to assess
- In industry, the aforementioned parameters are easier to assess and predict



## "Bug Farm" vs. Industry (degree of control)

Parameter	Bug Farm	Industry
Temperature	++	+++
RH	++	+++
Light	++	++
Seasonality	+	+++
Prey	+	+++
Demography	++	+++
Contaminants	+	++



## "Bug Farm" vs. Industry (degree of control) Contaminants

- In "bug farm": Western flower thrips, leafminers, caterpillars
- In industry: other phytoseiid species, bran mites



## "Bug Farm" vs. Industry (strengths & weaknesses)

Parameter	Bug Farm	Industry
Economy	++	+++
Predictability	++	+++
QA, QC, PC	++	++
Field performance	++	+



Therefore:  
I believe that mass production  
of *P. persimilis* at BioBee should  
be considered as:  
"Industrial Bug Farm"



## Take home messages for: the future of arthropod rearing and QA

- "Bug farm" production or Industry production are species specific
- Industrializing production of arthropod BCAs is essential if we want to conquer new markets

Thank you!



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