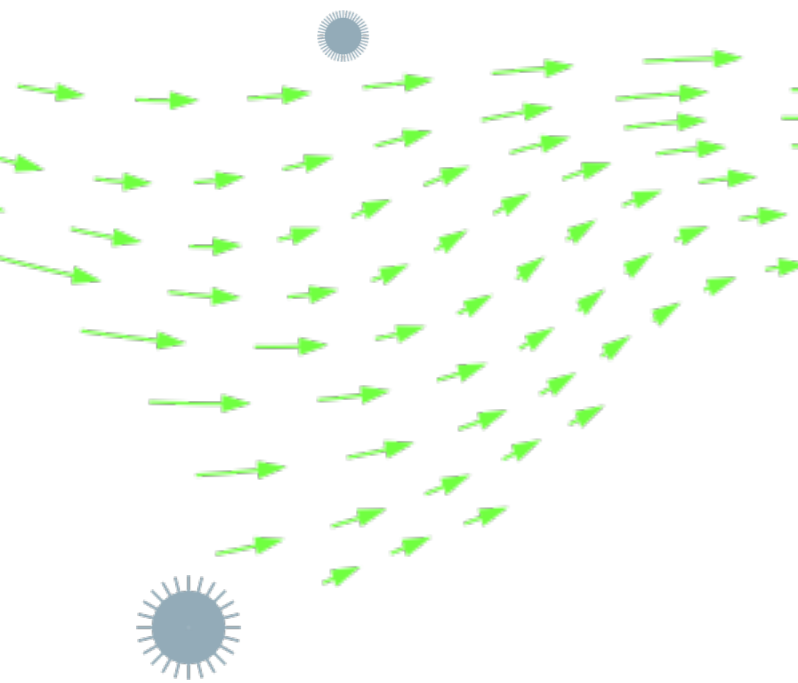


Bringing Biological tools to the market



# BIOCOMES

## Project Deliverables

Jürgen Köhl, Massimo Benuzzi, Daniel Zingg,  
Ralf-Udo Ehlers

Annual Biocontrol Industry Meeting

Basel, 23 - 25 October 2017

# BIOCOMES – The targeted pests and diseases

## Arable crops

Wheat  
Powdery mildew



Rapeseed  
Verticillium wilt



Maize and wheat  
*Fusarium* spp.



Cabbage  
Cabbage moth



## Vegetables

Tomato & potato  
Tomato leaf miner  
Potato tuber moth



Vegetables  
White flies



# BIOCOMES – The targeted pests and diseases

## Fruit tree crops

Apple, pear, plum, peach, apricot, cherry

Aphids



Stone fruits

Brown rot



## Forestry

Conifers

Large pine weevil



Various tree species

Gypsy moth



Tree seedlings

Damping off



# BIOCOMES – 11 New biocontrol products

 Virus




 Bacteria



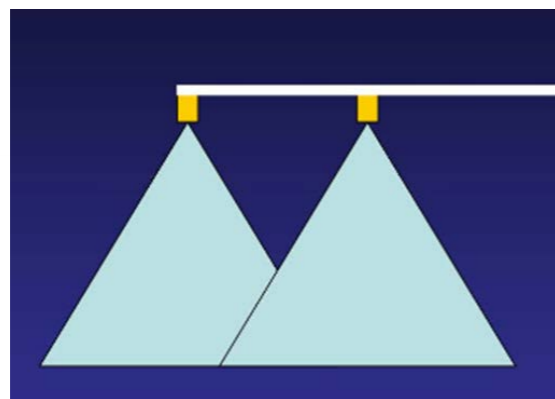
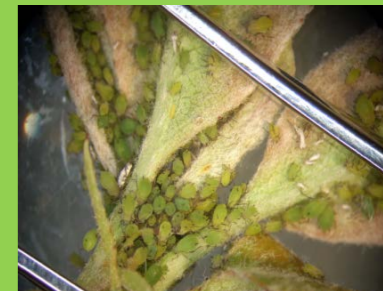
 Fungi



 Nematodes



 Insects



# BIOCOMES – The choice of 11 targeted pests and diseases

- ➔ Food losses
- ➔ Pesticide use
- ➔ Market size for biocontrol products
- ➔ Open field crops
  - ➔ Arable crops, Vegetables,
  - Fruit tree crops, Forestry
  - ➔ New production technologies
- ➔ Support implementation of Directive 2009/128/EC on use of IPM in agriculture and forestry



# BIOCOMES – Consortium



- ➔ 13 industrial partners
  - ➔ Production and marketing of BCAs 6
  - ➔ Evaluation of risk and sustainability of BCAs 2
  - ➔ Field testing of BCAs 5
- ➔ 14 research institutes and universities
- ➔ 14 countries
- ➔ Wageningen UR: project coordination & dissemination
- ➔ Duration: 48 months; Start: 1 December 2013
- ➔ € 12 million; € 9 million contribution from European Commission



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[www.biocomes.eu](http://www.biocomes.eu)

Co-funded by  
the European Union



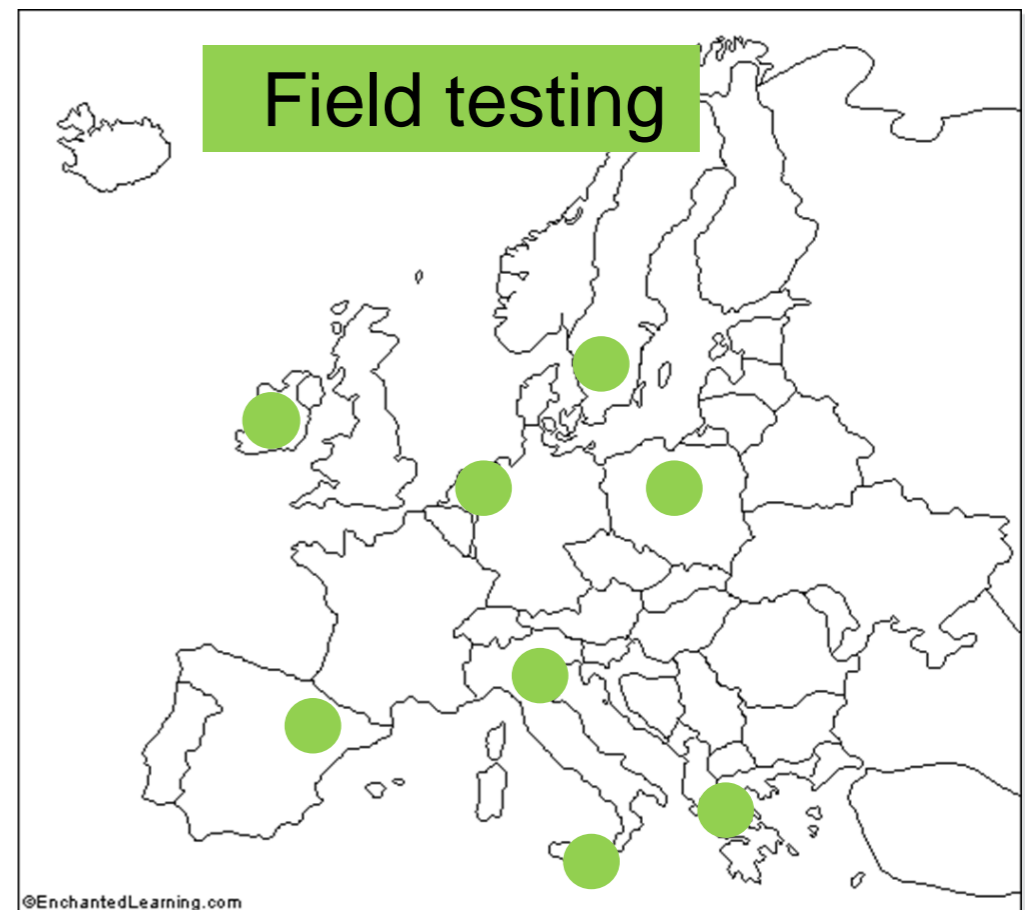
# BIOCOMES – Consortium

## Teams per biocontrol product

1 Biocontrol industry partner  
+ Partners with specific expertises  
needed

## Common infrastructure

- Field testing
- Molecular identification
- Registration issues
- Economic evaluation
- Environmental sustainability
- Communication





# BIOCOMES – Added value of a public private cooperation in view of biocontrol industries



Massimo Benuzzi  
Technical Director



New BCA for control of  
Fusarium head blight  
in wheat and pink ear  
rot in maize



Daniel Zingg  
Managing Director



New BCA for control of  
tomato leaf miner and  
potato tuber moth



Ralf-Udo Ehlers  
Managing Director



Breeding  
entomopathogenic  
nematodes

# Added value of a public private cooperation

Biogard & BIOCOMES



Massimo Benuzzi

Technical Director - Biogard Division of CBC Europe srl

# BCA to control

WP 6 - *Fusarium* spp in wheat and maize



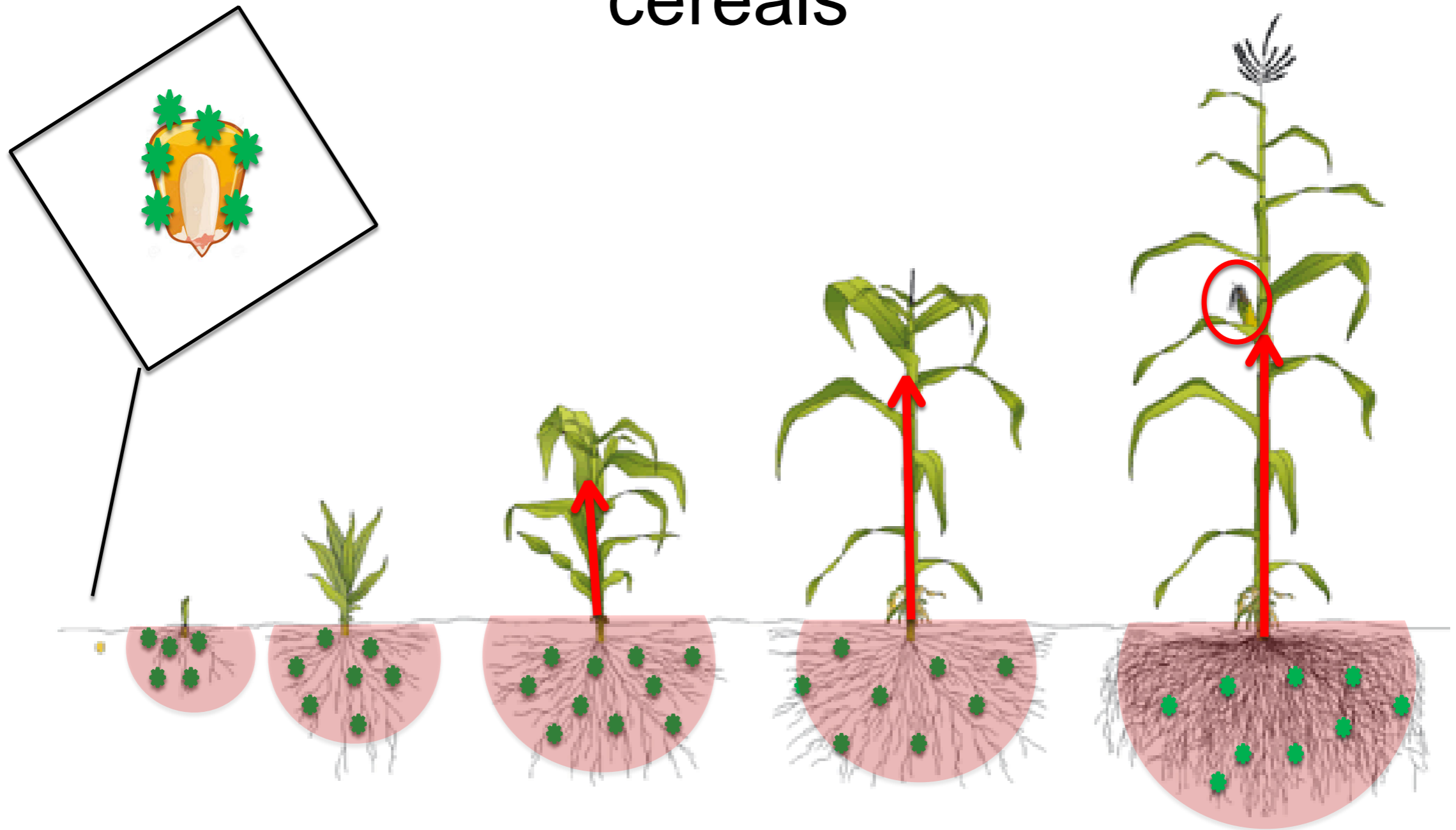
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*Agro Plantarum*



# WP 6- *Trichoderma harzianum* (DSM25764) seed treatment for control of *Fusarium* spp. on cereals



# Added value of BIOCOMES

- ➔ Development of a BCA against:
  - ➔ Fusarium head blight of wheat and pink ear rot of maize
- ➔ Scientific partner: University of Padova
- ➔ Availability of expertises in BIOCOMES consortium:
  - ➔ Field testing
  - ➔ Risk assessments
  - ➔ Check on ecological sustainability



# Collaboration

Between the companies

- ➔ Collaboration between the companies
  - ➔ The framework of the project has allowed every company to work on his target, in some cases also with the cooperation of other companies
  - ➔ Avoiding competition
  - ➔ Stimulating collaboration and contact
  - ➔ Many advices/exchanges of experience among WPs

# Collaboration

Between the companies & Research Institute(s)

- ➔ Collaboration Research Institute and companies
  - ➔ The possibility of having the scientific support of Research Institutes was a **Key point** of Biocomes project
  - ➔ The goal was mainly the development of a commercial product and not (only) scientific publications
  - ➔ Exchange of expertise and different approach (mainly due to the need to follow GEP procedures for registration purposes)
  - ➔ Field efficacy approach
  - ➔ Stimulating collaboration and contact

# Doing Research ?

What are we looking for?

Looking for  
what is  
actually  
needed to  
have a  
commercial  
product on  
the market








# Results & expectations

At the end of the BIOCOMES project 

- A better understanding of the mode of action of the BCA we are developing
-  • Identification of ways on how to improve its efficacy and of possible bottle-necks
- Support for potential upcoming registration (especially for the characterization of the BCA, studies on its environmental fate and persistence, and GEP trials)
- Even if the whole registration dossier has to be prepared a crucial support came out by the project
- New contacts with Biocontrol experts and companies

# Added value of a public private cooperation

Andermatt Biocontrol & BIOCOTES

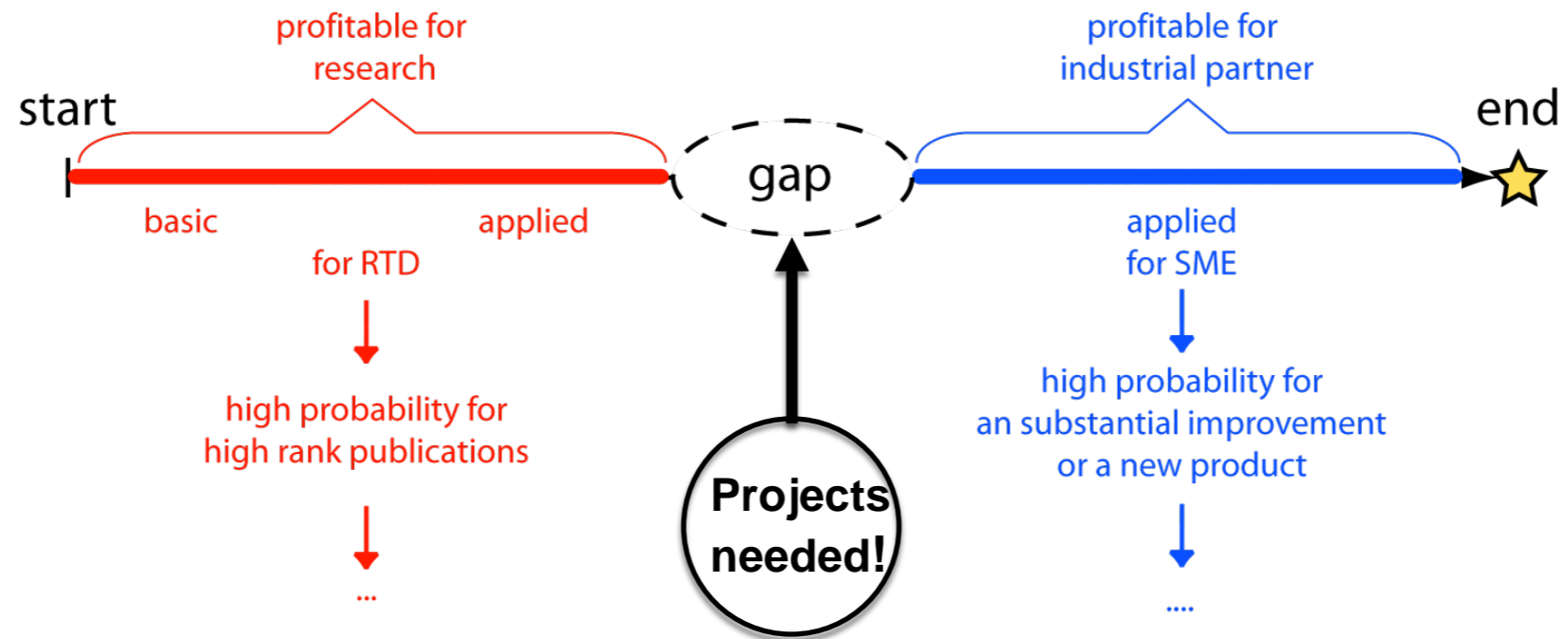


Daniel Zingg

Managing Director Andermatt Biocontrol



# Usual phenomenon in research & development of new findings / products



The map shows the geographical distribution of these organizations across Europe. Callouts include:

- Andermatt Biocontrol (ABC)**, Switzerland
- BIOGARD® (BIOGARD)**, Italy
- Universidad Pública de Navarra (UPNA)**, Department of Crop Production, Spain
- Julius Kühn-Institut, Federal Research Centre for Cultivated Plants (JKI)**, Germany
- HELLAFARM S.A (HEFA)**, Greece

Logos for each organization are displayed around the map: Andermatt Biocontrol, BIOGARD (Division of CBC (EUROPE)), upna (Universidad Pública de Navarra), JKI (Julius Kühn-Institut), and hellafarm S.A.

# BCA to control



*Tuta absoluta*



*Phthorimaea operculella*  
granulovirus



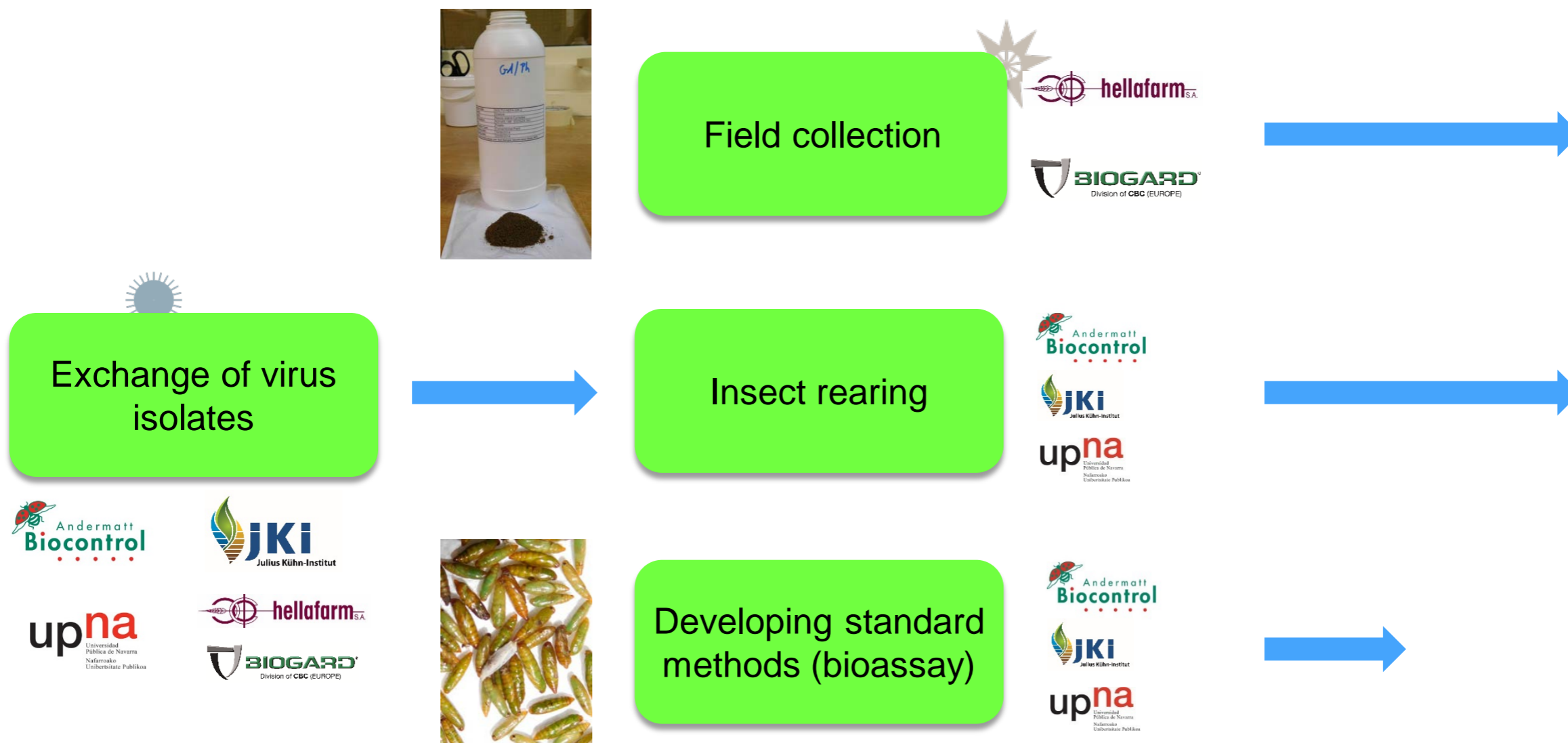
*Phthorimaea operculella*



*Tecia solanivora*

- ➔ Increasing resistances
- ➔ Biological control tools necessary for sustainable control (strategies)

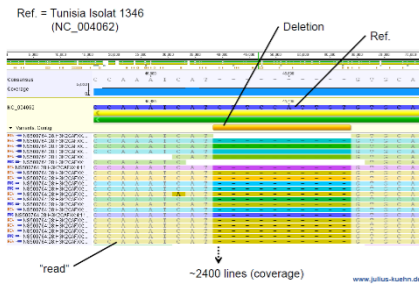
# Approach (was made possible thanks to BIOCOMES)



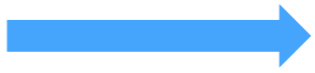
## Step 1

- ➔ Provide a wide genetic basis
- ➔ Establish insect rearing
- ➔ Development of necessary tools

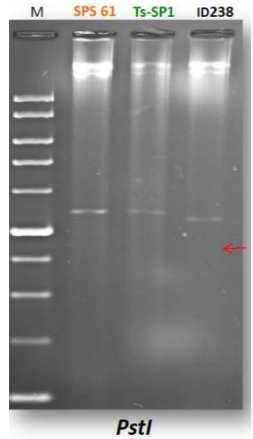
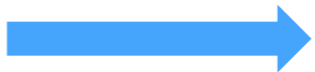
# Approach (was made possible thanks to BIOCOMES)



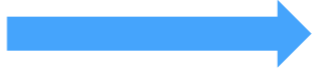
Sequencing / REN analysis of PhopGV



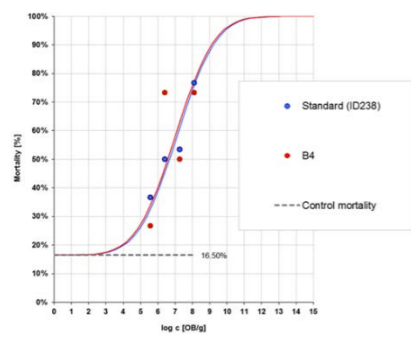
Determination of LC50 / LT50



Increase of virus yield



Most appropriate PhopGV isolates identified



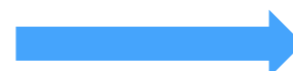
## Step 2

- ➔ Molecular characterization
- ➔ Determination of activity/speed of kill
- ➔ Optimization of production system

# Approach (was made possible thanks to BIOCOMES)



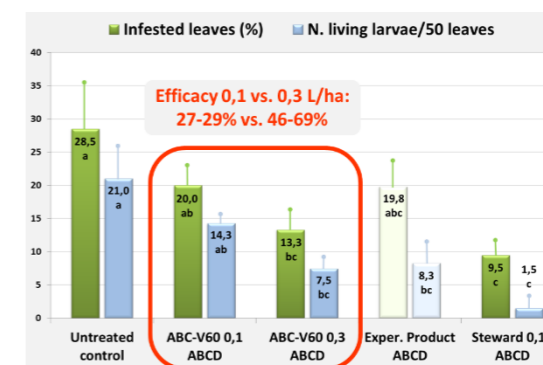
Production of test batches



Efficacy trials



Trial code:	HL-Bef/5/16/16-1	HL-Bef/5/16/16-2	HL-Bef/5/16/16-3
Population:	all stages of <i>T. absoluta</i> present from the beginning (26/05/2016) till the end (17/06/2016)	all stages of <i>T. absoluta</i> present from the beginning (26/05/2016) till the end (17/06/2016)	First adults' catches and L1-L2 larva of <i>T. absoluta</i> observed on 1st application (08/09/2016). From 3rd application (22/09/2016) till the end (14/10/2016) all stages
Damaged leaflets:	84-100%	48-100%	7-54%
Mines/leaflet:	2.5-14.8	1.2-8.5	0.1-1
Larvae/leaflet:	0.4-2.8	0.2-2.3	0.03-0.3
Damaged fruits:	9-90%	7-48%	10-16% (when available)



## Step 3

- ➔ Development of test products
- ➔ Trial protocols
- ➔ Greenhouse/field trials

# Added value of BIOCOMES

- ➔ Substantive, scientific investment needed
  - ➔ Closing the gap between Science and Industry
- ➔ Making the development of a new, marketable BCA possible
  - ➔ Accurately timed (for growers and for the producer)
  - ➔ Simplified cooperation (public-private) through adequate project structures
  - ➔ With support also for a niche market
- ➔ Specific expert knowledge available
  - ➔ Virology and insect pathology
  - ➔ Molecular methc



BIOCOMES

New biological control products  
for sustainable farming and forestry

➔ Applications tec



Andermatt  
**Biocontrol**


ow-how





# Results & expectations

At the end of the BIOCOMES project 

- ➔ Highly efficient and marketable PhopGV product
-  ➔ Sustainable control solution, also for resistance management
- ➔ Product against Tuta and PTM ready for registration
  - ➔ Additional data for the dossier has to be collected
- ➔ Comprehensive knowledge about the BCA PhopGV
- ➔ Stable and high-quality production process
- ➔ Extended expert network, valuable for future cooperation

# Added value of a public-private cooperation

e-nema & BIOCOMES



Ralf-Udo Ehlers  
e-nema GmbH



# New technology

Domestication of a biocontrol agent:

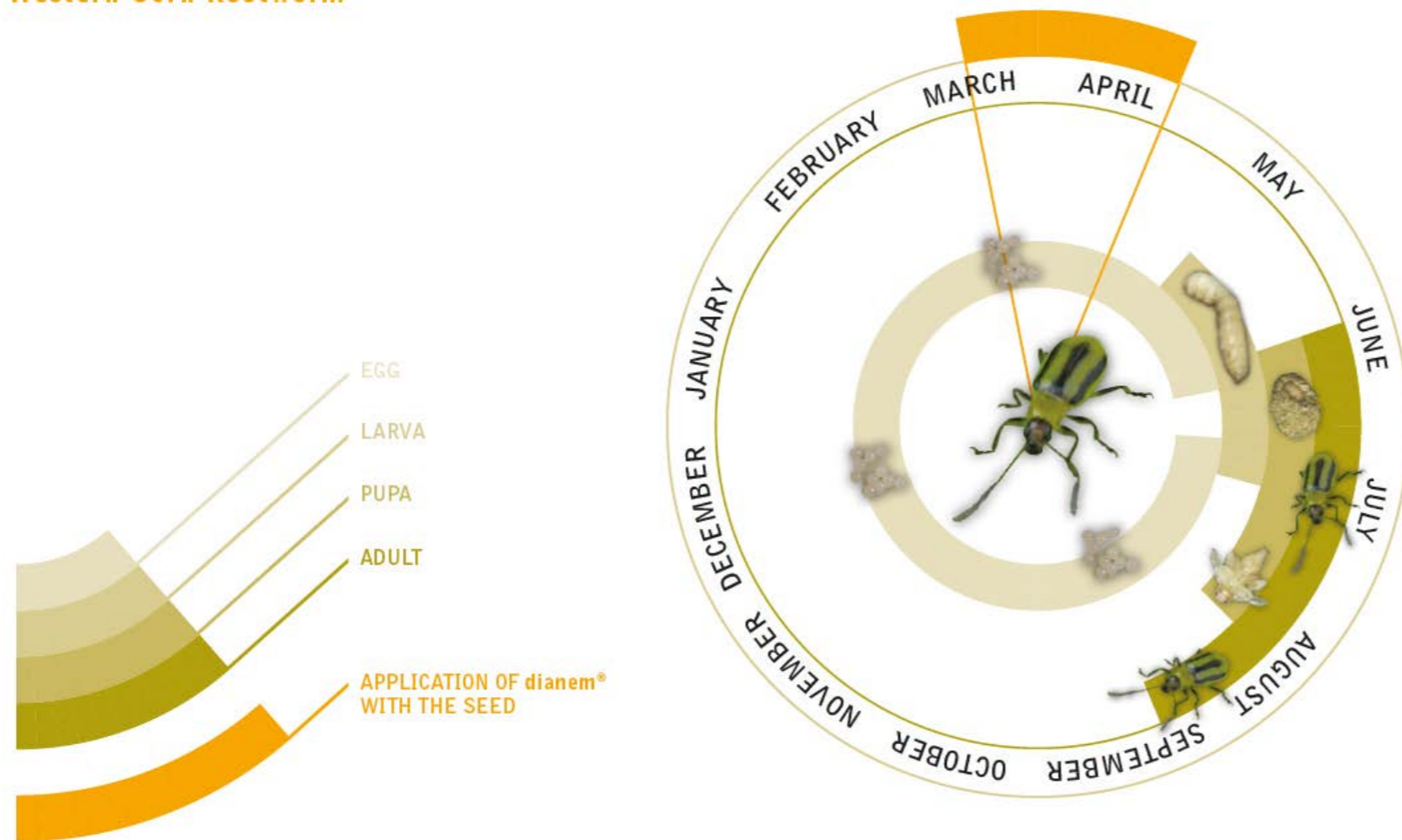
Entomopathogenic nematode

*Heterorhabditis bacteriophora*

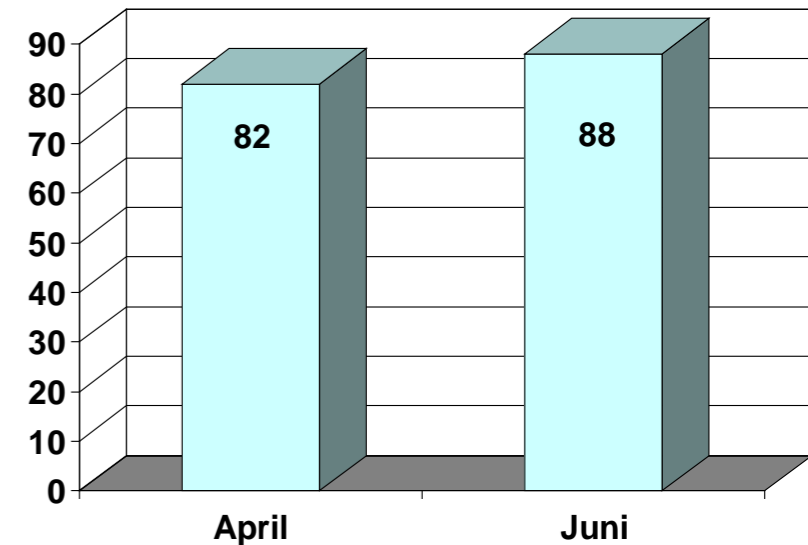


# Lifecycle Corn Rootworm (CRW)

Western Corn Rootworm



Control Adults/Plant (%)



Application during sowing into the drill. No extra application costs. Application with 200-400 ltr./ha. Nematodes must persist until larval hatch (4-6 weeks)

## BIOCOMES WP2 main objective

### Produce a nematode strain with better performance

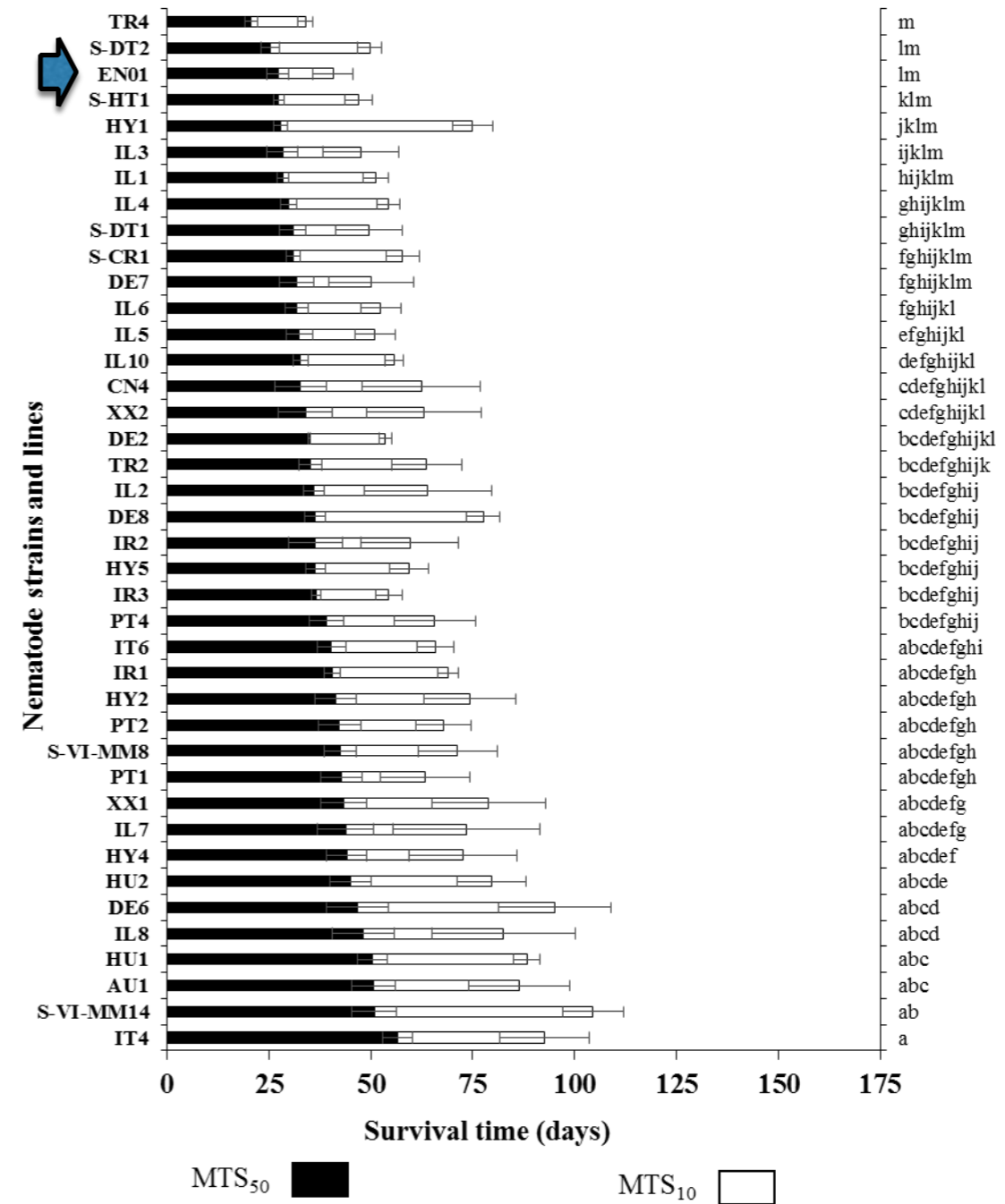
#### Improvement of traits:

- Shelf-life and field persistence (longevity)
- Tolerance to desiccation and heat
- Virulence against Corn Rootworm

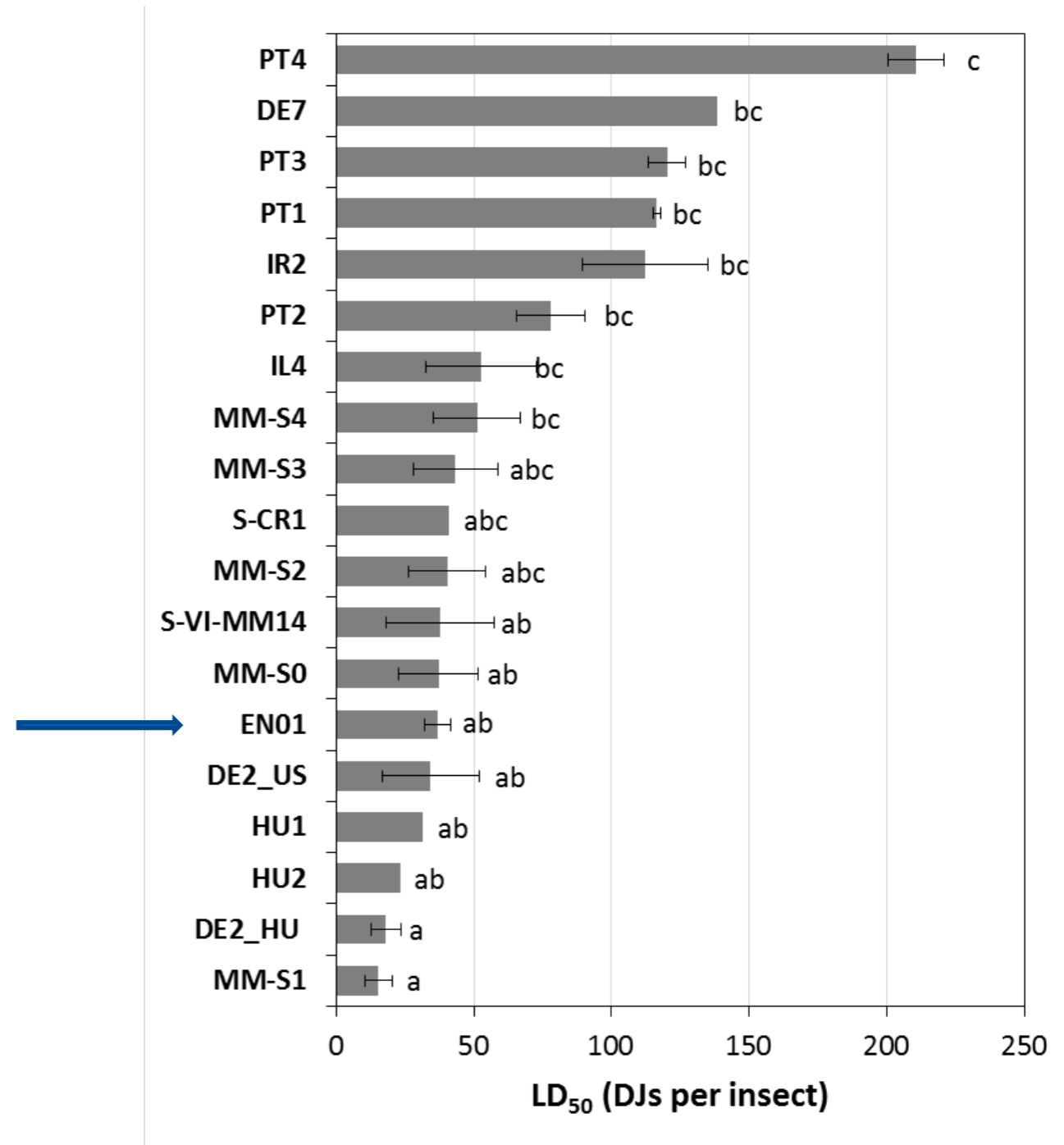
# How to reach that goal?

First step:  
Phenotyping strain collection

Mean time survived by 50% ( $MTS_{50}$ ) and 10% ( $MTS_{10}$ ) of 40 *H. bacteriophora* strain and inbred line DJ populations stored in Ringer's solution at 25°C



# Phenotyping virulence against CRW



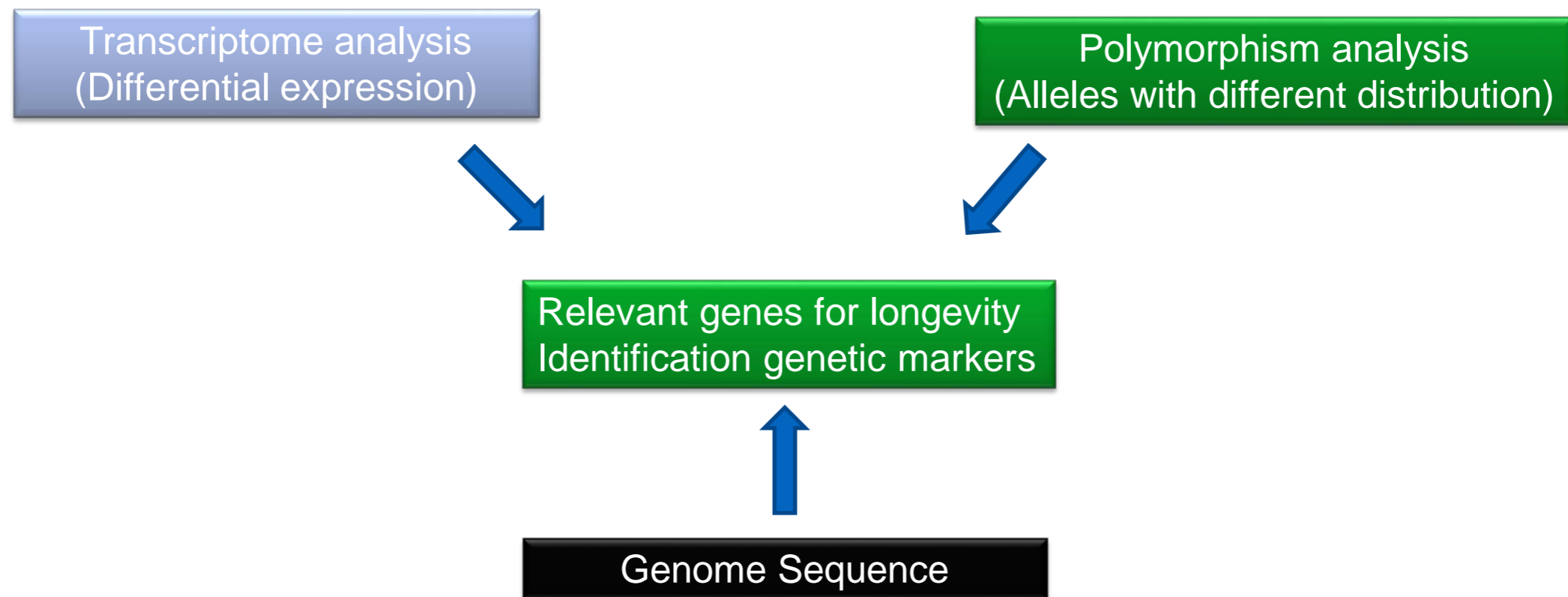
# Genotyping

Expression analysis was performed for longevity

Forty eight strains were sequenced via GBS (genotyping by sequencing)

Genome sequence produced from two strains

Genetic markers (QTL) related with longevity and persistence were identified





# Added value of BIOCOMES

- ➔ We have been breeding in the past
- ➔ Biocomes enabled us to establish new technology
- ➔ Contact with academia accelerated progress
- ➔ Our activities might motivate more labs to work with EPN
- ➔ We participated also in other fields

[www.e-nema.de](http://www.e-nema.de)

Youtube: e-nema nematode

# Learn more about public private cooperations in BIOCOMES: Visit Booth 28 and [www.biocomes.eu](http://www.biocomes.eu)



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