

SASA



## EUPHRESKO II

### PHYLIB

**Epidemiology and diagnosis of potato  
phytoplasmas and *Candidatus Liberibacter  
solanacearum* and their contribution to risk  
management in potato and other crops**

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Science and Advice  
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# EUPHRESKO

- to increase cooperation and coordination of national phytosanitary (statutory plant health) research programmes at the EU level through networking of research funding activities
- management funded from the EU Framework Programme (FP7 from 2011-2013).

**is essential to ensure effective support of EU policy and its implementation.**

# EUPHRESKO

**2006-2010:** 23 partners in 17 countries

**2011-** 31 partners in 22 countries

12 European observer countries

2 international observers



# PHYLIB: key objectives

**to develop sampling and diagnostic methods to ensure reliable screening of material for phytoplasmas and *Ca Liberibacter solanacearum***

- database of collections (DNA, live) worldwide
- establish reliable methods for maintenance of isolates in host(s)  
eg potato/periwinkle microplants (in vitro)
- mapping of movement in potato
- establish genetic diversity of populations
- selection of “best” diagnostic protocols/ development
- Ring tests / proficiency tests

# PHYLIB: key objectives

to improve our understanding of the epidemiology of both  
**Phytoplasma's and *Liberibacter solanacearum***

- Are the Lso haplotypes present in the EU able to affect potato?**
- What is the source of inoculum?**
  - seed transmission e.g. carrot, celery
  - overwintering hosts
  - other ?
- Can vectors transmit Lso from carrot/celery to potato/tomato**

| <b>Ribosomal subgroup</b> | <b>Phytoplasma group</b>        | <b>Phytoplasma species</b>          |
|---------------------------|---------------------------------|-------------------------------------|
| 16SrI-A                   | Aster yellows                   | <i>Ca. Phytoplasma asteris</i>      |
| 16SrI-B                   | Aster yellows                   | <i>Ca. Phytoplasma asteris</i>      |
| 16SrII                    | Peanut witches broom            | <i>Ca. Phytoplasma aurantifolia</i> |
| 16SrIII                   | X-disease                       |                                     |
| 16SrV                     | Elm yellows                     |                                     |
| 16SrVI                    | Clover proliferation            | <i>Ca. Phytoplasma trifolii</i>     |
| 16SrX-A                   | Apple proliferation group       | <i>Ca. Phytoplasma mali</i>         |
| 16SrXII-A                 | Bois Noir                       |                                     |
| 16SrXIII                  | Stolbur                         | <i>Ca. Phytoplasma solani</i>       |
| 16SrXVIII-A               | American potato purple top wilt | <i>Ca. Phytoplasma americanum</i>   |
| 16SrXVIII-B               |                                 | <i>Ca. Phytoplasma americanum</i>   |

potato purple top

# Zebra chip disease

Darkened stripes in potato crisps



Discolouration of medullary rays



Swollen nodes, leaf curl, purple top, wilt, aerial tubers



Mexico 1994  
USA 2000  
Sporadic losses

2004+ USA  
\$ million + losses

2006+ eastern Europe  
\$ million + losses

# Bacteria associated with zebra chip

## ***Candidatus Liberibacter solanacearum***

**NZ** 2008

**North America:** Mexico (Coahuila, Sinaloa),  
USA (California, Kansas, Nebraska, Nevada, Texas,  
Wyoming).

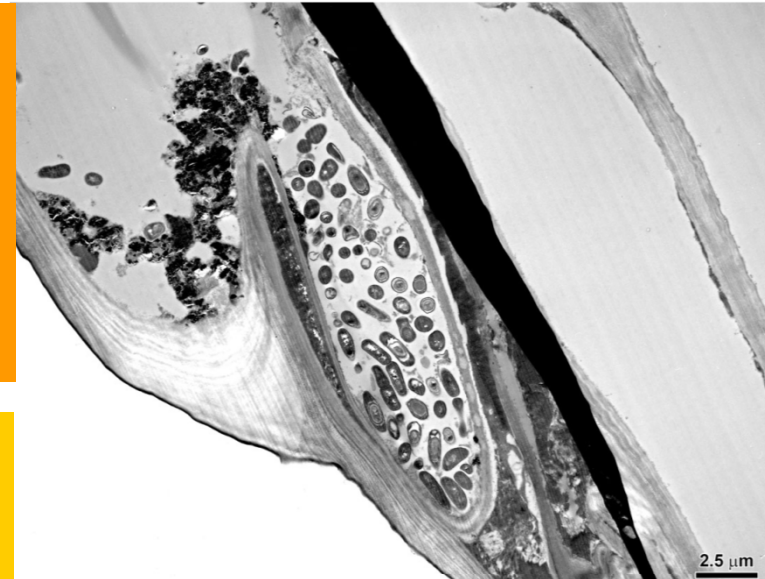
**Central America:** Honduras, Guatemala

## ***Ca. Phytoplasma solani***

**Europe:** Hungary, Romania, Russia

## **Phytoplasmas and Liberibacter**

- Obligate parasites of plant phloem tissue
- They cannot be cultured *in vitro* in cell-free media
- Liberibacter has a cell wall (gram-negative)
- Phytoplasmas do not have a cell wall



TEM images of *Ca. L. solanacearum*  
Images: G Secor

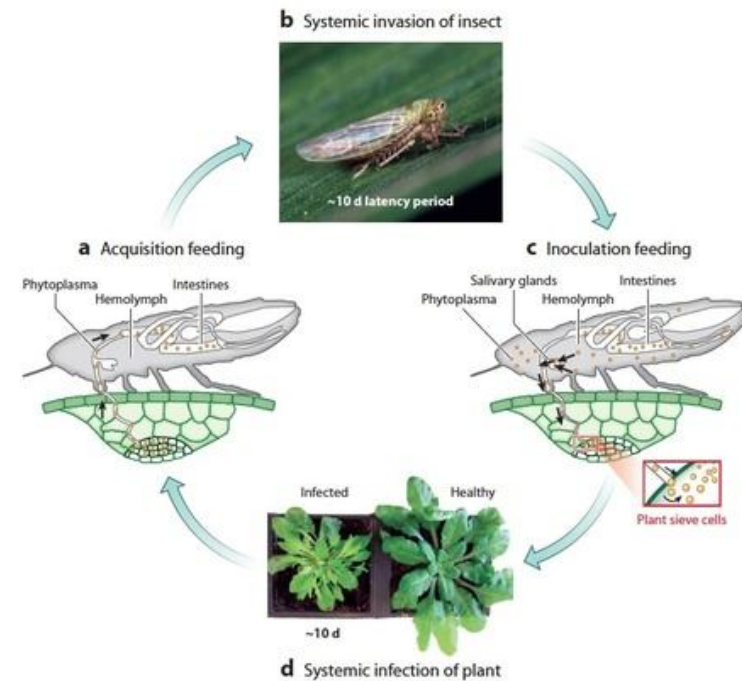
# Vectors and hosts

Psyllid not present in Europe

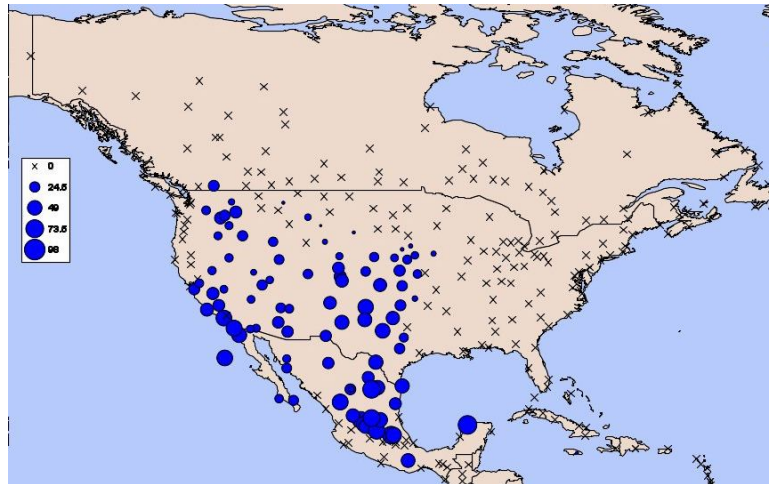
| <b>Ca P solani</b>   | <b>Ca L solanacearum</b>  |
|--|---|
| <b>VECTOR</b><br>Plant/leaf hopper:<br><i>Hyalesthes obsoletus</i><br><i>Reptalus</i> spp.                                     | <b>VECTOR</b><br>Psyllid:<br><i>Bactericera cockerelli</i><br>(potato/tomato)   |
| <b>HOSTS</b><br><b>Solanaceous crop plants</b><br>e.g.<br>Potato<br>Tomato<br><br><b>Others</b><br>Bindweed<br>Everlasting Pea | <b>HOSTS</b><br><b>Solanaceous crop plants</b><br>e.g.<br>Potato<br>Tomato<br>Pepper/Chilli<br>Eggplant<br>Cape gooseberry<br><br><b>Others</b><br>Peas ?<br>Mallow ?<br>Cypressus ?<br>Weeds<br>( <i>Polygonaceae/Solanaceae</i> ) |



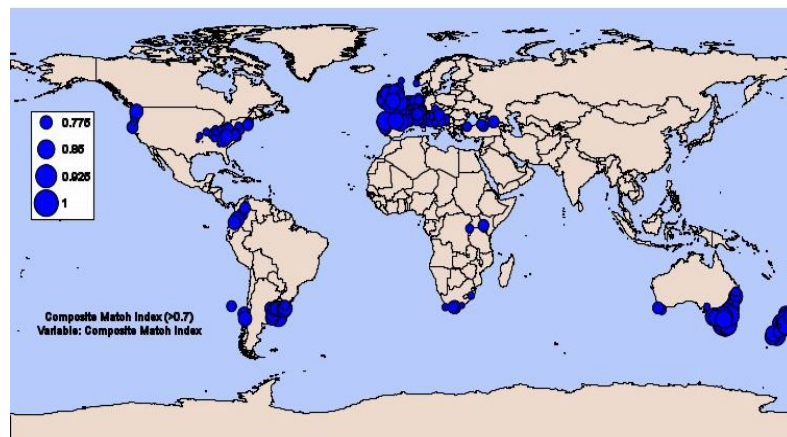
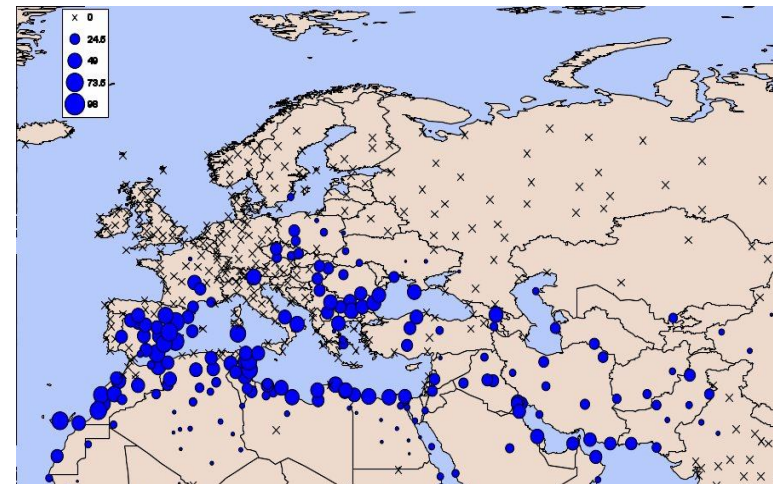
*Hyalesthes obsoletus*    *Bactericera cockerelli*



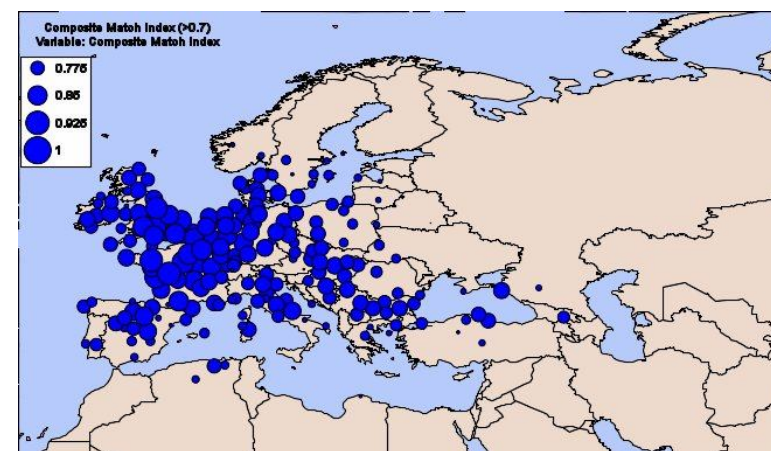
# CLIMEX: Potential distribution of *Bactericera cockerelli*



Potential distribution based on N America pest data



Potential distribution based on New Zealand pest data



# Ca L solanacearum: Carrots, Finland 2010

Carrots, celery, Spain 2011

Carrots, France, Norway, Sweden 2012



Feeding damage



Infection with Ca L solanacearum



Does not feed  
on potato

Carrot psyllid (*Troza apicalis*)



*Bactericera trigonica*

## EU: Potato stolbur legislation 2000/29/EC

**HARMFUL ORGANISMS WHOSE INTRODUCTION INTO, AND SPREAD WITHIN, ALL MEMBER STATES SHALL BE BANNED IF THEY ARE PRESENT ON CERTAIN PLANTS OR PLANT PRODUCTS HARMFUL ORGANISMS KNOWN TO OCCUR IN THE COMMUNITY AND RELEVANT FOR THE ENTIRE COMMUNITY**

Plants of *Solanaceae*, intended for planting, other than seeds

### EPPO (Recommendations)

Potato stolbur A2 pest

Potato purple-top wilt phytoplasma A1 pest

# *Candidatus Liberibacter solanacearum* and *Bactericera cockerelli*

## **EPPO Pest risk analysis for:**

- Candidatus Liberibacter solanacearum* in *Solanaceae*
- Bactericera cockerelli*
- Approved by EPPO September 2012
- EPPO A1 quarantine pests
  
- Soliman *et al* (2013) Economic justification for quarantine status – the case study of ‘*Candidatus Liberibacter solanacearum*’ in the European Union. Plant Pathology (online) Jan 2013.

# *Candidatus Liberibacter solanacearum* and *Bactericera cockerelli*

## **EPPO Pest risk analysis for:**

*Candidatus Liberibacter solanacearum* in *Solanaceae*

*Bactericera*

Appro

EPPO

Solim *et al* (2013) *EU Quarantine*

status – the case study of ‘*Candidatus Liberibacter solanacearum*’ in the European Union. *Plant Pathology* (online) Jan 2013.

**Action by  
EU Plant Health Standing Committee  
????????**

# Diagnosics

## **Post-entry quarantine requirements for potato specified in 2008/61/EC**

- no testing is specified for phytoplasmas and *Liberibacter solanacearum*
  
- EPPO recommends testing for phytoplasmas using universal primers

# Diagnostics

## Post-entry quarantine requirements specified in 2008/61/EC

- no testing is specified for phytoplasmas and *Liberibacter solanaceae*

- EPPC universal  
prime

No testing done by NPPOs  
in potato post-entry quarantine  
or  
potato nuclear stocks for entry to potato  
certification schemes?